

**BEFORE THE HON'BLE NATIONAL GREEN TRIBUNAL
EASTERN ZONAL BENCH - KOLKATA
IN**

O.A. No. 154/2022/EZ (IA No. 236/2022/EZ) & EA No. 02/2024/EZ IN

THE MATTER OF:

Yodh Bdr. Thapa

...Applicant

Versus

Bharat Petroleum Corp. Ltd. & Ors.

... Respondent(s)

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S' L. Instrument No. 29

Date 19/08/2024

(Mantu Kumar Choudhury)

Regional Director & Scientist 'F',
Central Pollution Control Board, CTO
Building, Shillong 793001.

Filed Through Counsel

Dated: 19.08.2024
Place: Shillong

एम. के. चौधुरी/ M. K. Choudhury
वैज्ञानिक 'एफ' / Scientist 'F'

केन्द्रीय प्रदूषण नियंत्रण बोर्ड
Central Pollution Control Board
(पर्यावरण वन और जलवायु परिवर्तन मंत्रालय, भारत सरकार)
(Ministry of Environment, Forest & Climate Change, Govt. of India)
क्षेत्रीय निदेशालय - शिलांग
Regional Directorate - Shillong
वी एस एन एल, एन ई - 1, टेलीकॉम सर्कल, सी टी ओ भवन, शिलांग - 793001
BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001



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AFFIDAVIT ON BEHALF OF THE RESPONDENT NO. 3 CENTRAL POLLUTION CONTROL BOARD FOR SUBMISSION OF DOCUMENT (SOP FOR PETROL DEPOTS).

I, Mantu Kumar Choudhury S/o Late A. C. Choudhury, aged about 59, scientist 'F' and Regional Director, having office at the Regional Directorate, Central Pollution Control Board (CPCB), CTO- Building, Shillong-793001, do hereby solemnly affirm and declare as under:

1. That the deponent herein is authorized representative to represent the Respondent CPCB in the present case, and hence, competent and authorized to depose and swear the present affidavit.
2. That Hon'ble National Green Tribunal, Eastern Zone Bench, Kolkata in the matter of Original Application No.154/2022/EZ (I.A. No.236/2022/EZ) vide order dated 17.04.2023 had directed Central Pollution Control Board to prepare Standard Operating Procedure (SOP) for Petrol Depots within three months.
3. That the first draft of SOP for Petrol Depots was prepared in May 2023. Further the draft SOP was sent to Ministry of Petroleum and Natural Gas (MoPNG) vide letter dated 18 July 2023 for providing their comments.
4. That the Ministry of Petroleum and Natural Gas (MoPNG) through their office memorandum dated 13.11.2023 provided the comments of Oil India Safety Directorate (OISD), Petroleum and Natural Gas Regulatory Board (PNGRB) and Oil Manufacturing Companies and requested CPCB to conduct a meeting with all the stakeholders before finalization of SOP.



एम. के. चौधुरी/ M. K. Choudhury
वैज्ञानिक 'एफ' / Scientist 'F'

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(Ministry of Environment, Forest & Climate Change, Govt. of India)
क्षेत्रीय निदेशालय - शिलांग
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बी एस एन एल, प्लॉट ई - 1, टेलीकॉम सर्कल, सी टी ओ भवन, शिलांग - 793001
BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001

5. That subsequently a meeting through video conference with petroleum industry representatives was conducted on 04.12.2023. The draft of SOP was further modified on the basis of discussions held during meeting dated 04.12.2023.
6. That after the discussions, the draft SOP was communicated to all State Pollution Control Boards / Pollution Control Committees vide letter dated 06.05.2024 to provide their comments within 01 month and a copy of draft of SOP was also uploaded on CPCB's website for general public / stakeholders for providing comments within one month.
7. That the MoPNG vide office memorandum dated 17.05.2024 provided the comments of PNGRB and OISD on the draft of SOP and requested CPCB again for detailed consultation / deliberation with the stakeholders before finalization of SOP.
8. That Central Pollution Control Board conducted a meeting through Video Conference on 26.06.2024, along with Oil Manufacturing Companies / OISD / PNGRB on the draft of SOP for Petrol Depots which was uploaded on CPCB website.
9. That after deliberations of the aforementioned two meetings dated 04.12.2023 and 26.06.2024 and giving consideration to the opinion of stakeholders, CPCB has prepared the SOP for Petrol Depots.
10. That the Hon'ble Tribunal vide order dated 06.08.2024, directed CPCB to file fresh affidavit in compliance of which the present affidavit is being filed before Hon'ble Tribunal.
11. That vide para 8 to 10 of the Hon'ble Tribunal's aforementioned order dated 06.08.2024, CPCB was directed to submit the extant law/guidelines issued by the Ministry of Petroleum and Natural Gas/PESO/any other statutory organization regarding location and siting of Petrol Depot. In this regard, it is respectfully submitted that :
 - (i) Petroleum and Natural Gas Regulatory Board (PNGRB) vide its notification F. No PNGRB/Tech/7-T4SPI (1)/2020 dated 11.11.2020 has notified the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Regulations, 2020; and the Oil Industry Safety Directorate (OISD) has prescribed standards regarding Layouts for Oil and Gas Installations vide OISD standard- 118. The aforementioned PNGRB Regulations and OISD standards are applicable for petroleum installations including petrol depots. The aforementioned PNGRB Regulations and OISD standards emphasized on crucial aspects viz. Site topography including elevation, slope, and drainage, Meteorological data, Bathymetric data for installations in coastal areas, Seismic data and probability of Tsunami in coastal areas, Highest flood

एम. के. चौधुरी/ M. K. Choudhury
वैज्ञानिक एफ/ Scientist 'F'

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(Ministry of Environment, Forest & Climate Change, Govt. of India)
क्षेत्रीय निदेशालय - शिलांग
Regional Directorate - Shillong
डी एस एन एल, एन ई - 1, टेलीकॉम सर्कल, सी टी ओ भवन, शिलांग - 793001
BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001

level in the area, water table, natural streams or canals, Approach roads, Statutory requirements etc. amongst other aspects while planning layout of petroleum installations. Further, the Petroleum Rules, 2002 notified by Ministry of Petroleum and Natural Gas (MoPNG) on 13.03.2002 vide Rule 131 specify the role of Chief Controller (Chief Controller of Explosives) in prior approval of specifications and plans of premises proposed to be licensed for storage and import of petroleum. Further, it is respectfully submitted that the Chief Controller of Explosives (PESO) is the authority listed in Schedule 5 of The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 regarding approval and notification of sites in respect of Industrial installation and isolated storages dealing with hazardous chemicals that include Petrol Depots also. The copies of aforementioned PNGRB regulations, OISD standards, Petroleum Rules, 2002 and The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 are enclosed as **Annexure – I to IV** respectively.

- (ii) It is respectfully submitted that while preparing the SOP, it was observed that separation distances between tank / offsite facilities for large and small installations that are specified in aforementioned PNGRB regulations and OISD standards are limited to the boundary walls of these installations.
- (iii) Further, it is respectfully submitted that the Ministry of Petroleum & Natural Gas (MoP&NG) had constituted a seven-member independent inquiry committee chaired by Sh. MB Lal to inquire into the incident dated 29.10.2009 at the Indian Oil Corporation's POL (Petroleum Oil Lubricants) Terminal at Jaipur. The report of the aforementioned committee is uploaded on the website of OISD. Under Chapter 10 titled recommendations, the S No. 10.20(ii) titled Amendment of Existing Statutes reads as follows :

"The Petroleum Rules 2002 which regulates the Safety in Petroleum Installations do not specify any distances to be kept clear or unoccupied beyond the boundaries of the Installation. The Committee has studied the vapour cloud dispersion models in this incident and is of the opinion that a distance of 250 to 300 meters from the likely point of ignition is necessary to be kept clear. The Committee recommends that the Petroleum Rules 2002 may be suitably amended for a buffer safety zone around the Petroleum Installations."

The report of aforementioned MB Lal Committee is enclosed as **Annexure – V**.

- (iv) Further, it is respectfully submitted that Standing Committee On Petroleum & Natural Gas (2018-19) presented its twenty sixth report titled "Action Taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Standing Committee on Petroleum and Natural Gas (2017-18) on the subject Safety, Security and Environmental Aspects in Petroleum Sector" in The Lok Sabha on 07.01.2019. The aforementioned standing committee report is enclosed as **Annexure –VI**.

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एम. के. चौधुरी / M. K. Choudhury
वैज्ञानिक एफ / Scientist 'F'

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(Ministry of Environment, Forest & Climate Change, Govt. of India)
क्षेत्रीय निदेशालय - शिलांग
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BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001

Chapter II of aforementioned standing committee report (From Page No. 23 to 35) contains the recommendations / observations which have been accepted by the Government. And the recommendations of MB Lal Committee regarding buffer zone are also listed under the recommendations/ observations which have been accepted by the Government (at Recommendation no. 11, Page No. 30) of aforementioned standing committee report.

The aforementioned standing committee emphasized on buffer zone of at least 250-300 metres around petroleum installations.

From the aforementioned standing committee report it is observed that regarding recommendations of buffer zone, the MoPNG had stated its reply that a communication was sent to all the Chief Secretaries of States / Union Territories on 02.04.2013 regarding prohibition of proliferation of unauthorized hutment, shops or residential houses within a band of at least 250-300 metres around periphery of Oil installation. The aforementioned communication was followed by a reminder on 20.01.2016. Reports were received only from 4 States/ Union Territories ; and another communication was sent to States/ Union Territories on 30.08.2018.

- (v) It is respectfully submitted that in view of aforementioned facts, CPCB in the SOP filed before the Hon'ble Tribunal included the following points amongst others under the subheading Location and Siting of Petrol Depots that *"the location and siting of petrol depot shall strictly be in accordance with the extant law / guidelines issued by Ministry of Petroleum and Natural Gas / PESO / any other statutory organization as applicable; and The petrol depots shall comply with the MoPNG accepted recommendations of the M.B. Lal Committee (which was constituted by MoPNG to probe the incident of fire at IOC's POL Terminal at Jaipur in 2009) regarding creation of a buffer zone around oil installations and terminals as per extant rules and policies of MoPNG. The quantitative/cumulative risk of all tanks of petrol depots should be zero at petrol depot boundary wall by providing adequate mitigation measures."*

12. That vide para 11 to 12 of the Hon'ble Tribunal order dated 06.08.2024, CPCB was directed to disclose whether the siting criteria stated in the SOP filed by Sikkim State Pollution Control Board states that *"unit shall maintain a distance of at least 100 m from residential area, educational institutions, healthcare facilities, historical structures, places of worship"* has been considered by CPCB or not. In this regard, it is respectfully submitted that CPCB has not considered the aforementioned siting criteria stated in the SOP filed by Sikkim State Pollution Control Board since it contravenes the recommendations regarding buffer zone of 250 to 300 metres, which is recommended by MB Lal Committee and accepted by the MoPNG. It is respectfully submitted that



एम. के. चौधरी / M. K. Choudhury
वैज्ञानिक एफ / Scientist 'F'

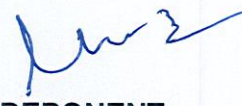
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क्षेत्रीय निदेशालय - शिलांग
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बी एस एन एल, एन ई - 1, टेलीकॉम सर्कल, सी टी ओ भवन, शिलांग - 793001
BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001

CPCB in its SOP filed before the Hon'ble Tribunal has mentioned that the petrol depots shall comply with the MoPNG accepted recommendations of the M.B. Lal Committee (which was constituted by MoPNG to probe the incident of fire at IOC's POL Terminal at Jaipur in 2009) and hence respectfully submits to the Hon'ble Tribunal that CPCB is of the opinion that a buffer zone of 250 to 300 metres around the petrol depot is imperative, in respect of the location of petrol depot from the areas of human habitation including residential, industrial and commercial areas.

Therefore CPCB respectfully submits that S No. 2 of Section F (Location and Siting of Petrol Depot) of the SOP submitted by CPCB before The Hon'ble Tribunal implies that a buffer zone of 250 to 300 metres should be provided between the petrol depots and the areas of human habitation including residential, industrial and commercial areas and other sites of human gathering including educational institutions, healthcare facilities, historical structures, places of worship etc. in accordance with the recommendations of MB Lal Committee.

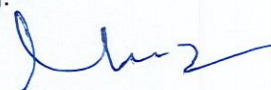
13. That, it is humbly submitted that CPCB has prepared the SOP after consideration and examination of the inputs received from the Ministry of Petroleum and Natural Gas, Oil India Safety Directorate, Petroleum and Natural Gas Regulatory Board and Oil Manufacturing Companies.
14. That the document "SOP for Petrol Depots" has been prepared in compliance of the order dated 17/04/2023 of Hon'ble NGT passed in instant matter and the same is attached as **Annexure-VII** to this affidavit.
15. That the affidavit has been filed under my instructions and authority, the contents thereof are true and correct on the basis of the record maintained during ordinary course of business of CPCB and the contents of the same are read over and explained to me and are not repeated herein for the sake of brevity.


DEPONENT

VERIFICATION

I, Mantu Kumar Choudhury, the above named deponent do hereby verify that the contents of the above affidavit and document are true and correct to my knowledge based on official records, no part of it is false and nothing has been concealed therefrom.

Signed and verified on this Day of 19th August, 2024 at Shillong.


DEPONENT

Through Counsel

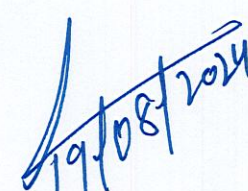
Advocate, Shillong
Meghalaya
Identified by

एम. के. चौधुरी/ M. K. Choudhury
वैज्ञानिक एफ/ Scientist 'F'

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क्षेत्रीय निदेशालय - शिलांग
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बी एस एन एल, एन ई - 1, टेलीकॉम सर्कल, सी टी ओ भवन, शिलांग - 793001
BSNL NE - 1, Telecom Circle, CTO Building, Shillong - 793001


Lakshmi Tiwari
Notary Public
Govt of India

PETROLEUM AND NATURAL GAS REGULATORY BOARD

NOTIFICATION

New Delhi, the 11th November, 2020

F. No PNGRB/Tech/7-T4SPI (1)/2020.-In exercise of the powers conferred by section 61 of the Petroleum and Natural Gas Regulatory Act, 2006 (19 of 2006), the Petroleum and Natural Gas Regulatory Board hereby makes the following Regulations, namely: -

1. Short title and commencement:

(1) These Regulations may be called the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Regulations, 2020.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions-

(1) In these regulations, unless the context otherwise requires,

- (a) “Act” means the Petroleum and Natural Gas Regulatory Board Act, 2006 (19 of 2006);
- (b) “Board” means the Petroleum and Natural Gas Regulatory Board established under sub-section (1) of section 3 of the Act;
- (c) “Bonding” means the process by which two electrical conducting bodies are connected using a conductor to maintain electrical continuity to prevent sparking;
- (d) “Clean agent” means electrically nonconductive, volatile or gaseous fire extinguishing medium that does not leave a residue upon evaporation and meets the requirements given in the latest NFPA 2001 on clean agent fire extinguishing systems in line with environmental considerations of Kyoto and Montreal Protocol and latest MOEF regulations (Government of India, Ministry of Environment, Forest and Climate Change);
- (e) “corrosion” means all forms of wastage, and includes oxidation, scaling, mechanical abrasion and corrosion;
- (f) “design pressure” means the pressure used in the design of equipment, a container, or a vessel for the purpose of determining the minimum permissible thickness or physical characteristics of its different parts and where applicable, static head shall be included in the design pressure to determine the thickness of any specific part;
- (g) “Dyke” means an area that may be defined through the use of structure or the topography at the site for the purpose of containing any accidental spill of petroleum products;
- (h) “Earthing” means the provision of a safe path of electrical current to ground, in order to protect structures, plant and equipment from the effects of stray electrical current, and electrostatics discharge;
- (i) “Effluent Treatment Plant (ETP)” means a mechanism and process used to treat waters

that have been contaminated due to presence of Oil or sludge or Grease or chemicals or sewage generated of different activities or operations in petroleum installations;

- (j) “Emergency Shutdown System” means a system that safely and effectively stops whole plant or an individual unit before unrecoverable incidents occurs;
- (k) “Explosive mixture” means a mixture of combustion agent (oxidising product gas, vapour, liquid or solid) and a fuel (oxidisable product - gas, liquid or solid) in such proportions that it could give rise to a very rapid and lively oxidization reaction liberating more energy than is dissipated through conduction and convection; and-
 - (i) “Lower explosive Limit (LEL)” means the minimum concentration of a vapour in air (or other oxidant) below which propagation of flame does not occur on contact with an ignition source and such limit is usually expressed as volume percentage of the vapour in air;
 - (ii) “Upper Explosive Limit (UEL)” means the maximum concentration of a vapour in air (or other oxidant) above which propagation of flame does not occur on contact with an ignition source and such limit is usually expressed as a volume percentage of vapours in air;
- (l) “Failsafe” means design features which will maintain or result in safe operating conditions in the event of a malfunction or failure of power, instrument air, components or control devices;
- ¹[(la) “Fire station” means building housing facilities for parking fire tenders and for keeping in readiness, other fire-fighting equipment for meeting plant emergencies and, fire control room with required communication facilities mimic panel.]
- (m) “Fixed-Length Dip Tube” means a pipe that has a fixed open end fitted inside a container at a designated elevation that is intended to show a liquid level;
- (n) “flammability range” means the difference between the minimum and maximum percentage by volume of the gas in mixture with air that forms a flammable mixture at atmospheric pressure and ambient temperature;
- (o) “Flash Point” means the lowest temperature at which the liquid yields vapour in sufficient concentration to form an ignitable mixture with air and gives a momentary flash on application of a small pilot flame under specified conditions of test as per IS: 1448 (Part-I);
- (p) “Hazardous Fluid” means a liquid or gas that is flammable or toxic;
- (q) “Hazardous Area” means the locations classified according to Zone System which defines the probability of the hazardous material, gas or dust, being present in sufficient quantities to produce explosive or ignitable mixtures which require special precautions for the construction, installation and use of electrical apparatus as specified below:
 - (i) “Zone 0” means ignitable concentrations of flammable gases or vapours which are present continuously or for long periods of time;
 - (ii) “Zone 1” means ignitable concentrations of flammable gases or vapours which are likely to occur under normal operating conditions; and
 - (iii) “Zone 2” means ignitable concentrations of flammable gases or vapours which are not likely to occur under normal operating conditions and do so only for a short period of time;
- (r) “Intrinsically Safe” means a circuit or part of a circuit, which is intrinsically safe when any spark or thermal effect produced normally (that is, by breaking or closing the circuit) or accidentally (for example, by short circuit or earth fault) is incapable, under

¹ Ins. by cl. (i) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

specific test conditions for such purpose, of causing ignition of a specific gas or vapour and an intrinsically safe apparatus is one in which all electrical circuits are intrinsically safe;

- (s) “Non- Hazardous area” means an area in which an explosive gas atmosphere is not expected to be present in quantities such as to require special precautions for the construction, installation and use of electrical apparatus;
- (t) “Ignition Source” means any item or substance capable of an energy release of type and magnitude sufficient to ignite any flammable mixture of gases or vapours that could occur at the site;
- (u) “Maximum Allowable Working Pressure” means the maximum gauge pressure permissible at the top of equipment, a container or a pressure vessel while operating at design temperature;
- (v) “NDT” means Non-Destructive Testing methods like Dye Penetration Inspection, Wet Fluorescent Magnetic Particle Inspection, Ultrasonic thickness checks, Ultrasonic Flaw Detection, Radiography, Hardness Test and other relevant Inspection procedures carried out to detect the defects in the welds and parent metal of the pressure vessel;
- (w) “Oil water separator (OWS)” means a system designed to separate gross amount of oil and suspended solids from the oily water effluent generated due to different activities or operations in Petroleum Installations;
- (x) “onshore” means areas other than offshore which shall form the scope of these regulations and Feeder lines from or to jetty or other storage points shall also form a part of the onshore pipelines;
- (y) “petroleum” means any liquid hydrocarbon or mixture of hydrocarbons and any inflammable mixture (liquid, viscous or solid) containing any liquid hydrocarbon, including crude oil and liquefied petroleum gas, and the expression ‘petroleum product’ shall mean any product manufactured from petroleum and Petroleum products are classified according to their closed cup flash points as given below; namely: -
 - (i) Class-A Petroleum: Liquids which have flash point below 23 °C;
 - (ii) Class-B Petroleum: Liquids which have flash point of 23 °C above but below 65 °C;
 - (iii) Class-C Petroleum: Liquids which have flash point of 65 °C and above but below 93 °C;
 - (iv) Excluded Petroleum: Liquids which have flash point of 93 °C and above; and
 - (v) Liquefied gases including Liquefied Petroleum Gas (LPG) do not fall under this classification but form separate category;
- (z) “Petroleum Installation” means a depot or terminal having facilities for storing, handling, distribution, transportation, loading or unloading of petroleum, oil and lubricants;
- (aa) “pressure vessel” means any closed metal container of whatever shape, intended for the storage and transport of any compressed gas which is subjected to internal pressure and whose water capacity exceeds one thousand liters and includes inter connecting parts and components thereof up to the first point of connection to the connected piping and fittings, but does not include containers wherein steam or other vapour is or is intended to be generated or water or other liquid is or is intended to be heated by the application of fire or the products of combustion or by electrical means, heat exchangers, evaporators, air receivers, steam type digestors, steam type sterilizers, autoclaves, reactors, calorifiers, pressure piping components such as separators or strainers and vessels containing a liquid under a blanket of compressed inert gas;

- (bb) “Pumpable Capacity (Net Capacity)” means the capacity of the tank during operation after subtracting the volume of tank bottom contents up to the top of pump out nozzle from safe filling capacity of the tank;
- (cc) “Safe Capacity of a Tank” means the capacity of the tank up to the maximum safe filling height (safe filling level) of the tank as per statutory requirements and the safe fill level shall be established for each specific tank that will depend on the type of tank, diameter, its internal configuration and condition, rate of filling and the operating practices;
- (dd) “Safety relief device” means an automatic pressure relieving device actuated by the pressure upstream of the valve and characterized by fully opened pop action, intended to prevent the rupture of a pressure vessel under certain conditions of exposure;
- (ee) “Schedule” means the schedule appended to these regulations;
- (ff) “Service Building” means building housing facilities for inspection or maintenance or other supporting services which are directly required for operation of the installation;
- (gg) “Shall” indicates a mandatory requirement;
- (hh) “Should” indicates a recommendation or that which is advised but not mandatory;
- (ii) “Slop” means off-specification products obtained from market that is to say Retail Outlet and like other outlets, during any disturbance in operation and draining and like other activities from various equipment or tanks or pumps containing oil - water mixture, but does not include interface generated during pipe line transfer operations;
- (jj) “Source of ignition” means naked lights, fires, exposed incandescent materials, electric welding arcs, lamps, other than those specially approved for use in flammable atmosphere, or a spark or flame produced by any means;
- (kk) “Stabling Line” means an additional railway line or spur reserved for additional rake or stabling;
- (ll) “Utilities” means buildings consisting of administrative building, QC Laboratory, canteen, parking shed, air compressors with or without dryers, dryers and like other device which shall be separated from other POL facilities and located as per the separation distance as specified in the standard in this regard.

- (2) Words and expressions, used and not defined, in these regulations, but defined in the Act or in the rules or regulations made there under, shall have the meanings respectively assigned to them in the Act or in the rules or regulations, as the case may be.

3. Application:

Definitions, layout, design, standard operating procedures, maintenance, inspection, competence assurance, fire protection, safety management plan and vehicle management system of Petroleum Installations shall be in accordance with the requirements of these regulations. ¹[These regulations will apply to petroleum installations with aggregate above ground storage capacity equal to or more than 1000 KL.]

4. Scope:

- (1) Requirements of these regulations shall apply to all existing and new Petroleum

¹ Subs. by cl. (ii) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

Installations.

- (2) These regulations cover safety in design, material and equipment, piping system components and fabrication, installation and testing, commissioning, corrosion control, operation and maintenance and safety of Petroleum Installations ¹[including Aviation Fueling Station (AFS) and Lube manufacturing and filling plants.]
- (3) These regulations also cover engineering considerations in design and installations including fire protection and safety systems.
- (4) These regulations do not cover the requirements in respect of liquified petroleum gas (LPG) installations.

5. **Objective:**

These standards are intended to ensure uniform application of design principles in layout, material and equipment selection, construction, operations, maintenance and like other process, as mentioned in regulation 3 above for safe operation at the facilities associated with Petroleum Installations.

6. **The standard:**

The technical standards and specifications including safety standards (hereinafter referred to as standards) for Petroleum Installations ²[including Aviation Fueling Station (AFS) or Aviation Service Facilities (ASF) and Lube manufacturing and filling plants are specified in Schedule-1, which are as under, namely: –

- (a) Part - A to Part - I which covers layout, design, standard operating procedures, maintenance, inspection, competence assurance, fire protection, safety management plan and vehicle management system;
- (b) Part - J for Aviation Fueling Station (AFS) or Aviation Service Facilities (ASF) which covers layout design, design considerations, safe operating practices in storage and handling of bulk aviation fuels, fire protection facilities and vehicle management system;
- (c) Part- K for lube manufacturing and filling plants which covers lube manufacturing and filling plant layout design, design considerations, safe operating and handling practices in lube manufacturing and filling plant operations, fire protection facilities, maintenance and inspection of equipment, and vehicle management system.]

7. **Compliance to these regulations:**

- (1) The Board shall monitor the compliance to these regulations either directly or through an accredited third party as per regulations applicable for such purpose on third party conformity assessment.

¹ Ins. by cl. (iii) *ibid.* (w.e.f. 29.03.2023)

² Ins. by cl. (iv) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (2) The Board of the concerned entity, within ninety days of the commencement of these regulations shall appoint one of its directors, who shall be responsible for ensuring compliance to these regulations
- (3) Any entity intending to set up a Petroleum installation shall make available its detailed plan including design consideration conforming to these regulations to Petroleum and Explosives Safety Organisation (PESO) for their approval.
- (4) If an entity before the commencement of these regulations, has laid, built, constructed, kept under construction or expanded the Petroleum Installation based on some other standard or is not meeting the requirements specified in these regulations, the entity shall carry out a detailed Quantitative Risk Analysis (QRA) of its infrastructure and the entity shall thereafter take approval from its highest decision making body or its board for non-conformities and mitigation measures and the entity's board approval along with the compliance report, mitigation measures and implementation schedule shall be submitted to Petroleum and Natural Gas Regulatory Board by such entity within six months from the date of commencement of these regulations.

8. Default and Consequences:

- (1) There shall be a system maintained by the entity concerned for ensuring compliance to the provision of these regulations through conduct of technical and safety audits during the construction, commissioning and operation phase.
- (2) In case of any deviation or shortfall in compliance with the provision of these regulations, the entity shall be given time limit for rectification of such deviation, shortfall, default and in case of non-compliance thereafter, the entity shall be liable for the penal action under the provisions of the Act or termination of operation ¹[*****].

9. Requirements under other statutes:

It shall be necessary to comply with all statutory rules, regulations and Acts in force as applicable and requisite approvals shall be obtained from the relevant competent authorities for Petroleum Installations.

10. Miscellaneous:

- (1) If any dispute arises with regard to the interpretation of any of the provisions of these regulations, the decision of the Board shall be final.
- (2) The Board may at any time, by notification in the Official Gazette, effect appropriate modifications in these regulations.
- (3) The Board may issue guidelines consistent with the Act to meet the objective of these regulations as it deems fit.

¹ The words and expression mentioned are omitted by cl. (v) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

SCHEDULE – 1

Technical Standards and Specifications including Safety Standards for Petroleum Installations

(See regulation 6)

–PART- A

(Design and Layout)

1.0 INSTALLATION LAYOUT:

1.1 LAYOUT PHILOSOPHY:

Following philosophy, which is fundamental in the implementation of these regulations relating to lay out of installation, should be adopted in layout of an installation:

- (1) Presence of ignition source shall always be contemplated beyond the boundary wall of installation;
- (2) Quantitative Risk Analysis or Assessment shall be carried out at the layout stage with an objective to arrive at any specific mitigation measures required for Hazards identified. Risk reduction or mitigation measures shall be given due credit as below:
 - (i) Risk assessment shall include Unconfined Vapour Cloud Explosion (UVCE). The outcome shall guide in preparation of onsite or off-site emergency plan; and
 - (ii) Quantitative Risk Assessment (QRA) shall be done whenever major addition in facilities or major change in the surrounding areas, operating parameters, product grade takes place or once in every five years, whichever is earlier;
- (3) Approaches from the highway or major road should be provided for normal or emergency movement with minimum road width of 3.5 metres for one-way movement;
- (4) Roads inside the hazardous area of Installation shall be restricted to vehicles required for operational, maintenance and safety or security reasons and allowed only with proper safety fittings and authorization from location in-charge or designated safety officer, except tank trucks coming inside for filling or decantation;
- (5) Alternative access shall be provided for each facility so that it can be approached for firefighting in the event of blockage on one route;
- (6) Road widths, gradient and turning radii at road junctions shall be designed to facilitate movement of the fire-fighting vehicle envisaged in the event of emergency. Minimum road width of 3.5 M should be maintained for each way. The turning radius at the gantry shall be designed to facilitate the smooth movement of the tank trucks (including trailer mounted);

- (7) Rail spur should be located close to the boundary of the installation to minimise road or pipe crossings and blockage of roads during shunting. The rail spur should be designed in line with the Railway Guidelines;
- (8) Layout should consider the space requirements for -
 - (i) Maintenance and inspection of each equipment or facility;
 - (ii) Dedicated area for construction or fabrication activities; and
 - (iii) Future expansion for addition of facilities;
- (9) Vehicles with spark ignition engine shall not be allowed in the hazardous area. Vehicles with internal combustion engine (compression ignition) such as tank truck (fuelled by HSD) required to be permitted for business shall have Petroleum and Explosives Safety Organization (PESO) approved tank body with approved spark arrestor fitted on the vehicle; and
- (10) Layout drawing indicating hazardous and non-hazardous area segregation or demarcation shall be available. Hazardous area segregation or demarcation shall be as per IS 5572:2009.

1.2 LAYOUT OF FACILITIES:

To prepare a layout, information should be collected on all applicable affecting aspects and not limiting to following, namely: -

- (1) Storage tanks, utility requirements;
- (2) Town planning;
- (3) Product receipt or dispatch and mode of transport (Rail, Road, Pipeline and Tanker or Barge);
- (4) Warehouses, storage areas for bitumen or asphalt, lube and like other lubricants and other open storage areas like scrap yards and dumping ground;
- (5) Chemicals or Toxic chemicals storage, Sludge, hazardous waste storage or disposal facilities and like other facilities;
- (6) Service buildings, fire station and allied facilities;
- (7) Site topography including elevation, slope, and drainage;
- (8) Meteorological data;
- (9) Bathymetric data (high tide level, surge wave height and like other tidal surge) for installations in coastal areas;
- (10) Seismic data and probability of Tsunami in coastal areas;
- (11) Highest flood level in the area, water table, natural streams or canals;
- (12) Approach roads for functional areas;
- (13) Aviation considerations to and from adjacent facilities;
- (14) Environmental considerations including water treatment plant and reuse of treated water, rain water harvesting and roof top solar system with connectivity to grid; and
- (15) Statutory requirements.

1.2.1 GENERAL CONSIDERATION:

While locating the various facilities the following should be considered, namely: -

- (1) Tank farm, loading or unloading gantry, utilities, Effluent Treatment Plant (ETP) or mechanised OWS, Drains and culverts and approach roads should be suitably constructed to prevent flooding;
- (2) Control room should be located in a non-hazardous area, upwind (Majority of the year) of hydrocarbon storage and handling facilities and at a distance from potential leak

sources. It shall not be located on a lower level than surrounding plants and tank farms. There shall be no structure in close vicinity that would fall on the control room in case of a blast. Control Room should be situated at such a place in the layout from which most of the facilities or activities of the location are visible;

- (3) In case, it is unavoidable to comply with inter distance requirements for control room, ¹[from Product tanks or Tank Lorry Filling (TLF) or Tank Wagon (TW) gantry or Unloading area or other hazardous equipment, then] the control room shall be made blast resistant;
- (4) The control room for Pipeline Tap off Point (TOP) (if applicable) at the same location of the same company, shall be in the same building where the Control room for Depot or installation is located;
²[Provided that this clause is not applicable for existing locations with separate control rooms having facility for real time exchange of signal and data sharing;
- (5) Utility block should be located outside the hazardous area;]
- (6) Overhead power transmission lines shall not pass over the installation including the tank truck parking areas. Horizontal clearance shall be in line with the Central Electricity Authority;
- (7) High Tension (HT) line and HT sub-station shall be terminated or located outside the hazardous area as per distance as specified in Table-1 in this Part;
- (8) Tank truck movement inside the installation shall be kept to minimum and for this purpose the truck loading or unloading facilities should be located at a safe distance near the gate meant for its movement and should be oriented to provide one-way traffic pattern for entrance and exit. Tank truck in the gantry shall always be in drive out position for easy escape in case of emergency;
- (9) Rail loading or unloading facilities should be located along the boundary of the installation. In case Tank wagon (TW) unloading facilities are located outside of installation boundary that should also have a boundary wall as per MOHA or Government Guidelines;
- (10) Drain shall be provided around the TT gantry loading platform area to collect product due to accidental spill over or leakage and shall be routed to OWS or ETP. The drains shall always be maintained clean;
- (11) Effluent Treatment Plant should be located at a distance as per distance as specified in Table-1 in this Part. This should be closer to disposal point by the side of the boundary and at lower grade to facilitate gravity flow of effluent;
- (12) Roads should be provided in a symmetric manner to serve all areas requiring access for the operation, maintenance and firefighting;
- (13) Smoking booths shall not be provided in Petroleum Installations, but, drinking water booths can be provided at prominent work stations like TLF, TW siding and like other places;
- (14) Firewater storage and firewater pump house should be located upwind of hydrocarbon storage area with straight approach from outside area to enable easy receipt of mutual aid and make up water;
- (15) The provision shall be made to receive water from external sources directly into fire water storage tanks and this can be from mutual aid members, fire brigade and like other devices;
- (16) All buildings which are not related to terminal operation should be located at upwind of hydrocarbon storage and handling facilities and they shall be located outside the hazardous area, and such areas include administration, canteen with a separate entry and

¹ Ins. by sub-cl (a) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² Ins. by sub-cl (b) *ibid.* (w.e.f. 29.03.2023)

special care needs to be taken for canteen location where any spark or open flame is likely to exist;

- (17) Congestion inside the hazardous area because of buildings, structures, pipelines, trees and like other things shall not be allowed. The location of such addition of facilities in existing installation shall be decided based on Risk Assessment;
- (18) Room for storing hydrocarbon samples shall be provided with bottom exhaust for release of flammable vapours. The racks and flooring should be made of fire resistant material. Electrical fittings as well as electrical equipment shall be flame-proof. Adequate number of portable fire extinguishers should be placed, where required;
- (19) The additives or blue dye and like other substances should be stored at the designated or segregated area as per respective Material Safety Data Sheet; and
- (20) Special precautions should be taken as required where ambient temperatures or the handling temperatures are higher than the flash point of the product or where product handled is artificially heated to a temperature above its flash point.

1.2.2 LAYOUT OF STORAGE TANKS:

1.2.2.1 Dyked Enclosures:

- (1) Petroleum storage tanks shall be located in dyked enclosures. Each dyke shall have roads all around for access for normal operation and maintenance as well as for emergency handling. Aggregate capacity (Combined safe capacity) of tanks located in one dyked enclosure shall not exceed following values, namely:-

- (i) 60,000 KL for a group of fixed roof tanks.
- (ii) 120,000 KL for a group of floating roof tanks

Safe Capacity limits do not apply to a single tank in a dyke.

Fixed cum floating roof tanks shall be treated as fixed roof tanks. but, in case these tanks are provided with windows opening on the shell and these windows will not get blocked in any case, then they shall be considered as floating roof tanks.

If a group of tanks contains both fixed and floating roof tanks, then, it shall be treated as a group of fixed roof tanks for the purpose of above limits specified in clauses (i) and (ii).

- (2) Dyked enclosure shall be able to contain the complete contents of the largest tank in the dyke in case of any emergency. A free board of 200 mm above the calculated liquid level or 10% of calculated dyke capacity, whichever is higher, shall be provided for fixing the height and capacity of the dyke.

Enclosure capacity shall be calculated after deducting the following volumes, namely: -

- (i) Volume of the tanks other than largest tank up to enclosure height without free board;
 - (ii) Volume of all tank pads;
 - (iii) Volume of fire breaks walls; and
 - (iv) Volume of pipes/supports or steps and like other volume.
- (3) The height of tank enclosure dyke (including free board) shall be at least 1.0 M and shall not be more than 2.0 M above average inside grade level, and -

- (i) Tank farm area shall be covered through CCTV surveillance system and same shall be continuously monitored;
- (ii) The dyke wall made up of earth, concrete or solid masonry shall be designed to withstand the hydrostatic load and shall be impervious;
- (iii) Dyke enclosure area (inside area of the dyke) shall be also impervious to prevent the ground water pollution;
- (iv) Dyke enclosure (entire area of the dyke) shall have impervious layer of suitable material such as EPDM (ethylene propylene di-monomer) liner or polyethylene sheet to prevent the ground water contamination in addition to brick or stone pitching PCC and like other materials ¹[for existing facilities, imperviousness should be ensured using a suitable technology];
- (v) The dyke and the enclosures will be inspected for cracks, visible damage and like other deficiencies. every six months (pre and post monsoons) and after every major repair in the tanks or dykes and like other appliances so as to keep it impervious;
- (vi) The dyke area shall have proper slope outward of tank pad towards the inner periphery of the dyke enclosure to prevent reverse flow;
- (vii) Earth-pits shall be provided outside of Dyke area and strips buried under the earth except at termination points from a shortest possible distance. The earthing layout diagram of each facility should be displayed near each facility for reference;
- (viii) For excluded petroleum, the capacity of the dyked enclosure should be based on spill containment and not for containment on tank rupture. The minimum height of dyke wall in case of excluded petroleum shall be 600 mm;
- (ix) Pump stations and piping manifold should be located outside dyke areas by the side of roads;
- (x) Horizontal above ground tanks mounted on pedestals shall meet separation distances and shall have dyked enclosure;
- (xi) The construction of dyke exceeding 2 M may be considered where there is severe constraint on space availability. In such case, additionally following conditions must be fulfilled, namely: -
 - (a) Total dyke capacity shall be based on containment of largest tank capacity;
 - (b) Monitors on raised platforms, if required, shall be provided so that throw of the monitors are not restricted;
 - (c) All the tanks inside such dyke shall be provided with sprinkler system, irrespective of the tank dia; and
 - (d) Tank farm area shall be covered through CCTV surveillance system and same shall be continuously monitored.
- (xii) In case of Under Ground Tanks:-
 - (a) kerb wall of minimum 300 mm height shall be provided in the UG tank Farm Area to contain accidental overflow;
 - (b) a minimum of 3 M clear distance around the tank shall be maintained (from structures or boundary wall);
 - (c) vents shall be located / terminated at a distance of 15 M from electrical hazards.
 - (d) pressure or Vacuum vents for –a class intends that a product and free vents for other class of products shall be provided and vent shall be at minimum 4 M height from the grade level;

¹ Ins. by sub-cl (c) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (e) the open end of free vent pipe shall be covered with two layers of non- corrodible metal wire gauze having not less than 11 meshes per linear centimetre and shall be further protected from rain by hood or by suitably bending it downward;
- (f) the petroleum products shall enter a tank through closed piping system or coupled electrically continuous and sound hose;
- (g) under Ground tanks for Ethanol service shall be provided with Silica Gel Traps in the Vents to prevent moisture ingress;
- (h) the manholes should be 30 cm above the grade level; and
- (i) corrosion control measures shall be undertaken.

1.2.2.2 Grouping of Storage tanks:

- (1) Grouping of tanks in a dyke should be made by grouping the storage tanks in a dedicated dyke according to their respective classification of petroleum product;
- (2) In case, different class of products are stored in any combination of product classification, the following shall, be applicable, namely:-
 - (i) Grouping of petroleum products for storage shall be based on the product classification. Class-A and Class-B petroleum may be stored in the same dyked enclosure and such Class-A and Class-B are stored in common dyke, so that fixed water spray system shall be provided on all tanks except for small installations as mentioned in paragraph 5.1.2 (8) of this schedule and the Rim seal fire detection and extinguishing system shall be applicable only to floating roof tanks on Class – A service.
 - (ii) Class-C petroleum should preferably be stored in separate enclosure;
 - (iii) Where Class-C petroleum is stored in a common dyke along with Class-A and/or Class-B petroleum, the fixed water spray system shall be provided on all Class C tanks irrespective of diameter except for small installations as mentioned in paragraph 5.1.2 (8) of this schedule;
- (3) Excluded petroleum shall be stored in a separate dyked enclosure and shall not be stored along with Class-A, Class-B or Class-C petroleum. In case, it is stored in the same dyke, the requirements that is to say Firefighting, interlocks, alarms, foam and like other requirements shall be in line with the requirements for the Class of product that is to say Class -A or Class -B or Class -C stored in the same dyke.
- (4) Tanks shall be arranged in maximum two rows so that each tank is approachable from the road surrounding the enclosure and such arrangements need not be applied to tanks storing excluded petroleum class;
- (5) Tanks having 50,000 KL capacities and above shall be laid in single row.
- (6) For tertiary containment, provision shall be made to prevent escape of spills due to failure of secondary containment for any reasons and not to allow such spill over to outside of the boundary of the installation that may lead to any damage to outside; and to meet the objective, all installations shall be provided with boundary wall with gates and sluice gates on drain. Pipe line openings and like openings shall be sealed. Efforts should be made to minimize such openings for drainage.

1.2.2.3 Fire walls inside dyke enclosure:

- (1) In a dyked enclosure where more than one tank is located, firewalls of minimum height of 600mm shall be provided to prevent spills from one tank endangering any other tank in the same enclosure;
- (2) A group of small tanks each not exceeding 9 meters in diameter and in all not exceeding 5,000 KL in capacity shall be treated as one tank for the provision of firewall; and

- (3) For excluded petroleum product storage, firewall of height not less than 300 mm shall be provided by limiting the number of tanks to 10 or the capacity of group of tanks to 5,000 KL, whichever is lower.

1.2.2.4 General:

- (1) The tank height shall not exceed one and half times the diameter of the tank or Maximum 20 m, whichever is less;
- (2) Every Piping from or to any tank including connected sprinkler or foam line shall comply the following, namely: -
 - (i) It shall not pass through any other dyked enclosure;
 - (ii) It shall run directly to outside of dyke to minimise piping within the enclosures; and
 - (iii) It shall not pass through other tank areas or fire walls.
- (3) Piping layout design inside tank dyke area should ensure easy accessibility for any operations in the tank farm and wherever necessary, well designed, cross-overs shall be provided to cross the pipelines running within the dyke area. Elevated Catwalks connecting the tank manifold to the dyke wall above the height of the dyke wall shall be provided for safe access and exit in case of normal or emergency situations. The catwalks shall run at the same level and terminate directly outside the dyke;
- (4) No part of the dyked enclosure shall be below the level of surrounding ground immediately around the outside of dyke area;
- (5) The minimum distance between a tank shell and the inside toe of the dyke wall shall not be less than half the height of the tank; and
- (6) Properly laid out road shall be provided for easy access on all four sides of each dyke.

1.2.2.5 Protection of facilities:

- (1) Properly laid out roads around various facilities shall be provided within the depot or terminal for smooth access of fire tenders and like other trends in case of emergency;
- (2) The boundary wall shall be constructed as per the directives of the Ministry of Home Affairs or any other Government directive. In any case the boundary wall shall be of minimum 3 M height from either side of boundary wall with V/U shaped barbed wire fencing on the wall with 600 mm diameter concertina coil on top;
- (3) There shall be a ¹[pathway] along the inside perimeter of the boundary wall for security patrolling. Security ²[watch tower] watchmen tower (if provided) shall have clear access;
- (4) The emergency gate shall be away from the main gate for evacuation of vehicles and personnel in emergency and shall always be kept available and free from obstruction;
- (5) CCTV shall be installed in depot or terminal locations covering entry or exit gate, periphery of installation and all critical operating areas (such as Tank farm, TT or TW operating area, product pump house, fire water pump house and like other places) which shall be monitored continuously;
- (6) The CCTV monitoring station shall be provided in control room, Security cabin and in-charge room. The CCTV data shall be stored for a minimum period of 60 days or in line with prevailing IB norms;
- (7) Proper sized TT parking area based on fleet size shall be provided with following facilities, namely: -

¹ Subs. by point (i) of sub-cl (d) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² Supra 1 (w.e.f. 29.03.2023)

- (i) Well laid out hydrant system with alternate double headed hydrant post and water or water cum foam monitors covering the parking area;
 - (ii) Segregation of parking area through chain link fence or boundary wall;
 - (iii) Separate entry and exit gate with access ¹[control]
 - (iv) Parking lane demarcation or slotting to ensure independent and quick evacuation ²[in emergency; and]
 - ³(v) For existing locations, wherever the parking area is inadequate due to space constraint, remote parking for empty Tank Trucks (TT) should be provided at designated place. In case remote parking for empty TTs are not feasible due to space constraint, proper monitoring of vehicle parking and movement shall be ensured in liaison with local administration. Such remote parking for empty TTs shall be covered under ERDMP of the installation.]
- (8) Hydrocarbon (HC) detectors shall be installed near all potential leak sources of class “A” petroleum products that is to say that tank dykes, tank manifolds and pump house manifold and such detectors shall be placed in a way that entire possible source of leaks and collection of products are continuously detected and alarm is set at 20% of lower explosive limit of class “A” petroleum products. (Refer clause 5.8.1 for details).

1.2.2.6 Separation distances:

- (1) Minimum separation distances between various facilities specified in preceding paragraph 1.2.2.5 shall be as per Table-1 in this part and the table shall be read in conjunction with the notes specified with the table.
- (2) The layout shall also take into account findings or recommendations Risk Analysis or Assessment study, which shall be carried out at all the stages of facility development process.

1.2.2.7 Separation Distances between tanks or offsite facilities:

The following conditions shall apply for the separation distances for above ground tanks storing petroleum products, namely: -

- (1) For larger installation, minimum separation distances shall be as specified in Table- 2 and Table-3 in this part and the Tables are applicable where total storage capacity for Class-A and Class-B petroleum products is more than 5000 KL or the diameter of Class-A or Class-B product tank is more than 9 meters;
- (2) For smaller installation, minimum separation distances shall be as specified in Table-4 in this part and the Table is applicable where total storage capacity of Class-A and Class-B petroleum is less than 5000 KL and diameter of any tank storing Class-A and Class-B petroleum product does not exceed 9 meters. Table-4 in this Part shall also be applicable for the installation storing only Class-C petroleum;
- (3) Excluded petroleum should be treated as Class-C petroleum for the purpose of separation distances and Table-4 in this Part shall be applicable for their separation distances; and

¹ Subs. by sub-pt. (A) of point (ii) of sub-cl (d) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² Subs. by sub-pt. (B) of point (ii) of sub-cl (d) of cl. (vi) of reg (2) *ibid.* (w.e.f. 29.03.2023)

³ Subs. by sub-pt. (C) of point (ii) of sub-cl (d) of cl. (vi) of reg (2) *ibid.* (w.e.f. 29.03.2023)

- (4) Separation distances between the nearest tanks located in separate dykes shall not be less than the diameter of the larger of the two tanks or 30 meters, whichever is more.

TABLE – 1
SEPARATION DISTANCES BETWEEN FACILITIES

S.No.	From/To	1	2	3	4	5	6	7	8	9	10	11	12
1	Control Room (Note –1)	X	Note-2	Note-3	30	45	12	X	6	15	30	X	15
2	Storage Tanks Class-A	Note-2	Note-4	Note-4	Note-4	30	60	30	T2	60	50	60	60
3	Storage Tank Class-B	Note-3	Note-4	Note-4	Note-4	30	60	30	T2	30	50	30	30
4	Storage Tank Class-C	30	Note-4	Note-4	Note-4	30	60	30	T2	30	50	15	30
5	Bulk Loading or unloading PETROLEUM (Rail or Road)	45	30	30	30	Note-5	60	Note-6	T2	30	30	30	30
6	Fire water storage and pump house	12	60	60	60	60	X	30	X	12	50	6	6
7	Rail Spur-stabling line	X	30	30	30	Note-6	30	X	20	6	50	6	15
8	Boundary wall around installation	6	T2	T2	T2	T2	X	20	X	6	15	15	6
9	Service buildings	15	60	30	30	30	12	6	6	X	50	12	6
10	OWS or effluent Treatment Plant or Oil sludge pit	30	50	50	50	30	50	50	15	50	X	45	30
11	Electrical Sub Station	X	60	30	15	30	6	6	15	12	45	X	6
12	Utilities ^(Broad Definition)	15	60	30	30	30	6	15	6	6	30	6	X

General Notes to Table-1:

- (a) All distances are in meters. “T” indicates the Table number in this part to be referred;
- (b) All distances shall be measured between the nearest points on the perimeter of each facility except (i) in case of tank vehicle loading or unloading area where the distance shall be from the centre of nearest bay;
- (c) Service building shall have minimal manning and normally no hot work would be done there;
- (d) “X” means any distance suitable for constructional or operational convenience; and
- (e) Fire station shall be in safe area or at least 60 m from other facilities.

Specific Notes to Table-1:

- Note-1: These distance norms are applicable to the locations where product receipt is through cross country pipelines. At all other locations, the building or room housing, the automation equipments or system shall be treated as utility building for the purpose of separation distance;
- Note-2: The distance shall be 60 meters for non-blast resistant construction and 30 meters for blast resistant construction;
- Note-3: The distance shall be 45 meters for non-blast resistant construction and 30 meters for blast resistant construction;
- Note-4: Separation distances between the nearest tanks located in two dykes shall be equivalent to the diameter of the larger tank or 30 M, whichever is more. For distances within a dyke, it shall be as per Table-2 and Table-3 in this part;
- Note-5: Separation distance between-
- (i) tank truck gantry and tank wagon gantry shall be 50m;
 - (ii) distance between two Tank trucks gantries shall be 15 M; and
 - (iii) distance between two tank wagon gantries shall be 50 M.
- Note-6: Separation distance between tank truck gantry and rail spur-stabling line shall be 50 M.
- ¹[Note -7: Distance of product pump house (loading or unloading) from utilities and electrical sub-station shall be 30 mtrs.]

TABLE - 2
SEPARATION DISTANCES BETWEEN TANK OR OFFSITE FACILITIES

Applicable for large installations where total storage capacity for Class-A and Class-B petroleum products is more than 5000 kl or the diameter of Class-A or Class-B product tank is more than 9 meters.

	Tanks or Facility	1	2	3	4	5	6
1	Storage Tank for Petroleum Class A or Class B.	T3	T3	30	30	8	0.5 D Min 20 m
2	Storage Tank for Petroleum Class C	T3	X	30	X	X	0.5 D Min 20 m
3	Tank vehicle loading or Unloading for petroleum class A or class B	30	30	X	X	8	20
4	Tank Vehicle loading or unloading for Class C	30	X	X	X	X	10
5	Flame proof Electric Motor	8	X	8	X	X	X
6	Boundary wall	0.5 D Min 20 m	0.5 D Min 20 m	20	10	X	X

TABLE- 3
SEPARATION DISTANCES BETWEEN STORAGE TANKS WITHIN A DYKE

¹ Ins. by sub-cl (e) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

(For large installations where total storage capacity for Class-A and Class-B petroleum products is more than 5000 cum, or, the diameter of Class-A or Class-B product tank is more than 9 meters)

	Item	Between floating Roof Tanks Class –(A and A) or (A and B) or (B and B)	Between fixed Roof Tanks Class – (A and A) or (A and B) or (B and B)	Between fixed and Floating roof Tanks Class-(A and A) or (A and B) or (B and B)	Between Class C Petroleum Storage tanks
1	All tanks with Diameter up to 50 meters	$(D+d) / 4$ or Min 10 m	$(D+d) / 4$ or Min 10 m	$(D+d) / 4$ or Min 10 m	$(D+d) / 6$ or Min 6 m
2	Tanks with Diameter exceeding 50 meters.	$(D+d) / 4$	$(D+d) / 3$	$(D+d) / 3$	$(D+d) / 4$

General notes to Table – 2 and 3

- (a) All distances are in meters;
- (b) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements;
- (c) D and d stands for diameter of larger and smaller tanks;
- (d) In Table – 2 all distances shall be measured between the nearest points on the perimeter of each facility except in the case of tank vehicle loading or unloading area where the distance shall be measured from the centre of each bay;
- (e) In Table –3, distances given are shell to shell in the same dyke;
- (f) For different combination of storage tanks, the stringent of the applicable formulae shall be considered for minimum separation distance;
- (g) The distance of storage tanks from boundary wall is applicable for;
 - (i) floating roof tanks having protection for exposure; and
 - (ii) tanks with weak roof-to-shell joint having approved foam or inert gas system and the tank diameter not exceeding 50 meters;
- (h) Distances mentioned in Table-2 are for electric pump motor located outside dyke, but, for side entry mixer attached to tank shell, the motor can be mounted on the tank shell; and
- (i) For the facilities not covered in Table- 2, refer Table-1.

TABLE – 4
SEPARATION DISTANCES BETWEEN TANKS OR OFFSITE FACILITIES

(For small installations where total storage capacity of Class-A petroleum and Class-B petroleum is less than 5000 kl and diameter of any tank storing Class-A and Class-B petroleum product does not exceed 9 meters. This Table shall also be applicable for the installation storing only Class-C Petroleum and Excluded Petroleum)

		1	2	3	4	5	6	7	8	9	10
1	Storage Tank Class A petroleum	0.5D	0.5D	0.5D / 6.0	15	15	15	3	15	15	15

2	Storage Tank Class B petroleum	0.5D	0.5D	0.5D / 6.0	9	4.5	4.5	3	4.5	D Min 4.5	D Min 4.5
3	Storage Tank Class C petroleum	0.5D / 6.0	0.5D / 6.0	X	9	4.5	X	X	X	0.5D Min 3.0	0.5D Min 3.0
4	Tank truck Loading or unloading Class – A petroleum	15	9	9	X	9	9	3	9	9	9
5	Tank truck Loading or unloading Class – B petroleum	15	4.5	4.5	9	X	4.5	1.5	4.5	4.5	4.5
6	Tank truck Loading or unloading Class – C petroleum	15	4.5	X	9	4.5	X	X	X	3	3
7	Flame proof Electric motors	3	3	X	3	1.5	X	X	3	X	X
8	Non Flame proof Electric motors	15	4.5	X	9	4.5	X	3	X	X	X
9	Office building, stores, amenities	15	D Min 4.5	0.5 D Min 3.0	9	4.5	3	X	X	X	X
10	Boundary wall	15	D Min 4.5	0.5D Min 3.0	9	4.5	3	X	X	X	X

General notes to Table –4:

- (a) All distances are in meter and the table specifies the minimum requirement;
- (b) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements;
- (c) “D” indicates the diameter of the larger tank;
- (d) Distances given for the tanks are shell to shell in the same dyke;
- (e) Where alternate distances are specified (like 0.5 D / 6.0), the minimum thereof shall be used;
- (f) All distances shall be measured between the nearest points on the perimeter of each facility except in case of tank truck loading or unloading area where the distance shall be from the centre of each bay;
- (g) Pig launcher or receiver at liquid hydrocarbon handling pipeline installations should be located at least 5 m from boundary wall; and
- (h) Distances mentioned in the Table-4 for electric pump motor located outside dyke, but for side entry motor attached to tank shell, the mixer can be mounted on the Tank Shell.

PART – B

(Design Considerations)

2.0 DESIGN CONSIDERATIONS:

- (1) External Floating roof tanks (EFRT) with single deck pontoon roof or Double deck or Internal Floating Roof Tanks shall be designed as per API STD 650;

- (2) Atmospheric or low pressure fixed roof tanks shall be designed as per API STD 650 or API STD 620;
- (3) Selection of type of tank generally depends on ambient conditions and the product handled;
- (4) The external floating roof storage tanks with Pan Roof shall not be used as they are considered unsafe;
- (5) IFRT and EFRT shall be provided with double seal with minimum vapour recovery of 96%;
- (6) Primary seal shall be liquid or shoe mounted for EFRT and vapour mounted for IFRT. Maximum seal gap width should be 4 cm and maximum gap area should be 200 cm²/m of tank diameter;
- (7) Secondary seal shall be rim mounted. Maximum seal gap width should be 1.3 cm and maximum gap area should be 20 cm² /m of tank diameter; and
- (8) Tank bottoms shall be of cone up or cone down ("Apex down").

2.1 TANK APPURTENANCES:

- (1) Ladders and Handrails shall be such that individual tank shall be provided with access to the roof. A platform with railing should be provided from the top of the stairway to gauge well and roof ladder. On floating roof tanks, non-sparking self-levelling tread type rolling ladder with suitable double earthing connection are to be provided;
- (2) Stairs should be made of grating. All staircases shall have resting or landing platform for every 5m height;
- (3) Number of manholes shall depend on diameter of the tank as per API650; and
- (4) Walkway with handrail on the roof of the tank should be provided to facilitate inspection or checking of vents or flame arrestor and like other devices so that movement of personnel on roof is safer.

2.2 TANK FARMS OR MANIFOLDS:

2.2.1 Tank Farm Drains:

- (1) The dyke drain shall be provided along the inside periphery of the dyke enclosure wall and in case circular drain around tank pad is provided, the same needs to be connected to the peripheral drain;
- (2) The outlet from dyke shall have the provision to either divert to the effluent Treatment plant or OWS or to main storm water drain; and
- (3) Dyke drain Valves shall be provided with position indication and alarm system in the event of opening the valve.

2.2.2 Tank Manifold:

- (1) The number of inlet or outlet connections to the tank shell should be kept minimum;
- (2) Tank body valves on process lines (inlet, outlet and recirculation) of all storage tanks storing class-A and class-B products shall be remote operated shut off valves. Mitigation measures due to sudden closure of shut off valve shall be incorporated in the design;
- (3) The second valve which is motor operated valve (MOV) on inlet, outlet and recirculation lines should be outside the dyke;
- (4) Tank body valves including remote operated shut off valves should remain shut after closure of day operations.
- (5) For positive isolation a suitable Valve other than Hammer Blind shall be provided so that under no circumstances the product is exposed to atmosphere from the valves and in any case Hammer blind valves of any type shall not be used in the depot or terminals.
- (6) ROSOV shall be fail safe and fire safe (shall close in case of signal failure) and the actuator shall be fail-safe. The cables leading to the control room shall be fire resistant;

- (7) ROSOV shall have only close operation from control room or at a strategic remote location;
- (8) The Open or Close push buttons of ROSOV shall also be provided in field that is to say just outside the dyke and such push buttons shall have distinctive feature so that opening is different than action required for closing (such as pull type and push type). The push button assembly shall be mounted at a place where it is easily visible and accessible to the operator;
- (9) MOV or DBBV shall have open and close remote operation from control room and at field outside of dyke;
- (10) Tank manifold, if provided, shall be located outside the dyke area. The floor underneath the manifold shall be paved and have Kerb walls and connected to oil water drainage system leading to ETP or OWS;
- (11) Thermal safety valve (TSV) or Expansion line shall be provided for blocked portion of pipe line to take care of the thermal expansion of product due to rise of temperature;
- (12) TSV outlet line or expansion line shall be connected back to tank or tank inlet or outlet line before ROSOV is connected with suitably positioned isolation valve. One isolation valve on TSV outlet line or expansion line shall be installed close to the tank shell or inlet or outlet line to the maximum extent possible;
- (13) The expansion lines to be connected at roof tops in case of CRVTs and through combined gauge well in case of FRVTs or IFRVTs and shall be extended inside up to the tank bottom to avoid freefall of product through vapour space with provision of siphon breaker on top and expansion lines should be provided with class 800 flanged gate valves;
- (14) Termination of expansion line on tank roof top shall not be allowed as free fall through vapour space is unsafe;
- (15) At existing locations where ever the arrangement specified in the paragraph 2.2.2(13) does not exist, the same shall be provided on all tanks during scheduled tank maintenance or cleaning;
- (16) Any electrical fittings and fixtures inside the dyke shall be as per the hazardous area classification. but, such fittings and fixtures except for actuators of ROSOV or MOVs or HC detectors or PESO approved ex-proof water flow switch or ex-proof pressure transmitter should be above the dyke height.

2.2.3 Tank Settlement:

Settlement of tanks takes place over a period of time and a depression is formed on tank pad along the circumference and the same should be effectively made up with proper slope to avoid rain water accumulation and subsequent corrosion of the bottom plate and where large settlement is anticipated, supporting arrangement for the connected piping shall be suitably designed to take care of the settlement.

2.3 TANK HEATERS:

Tank heating can be accomplished either by steam heating or electric tracing or hot oil circulation and Heating flues using fired burners shall not be permitted.

2.3.1 Heaters:

Tank heaters shall be designed to hold the product at the specified storage temperature when tank is filled up to safe filling height. For design calculations, it is necessary to specify average wind velocity and minimum ambient temperature over extended period of time.

2.3.2 Steam Heating:

Manway and such heaters consist of a tube bundle, usually of hairpin type, fixed through a manhole of the tank and such heaters shall be designed so that its removal can be done without

the requirement of person entering in the tank. Steam coils should have no flange connections inside the tank and provision should exist in condensate outlet lines to check for oil leak. Gradient of the coil bundle inside the tank should be such that condensate accumulation is avoided.

2.3.3 Electric Heating:

Electric tracing of one or more courses of shell can be provided, but, the classification and thermal rating of electric tracing should be verified before application and the electric conduits and cabling should conform to Classification of Areas for Electrical Installations.

2.3.4 Crude tanks: Crude tanks may be provided with side entry swivel angle type mixers.

2.4 DRAINS FROM THE TANKS:

2.4.1 Bottom Drains:

- (1) Drains should be provided in all tanks for draining water and also for emptying out the tank for cleaning and such arrangement would also be useful for draining water after a hydro test or initial flushing during a start-up operation. Number and details of the drains shall be as per the applicable tanks design standard.
- (2) Each drain line shall have minimum two isolation valves separated by spool piece and pipe shall be extended beyond tank pad up-to drain point. One of such valves shall be of quick closing type. Ends of each drain point should have provision of blind flange or capping arrangement.

2.4.2 Floating Roof Drains:

- (1) Roof drain shall be of robust design to prevent oil coming out during draining operation. Maximum hourly rainfall rate during the past 15 years shall be considered for designing the number and size of drains for open floating roof tank. Rain water should not be taken directly into the tank;
- (2) The roof drain system shall have provision for connection to the drain through a suitably designed robust system and shall include a suitable outlet valve;
- (3) Due care shall be taken while designing to ensure the system integrity and performance when roof is resting on the low legs; and
- (4) The inlet of roof drain shall have a check valve to prevent product from flowing to the roof in the event of failure of the system.

2.4.3 Emergency Roof Drain:

Emergency drain for floating roof tank shall be provided on the roof to take care of disposal of water in case of choking or malfunctioning of the primary roof drain. It shall have water seal arrangement to prevent oil spill on the roof.

2.5 VENTS:

2.5.1 Open Vents:

Flash Back Arrester (Flame arrester) should be fitted to Vents as per IS 11006:2011. For sizing the vents API STD 2000 is to be referred and the following are the basic guidelines need to be considered, namely: -

- (1) Maximum and minimum ambient temperatures;
- (2) Vapour pressure of the product at operating or design temperature;
- (3) Maximum pumping in and out rates. In the event of change in any operating parameters involving change in pumping rates complete end to end system check shall be done in line with Management of Change; and
- (4) Blending components likely to be handled in the tank.

2.5.2 Breather Valve:

- (1) The breather valves for the blanketed tanks and low-pressure tanks shall be provided as per API STD 650 and API STD 620 respectively and the tank breathes - in air will be when the tank pressure is lower than the atmospheric pressure and breathes- out will be when tank pressure is greater than the set pressure;
- (2) Pressure and Vacuum Relieving Valves (PVRVs) provided on cone roof tanks usually have 20% accumulation and while designing, it is necessary to ensure that under full relieving conditions, the design pressure or vacuum in the tank is not exceeded. Set pressure of PVRV shall be decided according to API STD 2000.
- (3) Breather vents or flame arrestors are known to fail through the formation of crystalline waxy or heavy hydrocarbon deposits or ice on the seats of valve diaphragms or inside the nozzle connection upon which the valve is mounted, as such Breather vents or flame arrestors shall not be recommended on these services, instead only open vents should be provided; and
- (4) Where tanks are blanketed, breathing-in will be from the blanketing gas system and necessary control valve shall be provided for supply of blanketing gas at constant pressure. The tank shall be provided with a safety valve by way of lift disc or diaphragm or any other suitable device. Gauge hatch and other manholes shall be of gas tight construction.

2.5.3 Emergency Vents:

Emergency Vents shall be provided for the tanks as per API STD 2000.

2.6 DIP HATCH OR SAMPLING:

- (1) Dip hatch or gauge hatch is used for gauging the height of the liquid in a tank as well as to take out samples for testing as such, the gauge hatch shall be non-sparking (or lined with non-sparking material) ¹[should be] and self-closing type;
- (2) Gauge well pipe should be provided with slots; and
- (3) The gauge well shall be properly supported by means of angles or strips with bottom plate of the tank and such arrangement also makes the tank safer with respect to dissipation of static charge accumulation.

2.7 INSTRUMENTATION:

2.7.1 Safety Integrity Level (SIL):

The SIL classification study shall be carried out to determine the required SIL level. SIL of the safety instrumented function for the tank including overfill protection shall meet the requirement of Part 1 of IEC 61511. The SIL level of the entire interlock loop shall also meet the requirement of IEC 61511.

¹ Ins. by sub-cl (f) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

2.7.2 Level controls on Tanks:

For all storage tanks storing Class A/B products, the following instruments or alarms shall be provided, namely: -

- (1) High Level (H), High High Level (HH) alarms, that is to say that each tank shall have provision of level instruments for sending audio visual alarms to the control rooms. All the alarms shall be of different type so that the “H” level alarm and “HH” alarms can be distinctively identified;
- (2) Level for “H” and “HH” alarms shall be decided based on site specific operating parameter that is to say diameter of tank, flow rate and operators response time for corrective measures to stop product level reaching curb angel or maximum floating position, but such, these levels shall be lower than the level corresponding to PESO approved safe filling capacity;
- (3) Independent level switch shall be provided at the “HHH” which in any case shall not be above the level corresponding to PESO approved safe filling capacity of the tank;
- (4) The level switch shall enable initiation of action for closure of the respective inlet valve that is to say the ROSOVs, MOVs and product pumps so that the entire receipt operation closes on safe mode and the product does not over flow;
- (5) Two nos. independent level instruments shall be provided out of which one instrument shall be of radar gauge type and each of the instruments shall have provision both for “H” and “HH” alarms. Provision shall be made in the system configuration for transmitting only two signals (one for “H” and one for “HH”). The signals that is to say the “H” and “HH” from each level instrument shall be available parallel in the control room using OR gate PLC logic;
- (6) Over spill Level switch, that is to say that an independent hardwired level switch like Vibrating Fork and like other switches shall be provided for actuating remote operating shut off valve. Over spill level switch should be connected to remote operating shut off valve through safety PLC for SIL loop compliance;
- (7) For tanks storing class that is to say that C products two nos. independent level instruments shall be provided out of which one instrument shall be of radar gauge type. Each of the level instruments shall have provision for both “H” and “HH” alarms and the signal transmitting shall be as so explained;
- (8) There shall be exchange of signals between the receiving and dispatch location in case of receipt of product through cross country pipe lines and provision shall be made for monitoring of level of the receiving tank along with pressure in the pipe line and ROSOV status and to ensure safe shut down of the system in case of any abnormal situation; and
- (9) Care need to be taken for tanks receiving product from ship or cross country pipeline at high flow rates for surge pressures due to sudden closures of valves and accordingly where ever required, suitably designed Surge relief system or pump tripping to be provided.

2.7.3 Tank farm management system integration:

TAS (terminal automation system) including TFMS (tank farm management system) shall be integrated with software for back up at remote location (DRC) with provision for recording of all critical events in the system and back up data shall be retained for a minimum period of 30 days and if in the event, the backup data is proposed to be stored within the same installation then, and if in the room for storing the backup data shall be blast resistant at a secured place.

2.7.4 Temperature and Insulation:

When product storage temperatures are likely to be higher than 100°C, a remote temperature indicator with alarm should be provided in addition to local indicators. For tank capacity higher than 5000 kl a minimum of two numbers of local temperature indicators should be so located (within 500 mm above the inlet or outlet nozzle) as not to sense the direct heat of the coil. Insulation shall be provided for heat conservation. The tanks having higher surface temperature shall have insulation up to minimum 2 meters high for personal protection and also, patch insulation should be provided on the shell along with spiral stairway and provision for inspection.

2.8 PIPING OR VALVES OR FLANGES:

2.8.1 Piping:

- (1) Piping shall be designed for handling of hydrocarbon liquid as per “ASME B 31.3: Process Piping” or ASME B 31.4 (for cross country pipelines only entering the terminal) or API 5L or equivalent as applicable;
- (2) Pipe joints should be welded as far as practicable with full penetration weld and number of flanged or threaded joints should be kept to a minimum;
- (3) In case sampling point is provided on receipt line for operational requirement, the same should be provided outside of dyke in the manifold;
- (4) Sectionalizing of the pipe lines with isolation valves and arrangements for injection or draining of water shall be provided for facilitating hydro-testing of the pipe lines;
- (5) Buried piping shall be protected against physical damage and corrosion with suitable protective coating;
- (6) At road crossings, in addition to protective coating, pipes should pass through secondary encasing with properly sealed at both the ends;
- (7) The pipe lines should be provided with low point’s drains and high point vents to facilitate emptying or hydro-testing and like other testings and ends of each drain point shall have provision of blind flange or capping arrangement; and
- (8) Jetty lines should be provided above ground properly spaced and approachable to maintain the lines.

2.8.2 Valves:

Steel valves conforming to relevant API standards shall be used. Cast iron valves should not be used.

2.8.3 Fittings:

- (1) Steel flanges and flanged fittings shall conform to relevant ASME or ASTM or ANSI or equivalent;
- (2) Slip on or weld neck flanges should be used;
- (3) Screwed flanges for sizes 50 mm or smaller may be used;
- (4) Steel flanges should conform to the applicable provisions of ASME B 16.5 or equivalent;
- (5) Steel screwed fittings and couplings shall conform to ASME B 16.11 or equivalent;
- (6) Steel unions shall have ground metal to metal seats. Gasket type unions shall not be used;
- (7) Plugs shall be of steel. Cast iron or brass plugs shall not be used; and
- (8) Electrical continuity across flange joints shall be maintained by providing metallic gaskets or jumpers.

2.9 BULK LOADING OR UNLOADING OPERATIONS:

2.9.1 Loading or unloading Pumps:

- (1) Pumps conforming to relevant API standards shall be used;
- (2) Product pumps shall be provided with suitable sized strainers on suction and NRVs on discharge lines. All drain points of strainers shall be provided with double isolation valve and ends having provision for blind flange or screw capped;
- (3) Pumps shall be located in an exclusive paved area with drainage facilities routed to OWS or ETP;
- (4) Tank lorry loading or unloading pump house shall be positioned at an elevated level and shall be well ventilated on all four sides;
- (5) Open roof Pump house are to be provided with suitable IP protection for the equipment;
- (6) In case of sunken pump house for Tank Wagon unloading facilities, Pump house shall be so positioned that it ensures proper ventilation and efficient disposal arrangements of accumulated products;
- (7) To avoid wide variation in pressure, leading to a 'kick' or 'hammering' in header and hoses, it is necessary to choose pumps with flat characteristic curves;
- (8) Locations having automation shall be provided ESD feature through Automation system;
- (9) Dedicated pumps for individual products shall be provided. Minimum one stand by pump for each product shall be provided;
- (10) Separate pumps shall be provided for Tank truck loading/unloading and wagon loading or unloading; and
- (11) All closed sections of pipings shall be provided with thermal safety relief device to relieve pressure due to ambient temperature rise. Thermal Safety relief device may vent into a tank or piped to OWS located in safe area and when connected to tank, TSV shall be provided with isolation valves. One isolation valve shall be installed close to the tank shell to the maximum extent possible. The vent should be piped to closed blow-down system.

2.9.2 Tank truck and tank Wagon Loading Gantries:

- (1) Loading points shall have quick shut-off valves such as Cast steel Plug or Ball Valves;
- (2) No vehicle shall be loaded at a rate exceeding (volumetric flow rate corresponding to linear velocity one meter per second at the delivery (at the least dia fitting) and of the filling pipe until the filling pipe is completely submerged in petroleum and thereafter the loading rate should be gradually increased but it shall at no point of time exceed six meters per second at the ¹[delivery end of the filling pipe. Further, adequate measures should be taken to avoid accumulation of static charge in case of loading low Sulphur or low conductivity petroleum products;]
- (3) Location should be provided with facilities where loading and unloading of Tank trucks is possible in a closed loop system that is to say top or bottom loading provisions with Vapour Recovery System;
- (4) Where flow indicators or totalizers are provided for gantries, vapour eliminators shall be incorporated;
- (5) The provision for Kerosene and MS or Naptha loading in TT (tank truck) loading gantry shall not be in the same bay;
- (6) For safety reason the level adjustment in the tank lorry compartments should be done through suitable system wherein product is not exposed in open atmosphere at any point of time;
- (7) In case of loading hoses, only neoprene impregnated hoses having electrical continuity between nozzle and flange shall be used;

¹ Ins. by sub-cl (g) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (8) All tank wagons and tank trucks shall have a fill pipe extended up to the bottom to avoid splash filling;
- (9) The splash filling is permissible for asphalt loading in tank truck or tank wagons;
- (10) Where bottom loading is done, deflector plates in the trucks to be ensured;
- (11) Bottom flameproof lighting shall be provided for night time checking of wagon bottom leaks and also for proper sealing and inspection, wherever loading or unloading during night is required to be done;
- (12) Loading gantry should be provided with at least one suitable explosion-proof telephone or paging device for communication with pump house, control room and like other communication in normal and emergency operations and in addition, operating personnel shall be provided with intrinsically safe walky-talky suitable for use in oil installations;
- (13) Tank wagon and truck loading gantries shall be suitable for all weather conditions;
- (14) Tank Truck loading gantries shall be provided with safety harness to protect the operating crew against ¹[fall from height. Integrity check of anchoring point with gantry should be conducted prior to installation of harness and at periodical intervals];
- (15) ²[*****] loading ladders ³[have to] and hand railing ⁴[and] shall be light in construction. Neoprene packing shall be provided at the bottom rest to avoid spark generation due to impact.
- (16) Proper handrail arrangement shall be provided on platforms and stairs for safe movement of personnel;
- (17) Adequate safe escape ladders including from overhead platform shall be provided at intervals on the gantry for emergency use and escape ladders shall be prominently identified from distant view;
- (18) Protection against pressure surge in the loading header due to sudden change in loading rate need to be considered and provision of shock absorber as one of the surge protection method at suitable locations on rail or road loading header should be considered;
- (19) Provision shall be made for quick isolation of main product headers in case of emergency and for such purpose, suitable type hand operated valves or remote operated valves shall be considered as per the site conditions and overall automation system in the installation;
- (20) Loading gantry area including areas below railway lines shall be paved for smooth draining and collection of spillages into drains;
- (21) Open drains along the railway line or gantry shall be covered with gratings so as not to endanger movement of personnel;
- (22) All trucks entering truck loading gantry shall be PESO approved and provided with approved spark arrestor or flame arrestors at the exhaust. The Vehicle conforming to emission level BS IV and beyond are exempt from fitment of spark arrestor;
- (23) Oil and water collected from loading or unloading areas shall be routed to Oil water separator system or Effluent Treatment Plant or similar facility and a slop tank should be earmarked for storing separated oil;
- (24) The tank truck gantry shall be so designed that all the compartments of the tank truck are filled at one bay only. The layout shall ensure that all operations are planned in a manner so that no zigzag movement of the tank truck around the gantry should take place;
- (25) For tank wagon gantry where placement of tank wagon is by electrical LOCO, traction line must terminate 15 M short of the first loading or unloading point at all Installations;

¹ Ins. by sub-cl (h) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² The words and expression mentioned are omitted by sub-cl (i) *ibid.* (w.e.f. 29.03.2023)

³ Ins. by Supra 2 (w.e.f. 29.03.2023)

⁴ Subs. by Supra 2 (w.e.f. 29.03.2023)

- (26) For placement, brake van or dummy wagons shall be used. Separate segregation gate shall be provided at terminating point and area between boundary wall and segregation gate¹[shall be outside the Hazardous area];
- (27) Main railway track shall be isolated from wagon gantry siding at least 15 meters from 1st loading or unloading point by providing insulation joint at terminating point and loco shall stop before the insulation joint; and
- (28) Sampling points shall be provided as per requirement of Industry Quality Control Manual (IQCM).

2.10 Design layout for handling of sick wagon:

When a wagon is found leaking during loading, provision shall be kept for safe handling of such wagons and such methods should include the following, namely: -

- (1) Arresting of leaks using cold weld as a first aid measure till the wagon is unloaded safely at the gantry itself and in no case such wagons to be used for transportation;
- (2) A dedicated drain header for instantaneous unloading of the sick wagons shall be provided and alternately, the existing headers may be utilized for immediate decantation of product from sick wagons by providing suitable arrangements in the manifold; and
- (3) A portable pump with flame proof or explosion proof motors and other electrical fittings to be used with suitable flexible hose connection for quick withdrawal of products into sump tanks and such drained products to be handled further as per IQCM (Industry Quality Control Manual).

2.11 Design Layout for handling slop:

2.11.1 Collection and Drainage:

A network of drainage system shall be provided to collect oil drains from various equipments, gantry areas, pump houses and like other passages and they should also collect surface drains from places where oil spillages are likely to occur and such drainage shall lead to OWS or ETP as the case may be.

2.11.2 Mechanised OWS:

The receiving sump of the OWS shall have suitable arrangement for skimming off upper layer of accumulated oil and provision shall be made for directing the collected oil to the slop tank.

2.12 Layout and Selection of electrical equipment:

- (1) Electrical equipment including the lighting system shall conform to hazardous area classification. The hazardous area shall be classified as per IS: 5572. The electrical fittings or equipment in the respective classified area or zone shall be of a type suitable for the particular area or zone as per classification in line with IS: 5571;
- (2) Electrical equipment shall be selected, sized and installed so as to ensure adequacy of performance, safety and reliability and the equipment in general shall conform to relevant Indian Standards and shall be suitable for installation and satisfactory operation in the service conditions envisaged;
- (3) The protective system shall be designed to ensure Protection of Personnel and plant equipment against damage which can occur due to internal or external short circuits,

¹ Subs. by sub-cl (j) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

overloading, abnormal operating conditions, switching, lightning surges, and like other damages accordingly, relays and protective devices shall be suitably selected and installed. All the protective relays for the Generator, Transformer, Motors and Switchgears shall be tested at least once in a year and test records maintained;

- (4) The outer PVC sheath of all cables used inside the dyke shall be fire retardant type conforming to category AF as per IS: 10810;
- (5) All cables shall be laid in proper cable trenches or cable trays suitably designed to ensure their protection and identification at all times;
- (6) All power and control cables shall have extruded inner and outer sheaths and such cables should be Aluminium or Copper Conductor, PVC or XLPE insulated, PVC sheathed and armoured type;
- (7) Instrument and signal communication cables shall not be laid in the same trench or tray along with electrical cables and the overall cable layouts shall be designed for minimum interference between signal and power cables; and
- (8) Cable route markers shall be installed at every 30 metres intervals all along the cable routes and also at cable joints and locations where the direction of cable trench changes.

2.12.1 Earth resistance:

- (1) Earth resistance can be directly read through an earth resistance tester which has associated Test, auxiliary Current and Potential electrodes and such instrument shall be a combination of ohmmeter and generator works on 'fall of potential' principle and the test voltage shall be derived from the generator of the earth resistance tester. Earth resistance also can be measured through Direct Earth Clamp Tester (DECT);
- (2) The testing of the Earth Pits shall be done six monthly, once in dry and once in wet weather and records thereof shall be maintained;
- (3) Removable link shall be provided to allow measurement of an earth electrode-resistance;
- (4) The resistance value of an earthing system to general mass of the earth should not exceed, -
 - (i) 4 Ohms for electrical systems and metallic structures;
 - (ii) 7 Ohms for storage tanks;
 - (iii) 1 Ohm for main earth grid, and bonding connections between joints in pipelines and associated facilities; and
 - (iv) 2 Ohms for each electrode to the general mass of the earth.
- (5) Earth resistance can be directly read through an earth test Megger which has associated Test, auxiliary Current and Potential electrodes and such instrument shall be a combination of ohmmeter and generator works on 'fall of potential' principle and the test voltage shall be derived from the generator of the Megger.

2.12.2 INSTALLATION EARTHING:

- (1) Installation earthing design shall be carried out in accordance with the requirements of Central Electricity Authority Regulations -2010 and IS: 3043 or equivalent system recognised by statutory authorities under the law in force relating petroleum and electricity and all earth connections should be visible for inspection to the extent possible. The earthing system shall have an earthing network with required number of earth electrodes connected to it.
- (2) Earthing system shall be designed for the following, namely: -
 - (a) System neutral earthing;
 - (b) Protective Equipment Earthing for personnel safety;
 - (c) Protection against Static discharges;
 - (d) Lightning Protection; and

(e) Earthing for Data Processing system.

2.12.2.1 Electrically independent earth electrodes:

- (1) Earth electrodes shall be located at such a distance from each other so that the maximum current likely to flow through one of them does not significantly affect the potential of the other;
- (2) The Lightning Arrestor (LA) of the Two Pole or Four Pole structure shall be connected to two distinct earth pits. The strips shall run on insulators or isolators so as not to come in contact with the Pole structure. Connections shall be made to the pit directly and then pits will be connected to each other to form a grid. The Grid of LA shall be distinct and shall not be connected to any other earth Grid;
- (3) The Two Pole or Four Pole structure shall be earthed with two distinct earth connections. The Gang Operated Switch shall also be earthed;
- (4) Fencing of Two Pole or Four Pole, Transformer yard shall be earthed and also electrical continuity between various structures the fencing shall be ensured;
- (5) The Neutral of the Transformer shall be earthed with two distinct earth pits separately. Connections will be made to the pit directly and then pits will be connected to each other to form a grid and such Grid shall be distinct and shall not be connected to any other earth Grid;
- (6) The Neutral of the Diesel Generator shall be connected to two distinct earth pits separately. Connections shall be made to the pit directly and then pits will be connected to each other to form a grid and such Grid shall be distinct and shall not be connected to any other earth Grid;
- (7) The transformer body shall be earthed at two points separately leading to earthing system;
- (8) All Metallic non-current carrying parts of all electrical apparatus shall be earthed to ensure that the exposed metallic parts do not become dangerous by attaining high voltages i.e. exceeding 650 volts in case of faults.
- (9) All the electrical equipment operating above 250 volts shall have two separate connections to the earth Such as Sub Station Panels, Motors, FLP JB's and like other separate connections;
- (10) All Steel structures, loading platform or gantries and like other structures shall have two separate and distinct connections and such connections will be made to the pit directly and then pits will be connected to each other to form a grid; and
- (11) Product Storage Tanks and like other storage chamber shall have two separate and distinct connections and each connection will be made to the respective earth pit directly, then, such earth pits should be inter-connected to form a dedicated grid for Tank Farm. The number of earth pits or connections to be increased for large tanks so that the distance between the connections does not exceed 30 meters on the tank perimeter.

2.12.3 Bonding:

- (1) All flanged connections shall be effectively bonded by strips of suitable material.
- (2) Continuity between rail spur and gantry in tank wagon loading or unloading gantry shall be ensured by checking at a suitable frequency. The gantry structure to be suitably earthed in earthing pits of standard specifications and the tank wagon siding to be insulated from main running track.
- (3) In tank truck loading and unloading gantry, 6 mm Sq. braided copper wire with one end firmly bolted to the Loading Unloading Arm or hoses and the other end provided with G.I or Copper or Non-corrodible metal crocodile clips shall be used and the crocodile clips being attached to the tank-truck under loading or discharging, for External Bonding of Loading unloading arms or hose with the Tank Truck.
- (4) For sampling jars to be inserted into product tanks, use only manila or sisal ropes.

2.12.4 Static earthing:

- (1) Static earthing (earthing for static charge dissipation) shall be provided at Tank Lorry or Wagon Filling or Decantation Gantries, to prevent building up of Static Charges; and
- (2) Earthing connections for static charge dissipation, electrical system, structure and instrumentation system shall be separate from each other, but such separate leading strips can be connected with main grid below the ground.

2.12.5 Lightning Protective System:

- (1) Lightning protection shall be provided for the equipment, structures and buildings which are higher than 20 meters or as per the risk index analysis worked out as per IS 2309;
- (2) Self-conducting structures (having min thickness 4.8 mm) do not require lightning protection with aerial rod and down conductors and they shall be connected to the earthing system at two points of the base; and
- (3) If lightning arrester is provided an independent earthing network shall be provided for lightning protection.

2.12.6 Earthing for data processing system:

- (1) Low noise earthing is required for critical data processing equipments and such earthing shall be independent of any other earthing of the Building. The RFI (Radio frequency interference) suppression filters fitted to the data processing equipment may produce high earth leakage current and in such cases failure of protective earth connection may lead to high touch voltages; and
- (2) Where ever isolation transformers are used the output neutral of the transformer shall be independently earthed so as to ensure that the Earth-Neutral Voltage is less than 1 volt.

2.12.7 Minimum Permissible Sizes of the Earthing Conductors:

Size of the conductor shall be selected, based on the fault current that is required to be dissipated during emergencies.

2.12.8 No of earth pits:

The earth is a minimum requirement and additional earth pits shall be made such as to maintain Grid Values below 1 Ohm.

Equipment	Nos
Earthing for Lightning Arrestor	2 Nos independent
For Di or Four Pole Structure, GO, Fence	2 Nos (All metal bodies connected)
Neutral of the transformer	2 Nos independent
Neutral of the DG Set	2 Nos independent for each DG Set
Body of DG Set or control panel for DG Set	2 Nos
Sub-station –PMCC Room	4 Nos
Fire Pump House	2 Nos
Air Comp House	2 Nos

All structures Shed of Pump House or Fire Engine or Loading unloading Gantry or Air Compressor or Engg. Store and like other structures	2 Nos for each structures
Static Earth for Loading or unloading Gantry (Tank Truck) operations.	2 Nos earth pits for 8 bay gantry.
Static Earth for Loading unloading Gantry (Tank Wagon) operations.	Min. 4 nos. earth pits for each (single or two spur) gantry. For rail track as per railway norms.
All 3 Phase Motors or FLP lights in each shed	2 Nos
High Mast Tower (HMT)	2 Nos for each HMT
Admin Blocks	2 Nos
Data Processing	One for Metallic body parts of equipments and one for neutral of isolation-transformer
Inspection Platform or Watch Tower or Weigh Bridge	1 Nos each
Water Storage Tanks (Fire Water Tank)	2 per tank
Product Storage Tank	Minimum 2 nos and further as defined in Clause 2.12.2 (11) above.

2.12.9 General:

- (1) Fail safe Interlock or change over switch shall be provided between the Grid Power and the DG power to ensure that the equipments get supply from one source only;
- (2) Insulation mats shall be provided in the Sub Station, control panels and like other points;
- (3) Relays/Cables shall be tested once in a year and records maintained.
- (4) Transformer oil shall be tested once in a year and records maintained.

2.12.10 Emergency Feeder:

Emergency Feeder shall host the Jockey Pump, Critical lighting, Fire Siren, Borewell, Gate Barrier, safety instrumentation and interlocks such as CCTV, Hydro Carbon detector, Dyke drain valve system, UPS of automation and supply to essential fire-fighting equipment.

2.13 INSTALLATION LIGHTING:

- (1) Sufficient lighting shall be provided so as to enable terminal operators to move safely within the accessible areas of installation and to perform routine operations. In the event of normal power failure, emergency lighting shall be provided in critical areas;
- (2) Normal lighting system shall be on 415/ 240V AC supply. Emergency lighting shall be provided in critical areas like Sub-Station, D G Room, Control Room and Security cabin;
- (3) Under normal operation, both emergency and normal lighting shall be fed by normal power source. On failure of normal supply, emergency lighting shall be available until the start of D.G.;
- (4) Lighting shall be provided for the various facilities in the Depot or Terminal as per good engineering practice;
- (5) The Illumination in the operational areas including inside the dyke and manifold shall be such that adequate visibility is there at all times for emergency and normal operations;

- (6) Lighting requirements provided during the failure of power supply is intended broadly to such failure;
- (7) Facilitate carrying out of specified operations, for safe shutdown of the installation;
- (8) Gain access and permit ready identification of firefighting facilities such as fire water pumps, fire alarm stations and like other facilities;
- (9) To gain access to escape route for safe evacuation of operating personnel; and
- ¹[(10) Depending on the nature of job activities carried out, the minimum required illumination levels for various areas shall be ensured for safe movement or operations or emergency handling, as under , namely:-

Sl. No.	Area	Lux Level
1	Main roads (Gate entry or exit, roads around TT gantry	20
2	Secondary roads (along storage tanks and Periphery and like other places)	10
3	Tank farm area	20
4	Pump or Compressor or Dosing Sheds or Fire Pump House	100
5	Main Operation Platforms and Access Stairs (TT and TW gantry, Tank manifold)	60
6	Ordinary Platforms	20
7	OWS or ETP Area	60
8	Sub Station or PMCC room	150
9	Transformer yard or HT Di pole area	100
10	Battery room, Charger or UPS rooms	100
11	Control Room building or laboratory	150
12	Lube Warehouse	100
13	Admin Building	200
14	Security Cabin or Watch Booth	100
15	Stairs	50
16	Corridors	70
17	Tank truck Parking area	20

Notes:

- (a) The lighting fixtures on various circuits shall be suitably designed so that failures of any one circuit do not result in complete darkness.
- (b) Switches controlling the lighting fixtures and exhaust fan shall be installed outside the battery room.
- (c) Switches of lighting panels installed in hazardous area, shall have a pole to break the neutral, in addition to the poles for phases.
- (d) Low pressure sodium vapour lamps shall not be installed in hazardous areas.

PART- C

(Safe Operating Practices)

3.0 Safe Operating Practices:

- (1) Operational safety aspects for Petroleum Product terminal or depot shall be built into the design which should also be reviewed during the construction phase from safety or

¹ Subs. by sub-cl (k) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

maintenance point of view and only skilled and trained personnel shall be deployed for effective operation, inspection, maintenance and like other work for the installation;

- (2) The operating procedures shall provide plant specific instructions on what steps to be taken or followed while carrying out Start-up, Normal operation, Temporary operation, Normal shut-down and Emergency operation and shut-down;
- (3) Manuals of operating procedures shall be made available to the employees. Training shall be imparted to the operators on operating procedures and should be certified as competent;
- (4) When changes are made in facilities, operating procedures should be reviewed as part of the management of change procedure. In addition, operating procedures should be reviewed periodically to verify that they reflect current and actual operating practices. Operating manuals should be certified as updated by authorized or competent person every year; and
- (5) The Safe Operating Practices (SOPs) mentioned in paragraph 3.1 shall outline the general guidelines and are not intended to override sound engineering practices and safety parameters regarding when and where the operating procedures should be used and any additional steps that may be sought to be included to ensure process safety.

3.1 Safe Operating Practices (for general guidelines), namely:-

Safe Operating Practices to outline the general guidelines shall include the following

- (1) Terminal or depot Control room where ever provided shall be manned on continuous basis during operations and in emergency;
- (2) No Person shall be allowed to smoke, carry matches, lighters, flammable material or any other appliances capable of producing ignition or explosion inside the licensed area of the installation;
- (3) Non-flame proof or Non-intrinsically safe Mobile phones and any other source of ignition shall not be allowed inside the Petroleum Installation operational areas where petroleum products are stored pumped and handled;
- (4) Site specific Standard Operating Procedures (SOPs) for each operation or activity shall be developed and complied with;
- (5) SOPs shall be periodically reviewed, updated and records and maintained especially whenever any changes or modifications to the facilities are made as per Management of Change procedure (MOC);
- (6) The critical operating steps based on Safe Operating Practices (SOPs) shall be displayed on the board near the location wherever applicable. In local language also and shall be made simple and user friendly;
- (7) All operations shall be carried out under supervision of designated personnel ¹[and periodic training and refresher needs should be given to such personnel];
- (8) All precautions shall be taken to ensure isolation of sources of ignition during maintenance (such as welding, cutting, and other process) from potential sources of flammable vapours. Presence of vapour at location of maintenance and its surrounding shall be constantly monitored by suitable portable device for flammable gas detection;
- (9) Maintenance or repair work or entry into confined space including closed drains or manholes ²[or work at height or any non-routine activity] shall be carried out in accordance with the Work Permit System;

¹ Ins. by sub-cl (l) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² Ins. by sub-cl (m) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (10) Non-Sparking tools shall be used to carry out the maintenance jobs in operational areas where flammable materials are handled or stored;
- (11) Check list for operators for monitoring and checking safety system and equipment shall be prepared, followed and records maintained thereof;
- (12) Roads inside the hazardous area of Installation shall be restricted to vehicles required for operational, maintenance and safety or security reasons and allowed only with proper safety fittings and authorization from designated officer;
- (13) Vehicles with internal combustion engine (compression ignition) such as tank truck required to be permitted for business shall have Petroleum and Explosives Safety Organization (PESO) approved spark arrestor fitted on the vehicle. Vehicles with spark ignition engine shall not be allowed inside hazardous area;
- (14) TTs to be parked in drive-out position in parking area having separate entry and exit gates;
- (15) All electrical equipment shall be maintained to ensure its integrity and type of protection as well as electrical area classification;
- (16) Suitable interlocks shall be provided for tripping or alarm or remote valves operation based on the events such as low level, high level, high-high level, high pressure, low pressure and like other events;
- (17) The contents of the dyke drain generated from draining of tanks, any other spillage or effluent containing oil shall be diverted to Oil Water separator (OWS) or Effluent Treatment Plant for safe disposal;
- (18) Personnel protective equipment such as safety shoe, hand gloves, apron, safety goggles, safety belt, helmet, ear muff, dust respirator, self-contained breathing apparatus (SCBA), resuscitator, fire proximity suits and like other protection equipments as applicable shall be worn while carrying out operations in normal and emergency situations;
- (19) Intrinsically safe handsets working on VHF or UHF or any other acceptable frequency band shall be used in operating areas;
- (20) Manning level in the shift shall be adequate to ensure coverage for normal and emergency operations;
- (21) The Petroleum Installation shall have provisions for handling leakage or spills at high risk areas, tank lorries and tank wagons;
- (22) Hydrocarbon Gas detection system shall be installed with audio or video alarm system in the control room as well as in the effective risk zones or areas;
- (23) All personnel who are handling petroleum products shall be suitably trained on use of firefighting, equipment and first aid. Thorough training shall be incorporated to all personnel on various levels of emergency response;
- (24) All other contract personal and supervisors entering the premises shall have basic safety training and should be aware about emergency duty and knowledge of the emergency exit route at all work locations;
- (25) The Petroleum Installation shall have effective CCTV system covering the entry or exit gate roads, periphery of installation and all critical operating areas (such as Tank farm, TT or TW operating area, product pump house, Fire water pump house and TT Parking area and like other areas) which shall be monitored continuously; and
- (26) The CCTV monitoring station shall be available in Control room, Security cabin and Depot in-charge room. The CCTV data shall be stored for a minimum period of 60 days.

3.2 Tank Farm area:

- (1) Ladders and Handrails of the product tank shall be free from any obstruction and to be in impeccable condition. The platform and railing on the top of the stairway to gauge well and roof ladder should have free access. Walkway with handrail on the roof of the tank should be inspected or checked, so that movement of personnel on roof is safe;
- (2) The tank farm management system shall be integrated with Enterprise Resource Planning (ERP) or Terminal Automation System (TAS) with provision of recording and display of

- real time inventory levels and ensure the effectiveness at regular interval and whenever the system is by pass, all necessary record shall be maintained;
- (3) Dyke drain Valves shall be provided with position indication and alarm system in the event of opening the valve. The dyke drain shall be provided along the inside periphery of the dyke enclosure wall and in case circular drain around tank pad is provided, the same needs to be connected to the peripheral drain. The outlet from dyke shall have the provision to either divert to the effluent Treatment plant or OWS or to main storm water drain;
 - (4) Dyke drain valves shall be in closed condition and shall be operated only under supervision of an authorized person and log book maintained. Piping through dyke wall, if any, shall be sealed to make dyke impervious;
 - (5) All electrical fittings and fixtures inside the dyke shall be as per the hazardous area classification and its integrity maintained;
 - (6) The dyke and the enclosures shall be inspected for cracks, visible damage and like other damages every six months (pre and post monsoons) and after every major repair in the tanks or dykes and like other devices so as to keep it impervious;
 - (7) All the tanks inside the dyke shall have fire-fighting system in operating condition;
 - (8) There shall be ensured “No” chocking of water spray nozzles.
 - (9) The dyke area shall have proper slope outward of tank pad towards the inner periphery of the dyke enclosure to prevent reverse flow;
 - (10) The Remote Operated Shut Off Valve (ROSOV) and Motor Operated Valve (MOV) of the tanks and pipeline manifold (inlet, outlet and recirculation) of all storage tanks storing class A and class B products shall be operational and should remain shut after closure of day operations;
 - (11) ROSOVs and MOVs shall be fail safe and fire safe (shall close in case of signal failure). The actuator shall be fail-safe. The cables leading to the control room shall be fire resistant and the ROSOVs shall be operational from the field and also from control room;
 - (12) Thermal safety valve (TSV) and Expansion line shall be connected for blocked portion of pipe line to take care of the thermal expansion of product due to rise of temperature. Temperature Safety Valves (TSV's) and downstream valves shall be always kept open and its discharge should be routed to slop collection system and alternatively, the discharge may be connected to a common header and back to the tank through NRV;
 - (13) The area floor underneath of the pipeline manifold shall be paved and the Kerb walls or drain connected to oil water drainage system leading to ETP or OWS;
 - (14) Product storage Tanks must be periodically inspected and checked for leakages or sweating. Repairs must be immediately carried out, whenever scaling or pitting are observed;
 - (15) Movement of floating roof must be smooth during operation. Free movement of rolling ladder must be ensured by proper lubrication of moving parts and ensure free movement of wheels;
 - (16) Floating roof deck must be kept clean and free from all foreign materials or dust and like other materials so as to avoid clogging of roof drain sump;
 - (17) Tank farm area shall be covered through CCTV surveillance system and monitored;
 - (18) Water seal must be maintained in the emergency drain in floating roof tanks and it shall be ensured that adequate water is maintained in the water pot of the emergency drains;
 - (19) Proper earthing and bonding shall be maintained and ensured at all times for the tank body, electrical continuity from shell to ladder and from ladder to floating roof;
 - (20) Safe Operating Practices (SOPs) for entry on floating roof or confined spaces for maintenance and inspection (when the tank is with product for normal operation) shall consider the following, namely: -
 - (i) Floating roof is levelled, free of oil and excessive water and is at higher operating level;

- (ii) Adequate manpower with a canister mask or breathing apparatus and like other apparatus is deputed;
 - (iii) A life line with safety belt to be used for entering into confined space and the other end of the line held by the standby person at the top of platform; and
 - (iv) In case of requirement of going on floating roof deck for inspection during normal operation, at least one person should accompany the person making the inspection.
- (21) No gauging or sampling of tanks shall be undertaken during thunder or hail storms;
 - (22) Water draining from tanks should be done under close supervision as per approved Safe Operating Practices (SOPs);
 - (23) Receipt and withdrawal rate from the tanks shall be limited to the design parameters of the tank below and the flow velocity at tank inlet shall not exceed 1 m/s until the inlet is completely submerged;
 - (24) Breather vents provided on cone roof tanks shall be checked to ensure normal operation and ensure its effectiveness;
 - (25) Special attention shall be given during receipt as well as transfer from the floating roof tanks when roof is in semi floating condition that is to say operating in erroneous zone;
 - (26) Safety shoe (Conductive type) shall be worn while gauging, sampling or taking temperatures;
 - (27) Tank dip pipes shall be extending to tank bottom and if dip pipes are not provided, give a settling time of 30 minutes after receipt or discharge before sampling or gauging;
 - (28) Synthetic fibre cord shall not be used for sampling, dipping, gauging and like other process. If in the sampling, gauging, dipping, like other process, equipment is a conductor, the cord must be conductive, such as a metal wire. Metal chains shall not be used, instead Natural fibres such as sisal and manila which have sufficient conductivity to prevent the operator from becoming charged by handling it, can be used;
 - (29) There shall be ensured that gauge tapes and other sampling equipment are of non-sparking type;
 - (30) During receipt, tank level shall be monitored at regular intervals. Effective communication shall be provided in the tank farms, which may include Intrinsically safe VHF or UHF or any other acceptable frequency band handset and like other devices and such system can also be utilised for communication during emergency;
 - (31) Cleaning of tanks should be carried out as per plan in line with the approved Safe Operating Practices (SOPs). Gas oil spray and steam shall not be used for cleaning of Class A and class B tanks;
 - (32) Earthing and bonding connections shall be ensured during the entire operating process. The earthing system shall be checked for bonding and earth continuity as required and the records maintained thereof;
 - (33) Hydrocarbon (HC) detectors shall be installed near all potential leak sources of class "A" petroleum products that is to say tank dykes, tank manifolds and pump house manifold. And such detectors shall be placed in a way that entire possible source of leaks and collection of products is continuously detected and alarm is set at 20% of lower explosive limit of class A petroleum products; Further, hydrocarbon detectors shall be installed near all potential leak sources of class "B" petroleum products as and when such effective and proven detectors are available.
 - (34) Fire-fighting system provided for above ground Tanks shall be operational, and the effectiveness of the system to be ensured checked periodically for operation as per design capacity;
 - (35) The tank farm must be kept clean and shall be free from dry vegetation;

- (36) OWS system shall be maintained ¹[clean] by periodic cleaning. End of the vent of Inspection chamber of the OWS system shall be provided with wire mesh. The accumulated oil from the OWS sumps shall be collected and sent to slop tanks at regular intervals;
- (37) Disposal of sludge collected during cleaning of the tanks shall be done as per the applicable guidelines; and
- (38) The product storage tanks shall have level indicators as well level alarms and interlocking with MOV and ESD. The effectiveness of the system or interlocking shall be checked regularly. The interlocking or ESD shall not be bypassed. In case of any such exigency, the approval from authorised person in this behalf shall be taken with requisite precautions and records maintained thereof.

3.3 Bulk handling:

3.3.1 Tank Truck (TT) Loading or Unloading:

Transportation of petroleum products by road is regulated by PESO in accordance with the provisions of the Petroleum Rules 2002 the carriage by Road act, 2007(4 of 2007) and the rules made thereunder and the Central Motor Vehicle Rules, 1989, Legal Metrology Act 2009(1 of 2010).

3.3.1.1 Before Commencement of Loading or Unloading:

- (1) Open source of ignition shall not be allowed in any part of the Petroleum Installation operational area including tank lorry loading or unloading area;
- (2) The following shall be ensured in a tank truck as per statutory regulations before accepting it for filling, namely: -
 - (i) Provision of PV vent, emergency vent, Master valve and other safety fittings;
 - (ii) Fire screen between cabin and tank is provided and for such purpose, cabins with metallic back cover without any opening will be considered as fire screen;
 - (iii) Provision of 2 nos. of Fire Extinguishers of ISI mark (1 no. X 10 or 9 kg DCP and 1 no. 1 kg CO₂ or DCP or equivalent approved fire extinguisher);
 - (iv) Spark arrestors of the approved designed shall be welded with the exhaust in front of the vehicle and the vehicle shall have valid Explosive License and RTO certificate along with PESO approved drawings of the tank and such arrangement in case of BS-IV and future models may not be required if exempted by PESO;
 - (v) Availability of brazed copper strip for earthing or bonding connection; and
 - (vi) Tank trucks should be equipped with ABS.
- (3) The Double pole master switch shall be put off immediately after parking the truck in the position. No electrical switch on the truck shall be turned "on" or "off" during the loading or unloading operation;
- (4) Wheel choke shall be placed at wheels to prevent accidental movement of the truck and hand brakes should also be applied during the entire loading or unloading operation;
- (5) The first process after positioning the truck shall be to provide appropriate earthing and after the loading or unloading operation, earthing shall be disconnected just before the release of the truck;
- (6) Vapour Space of 3% of its capacity shall be kept in each tank truck in respect of Petroleum Class A and Class B products and 2% vapour space in tank trucks in respect of Petroleum class C products;
- (7) No repairs shall be made on the Tank Lorries, while it is in the loading or unloading area;

¹ Subs. by sub-cl (n) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (8) Personnel deployed in the loading or unloading area shall make use of Personal Protective equipment and wear all throughout the working period;
- (9) Loading or unloading area pipeline manifold shall have provision of quick shut-off valves;
- (10) No tank vehicle shall be loaded at a rate exceeding (volumetric flow rate corresponding to linear velocity) one meter per second at the delivery (at the least dia fitting) and of the filling pipe until the filling pipe is completely submerged in petroleum and thereafter the loading rate should be gradually increased, but it shall at no point of time exceed six meters per second at the delivery end of the filling pipe;
- (11) Oil and water collected from loading or unloading areas shall be routed to Oil water separator system or Effluent Treatment Plant or similar facility. A slop tank should be earmarked for storing separated oil;
- (12) The tank truck gantry shall be so designed that all the compartments of the tank truck are filled at one bay only and the layout shall ensure that all operations are planned in a manner so that no zigzag movement of the tank truck around the gantry should take place; and
- (13) The maximum safe carrying capacity in weight of Petroleum that can be carried in a tank vehicle shall not exceed the difference between the unladen weight of the vehicle and the maximum gross weight permitted for the class of vehicle under the appropriate transport regulations.

3.3.1.2 During Loading or Unloading Operation:

The following shall be ensured during the loading and unloading operation, namely: -

- (1) Move truck to the loading or Unloading bay and position the TT in the loading or unloading bay and place wheel chokes at front and rear wheels of the vehicle. Keep the TT in neutral mode with hand brakes;
- (2) Certified ISI Mark fire extinguishers shall be placed near the tank trucks, during loading or unloading operations at a designated marked place;
- (3) Stop the engine of TT and “Switch off” Master switch, so that the TT cannot be started incidentally, and the TT electrical supply shall be disconnected totally;
- (4) The TT driver and cleaner shall be outside the vehicle to meet any exigency, and “no” person shall be in the driver's cabin;
- (5) Provide earthing connections of the vehicle at specified point on tanker tank to the fixed grounding system;
- (6) Ensure that TTs manifold valve are closed and capped;
- (7) Test the connections for any product leakages;
- (8) Loading of TTs shall be through dedicated loading arms and through flow meters. The correctness of the mass flow meter shall be ascertained periodically. Splash loading shall be avoided;
- (9) Start the loading operations with initially loading rate which shall not exceed 1 m/s till fill pipe is completely submerged with petroleum products and there after gradually increased loading rate but shall not exceed 6 m/s (should preferably not exceed 4 m/s);
- (10) The quantity loaded into the truck can be assessed by-
 - (i) Liquid level through manual dipping; and
 - (ii) Filling through Flow meter;
- (11) Filling or transfer operations shall be suspended immediately in the event of-
 - (i) Uncontrolled leakage occurring; or
 - (ii) A fire occurring in the vicinity; or
 - (iii) Lightning and thunder storm;

- (12) The personal working engaged in loading unloading operation, shall use fall protection system designed for the purpose;
- (13) An authorized person of the company shall supervise the filling operation and respond immediately in the event of an emergency; and
- (14) Trucks meant for loading may be inducted in line with approved acceptance checklist, Filling Checklist and records thereof shall be maintained.

3.3.2 Tank Wagon (TW) Loading or Unloading:

Before Commencement of Loading / Unloading, the following shall be complied with, namely:-

- (1) Ensure that the loco is at least at a distance of 15 metre from the first loading / unloading point when the wagons are being placed or removed in the gantry for loading or unloading;
- (2) Main railway track shall be isolated from wagon gantry siding at least 15 meters from 1st loading or unloading point by providing insulation joint at terminating point and loco shall stop before the insulation joint using adequate number of dummy wagons;
- (3) The loading or unloading operation shall be carried out under close supervision of authorized person;
- (4) After the wagons have been placed at the gantry for loading or unloading breaks are to be applied before detaching the loco;
- (5) Open source of ignition shall not be allowed in any part of the area where product transfer operations are being carried out. Use of mobile phone is prohibited in the zone or area;
- (6) Ensure that all fittings on the tank wagons are checked physically that is to say before and after loading or unloading;
- (7) Always use gantry platform for movement from one wagon to other wagon. Movement from wagon to wagon is prohibited, but ¹[movement] from wagon to wagon with adequate Fall protection system or Safety harness shall be permitted;
- (8) The first operation after positioning the wagon shall be to provide appropriate earthing of all the tank wagons. Ensure that electrical continuity of the system is intact by providing bonding in flanges and checking of continuity;
- (9) Ensure all the firefighting equipments are in good working condition, and the fire fighting ring main system is pressurized and maintained;
- (10) The loading unloading system or equipment's shall not operate more than its designing capacity;
- (11) Any non-routine work in the operational area shall be permitted with work permit only;
- (12) Every individual working in the Tank Wagon operating area must be familiar with all the firefighting equipment, their care and their use in the event of fire;
- (13) Use of right kind of equipment to handle loading or unloading operation. After using the equipment or material or tools shall not be placed at rail track;
- (14) Maintenance jobs on rail track during placement or removal of rake are strictly prohibited;
- (15) Oil and water collected from loading or unloading areas shall be routed to Oil water separator system or Effluent Treatment Plant or similar facility. A slop tank should be earmarked for storing separated oil;

¹ Subs. by sub-cl (o) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (16) Open drains along the railway line or gantry shall be covered with gratings so as not to endanger movement of personnel;
- (17) Minimum Vapour space for tank wagons carrying different classes of petroleum products shall be for Petroleum Class A - 4% and for Petroleum Class B and C - 2.5%;
- (18) Tank wagon loading or unloading operations shall be suspended immediately in the event of uncontrolled spill, or fire in the vicinity;
- (19) Before the wagons are moved from the spur, brakes on all the wagons shall be released;
- (20) The railway siding railway track shall be properly insulated from the main line and grounded, vis-a-vis main rail track;
- (21) Wagon to be checked for mechanical condition, dents, and leaks and the report of defective wagons to be provided to Railways;
- (22) All drain and vent point in pipe line shall be kept closed and capped; and
- (23) Good housekeeping to be ensured all the time in Railway siding or gantry and all the personnel working in the area shall wear Personal Protective equipment.

3.3.2.1 During Tank Wagon Loading Operation:

During tank wagon loading operation, the following shall be observed, namely: -

- (1) Accept the tank wagons for loading only after the railway staff declares the tank wagons are fit for loading or unloading operation;
- (2) Before loading of a wagon, a bonding connection shall be made before opening of manhole cover and shall remain in place until filling is completed and all dome covers shall be closed and secured;
- (3) Dip tape or sampler shall not be lowered during loading time or just after completion of loading in a wagon to permit relaxation of charges; and
- (4) No Wagon shall be loaded at a rate exceeding (volumetric flow rate corresponding to linear velocity) one meter per second at the delivery or at the least smallest pipe fitting and of the filling pipe until the filling pipe is completely submerged in petroleum and thereafter the loading rate shall be gradually increased but it shall at no point of time exceed six meters per second at the delivery end of the filling pipe.

3.3.2.2 During Tank Wagon Un-Loading Operation:

During tank wagon un-loading operation, the following shall be observed, namely: -

- (1) Ensure health of unloading pumps required for unloading of wagons;
- (2) Ensure mobilization of required hoses, gaskets, adapters, nuts, bolts and like other devices at the site;
- (3) Ensure correct line up from unloading pump discharge to product tank;
- (4) Record all seals numbers, density and DIP in "sick wagon unloading register";
- (5) Confirm the correctness of the line-up hoses and product pipeline connections. Recheck and ensure that product exchange shall not take place;
- (6) Ensure earth continuity from Wagon to unloading point by providing required copper jumpers at flange joints;
- (7) Measure the initial dip of the tank wagon prior to unloading;
- (8) Record the initial dip of the tank wagon and the designated tank dip prior to unloading;
- (9) Open air vent valve and filling pipe cover for air breathing;
- (10) Open the master valve and bottom valve of the tank wagon; and
- (11) Monitor the physical dip of the product in the Tank wagon, particularly towards end of the unloading.

3.3.3 Handling and Unloading of Sick Tank Wagon:

While handling and unloading Sick Tank Wagon, the following shall be observed, namely: -

- (1) In case of minor leak, try to arrest the leak at the site with the help of railway staff only through cold repair methods only;
- (2) When a wagon is found leaking during loading or unloading, provision shall be kept for safe handling of such wagons and as a first aid measure arresting of leaks using cold weld compounds at gantry itself and in no case such wagon to be used for transportation;
- (3) If the leak is minor and not stopped by TXR staff or Maintenance, then, make arrangements to decant the wagon into Product Tank;
- (4) If the leak is major, then, immediately inform the concerned Railway staff and in the meantime try to contain the spill using container or drums;
- (5) Connect the un-loading hose to wagon's unloading flange and nearest sick wagon unloading point of the gantry;
- (6) Product should be then transferred to suitable storage and leakage shall be arrested by cold repair methods and in case leakage cannot be arrested, wagon shall be declared sick in concurrence with the railways staff and emptied out completely;
- (7) A dedicated drain header shall be provided for instantaneous unloading of the sick wagons and alternately, the existing headers may be utilized for immediate decantation of product from sick wagons by providing suitable arrangements in the manifold; and
- (8) A portable pump with flame proof or explosion proof motors and other electrical fittings to be used with suitable flexible hose connection for quick withdrawal of products into sump tanks and such drained products to be handled further as per IQCM (Industry Quality Control Manual).

3.3.4 Tank Wagon Unloading in Slop Tank:

While Tank Wagon unloading in Slop Tank, the following shall be observed, namely: -

- (1) Ensure earth continuity from Wagon to unloading point by providing required copper jumpers at flange joints and appropriate earthing connection shall be made before the start of unloading activity;
- (2) Ensure that required ullage is present in the slop vessel to accommodate the quantity to be unloaded from the sick tank wagon and check the dip of product in the slop vessel physically and record it;
- (3) Ensure mobilization of required hoses, gaskets, adapters, nuts, bolts and like other devices near the sick wagon;
- (4) Ensure that the all other stub or branch pipe of the sick wagon unloading header throughout the gantry are properly blinded;
- (5) Record the product specification and density and DIP in "sick wagon unloading register";
- (6) Confirm the correctness of the line up to the slop vessel;
- (7) Connect the un-loading hose to wagon's unloading flange and nearest sick wagon unloading point of the gantry;
- (8) Open air vent valve and filling pipe cover of wagon for air breathing;
- (9) Open the master valve and wagon bottom valve of the wagon;
- (10) Continuously monitor the dip level of the wagon during unloading operation;
- (11) Check and ensure that there is no leakage of product from other flanges of the unloading header in the gantry area;
- (12) Monitor level of product in the slop vessel;

- (13) Monitor the physical dip of the product in the Tank wagon, particularly towards end of the unloading;
- (14) Check the emptiness of the wagon;
- (15) Disconnect the flexible hose carefully; decant the remaining material of the hose into slop vessel;
- (16) Close bottom valve as well as master valve of the tank wagon;
- (17) Place the unloading hoses and other material at designated place;
- (18) Check the closing stock or physical dip of product in slop vessel and record it; and
- (19) Reconcile the quantity unloaded from Tank Wagon and quantity received in the slop vessel.

3.4 Transfer of Product through Pipeline:

Where ever pipe line transfer is envisaged between various entities, a mass flow meter with integrator shall be installed on receipt line at both ends that is to say dispatch and receipt ends and signal shall be provided in the control rooms of both dispatching and receiving companies or locations for monitoring.

The following safe practices to be followed, namely: -

- (1) Gauging procedure shall be completed and line shall be made through;
- (2) Physical inspection shall be carried out up to the exchange manifold for any leakage or damage and like other harms;
- (3) Monitoring systems such as SCADA shall be installed in cases of cross country pipeline transfers;
- (4) Seal the pressure relief lines of receipt nozzles of product tanks connected to the same common receipt header;
- (5) After ensuring that there are no leaks, pumping shall be commenced;
- (6) Pumping shall be commenced initially at low flow rate and only after stabilizing of flow and the flow rate may be increased;
- (7) Product shall not be pumped beyond safe filling height of the tank and necessary alarms and interlocks in the automation shall be put in place to ensure the safe filling;
- (8) After completion of the receipt, pumps must be stopped;
- (9) In case of Emergency Shutdown, care shall be taken so that back pressure is not developed in the pipelines and pump head;
- (10) Sampling shall be carried out as per provisions of Industry Quality Control Manual(IQCM);
- (11) Pipe Line transfer (PLT) shall not be taken simultaneously in more than one tank; and
- (12) In case product is required to be taken into more than one tank, tank shall be switched over after completion of operation in first tank, close all valves to the first tank, make line through for the second tank as per procedure.

3.5 Marine Loading or Unloading:

- (1) Marine facilities handling petroleum products shall have clearly marked out escape route, and at the same time have sufficient access to fire fighting.
- (2) Fire fighting facility for a marine facility handling petroleum products shall be provided as per design standard.
- (3) Vessels berthed at the wharf shall be fastened with mooring ropes, ensuring that the vessel is well secured to the wharf.
- (4) Before commencement of loading or discharge of the vessel, shore and vessel representatives to jointly sign off safety check list covering all aspects of the vessel loading or discharge shall

be ensured and such safety Check list shall also cover emergency evacuation measures in event of emergency on shore and on board the vessel.

- (5) Clear communication channel shall be established between vessel and shore terminal.
- (6) Loading pumps capable of building up pressures that exceed the safe working pressure of cargo hose or loading arms shall be provided with bypasses, relief valves, or other arrangements to protect the loading facilities against excessive pressure. Relief devices shall be tested at least annually to determine that they function satisfactorily at their set pressure.
- (7) Vessel tanks nominated for loading petroleum products shall have oxygen content below 8% to ensure safe loading operation and such safe loading operation has to be ensured in all vessel or tanks nominated for loading, before any product loading can commence into any of the vessel tanks.
- (8) Loading or unloading arms or hoses connected to the vessel for loading or unloading shall have facility for emergency shut off and break away.
- (9) Loading or unloading quantity and rates shall be monitored on an hourly basis and corresponding ship and shore figures shall be hourly compared.
- (10) Loading or unloading arms or hoses shall be inspected hourly for leakages during the operations.
- (11) Vessel shall ensure and confirm to shore on hourly basis and the status of various vessel tanks shall ensure that no product migration is taking place between vessel tanks.
- (12) Abnormalities observed during operations shall be immediately communicated between ship and shore. In case of abnormality in operations, operations shall be stopped immediately. Operations shall only commence after conditions have been restored to normal. Abnormalities which shall be considered are the following, namely: -
 - (a) Large differences between vessel and shore tank hourly quantity;
 - (b) Variation in product densities from the certified density of the product under operation; and
 - (c) Leakages observed on board vessel or shore pipelines or hoses or spillage observed in the sea water.
- (13) Mechanical work shall not be performed on the wharf during cargo transfer, except under special authorization based on a review of the area involved, methods to be employed, and precautions necessary.

3.6 Ethanol Handling:

In case ethanol is used for blending with Motor Spirit at the petroleum installation, facilities for storing and handling of ethanol shall be provided and all practices as being followed in handling Class 'A' Petroleum Products are required shall be adhered to while handling Ethanol and Ethanol Blended Motor Gasoline. ¹[Adequate flame or heat detection mechanism shall be provided for detection of ethanol fires as ethanol burns with a flame which is not clearly visible in bright sun light. Alcohol Resistant foam shall be provided to fight ethanol fires. For fighting other fires including ethanol Blended MS, Aqueous Film Forming Foam (AFFF) can be used.]

3.6.1 Receipt, storage and handling of ethanol:

- (1) Ethanol shall be received at installations/ depots in dedicated tank trucks and all care shall be taken to prevent ingress of water into the compartments during transportation.
- (2) The fittings in tank trucks used for transportation of Ethanol to receiving locations shall be the same as used for storage and handling of Class 'A' Petroleum products.

¹ Ins. by sub-cl (p) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (3) Ethanol can be stored in above ground or underground tanks depending on local requirement.
- (4) The unloading operations shall be carried out through special Nitrile rubber or any other compatible hoses. Hose shall have external bonding wire to ensure electrical continuity.
- (5) Ethanol being hygroscopic in nature, utmost precaution needs to be taken to ensure that there is no ingress of water or humidity. Both the ends of the hoses after use shall be capped and 80 mesh strainers shall be provided before the pump or tank inlet, as the case may be.
- (6) Appropriate recommended dosage of Corrosion inhibitor shall be added during the decantation of Ethanol from tank truck into the storage tank, so as to ensure homogeneity of additives with ethanol in the storage tank.
- (7) Storage tanks and allied facilities for Ethanol shall be positively segregated and the tank shall be absolutely free from water at all times.
- (8) Ethanol, being hygroscopic, will absorb moisture from the air and Silica Gel trap shall be provided in the vent pipe of the tank to prevent ingress of moisture into the tank. Regular check on the colour of silica gel shall be maintained (Blue Colour) and shall need immediate replacement on showing signs of saturation by way of change of colour.
- (9) Ethanol storage tanks shall be cleaned once in two years or more frequently depending on the need.
- (10) Storage tank openings or pipeline fittings shall be airtight and the threaded connections if any shall be tightened with the help of Teflon paste or Teflon tapes and Bolted connections shall have gaskets of Teflon.
- (11) To ensure uniform doping of Ethanol with Motor Gasoline, on line doping of Ethanol shall be carried out through a closed system, with proper interlocks, while maintaining efficacy of mixing Ethanol in the right proportion of % v/v as per specification.
- (12) An 80-mesh filter shall be provided on the delivery side of Ethanol storage tank that is to say between pump and tank lorry filling (TLF) Gantry point.
- (13) Safety requirements as specified in Material safety data Sheet (MSDS) shall be ensured.
- (14) "Safe Operating Practices (SOP)" shall be displayed. Persons handling ethanol shall be trained for handling of ethanol.
- (15) Emergency instructions and hazardous instruction shall be displayed and PPE as per MSDS requirement shall be in place.
- ¹ (16) Ethanol should be stored either in underground tanks or semi-buried tanks or above ground tanks and aboveground tanks for ethanol storage shall be of Internal Floating Roof Type or Cone Roof type. External Floating Roof tank or Internal Floating Roof tank with window opening on the shell shall not be used for ethanol storage.
- (17) Adequate corrosion protection measures should be taken for ethanol service tanks.
- (18) Fire fighting on fires related to Ethanol –
 - (i) for spill of ethanol at TLF gantry or during unloading of Ethanol TT alcohol resistant foam cover to be immediately spread over the spilled contents using portable Medium Expansion Foam Generator (MEFG) or appropriate equipment;
 - (ii) for leak of ethanol from gaskets in Pump House or in Tank farm, alcohol resistant foam covers to be immediately spread over the spilled contents using portable MEFG or appropriate equipment;
 - (iii) if in Tank Farm, common HVLR is used for tanks storing MS or ethanol or ethanol blended MS, then, appropriate SOP for use of such HVLR for different fires shall be prepared, displayed and practiced in mock drills;
 - (iv) minimum two MEFG for each tank inside dyke area storing ethanol or ethanol blended MS shall be provided. Separate Alcohol Resistant Foam feeding arrangement shall be made for such MEFGs. Appropriate SOP shall be prepared and displayed near the operating area;

¹ Ins. by sub-cl (q) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (v) Hydro Carbon Detection system as applicable for ethanol shall be provided at all possible places of leak including isolation valve inside dyke and at sump near dyke drain valve;
- (vi) foam pourer system as provided in Internal Floating Roof Vertical Tank (IFRVT) or in Cone Roof Vertical Tank (CRVT) for ethanol service shall have dedicated provision for Alcohol Resistant Foam for fire-fighting; and
- (vii) inspection frequency: Internal inspection of ethanol tanks shall be done once in 5 years; External inspection shall be done visually six monthly and Ultrasonic Thickness testing shall be done once in 3 years.]

PART - D

(Commissioning or De-commissioning of facilities)

4.0 Commissioning or De-commissioning of facilities:

Commissioning is the process of assuring that all systems and components of a facility, a process, or a plant are installed, tested, and operated according to the design parameters and operational requirements. De-commissioning is the process of assuring that all systems and components of a facility, a process, or a plant are tested and confirmed that there is no Hazard available or balance, which may cause any potential damage to the personal and also equipment or facilities installed in the vicinity before shutdown of the facility. The commissioning or de-commissioning process shall include the following aspects, namely: -

- (1) Standard operating procedures for commissioning or decommissioning of the equipment and facility shall be formulated, reviewed and approved by designated personnel;
- (2) Only experienced and trained personnel shall be deployed for commissioning or de-commissioning activities;
- (3) The de-commissioning or commissioning of the facility shall be carried out under the close supervision of the experienced and expert supervisors;
- (4) The role and responsibilities of each personnel associated with the commissioning or de-commissioning activities shall be clearly defined and approved;
- (5) The commissioning process comprises the integrated application of a set of engineering techniques and procedures to check, inspect, test, and verify every operational component of the project, from individual functions, such as stand-alone equipment and instrumentation to complex combinations of modules, subsystems and systems;
- (6) There shall be an approved commissioning or de-commissioning plan for each facility or process unit of the project;
- (7) The procedures shall be developed taking into account the various hazards that are likely to be encountered during the commissioning process and shall also address the prevention or mitigation systems that need to be in place prior to commencing each activity;
- (8) The procedure referred to in clause (7) should also take into account any risks to the operators, facility, and environment based on a risk assessment;
- (9) Procedures shall ensure that all necessary checks or safeguards are correctly addressed. Procedures shall be supported with proper checklists for verifying compliance;
- (10) Pre-commissioning activities like vessel entry, work at height, hot work, and all commissioning or de-commissioning activities shall be carried out complying with work permit system;

- (11) Compliance to work permit requirements should be monitored via regular safety inspection;
- (12) All staff and the associated contractors, vendor representatives at site shall use Personal Protective Equipment (PPE) as specified for such purpose;
- (13) In the event of an emergency occurring in the Project site or area, the emergency response shall be in accordance with the established Emergency Response Procedures;
- (14) Hazardous waste and non-hazardous waste produced in the pre-commissioning or commissioning activity (that is to say flushing lube oil, oil contaminated water or soil) shall be handled in accordance with established environmental procedures of waste management;
- (15) A comprehensive testing procedure shall be developed which address the safety of all personnel involved therein and include the provision of specific work instructions and related training and induction for all personnel involved in testing operations. The testing must be supervised by trained and experience personnel. Coordination and team work between Construction, QA or QC, Safety, and Contractor is very important;
- (16) Any pressure test activity shall have approved pressure test Certificates of relevant testing equipment or instruments, work permit and job safety analysis;
- (17) The hydrostatic and pneumatic test pressure utilized for testing of systems shall be as indicated in the data sheet and the relevant Codes and Specifications for the system shall be used for determining the hydrostatic or pneumatic test pressures;
- (18) Test facility shall be set up with provision of a relief valve and calibrated pressure gauge (at least two units in the test loop) shall be deployed;
- (19) Prior to commencement of any pressure test, the relief valves shall be correctly set and not isolated, and the pressure gauges shall be functional;
- (20) Equipment or piping system isolation spades, gaskets, flanges and like other devices should be checked for correct size, thickness and rating;
- (21) All vents and other connections which can serve as vents shall be open during filling, so that all air is vented prior to applying test pressure to the system;
- (22) Temporary spades and blanks installed for testing purposes shall be designed to withstand the test pressure without distortion;
- (23) Piping shall be tested prior to installation of inline items such as rupture discs, displacement and turbine meters, orifice plates, flow nozzles, level gauges, rotameters, strainers and like other devices; and
- (24) Many potential hazards can be realized during start-up or shut-down of a plant or a process unit. Specific Emergency procedures should be provided which take into account all possible eventualities.

PART - E

(Fire Protection and Prevention Facilities)

5.0 Fire Protection and Prevention Facilities:

5.1 Fire Protection Philosophy:

Fire protection philosophy is based on loss prevention and control. It considers that a depot or terminal carries an inherent potential hazard due to flammable nature of petroleum products stored therein. A fire in one facility can endanger other facility of the depot or terminal, if not

controlled or extinguished as quickly as possible to minimize the loss of life and property and to prevent further spread of fire.

5.1.1 Fire protection:

Depending on the nature of risk, following fire protection facilities shall be provided in the installation, namely: -

- (i) Fire Water System-(storage or pumps or distribution piping network with hydrant or monitors);
- (ii) Fixed Water Spray System;
- (iii) Foam System;
- (iv) First Aid Fire Fighting Equipment;
- (v) Trolley mounted or Mobile Fire Fighting Equipment;
- (vi) Carbon Dioxide System or Clean Agent Fire Fighting System or Dry Chemical Fire Fighting System;
- (vii) Dry Chemical Extinguishing System;
- (viii) Clean Agent Protection System;
- (ix) Leak detection System and Alarm System;
- (x) Fire Detection and alarm systems; and
- (xi) Communication System.

5.1.2 Design criteria for fire protection system:

- (1) Facilities shall be designed on the basis that city fire water supply is not available close to the installation. The Installation or Depot should have its own independent Fire Fighting System. Pipeline installation co-located with Refinery or Marketing installation may be covered by fire fighting system of later and need not require independent fire fighting system.
- (2) The fire water pumps shall be provided with auto start facility with pressure drop in fire water network.
- (3) The fire water system shall be based on single contingency for all locations where total storage capacity in the location is up to 30,000 KL (Including storage of Class C products if stored with Class A and / or Class B). Wherever water replenishment @ 50% or more is available, the storage capacity can be reduced to 3 hours aggregate rated capacity of main pumps.
- (4) The fire water system shall be provided based on two largest fire contingencies simultaneously for all locations where total storage capacity in the location is above 30,000 KL (Excluding Class-C products stored in a separate dyke conforming to prescribed separation distances) and wherever water replenishment @ 50% or more is available, single fire contingency shall be considered for Fire water storage. This clause shall not be applicable for locations exclusively storing class C and / or excluded products.
- (5) At locations where cluster of OMCs exist, fire water shall be shared. Water requirement shall be worked out based on fire scenario of single largest tank, CR or FR tank, as the case may be. At locations where single OMC exist, it shall have water requirement for 4 hours.
- (6) For location or dyke storing exclusively Class C or excluded or combination of Class-C and excluded products, the water requirement shall be based on 1 monitor of 144 kl/hr and 4 hose streams of 36 kl/hr that is to say a total of 288 kl per hr for four hrs.
- (7) The hazardous areas shall be protected by a well laid combination of hydrants and monitors and the installations having aggregate above ground storage capacity of less than 1000 KL (Class A+B+C) are exempted from such protection.

- (8) The installations storing Class A petroleum in above ground tanks shall have fixed water spray system, but the installations above 1000 KL storage fulfilling the following both conditions are exempted from the provision of fixed water spray system, namely: -
 - (i) Aggregate above ground storage of Class A and Class B petroleum up to 5000 KL; and
 - (ii) Floating roof tank storing Class A petroleum having diameter up to 9 M.
- (9) Class 'B' above ground Petroleum storage tanks (fixed roof or floating roof) of diameter larger than 30 m shall be provided with fixed water spray system.
- (10) Fixed foam system or Semi-fixed foam system shall be provided on all tanks (floating roof or fixed roof) exceeding 18 m diameter storing Class A or Class B petroleum.
- (11) When Class A and Class B above ground storage tanks are placed in a common dyke then, the fixed water spray system shall be provided on all tanks except for small installations as mentioned in sub-para (8).
- (12) Installations where inter distances between tanks in a dyke or within dykes are not conforming to these regulations, the following additional facilities shall be provided to enhance safety namely: -
 - (i) The fixed water sprays system on all tanks, irrespective of diameter in the installations; and
 - (ii) The Fixed or semi fixed foam system on all tanks, irrespective of diameter in the installation.
- (13) Tank Truck (TT) or Tank Wagon (TW) loading or unloading gantries or facilities, Manifold area of product pump house and Exchange pit shall be fully covered with alternate hydrant and water cum foam monitors of approved make having multipurpose combination nozzles for jet, spray and fog arrangement and located at a spacing of 30 M on both sides of gantry ensuring minimum foam application rate of 6.5 lpm/sq.m (in line with NFPA-11 for spill fire more than 1 inch deep) to the target zone (3 adjacent segments of 15 meters each for TW gantry and 08 bays for TT gantry) of the relevant facility.
- (14) The hydrants and monitors shall be located at a minimum distance of 15 m from the hazard (such as TW and TT loading or unloading facilities) to be protected.
- (15) Tank wagon loading gantries shall be provided with manually operated fixed water spray or sprinkler system. The gantry shall be divided into suitable number of segments (each segment having minimum length of 15 m length and width of 12 m) and three largest segments operating at a time shall be considered as single risk for calculating the water requirement and accordingly, a provision shall be made to actuate the water spray system from a safe approachable central location that is to say affected zone and adjoining zones.
- (16) Portable monitors or foam hose streams shall be provided for fighting fires in dyke area and spills.
- (17) Medium expansion foam generators shall be provided for dyke area to arrest vapour cloud formation from spilled volatile hydrocarbons.
- (18) Installation of medium expansion foam generator shall be as per following criteria, namely: -
 - (i) Class A tanks: Two Nos. Fixed type foam generators (minimum) for each tank dyke, and
 - (ii) Class B tanks: Two Nos. Portable foam generator (minimum) for each location.
- (19) Remote or manually operated high volume long range water cum foam monitors (capacity 500/750/1000 GPM and above) to fight tank fires shall be provided at petroleum installations. Numbers and Capacity of monitor or foam pourer shall be provided in such a way that the foam delivery rate from the monitors' meets requirement of foam application rate (8.1 LPM/m²) for full surface tank fire.
- (20) The location of HVLRS monitors shall be planned in such a way that the very purpose of such monitors is served and throw of the monitors is safely delivered at the aimed object and such

high volume long range monitors shall be positioned located at a distance of 15 m to 45 m from the hazardous equipment subject to the following, namely: -

- (i) Monitors shall be positioned in such a way that throw of monitors are safely directed to the target tank under full surface fire without damaging tank shell, tank pad and other objects; and
 - (ii) The throw is directed on the inner upper surface of the tank and not in the middle of the tank to prevent splash over.
- (21) Fixed or mobile HVLRs shall be used for fighting full surface fire on external floating roof tanks.
- (22) Care need to be taken for petroleum installations located in habituated areas or adjoining to other objects such as High tension line and like other objects and there should not be any High tension line passing through the depot or installation.
- (23) Water cum foam monitors shall be installed in such a way that all the tanks in the installation are within the horizontal range of foam throw.
- (24) Additional monitors shall be provided in such a way that each tank is in the coverage area of at least two monitors.
- (25) Provision for connecting or hooking the portable monitor shall be made in the hydrant system around the fixed roof tanks at various strategic points.
- (26) Well laid procedures and plans shall be made and put into use for use of HVLRs to combat emergencies without loss of much time.
- (27) For determining the total foam solution requirement, potential foam loss from wind and other factors shall be considered while designing.
- (28) Adequate foam drum or tank or reliable replenishment for foam induction system shall be provided.
- (29) Automatic actuated rim seal fire detection and extinguishing system shall be provided on all existing as well as new external floating roof tanks storing Class A petroleum. The detection and extinguishing system shall have the following features, namely: -
- (i) The system must detect fire in Rim Seal area immediately but not later than 10 seconds and extinguish the fire in its incipient stage that is to say within 40 seconds of its indication;
 - (ii) The system must be robust, such as it should not be affected by environmental conditions like low or high ambient temperature, dust, external corrosion, hydrocarbon vapour, rain and like other environmental conditions;
 - (iii) The extinguishing foam must apply in the seal area @18 LPM per square meter in a uniform manner in maximum of 40 seconds; and
 - (iv) The detection and extinguishing system shall be coupled with fire control panel with audio-visual alarm for necessary fire alert.
- (30) In alternative to the system specified in sub-paragraph (29), the following system can be provided, namely: -
- (i) The detection system shall detect the fire immediately but not later than 10 seconds;
 - (ii) The actuation system shall be actuated immediately on detection of fire;
 - (iii) Minimum 10 minutes foam discharge for below seal application or minimum 20 minutes discharge for above seal application shall be undertaken; and
 - (iv) The application rate shall be 20.4 lpm/m² of the area.
- (31) In addition, the individual components shall have certification from competent authority for suitability for applicable hazardous zone.
- (32) Fixed water spray system shall also be provided in lube oil drum areas if located in hazardous area.

(33) Clean Agent (Halon substitute) based flooding system should be provided for control rooms, computer rooms or repeater station and pressurized rooms in major locations having automated pipeline receipt or dispatch or TW or TT loading facilities. Selection of clean agent and design of fire protection system for control rooms, computer rooms and pressurized rooms should follow the Standard on “Clean Agent Extinguishing systems NFPA Standard 2001 including its safety guidelines with respect to “Hazards to Personnel”, electrical clearance and environmental factors in line with environmental considerations of Kyoto and Montreal Protocol and MOEF&CC regulations.

5.1.3 In case, combined Petroleum and LPG facilities have been provided in the same premises, the common water storage facility for fire fighting purpose may be shared between Petroleum Installation and LPG Plant under following conditions, namely: -

- (1) If both locations are located within same premise, then, one largest fire scenario to be considered and water requirement shall be worked out accordingly. In case, the premises are separate, water requirement to be worked out for independent location;
- (2) Each Petroleum or LPG facility shall independently meet the design, layout and fire protection system requirements of PNGRB regulations and have common boundary wall and ownership of both the facilities under same company; and
- (3) The pump house may be common or separate and in case common pump house is provided the control of the pump house shall remain with group whose premises such pump house is situated.

5.2 Fire water system design:

Fire water system shall be designed for a minimum residual pressure of 7 kg/cm² at hydraulically remotest point in the installation considering the design flow rate, namely: -

- (1) A fire water ring main shall be provided all around perimeter of the location facilities with hydrants or monitors spaced at intervals not exceeding 30 M when measured aerially. Fire hydrants and monitors shall not be installed within 15 Meters from the facilities or equipment to be protected, and
- (2) The installation shall have facilities for receiving and diverting all the water coming to the installation to fire water storage tanks in case of an emergency.

5.2.1 Fire water design flow rate:

(1) Fire water flow rate for a tank farm shall be aggregate of the following, namely: -

- (i) For water flow calculations, all tanks farms having Class A or Class B petroleum storage shall be considered irrespective of diameter of tanks, whether fixed water spray system is provided or not;
- (ii) Water flow calculated, for cooling a tank on fire at a rate of 3 lpm / sqm of tank shell area;
- (iii) Water flow calculated, for exposure protection for all other tanks falling within a radius of (R +30) m from centre of the tank on fire (R-Radius of tank on fire) and situated in the same dyke, at a rate of 3 lpm / sq.m of tank shell area;
- (iv) Water flow calculated, for exposure protection for all other tanks falling outside a radius of (R+30) m from centre of the tank on fire and situated in the same dyke, at a rate of 1 lpm/m² of tank shell area;
- (v) Water flow required for applying foam on a single largest tank by way of fixed foam system, where provided, or by use of water or foam monitors whichever is higher (Foam

solution applicable rate for cone roof tanks shall be taken as 5 lpm/sqm and for floating roof rim seal protection it shall be 12 lpm / sqm); and

- (vi) Various combinations shall be considered in the tank farm for arriving at different fire water flow rate and the largest rate to be considered for design.
- (2) For location or dyke storing exclusively Class C or excluded products, the water requirement shall be based on 1 monitor of 144 kl / hr and 4 hose streams of 36 kl / hr that is to say a total of 288 kl per hr for four hrs.
- (3) Fire water flow for product pump house shed for depot or terminal and cross country pipe line installations with or without tankage shall be at a rate of 10.2 lpm / sqm.
- (4) Pumps of volatile products located under pipe rack fire water flow rate shall be calculated at a rate of 20.4 lpm / sqm.
- (5) Fire water flow rate for TT and TW loading Gantry in a depot or terminal shall be calculated at a rate of @ 10.2 lpm / sq.m. The gantry shall be divided into suitable number of segments (each segment having minimum length of 15 m length and width of 12 m) and three largest segments operating at a time shall be considered as single risk for calculating the water requirement. Design flow rate shall be largest of 5.2.1.a, 5.2.1.b, 5.2.1.c, 5.2.1.d and 5.2.1.e. Design flow rate for roof sinking case of largest tank shall be calculated and wherever, the design flow rate of roof sinking case is higher than single or two contingencies, as the condition applicable, the same shall be considered for calculating water requirement.
- (6) Fire water flow rate for supplementary streams shall be based on using 4 single hydrant outlets simultaneously. Capacity of each hydrant outlet as 36 kl/hr shall be considered at a pressure of 7 kg/cm² and the supplementary water stream requirement shall be in addition to the design flow rates.

5.2.2 Fire water storage

- (1) Water for the fire fighting shall be stored in easily accessible surface or underground or above ground tanks of steel, concrete or masonry.
- (2) The effective capacity of the reservoir or tank above the level of suction point shall be minimum 4 hours aggregate rated capacity of pumps. Subject to the design criteria specified in sub-paragraph (3) and sub-paragraph (4) of paragraph 5.1.2.
- (3) Fresh water should be used for fire fighting purposes and in case sea water or treated effluent water is used for fire fighting purposes, the material of the pipe selected shall be suitable for the service.
- (4) Storage reservoir (RCC) shall be in two equal interconnected compartments to facilitate cleaning and repairs and in case of steel tanks there shall be minimum two tanks and all the tanks shall be of equal height or depth to prevent any migration or overflow due to difference in height or depth. During maintenance of water tanks, availability of at least 50% of the water capacity shall be ensured.
- (5) Large natural reservoirs having water capacity exceeding 10 times, the aggregate fire water requirement can be left unlined.

5.2.3 Fire water pumps:

- (1) Fire water pumps having flooded suction shall be installed to meet the design fire water flow rate and head. If fire water is stored in underground tanks, an overhead water tank of sufficient capacity shall be provided for flooded suction and accounting for leakages in the network, if any and pumps shall be provided with suitable sized strainers on suction and NRVs on discharge lines.

- (2) The pumps shall be capable of discharging 150% of its rated discharge at a minimum of 65% of the rated head. The Shut-off head shall not exceed 120% of rated head for horizontal centrifugal pumps and 140% for vertical turbine pump.
- (3) At least one standby fire water pump shall be provided up to 2 nos. of main pumps. For main pumps 3 nos. and above, minimum 2 nos. standby pumps of the same type, capacity and head as the main pumps shall be provided. Fire water pumps shall be of equal capacity and head.
- (4) The fire water pump including the standby pump shall be of diesel engine driven type. Where electric supply is reliable, 50% of the pumps can be electric driven. The diesel engines shall be quick starting type with the help of push buttons located on or near the pumps or located at a remote location. Each engine shall have an independent fuel tank adequately sized for 6 hours continuous running of the pump. Fuel tank should be installed outside of fire pump house and shall have provision for venting. If tanks are located inside the pump house, the vent shall have provision for venting outside the pump house.
- (5) Fire water pumps and storage shall be located far away from the potential leak sources or tankage are and shall be at least 60 M (minimum) away from equipment or where hydrocarbons are handled or stored.
- (6) Fire water pumps shall be exclusively used for fire fighting purpose only.
- (7) Suction and discharge valves of fire water pumps shall be kept full open all the times.
- (8) Jockey pump shall be provided for keeping the hydrant system or line pressurized at all times. The capacity of the pump shall be sufficient to maintain system pressure in the event of leakages from valves and like other devices and besides the main jockey pump the stand by pump of same capacity and type shall be provided.
- (9) Auto cut-in or cut-off facility should be provided for jockey pumps to maintain the line pressure.
- (10) The fire water pumps shall be provided with auto start facility which shall function with pressure drop in hydrant line and specified logic even if initial pump does not start or having started, fails to build up the required pressure in the fire water ring main system and the next pump shall start and so forth and so on.
- (11) The fire hydrant system should be able to maintain a pressure of minimum 7 kg/cm² in the line at the farthest end.

5.2.4 Fire hydrant network

- (1) The fire water network shall be laid in closed loops as far as possible to ensure multi-directional flow in the system. Isolation valves shall be provided in the network to enable isolation of any section of the network without affecting the flow in the rest. The isolation valves shall be located normally near the loop junctions. Additional valves shall be provided in the segments where the length of the segment exceeds 300 M.
- (2) Fire hydrant ring main shall be laid above ground ensuring that-
 - (i) the pipe line shall be laid at a height of 300 mm to 400mm above finished ground level;
 - (ii) the pipe support shall have only point contact. The mains shall be supported at regular intervals;
 - (iii) for pipeline size shall be less than 150 mm and support interval shall not exceed 3 meters;
 - (iv) the pipe line size shall be 150mm and above not exceeding 6 meters or design approved;
 and

- (v) the system for above ground portion shall be analysed for flexibility against thermal expansion and necessary expansion loops where called for shall be provided.
- (3) Fire hydrant ring main may be laid underground at the following places, namely: -
- (i) At road crossings;
 - (ii) Places where above ground piping is likely to cause obstruction to operation and vehicle movement;
 - (iii) Places where above ground piping is likely to get damaged mechanically; and
 - (iv) Where Frost conditions warrant and ambient temperature is likely to fall below zero degree Centigrade, then, underground piping at least 1 meter below the ground level should be provided and alternatively, in such cases for above ground pipelines, water circulation to be carried out.
- (4) Fire water ring main laid underground shall ensure the followings, namely: -
- (i) Pipes made of composite material shall be laid underground;
 - (ii) The Ring main shall have at least one-meter earth cushion in open ground, 1.5 m cushion under the road crossings and in case of crane movement area pipeline shall be protected with concrete or steel encasement as per design requirement and in case of rail crossing, provisions stipulated by Indian Railways shall be complied;
 - (iii) The Ring main shall be suitably protected against soil corrosion by suitable coating or wrapping with or without cathodic protection; and
 - (iv) In case of poor soil conditions it may be necessary to provide concrete/ masonry supports under the pipe line.
- (5) Size of hydrant pipeline shall be as specified below, namely: -
- (i) The hydraulic analysis of network shall be done at the design time and whenever fire water demand increases due to addition of facilities or extensive extension of network, fresh hydraulic analysis shall be carried out;
 - (ii) The velocity of water shall not exceed 5 meter per second in fire water ring main;
 - (iii) Fire water ring main shall be sized for 120% of the design water flow rate and design flow rates shall be distributed at nodal points to give the most realistic way of water requirements in an emergency. It may be necessary to assume several combinations of flow requirement for design of network; and
 - (iv) The stand post for hydrants and monitors shall be sized to meet the respective design water flow rates.
- (6) The following requirements shall be complied with, namely: -
- (i) Fire water mains shall not pass through buildings or dyke areas. In case of underground mains the isolation valves shall be located in RCC or brick masonry chamber of suitable size to facilitate operation during emergency and maintenance;
 - (ii) Associated Sprinkler or foam riser or branch connections meant for storage tanks, if applicable, shall be taken directly to the outside of tank dyke and shall not pass through fire wall of any adjacent tanks; and

- (iii) The riser connections shall be taken directly from the mains and provided with separate isolation valve outside of dyke. Suitable strainer shall be provided on sprinkler branch connection and shall be located outside of dyke.

5.2.5 Hydrant or monitors:

- (1) Hydrants or monitors shall be located considering various fire scenario at different sections of the premises to be protected and to give most effective service.
- (2) At least one hydrant post shall be provided at every 30 mtrs. of external wall measurement or perimeter of battery limit in case of high hazard areas and for non-hazardous area, the hydrant post shall be spaced at 45 mtrs. intervals. The horizontal range and coverage of hydrants with hose connections shall not be considered beyond 45 mtrs.
- (3) Hydrants shall be located at a minimum distance of 15 mtrs. from the periphery of storage tank or equipment under protection and in case of buildings such distance shall not be less than 2 mtrs. and not more than 15 mtrs. from the face of building.
- (4) Provision of hydrants within the building shall be provided in accordance with IS: 3844.
- (5) Hydrant or Monitors shall be located along road side berms for easy accessibility.
- (6) Fixed water or water cum foam monitors on the network shall be provided with independent isolation valves and Double headed hydrants with two separate landing valves. Hydrants or Monitors shall be located with branch connection.
- (7) Double headed hydrants and monitors on suitably sized stand post shall be used. All hydrant outlets or monitor isolation valves shall be situated at workable height from ground or hydrant or monitor operating platform level.
- (8) Monitors shall be located to direct water on the object as well as to provide water shield to firemen approaching a fire. The requirement of monitors shall be established based on hazards involved and layout considerations.
- (9) Hydrants and monitors shall not be installed inside the dyked areas, but, as an additional requirement, oscillating monitors shall be provided in inaccessible area within the dyke with isolation valve or ROV outside the tank farm (in cases inter distances between tanks in a dyke or within dykes are not meeting the requirements).
- (10) TW or TT loading and unloading facilities shall be provided with alternate hydrant or water cum foam monitor of suitable capacity and size to ensure adequate coverage and located at a spacing of 30 M on both sides of the gantry.
- (11) The hydrants and monitors shall be located at a minimum distance of 15 M from the hazard (such as TW and TT loading or unloading facilities) to be protected.

5.2.6 Material specifications:

The materials used in fire water system shall be of approved type as indicated below, namely:-

- (1) In respect of pipes, Carbon Steel as per IS: 3589/IS: 1239/IS: 1978 or Composite Material or its equivalent for fresh water service and in case saline, brackish or treated effluent water is used, the fire water ring main of steel pipes, internally cement mortar lines or glass reinforced epoxy coated or pipes made of material suitable for the quality of water able to withstand the temperature and pressure shall be used and alternately, pipes made of composite materials shall be used. The composite material to be used may be as per API 15LR/API 15HR / IS12709. In case composite pipes are used they shall be used underground;
- (2) In respect of Isolation Valves, Gate valve or quick shut off type isolation valves made of Cast Steel having open or close indication shall be used and other materials such as

cupro-nickel for saline or brackish water can be used and the material of the valve shall be suitable for the service.

(3) In respect of Hydrants post-

- (i) Stand post made of Carbon Steel shall be used; and
- (ii) Outlet valves made of Gunmetal or Aluminium or Stainless or Steel or Al-Zn Alloy shall be used.

(4) Monitors or High Volume Long Range Water Cum Foam Monitors (HVLR) or Rim seal shall be approved or listed by any of the national or international certifying agencies like UL, FM, VdS or LPC, BIS or any other like agency and the electrical or hydraulic remote control mechanism shall be in line with Hazardous Area Classification;

(5) In respect of Fire Hoses, Reinforced Rubber Lined Hose shall be as per IS 636 (Type A) or Non-percolating Synthetic Hose (Type B) or Equivalent Standard.

(6) In respect of Painting, -

- (i) Fire water mains, hydrant and monitor stand posts, risers of water spray system shall be painted with “Fire Red” paint as per of IS: 5;
- (ii) Hose boxes, water monitors and hydrant outlets shall be painted with “Luminous Yellow” paint as per IS: 5; and
- (iii) Corrosion resistant paint shall be used in corrosion prone areas.

5.2.7 Fixed water spray system:

- (1) Fixed water spray system is a fixed pipe system connected to a reliable source of water supply and equipped with water spray nozzles for specific water discharge and distribution over the surface of area to be protected and the piping system is connected to the hydrant system water supply through an automatically or manually actuated valve which initiates the flow of water and in case the system is manually actuated, the isolation valve shall be located outside the dyke for ease of access and operation.
- (2) Spray nozzles shall be directed radially to the tank at a distance not exceeding 0.6 M from the tank surface.
- (3) While calculating the water rates for spray application for cases other than tanks such as pump house and tank wagon gantry, the area should be divided into suitable segments so that maximum water requirement can be optimized.
- (4) For TW loading gantry, sprinklers shall be provided to ensure full surface coverage and three largest segments shall be considered for water requirement.
- (5) For Tank Truck loading gantries specifically for those cases which have obstructions in water throw, sprinklers should be provided.
- (6) The flow rate in the sprinkler system shall be either 1 lpm or 3 lpm depending upon whether tank is outside or within a distance of R+30 m from the tank on fire.

5.3 Foam protection system:

5.3.1 Storage tank:

5.3.1.1 Floating roof tank:

For floating roof tank, foam shall be poured at the foam dam to blanket the roof seal and the features of foam system for floating roof tank protection shall be as follows, namely: -

- (i) The system shall be designed to create foam blanket on the burning surface in a reasonably short period;
- (ii) The foam shall be applied to the burning hazard continuously at a rate high enough to overcome the destructive effects of radiant heat; and
- (iii) The foam makers or foam pourers shall be located not more than 24 M apart on the shell perimeter based on 600 mm foam dam height. The height of foam dam shall be at least 51 mm above the top of metallic secondary seal.

5.3.1.2 Fixed roof tank :

Foam conveying system shall have same features as of floating roof tank as specified in paragraph 5.3.1.1 excepting that a vapour seal chamber is required before the foam discharge outlet and features of the foam system for fixed roof protection shall be as follows, namely: -

- (1) The vapour seal chamber shall be provided with an effective and durable seal, fragile under low pressure, to prevent entrance of vapour into the foam conveying piping system and
- (2) Where two or more pourers are required such pourers shall be equally spaced at the periphery of the tank and each discharge outlet shall be sized to deliver foam at approximately the same rate. Tanks should be provided with foam discharge outlets or pourers as indicated below, namely :-

Tank diameter (In M)	Requirement of Foam Pourer (Minimum. Nos.)
Above 18 and up to 20	2
Above 20 and up to 25	3
Above 25 and up to 30	4
Above 30 and up to 35	5
Above 35 and up to 40	6
Above 40 and up to 45	8
Above 45 and up to 50	10

In case foam pourers are provided on tanks having diameter up to 18 m, minimum 2 nos. foam pourers shall be provided.

5.3.1.3. Floating cum fixed roof tank:

Protection facilities shall be provided as required for fixed roof tank.

5.3.1.4 Protection for dyke area or spill fire :

- (1) Portable monitors or foam hose streams shall be provided for fighting fires in dyked area and spills; and
- (2) In addition to as specified in clause (i), Medium expansion foam generators shall be provided to arrest vapour cloud formation from spilled volatile hydrocarbons and the installation of medium expansion foam generator shall be as per following criteria, namely: -
 - (i) Class A tanks: 2 nos. Fixed type foam generators (minimum) for each tank dyke;
 - (ii) Class B tanks: Two nos. portable foam generators (minimum) for each location.

5.3.2 Foam application:

5.3.2.1 Application rate:

The minimum delivery rate for primary protection based on the assumption that all the foam reaches the area being protected shall be as indicated below, namely: -

- (1) For cone roof tanks containing liquid hydrocarbons, the foam solution delivery rate shall be at least 5 lpm/ sqm of liquid surface area of the tank to be protected and for floating roof tanks containing liquid hydrocarbons foam solution, delivery rate shall be at least 12 lpm/ sqm of seal area with foam dam height of 600 mm of the tank to be protected; and
- (2) The height of foam dam shall be at least 51 mm above the top of metallic secondary seal. In the case of Floating roof tank roof sinking, the application rate shall be considered as 8.1 lpm/ sqm. In determining total solution flow requirements, potential foam losses from wind and other factors shall be considered.

5.3.2.2 Duration of foam discharge:

The equipment shall be capable of providing primary protection at the specified delivery rates for the following minimum duration namely: -

- (1) Tanks (fixed roof or floating roof) containing Class 'A' and Class 'B', the minimum duration shall be 65 minutes, and
- (2) Where the system's primary purpose is for spill fire protection such as dyked area and non dyked area (TT and TW and like other non dyked) the minimum duration shall be 30 minutes.

5.3.2.3 Water for foam making:

Water quantity required for making foam solution depends on the percent concentration of foam Compound and foams in normal use shall have a 1% to 6% proportioning ratio, but foam supplier data shall be used for determining water requirement.

5.3.2.4 Foam quantity requirement:

The foam quantity requirement shall be based on the following, namely: -

- (1) Foam solution application shall be at the rate of 5 lpm/ sqm. for the liquid surface of the single largest cone roof tank;
- (2) Foam solution application shall be at the rate of 12 lpm/ sqm. of seal area of the single largest floating roof tank;
- (3) Floating roof sinking case also shall be considered for foam compound requirement and storage. Application @ 8.1 lpm/sq.m by required Nos. HVLR of installed capacity and minimum aggregate foam storage shall be total of (1) + (2) or (3), whichever is higher; and
- (4) In case of Aviation Fuelling Stations, where aggregate product storage capacity is less than 1000 KL, foam quantity for spill fire protection of 30 minutes shall be made.

5.3.2.5 Foam compound storage:

¹[(1)Foam compound should be stored as explained in IS-4989 or equivalent standard. Type of foam compound to be used may be protein, fluro-protein or AFFF. Alcohol Resistant Foam shall be used for handling methanol or ethanol fires. Minimum 1000 litres of Alcohol

¹ Subs. by sub-cl (r) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

Resistant Foam compound shall be maintained at the installation to handle methanol or ethanol fire.]

- (2) Shelf life of foam compound shall be taken from manufacturer's data. Foam compound shall be tested periodically as per OEM guidelines to ensure its quality and the deteriorated quantity shall be replaced. The deteriorated foam compound can be used for fire training purposes.
- (3) Care shall be taken to avoid mixture of two or more different grades or batches of foam in a foam storage tank. In such cases foam shall be tested on yearly basis to check its efficacy and record shall be maintained thereof.
- (4) For details of type of tests and their periodicity, IS 4989 or equivalent Standard shall be referred.
- (5) Quantity of foam compound as per paragraph 5.3.2.4, should be stored in the Installation. At locations where cluster of OMC exists, foam requirement can be uniformly distributed at respective location. The stored quantity shall be made available to needy company in case of any emergency.
- (6) Foam may be stored either in storage tanks of fixed type or mounted on mobile trolleys.

5.4 Control room and computer room protection:

- (1) Control room and computer room should be protected by Clean Agent Fire Extinguishing System.
- (2) In order to minimize the exposure to Clean Agent Fire Extinguishing System, persons should be evacuated from the areas before the system comes into operation.
- (3) Clean agent fire extinguishing system as per NFPA-2001 shall be provided for the protection system. Each hazard area to be protected by the protection system shall have an independent system. The time needed to obtain the gas for replacement to restore the systems shall be considered as a governing factor in determining the reserve supply needed and 100% standby containers shall be considered for each protected hazard. Storage containers shall be located as near as possible to hazard area, but they shall not be exposed to fire. Storage containers shall be carefully located so that they are not subjected to mechanical, chemical or other damage.
- (4) All the components of the system shall be capable of withstanding heat of fire and severe weather conditions.

5.5 First aid fire fighting equipment:

The fire extinguishers shall be provided as per the Table given below, namely: -

Sr. No.	Type of Area	Scale of Portable Fire Extinguishers
(i)	Lube Godown	1 No. 9 Kg DCP extinguisher for every 200 m ² or min. 2 Nos. in each Godown, whichever is higher.
(ii)	Lube Filling Shed	1 No. 9 Kg DCP extinguisher for 200 m ² or min. 2 Nos. in each Shed, whichever is higher
(iii)	Storage of (Class A or Class B)	1 No. 9 Kg DCP extinguisher for 100 m ² or min. 2 Nos. in each Storage Area, whichever is higher.

	in packed containers and stored in open or closed area.	
(iv)	Pump House (Class A or Class B) Up to 50 HP (Class A and Class B) Above 50-100 HP Beyond 100 HP	1 No. 9 Kg DCP for 2 pumps. 1 No. 9 Kg DCP for each pump. 2 Nos. of 9 kg or 1 no. of 25 kg DCP for each pump.
(v)	Pump House (Class C) Up to 50 HP Above 50 HP	1 no. 9KgDCP for every 4 pumps up to 50 HP. 2 nos. 9 Kg DCP or 1x25 kg DCP for 4 pumps.
(vi)	Tank Truck loading and unloading gantry for POL or Special products	1 No. 9 Kg DCP extinguisher for each bay plus 1 No. 75 Kg DCP extinguisher for each gantry.
(vii)	Tank Wagon loading and unloading gantry or siding	1 No. 9 Kg DCP extinguisher for every 30 m of or siding plus 1 No. 75 Kg DCP extinguisher for each gantry or siding.
(viii)	A or G Tank Farm	2 Nos. 9 Kg DCP extinguishers for each tank plus 4 Nos. 25 Kg DCP extinguishers for each Tank Farm positioned at four corners. In case of adjoining tank farms, the no. of 25 Kg extinguishers may be reduced by 2 nos. per tank farm.
(ix)	U/G Tank Farm	2 Nos. 9 Kg DCP extinguisher for each Tank Farm
(x)	Other Pump Houses	1 No. 9 Kg DCP extinguisher for every two pumps or min 2 Nos. 9 Kg DCP extinguisher for each Pump House whichever is higher.
(xi)	Administration Building or Store House	1 No. 9 Kg DCP extinguisher for every 200 m ² or min. 2 Nos. 9 Kg DCP extinguishers for each floor of Building or Store whichever is higher.
(xii)	DG Room	2 Nos. each 9 Kg DCP & 4.5 Kg CO ₂ extinguishers for each DG room.
(xiii)	Main switch Room or Sub-Station	1 No. 4.5 Kg CO ₂ extinguisher for every 25 m ² plus 1 No. 9 Liter sand bucket per transformer bay.
(xiv)	Computer Room or Cabin	2 Nos. of 2 Kg CO ₂ or 2 Nos. of 2.5 Kg Clean Agent extinguisher per Computer Room and 1 No. 2 Kg CO ₂ or 1 No. 1.0 Kg Clean Agent extinguisher per cabin.
(xv)	Security Cabin	1 No. 9 Kg DCP extinguisher per cabin.
(xvi)	Canteen	1 No. 9 Kg DCP extinguisher for 100 m ² .
(xvii)	Workshop	1 No. 9 Kg DCP extinguisher and 1 No. 2 Kg CO ₂ extinguisher.
(xviii)	Laboratory	1 No. 9 Kg DCP extinguisher and 1 No. 4.5 Kg CO ₂ extinguisher.

(xix)	Oil Sample Storage Room	1 No. 9 Kg DCP extinguisher per 100 m ² or min. 1 no. 9 Kg extinguisher per room, whichever is higher.
(xx)	Effluent Treatment Plant	1 No. 75 Kg. and 2 nos. 9 Kg. DCP Extinguisher
(xxi)	Transformer	1 No. 9 Kg. DCP extinguisher.
(xxii)	UPS or Charger Room	1 No. 2 Kg. CO2 extinguisher.

Notes:

- (1) All fire extinguishers shall conform to respective BIS or equivalent codes, such as 9 Kg DCP Type (IS: 15683), 4.5/6, 8 Kg CO2 Type (IS: 2878) and 25/50/75 Kg DCP Type (IS: 10658) and bear ISI mark. BIS or Equivalent certificates of all extinguishers shall be maintained at the location;
- (2) While selecting the Extinguisher, due consideration should be given to the factors like flow rate, discharge time and throw in line with IS: 2190 or equivalent;
- (3) The Dry Chemical Powder used in extinguisher and carbon dioxide gas used as expelling agent shall be as per relevant BIS or Equivalent code;
- (4) While selecting the dry chemical powder, due consideration should be given to the typical properties such as Apparent Density (0.65 +/-0.05), Fire Rating (144B), Thermal Gravimetric Analysis (with decomposition at around 250°C) and foam compatibility;
- (5) Siliconised Potassium bicarbonate DCP powder (IS 4308:2003) or Mono-ammonium phosphate based DCP powder (IS: 14609) can also be used for recharging DCP fire extinguishers;
- (6) Spare CO2 cartridges and DCP refills as required based on their shelf life should be maintained, but minimum 10% of the total charge in the extinguishers should be maintained at the location;
- (7) Portable fire extinguishers shall be located at convenient locations and are readily accessible and clearly visible at all times;
- (8) The sand buckets shall have round bottom with bottom handle having 9 litre water capacity conforming to IS: 2546. The sand stored in bucket shall be fine and free from oil, water or rubbish;
- (9) Rain protection of suitable design should be provided for all extinguishers and sand buckets;
- (10) The maximum running distance to locate an extinguisher shall not exceed 15 m; and
- (11) The extinguisher shall be installed in such a way that its top surface is not more than 1.5m above the floor or ground level.

5.6 Emergency trolley and emergency kit:

- (1) A trolley containing Fire Proximity Suit, B.A. Set, Water Jel Blanket, Resuscitator, First Aid Box, Stretcher with blanket, Spare fire hoses, Special purpose nozzles, Foam branch pipes, Explosive meter, P.A. System shall be readily available at the location and positioned to have easy access to it during emergency situation.
- (2) An emergency kit shall be provided consisting of safety items shall be readily available at the terminals. All the items of the kit shall be kept on a trolley specifically designed for the purpose.

5.7 Motorable arrangement for towing or carrying mobile fire fighting equipment such as Foam trolleys, Portable water-cum-foam monitors and like other monitors should be made and available on sharable basis.

5.8 Hydrocarbon detection and annunciation, dyke drain valve annunciation system and emergency shutdown logic:

5.8.1 Hydro carbon detection and annunciation system:

Hydrocarbon detectors shall be installed near all potential leak source of class-A that is to say tank dykes, tank manifolds, pump house manifold and like other manifolds and Hydrocarbon detector of proper type shall be selected and also shall be proof tested and shall be maintained in good condition. The other details are specified as below, namely:-

(1) General:

- (i) The best method of prevention of explosion is to avoid basic build-up of Explosive Vapour concentration immediately on occurrence of leakage, and such method would require basically a reliable and continuous Hydro Carbon detection system with warning annunciation to alert the operating personnel to take timely corrective action;
- (ii) The Hydro Carbon Detection System shall provide early warning on build-up of Vapour concentration below the LFL limits.

(2) Application:

- (i) Hydrocarbon (HC) detectors shall be installed near all potential leak sources of Class-A Petroleum products such as tank dykes, tank manifolds and pump house manifold and such detectors shall be placed in a way that entire possible source of leaks and collection of products is continuously detected and alarm is set at 20% of lower explosive limit of Class-A petroleum products;
- (ii) The detection control equipment should be provided in the control room and the field for continuous monitoring should be provided even during power failure.

(3) Power Supply:

The supply to the system shall be through a reliable on line uninterrupted power supply. (online UPS).

(4) Architecture Components:

The main components shall be as specified below, namely: -

- (i) Hydro Carbon Detectors;
- (ii) Field Transmission units or Signal scanners;
- (iii) Control system or PC;
- (iv) Display;
- (v) Annunciation System and like other system;
- (vi) Cables, hooters, repeater, Power Supplies and like other devices; and
- (vii) All the components installed in the hazardous area shall conform to the Hazard Area Classification applicable and shall be certified by PESO or Authorized lab by the country of the origin.

(5) **Annunciation System:**

- (i) Appropriate annunciation system shall be available to ensure that all the alarms generated, both, audio and visual are reported to the installation personnel at local and remote control panel. The alarms both, audio and visual can be repeated at additional location to ensure corrective action is taken;
- (ii) Hydro Carbon Detectors should be available as per requirement;
- (iii) The detectors shall be able to detect the presence of Hydro Carbon Vapours well below the LEL level;
- (iv) Any one or more in combination from the following types can be provided Namely:
 -
 - a. Catalytic detectors;
 - b. Infra-red detectors; and
 - c. Line or Path detectors;
- (v) The system shall be available at all times;
- (vi) The control equipment should have data logging facilities to provide print outs of the history of the events with date and time of leakages; and.
- (vii) The control equipment should be able to generate at least two alarms at different levels of LEL concentration of Hydro Carbons.

(6) **Inspection and Testing:**

- (i) Calibration of the detectors shall be done as per OEM recommendation or once in six month, whichever is earlier;
- (ii) The drift in the sensitivity of the individual detectors shall be recorded in maintenance history log book during calibration and the detectors with abnormal or wide drift in sensitivity shall be rectified or replaced; and
- (iii) Standard calibration kit must be available in the location for periodic performance test of hydrocarbon detectors.

5.8.2 Dyke Drain valve Annunciation system:

- (1) All the dyke valves will be fitted with a proximity switch or sensor for indication of the position of the valve. The valves of the Dyke shall remain in closed position. In case any valve is open, then, Audio alarm and visual indication shall come at control panel for suitable corrective measures.
- (2) In case of automated locations existing PLC can be used, but where the locations are not automated, a standalone system shall be provided.

5.8.2.1 Power Supply:

The supply to the system shall be through a reliable on line uninterrupted power supply/ (Online UPS). The main components in the Architecture Components shall be as below, namely: -

- (i) Proximity Switches or Sensors;
- (ii) Field transmitter unit or Signal Scanners;
- (iii) Control System or PC or TAS;
- (iv) Display;
- (v) Annunciation System and like other systems; and
- (vi) Cables, hooters, Mimic, Power Supplies and like other systems.

5.8.2.2 All the components installed in the hazardous area shall conform to the Hazard Area Classification applicable and shall be certified by Central Institute of Mining and Fuel Research

(CIMFR) or Petroleum and Explosive Safety Organization (PESO) or Authorized lab by the country of the origin.

5.8.2.3 Appropriate annunciation system shall be available to ensure that all the alarms generated, both, audio and visual are reported to the installation personnel at local and remote control panel on real time basis and the alarms both, audio and visual should be repeated at additional location to ensure corrective action is taken.

5.8.2.4 The control system shall be available at all times and the control equipment should have data logging facilities to provide print outs of the history of the events with date and time of open and close position of the valves.

5.8.2.5 Inspection and Testing:

- (i) The system shall be checked by the safety officer on a daily basis.
- (ii) The system shall be thoroughly inspected every month by opening and closing the valves and verifying that the Audio Video alarms are generated at local and remote panel and records maintained.

5.8.3 Emergency shut Down (ESD) logic for Terminal Automation System (TAS):

The ESD for TAS enabled locations shall be provided in control room as well as at various strategic locations. ESD system shall be only through push buttons with wired connection. The other details are specified as below, namely: -

(1) Actuation or/ pressing of any ESD shall initiate following actions, namely: -

- (a) Process Shutdown;
- (b) Power Shutdown; and
- (c) Process Shutdown shall include the following, namely: -

- (i) To stop product loading pumps;
- (ii) Barrier gates to open;
- (iii) All ROSOVs and MOVs to close;
- (iv) Tank lorry filling (TLF) or tank wagon filling (TWF) operations through the batch controllers to stop; and
- (v) Fire siren to blow;

(2) Power Shutdown shall initiate the following, namely: -

- (i) Trip all the panels other than Emergency panel. The Emergency panel should host fire siren, bore wells, jockey pumps, critical High Mast tower lights outside the licensed area, security cabin, fire pump house, Critical lights in TLF, Admin block, MCC room and power to the control room or Automation system;
- (ii) There should be interlock between ESD for Process shut down and ESD for Power shut down so that full power shut down takes after a time lag required for closing the ROSOV or MOVs and full closure of valves shall be ensured. The time lag shall be location specific; and
- (iii) At pipe line locations alarm signal shall be exchanged between the two control rooms so that necessary actions are taken by the operating personnel at both ends;

¹[(3)Inspection and Testing:

The system shall be checked during mock drill conducted with full system shut down once in six months and records shall be maintained.]

5.9 Mock drills and Mutual aid:

- (1) Instructions on the action to be taken in the event of fire should be pasted at each siren point and familiarity with such instructions ensured and recorded.
- (2) Monthly fire drills considering various scenarios shall be conducted regularly with full involvement of all employees of the installation. The mock drill shall include the full shut down system activation once in six months.
- (3) The offsite disaster mock drills shall be conducted periodically as per local statutory requirements.
- (4) The company should approach and coordinate with the district authority for conducting "Offsite Mock Drills".
- (5) The post drill analysis should be carried out and discussed emphasizing areas of improvements.
- (6) The record of such drills should be maintained at the location.
- (7) Mock drill scenarios shall include all probable scenarios and the key areas like tank Farm, Rim seal fire, Gantry, Pump House, Tank Wagon gantry and like other key areas, shall be covered at least once in six months.
- (8) Security staff should be trained as first responders for fire fighting and rescue operation along with plant operating personnel.
- (9) Installation shall have a 'Mutual Aid' arrangement with nearby industries to pool in their resources during emergency.
- (10) Mutual Aid agreements shall be prepared and signed by all Mutual Aid members. Fresh agreement shall be made on expiry of 2 years or whenever there is change in the signatories to the agreement. Quarterly meeting of Mutual Aid members shall be conducted and the minutes shall be recorded and the minutes shall be reviewed in the subsequent meetings.

5.10 ERDMP (Emergency Response and Disaster Management Plan):

- (1) A comprehensive ERDMP shall be developed in accordance to the Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010 and the copies of the ERDMP shall be available to all personnel in the installation.
- (2) The key action points of the comprehensive ERDMP referred in sub-paragraph (1) shall be displayed at strategic locations in the installation for ready reference.

5.11 Fire Protection system: Inspection and Testing:

- (1) The fire protection equipment shall be kept in good working condition all the time.
- (2) The fire protection system shall be periodically tested for proper functioning and logged for record and corrective actions.

¹ Subs. by sub-cl (s) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (3) One officer shall be designated and made responsible for inspection, maintenance and testing of fire protection system.
- (4) The responsibilities of each officer shall be clearly defined, explained and communicated to all concerned in writing for role clarity.

5.11.1 Fire water pumps:

- (1) Every pump shall be test run for at least half an hour or as per OEM guidelines, whichever is higher twice a week at the rated head and flow.
- (2) Each pump shall be checked, tested and its shut-off pressure observed once in a month.
- (3) Each pump shall be checked and tested for its performance once in six months by opening required nos. of hydrants or monitors depending on the capacity of the pump to verify that the discharge pressure, flow and motor load are in conformity with the design parameters.
- (4) Each pump shall be test run continuously for 4 hours at its rated head and flow using circulation line of fire water storage tanks and observations relating thereto shall be logged once a year.
- (5) The testing of standby jockey pump, if provided shall be checked weekly. Frequent starts and stops of the pump indicate that there are water leaks in the system which should be attended to promptly.

5.11.2 Fire water ring mains:

- (1) The ring main shall be checked for leaks once in a year by operating one or more pumps and keeping the hydrant points closed to get the maximum pressure.
- (2) The ring mains, hydrant, monitor and water spray header valves shall be visually inspected for any missing accessories, defects, damage and corrosion every month and records thereof shall be maintained.
- (3) All valves on the ring mains, hydrants, monitors and water spray headers shall be checked for leaks, smooth operation and lubricated once in a month.

5.11.3 Fire water spray system:

- (1) Water spray system shall be tested for performance that is to say its effectiveness and coverage once in six months.
- (2) Spray nozzles shall be inspected for proper orientation, corrosion and cleaned, if necessary at least once a year.
- (3) The strainers provided in the water spray system shall be cleaned once in a quarter and records thereof shall be maintained.

5.11.4 Fixed and semi fixed foam system:

Fixed or Semi fixed foam system on storage tanks should be tested once in six months and such testing shall include the testing of foam maker or chamber. The foam maker or chamber should be designed suitably to facilitate discharge of foam outside the cone roof tank and after testing foam system, piping should be flushed with water.

5.11.5 Clean agent system:

Clean agent fire extinguishing system should be checked as below, namely: -

- (1) Agent quantity and pressure of refillable containers shall be checked once every six months; and
- (2) The complete system should be inspected for proper operation once every year (refer latest NFPA 2001 for details of inspection of various systems).

5.11.6 Hoses:

Fire hoses shall be hydraulically tested once in six months to a water pressure as specified in relevant IS/UL/equivalent codes.

5.11.7 Communication system:

Electric and hand operated fire sirens should be tested for their maximum audible range once a week.

5.11.8 Fire water tank or reservoir:

- (1) Above ground fire water tanks should be inspected externally and internally.
- (2) The water reservoir shall be emptied out and cleaned once in 3 years, but floating leaves, material or algae, if any, shall be removed once in 6 months or as and when required.

5.11.9 Fire extinguishers:

Inspection, testing frequency and procedure for **fire extinguishers** should be in line with design standard.

PART - F (Maintenance and Inspection)

6.0 MAINTENANCE AND INSPECTION:

Each facility shall have a documented operating manual including operations, maintenance, training procedures, purging and record keeping based on experience and conditions under which the Petroleum Installation is operated, and a documented maintenance manual and such facility shall also have written operating, maintenance, and training procedures based on experience, knowledge of similar facilities, and conditions under which they will be operated.

6.1 Basic Requirements:

Each facility shall meet the following requirements, namely: -

- (1) Have written procedures covering operation, maintenance, and training;
- (2) Keep up-to-date drawings of plant equipment, showing all revisions made after installation;
- (3) Revise the plans and procedures as operating conditions or facility equipment require;
- (4) Establish a written emergency plan;
- (5) Establish liaison with appropriate local authorities such as police, fire department, or hospitals and inform them of the emergency plans and their role in emergency situations;
- (6) Analyze and document all safety-related malfunctions and incidents for the purpose of determining their causes and preventing the possibility of recurrence;
- (7) As per maintenance philosophy, the activities should be identified that would be contracted to third party contractors for maintenance and support;
- (8) The activity supervisors shall be identified according to the level of supervision required;
- (9) The supervisors referred to in clause (8) shall be given safe supervisor training by designated staff and then they shall be put on the job;

- (10) The contractors staff shall be engaged in toolbox talk given on relevant topics are held with the Contract holders and owners; and
- (11) OEM service engineers are involved in critical overhauls for better quality assurance and for first time activities.

6.2 The operating manual for petroleum storage, handling and loading or unloading facilities shall include standard operating procedures which shall include procedures for the following, namely: -

- (1) Handling, maintenance, inspection and fire protection facilities;
- (2) Determining the existence of any abnormal conditions, and the response to such conditions in the plant;
- (3) The safe transfer of petroleum including prevention of overfilling of vessels;
- (4) For the proper startup and shutdown of all components;
- (5) To ensure that each control system is adjusted to operate within its design limits;
- (6) For monitoring operations; and
- (7) Emergency preparedness and handling

6.3 The operating procedures manual shall be accessible to all plant personnel and shall be kept readily available in the operating control room. The operating manual shall be updated when there are changes in equipment or procedures. All petroleum plant components shall be operated in accordance with the standard operating procedures as per operating manual.

6.4 The periodic inspections and tests shall be carried out in accordance with generally accepted engineering practice or recommendations of Original Equipment Manufacturer to ensure that each component is in good operating condition.

6.5 Each facility operator shall ensure that when a component is served by a single safety device only and the safety device is taken out of service for maintenance or repair, the component is also taken out of service.

6.6 It shall be ensured that where the operation of a component that is taken out of service could cause a hazardous condition, a tag bearing the words “Do Not Operate,” or the equivalent thereto, is attached to the controls of the component, and wherever possible, the component shall be locked out.

6.7 Stop valves for isolating pressure shall be locked or sealed open and such stop valves shall not be operated except by an authorized person.

7.0 Maintenance Manual:

7.1 Each facility operator shall prepare a written manual that sets out an inspection and maintenance program for each component that is used in the facility.

7.2 The maintenance manual for facility components shall include the following, namely: -

- (1) The manner of carrying out and the frequency of the inspections and tests as specified in this behalf;

- (2) All procedures to be followed during repairs on a component that is operating while it is being repaired to ensure the safety of persons and property at the facility; and
- (3) Each entity shall conduct its maintenance program in accordance with its written manual for facility components, and in addition, the history card of all critical equipments, instruments and systems shall be maintained.

7.3 Maintenance Work flow:

- (1) The objective of the work flow is to provide an integrated proactive and reactive work plan so that repair work is minimized and reliability and availability are optimized. Maintenance execution begins with the receipt of a work request and concludes with the close out of the work order.
- (2) Correct prioritization of work and proactively preparing activities through high quality work preparation, combined with accurate scheduling, will lead to a more stable work environment and reduce deferments and breakdowns, improve integrity and safety, and provide additional job satisfaction and ownership to technicians.
- (3) The management and control of day-to-day maintenance on all process units and utilities of a site is to provide-
 - (a) support for a maintenance strategy based on doing programmed maintenance on time;
 - (b) safe, healthy and environmentally sound execution of maintenance work;
 - (c) availability of equipment; and
 - (d) business efficiency.
- (4) The designated person for issue of work permit shall verify the execution of preparation activities before issue of the work permit.
- (5) Maintenance work shall be undertaken in accordance with work permit requirements.
- (6) Inspection personnel should be notified on time at which moment witnesses or hold points set.
- (7) A verification of the HSE requirements should be carried as the maintenance execution includes HSE review and a toolbox talk as outlined in the work permit or work pack.
- (8) The maintenance supervisor should ensure that a toolbox talk is held before work commences.
- (9) Upon completion of the job, the job site should be left safe, clean and tidy and any excess materials should be returned to the stores and tools should be cleaned and returned to the workshop or put away in the correct storage place.
- (10) On a daily basis, the progress of work should be reported. If the work is not completed, it should continue the next working day after taking requisite permission and approval from work permit issuing personnel.
- (11) The work permit duly signed shall be returned to issuing authority on completion of job, removal of all material from site and handing over of facilities to user and like other events.

7.4 Maintenance Strategy:

- (1) The facilities should be designed for minimum maintenance intervention.

- (2) The maintenance requirements should be clearly defined and further optimized based on maintenance strategy reviews using tools such as reliability centred maintenance, Risk Based Inspection and Risk Assessment Matrix (RAM), after detailed equipment specifications are known.
- (3) The criticality of the equipment shall be taken into account during the maintenance strategy selection.
- (4) Appropriate diagnostic tools and staff competencies shall be provided to facilitate rapid fault finding and rectification and also to provide opportunistic maintenance during outages.
- (5) Maintenance strategies shall maximize non-intrusive and on line data acquisition to support planning and analysis.
- (6) Special Critical Equipment shall have OEM defined performance standards which shall be periodically tested and verified.
- (7) Structural and pipeline survey and painting shall be done on a regular basis.

7.5 The entity shall prepare a written plan for preventive maintenance covering the scope, resources, periodicity and like other particulars. The corrective measures should include the preventive maintenance, scheduling, execution and closure.

7.6 Each facility should have well defined system for identification of spare part; rationalization and optimization to minimize any supply chain or logistics constraints and risks.

7.7 Well defined Roles and Responsibilities matrix should be available made for each machine as well as activity to be carried out in the workshop and the procedure for Audits and Review of the workshop shall be documented and adhered to.

8.0 Inspection:

- (1) Each facility shall have written inspection, testing and commissioning program in place. Inspection shall include before commissioning during installation as well as during regular operation of the Petroleum Installation.
- (2) All documents related to design, installation procedure of the respective vendors and the manufacturer's instruction for pre-commissioning and commissioning of the equipment, systems, instruments, control systems and like other devices shall be properly stored and followed.
- (3) Inspection shall cover the review of test protocols and acceptance criteria that such procedures are in accordance with the protocols and acceptance criteria specified in line with OEM specific requirements
- (4) Inspection shall cover that the equipment is installed in accordance with design, and any deviations documented and approved.
- (5) All safety systems are installed inspected and tested as per design or OEM requirement.
- (6) Inspection shall cover that all safety devices are installed and are in working condition as per the design or OEM requirements.
- (7) Inspection shall cover the verification of various safety interlocks and ESD provided in the design.
- (8) Inspection shall cover the adequacy of sealing systems.
- (9) Inspection shall cover the electrical systems, check its integrity, earthing resistance, bonding and like other requirements.

- (10) Inspection shall cover the integrity of mechanical and rotating equipment.
- (11) The integrity and efficacy of gas detection, fire protection and fighting system and connected equipments shall be covered in the inspection.
- (12) Inspection shall cover the efficacy of corrosion system.
- (13) Inspection shall cover and review the mechanical completion records that the PSVs are of the correct type and sizing as per the P and IDs/data sheets.
- (14) Inspection shall cover location of inlet pipe-work to relieving devices in relation to potential restrictions (such as above liquid levels, vessel internals, and like other potential restrictions).
- (15) Inspection shall cover and review P and IDs to check the position of isolation valves for relieving devices, their capacities. Inspection to confirm by review of all vent locations (atmospheric vent from drums or equipment seals) that they vent to safe location and in the event of liquid carry over will not discharge to areas that may cause a hazard to personnel.
- (16) Inspection shall review the area classification layouts and associated studies to confirm that all possible hazards have been appropriately considered (including possible migration) and the hazardous area drawings correctly account for the actual location of the sources of release the hazardous areas have been appropriately defined.
- (17) Inspection shall cover that all ESD devices move to their safe condition on loss of system output, hydraulic power or instrument air. All ESD Valves and actuators shall remain functional following an explosion or under fire conditions for a sufficient time period to perform their intended function.
- (18) The maximum allowable back pressure and minimum design temperature of the relief system shall be checked for suitability for the highest identified flow rate.
- (19) Control System shall include all status monitoring and actions to and from the Control Rooms.
- (20) Inspection shall cover the escape and evacuation passages.
- (21) Inspection shall cover the emergency communication system for its effectiveness during emergency situations.

PART - G

(Competence Assurance and Assessment)

9.0 COMPETENCE ASSURANCE AND ASSESSMENT:

9.1 Every entity shall develop, implement, and maintain a written training plan to instruct all Petroleum installation personnel with respect to the following, namely: -

- (1) Carrying out the emergency procedures that relate to their duties at the petroleum installation as set out in the procedure manual and providing first aid;
- (2) Permanent maintenance, operating, and supervisory personnel with respect to the following, namely: -
 - (i) The basic operations carried out at the petroleum installation;
 - (ii) The characteristics and potential hazards of petroleum and other hazardous fluids involved in operating and maintaining the petroleum installation;

- (iii) The methods of carrying out their duties of maintaining and operating the petroleum installation as set out in the manual of operating, maintenance and transfer procedures;
- (iv) Fire prevention, including familiarization with the fire control plan, fire fighting, the potential causes of fire, the types, sizes, and likely consequences of a fire at petroleum installation; and
- (v) Recognizing situations when it is necessary for the person to obtain assistance in order to maintain the security of the petroleum installation.

- 9.2** Each entity shall develop, implement, and maintain a written plan to keep its personnel up-to-date on the function of the systems, fire prevention, and security at the petroleum installation.
- 9.3** The Refresher programs for training of all personnel shall be conducted at an interval not exceeding 3 years to keep personnel updated on the knowledge and skills.
- 9.4** Every entity shall maintain a record for each employee that sets out the training given to the employee under this Part.
- 9.5** Each entity shall ensure that petroleum installation personnel receive applicable training and have experience related to their assigned duties. Any person who has not completed the training or received experience shall work under the control of trained personnel.
- 9.6** For the design and fabrication of components, each entity shall use personnel who have demonstrated competence by training or experience in the design of comparable components and for fabrication who have demonstrated competence by training or experience in the fabrication of comparable components.
- 9.7** Supervisors and other personnel utilized for construction, installation, inspection, or testing shall have demonstrated their capability to perform satisfactorily the assigned function by appropriate training in the methods and equipment to be used or related experience and accomplishments and further their capability shall be assessed periodically.
- 9.8** Each entity shall utilize for operation or maintenance of components only such personnel who have demonstrated their capability to perform their assigned functions by successful completion of the training as specified in this behalf and possess experience related to the assigned operation or maintenance function.
- 9.9** Corrosion control procedures including those for the design, installation, operation, and maintenance of cathodic protection systems, shall be carried out by, or under the direction of, a person qualified by experience and training in corrosion control technology.
- 9.10** Personnel having security duties shall be qualified to perform their assigned duties by successful completion of the training as specified in this behalf.
- 9.11** There shall be a minimum level maintained with men apart from the security personnel for monitoring the facilities even during non operational hours.
- 9.11.1** During all operations even after the general shift, a dedicated fire fighting team should be present. Alternatively, the security personnel shall be trained and certified for operation of fire fighting and emergency handling.
- 9.11.2** A dedicated, qualified and experienced officer should be designated as ‘Safety Officer’ of the Terminal after training. He shall be given exposure to Hazop, Risk Assessment, Safety Audit and upkeep of fire fighting facilities and conducting Safety Meetings.

- 9.12** Each entity shall follow a written plan to verify that personnel assigned operating, maintenance, security, or fire protection duties at the petroleum installation do not have any physical condition that would impair performance of their assigned duties. The plan shall be designed to detect both readily observable disorders, such as physical handicaps or injury, and conditions requiring professional examination for discovery.

9.13 Operations and Maintenance training:

Each entity shall provide and implement a written plan of initial training to instruct, the personnel as specified in succeeding paragraph 9.13.1 to 9.13.3.

9.13.1 All permanent maintenance, operating, and supervisory personnel;-

- (1) about the characteristics and hazards flammable fluids used or handled at the facility, including, flammability of mixtures with air, odourless vapour, boil off characteristics, and reaction to water and water spray;
- (2) about the potential hazards involved in operating and maintenance activities; and
- (3) to carry out aspects of the operating and maintenance procedures that relate to their assigned functions.

9.13.2 All personnel of petroleum installation shall be trained to carry out the emergency procedures that relate to their assigned functions; and to give first-aid;

9.13.3 All operating and appropriate supervisory personnel of petroleum installation shall be trained to understand detailed instructions on the facility operations, including controls, functions, and operating procedure.

9.14 Security Training:

Personnel responsible for security at petroleum installation shall be trained in accordance with a written plan of initial instruction to-

- (1) recognize breaches of security;
- (2) carry out the security procedures that relate to their assigned duties;
- (3) be familiar with basic plant operations and emergency procedures, as necessary to effectively perform their assigned duties; and
- (4) recognize conditions where security assistance is needed.

9.15 Fire Protection and Fighting Training:

All personnel including officers, operators, security, T/T drivers and contract workmen, clericals who are likely to be present/working in the petroleum installation shall be trained in accordance with a written plan of initial instruction, including plant fire drills, to –

- (1) know and follow the fire prevention procedures as specified in this behalf;
- (2) know the potential causes and areas of fire determined;
- (3) know the types, sizes, and predictable consequences of fire determined;
- (4) know and be able to perform their assigned fire control duties according to the procedures and by proper use of equipment provided;
- (5) each employee who undergo a refresher course once in every three years after initial training; and

- (6) every employee or authorized person of contractor working in the installation who shall be familiarized with fire siren codes and the location of fire siren operating switch nearest to his place of work.

9.16 Training Records;

Each entity shall maintain a system of records which-

- (1) Shall provide evidence that the training programs required under this part have been implemented;
- (2) Shall provide evidence that personnel have undergone and satisfactorily completed the required training programs; and
- (3) Shall ensure that the records maintained for one year after personnel are no longer assigned duties at the petroleum installation.

PART - H

(Vehicle Management System)

10.0 Vehicle Management System:

The transportation management document shall describe the procedures for effective day-to-day management of Road Transport and such management shall include driver selection, recruitment and training, health screening, working hours and other terms and conditions relating thereto.

10.1 Driver Management:

The selection and training of drivers shall be in consonance with conditions as specified in succeeding paragraph 10.1.1 and 10.1.2.

10.1.1 Qualification of driver:

- (1) The driver shall hold a valid driving license for type of vehicle to be driven and shall be authorized to drive vehicles carrying specific class of product under local Dangerous Goods regulations.
¹[****]
- (3) The driver can demonstrate knowledge of local road or highway regulations.
- (4) The driver can able to read and write in local language and comply with local legal regulations in terms of qualifications and requirements for him.
- (5) Competence assessment of the driver should be carried out by a company-approved driving examiner with on-road test.

10.1.2 Training and communications:

The following shall be ensured, namely; -

¹ The words and expression mentioned are omitted by sub-cl (t) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (1) That the driver has completed induction training on company rules and emergency response procedures;
- (2) That the driver has attended defensive driving course within last two years;
- (3) That the driver has undergone training on first aid procedures;
- (4) That the driver has completed necessary training as per hazardous good transportation procedures;
- (5) That the driver should attend regular tool box meeting, safety meetings; and
- (6) That the driver should attend daily/trip wise counselling on journey management.

10.2 Journey Management:

10.2.1 Journey management plans and controls shall have the following elements, namely: -

- (1) Routes between supply point and major destination shall be drawn up using effective journey management system in order to avoid unsuitable roads and congested areas as far as practicable;
- (2) Journey time shall be established for such routes and rest and reporting points designated on the long routes which exceed normal driver shift time;
- (3) Resting points where suitable accommodation is available to be designated by management;
- (4) Competent person supervise the journey management plan and procedures;
- (5) System to be in place for deployment of emergency response procedures;
- (6) Known en-route hazards, such as steep gradients, narrow bridges, poor road surface to be identified and recorded in the journey management plan;
- (7) Route hazards maps to be produced and made available to drivers; and
- (8) Trip time and other special route hazard information to be given to driver with customer invoice paperwork.

10.2.2 Driving and duty hours:

- (1) Comply to legal requirements, if any, irrespective of any limits specified in the succeeding sub-paragraph and the drivers shall not drive or be requested to drive when feeling tired and effective fatigue management procedures should be in place.
- (2) The continuous driving shall not exceed three hours and it should be followed by minimum 15 minutes rest. The rest shall be taken on continuous block and either away from vehicle or, if taken in a sleeper cab, while vehicle shall be stationary and alternatively, two drivers can be used with a monitoring system for rest after every three hours.
- (3) Tachograph or in vehicle monitoring system to be fitted for vehicles.

10.3 Vehicle Management:

All vehicles shall comply with local legal requirements and respective company standards and the vehicles shall be designed and equipped for local environments and intended range of operation and the following shall be ensured, namely: -

- (1) The tank truck shall be visually “well maintained “and capable of meeting basic safety inspection consistent with safe manoeuvring at low speeds within confines of loading or delivery location. The inspection includes brake operation and tyre inspection. (tie having a visible tread pattern and no obvious damage);
- (2) Three-point inertia reel seat belts to be fitted for crew;
- (3) The tank truck shall be fitted with an external engine cut-off device;
- (4) The tank truck shall be fitted with audible reversing alarm;

- (5) The tank truck should have product tank with an internal valve to prevent product leakage if an external outlet valve is damaged;
- (6) The tank truck shall have an exhaust system adequately shielded from direct contact with fuel from overfilled tanks leaks;
- (7) The tank truck ¹[or the loading arm meant for filling the tankers] shall have overfill protection system (compatible with loading rack facilities);
- (8) The tank trucks shall be loaded and operated within maximum permissible gross weight and in accordance with national regulation and approved limits by RTO for both rigid chassis and trailer body;
- (9) Trailer tank to be fitted with overturn protection that gives effective protection to man lids in the event of vehicle roll-overs;
- (10) Tank top safety rail or harness system to prevent driver from falling when or if working on tank top;
- (11) Tank truck shall be provided with a spill kit capable of dealing with small spills < 10 ltrs."; and
- ²[(12) In case of Dangerous Goods, Heavy Goods Vehicles (HGV) shall be fitted with at least One number of minimum 9 kg Dry Powder fire extinguisher on side of tank and 1 kg CO2 Fire extinguisher in Tank Truck cabin.]

PART - I

(Safety Management System)

11.0 Safety Management System:

The organization should establish a safety management system which shall be an integral part of the overall management system. Safety Management System (SMS) should be based on PDCA (Plan, Do, Check and Act) cycle which comprises of-

- (1) Policy setting which includes policy, corporate acceptance of responsibility, objectives, requirements, strategies;
- (2) Organization which includes structure, accountability and safety culture, involvement of the workforce, systems for performing risk assessment;
- (3) Planning and execution which includes operational standards and procedures for controlling risks, permit to work, competence and training, selection and control over contractors, management of change, planning and control for emergencies and occupational health;
- (4) Measuring and evaluating which includes active monitoring, recording and investigation of incidents or accidents, auditing and handling of non-conformities; and

¹ Ins. by sub-cl (u) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

² Subs. by sub-cl (w) *ibid.* (w.e.f. 29.03.2023)

- (5) Continuous improvement which includes review and application of the lessons learnt and Safety management system should not degenerate into a paper exercise only, conducted solely to meet regulatory requirements.

11.1 **Elements of Safety Management system:**

Safety management system should include at least the basic elements as specified in the succeeding paragraph 11.2 to 11.15.

11.2 **Safety Organization:**

Leadership and Management Commitment should be clearly visible in the SMS. Management should develop and endorse a written description of the company's safety and environmental policies and organizational structure that define responsibilities, authorities, and lines of communication required to implement the management program. Management should review the safety and environmental management program to determine if it continues to be suitable, adequate and effective at predetermined frequency. The management review should address the possible need for changes to policy, objectives, and other elements of the program in light of program audit results, changing circumstances and the commitment to continual improvement. Observations, conclusions and recommendations of management review should be documented.

11.3 **Safety Information:**

Comprehensive safety and environmental information for the facility, which includes documentation on process, mechanical and facility design, should be developed and maintained throughout the life of the facility.

11.4 **Process Hazard Analysis:**

The purpose of Process Hazard Analysis (PHA) is to minimise the likelihood of the occurrence and the consequences of a dangerous substance release by identifying, evaluating and controlling the events that could lead to the release. Process hazards analysis should be performed for any facility to identify, evaluate, and reduce the likelihood or minimize the consequences of uncontrolled releases and other safety or environmental incidents and human factors should also be considered in this analysis. The process hazard analysis should be updated and revalidated by a team, having requisite back ground, at least every 5 years after the completion of initial process hazard analysis. Recommendations resulting from the PHA should be completed before start-up for a new process or facility, or modification in existing facility.

11.5 **Operating Procedures:**

Written down operating procedures shall be available describing tasks to be performed, data to be recorded, operating conditions to be maintained, samples to be collected and safety and health precautions to be taken for safe operation. Operating procedures should be based on process safety information so that all known hazards are taken care of. The human factors

associated with format, content, and intended use should be considered to minimize the likelihood of procedural error.

11.6 **Safe Work Practices:-**

The entity shall maintain procedures that address safe work practices to ensure the safe conduct of operating, maintenance, and emergency response activities and the control of materials that impact safety and such safe work practices may apply to multiple locations and will normally be in written form (safety manual, safety standards, work rules, and like other written forms) but site-specific work practices shall be prepared and followed. In cases where an employee believes that following a procedure will cause an unsafe condition, he shall have authority to stop work and get permission from appropriate level to deviate and deviations should be documented for future analysis.

11.7 **Training:**

The training program shall establish and implement programs so that all personnel including contractors are trained to work safely and are aware of environmental considerations, in accordance with their duties and responsibilities. Training shall address the operating procedures, the safe work practices, and the emergency response and control measures and any change in facilities that requires new or modification of existing operating procedures may require training for the safe implementation of such procedures and the training should be provided by qualified instructors and documented.

11.8 **Management of Change (MOC):**

There should be procedures to identify and control hazards associated with change and to maintain the accuracy of safety information and for each MOC, the operator shall identify the potential risks associated with the change and any required approvals prior to the introduction of such changes. The types of changes that a MOC procedure addresses shall include-

- (i) technical;
- (ii) physical;
- (iii) procedural; and
- (iv) organizational,

and such procedure shall consider permanent or temporary changes and the process shall incorporate planning for the effects of the change for each situations relating thereto and the procedures should cover the following, namely: -

- (i) The process and mechanical design basis for the proposed change;
- (ii) An analysis of the safety, health, and environmental considerations involved in the proposed change, including, as appropriate, a hazards analysis;
- (iii) The necessary revisions of the operating procedures, safe work practices, and training program;

- (iv) Communication of the proposed change and the consequences of that change to appropriate personnel and the necessary revisions of the safety and environmental information;
- (v) The duration of the change, if temporary; and.
- (vi) Required authorizations to effect the change.

11.9 **Contractors:**

When selecting contractors, operators should obtain and evaluate information regarding a contractor's safety and environmental management policies and practices, and performance there under, and the contractor's procedures for selecting subcontractors. The entities shall communicate their safety and environmental management system expectations to contractors and identify any specific safety or environmental management requirements which they have for contractors. Interfacing of SMS of various entities (operator, contractor or service provider, subcontractor and third-party) should be ensured through a well written bridging document. Entity shall document the clear roles and responsibilities with its contractors.

11.10 **Assurance of quality and mechanical integrity of critical equipment:**

Procedures should be in place and be implemented so that critical equipment for any facility is designed, fabricated, installed, tested, inspected, monitored, and maintained in a manner consistent with appropriate service requirements, manufacturer's recommendations, or industry standards. Entity shall maintain inspection and testing procedures for safety-related equipment. Human factors should be considered, particularly regarding equipment accessibility for operation, maintenance and testing.

11.11 **Pre-startup Safety Review:**

Before a new or modified unit is started, a systematic check should be made to ensure that the construction and equipment are in accordance with specifications; operating procedures have been reviewed; hazards analysis recommendations have been considered, addressed and implemented; and personnel have been trained. It should be ensured that programs to address management of change are in place.

11.12 **Permit to Work (PTW) System:**

PTW system is a formal written system ¹[(online or offline)] used to control certain types of work which are identified as potentially hazardous. Essential features of permit-to-work systems are as specified below, namely: -

- (i) Clear identification of who may authorize particular jobs (and any limits to their authority) and who is responsible for specifying the necessary precautions;
- (ii) Training and instruction in the issue, use and closure of permits;
- (iii) Monitoring and auditing to ensure that the system works as intended;

¹ Ins. by sub-cl (v) of cl. (vi) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (iv) Clear identification of the types of work considered hazardous; and
- (v) Clear and standardized identification of tasks, risk assessments, permitted task duration and supplemental or simultaneous activity and control measures.

11.13 **Emergency Planning and Response:**

A comprehensive Emergency Response and Disaster Management Plan (ERDMP) shall be developed in accordance with the Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010. The copies of the ERDMP shall be maintained at each petroleum installation. The emergency response planning shall have clear written procedures for expected actions during anticipated emergencies and emergency response plan shall include operational and procedural requirements for various emergency scenarios that are relevant for the installation and the emergency procedures shall contain inter alia as specified below, namely: -

- (i) The emergency procedures shall include, at a minimum, emergencies that are anticipated from an operating malfunction of any component of the petroleum storage, handling and transportation facilities, personnel error, forces of nature, and activities carried on adjacent to the facilities;
- (ii) The emergency procedures shall include but not be limited to procedures for responding to controllable emergencies, including the following, namely: -
 - (a) The notifying of personnel;
 - (b) The use of equipment that is appropriate for handling of the emergency;
 - (c) The shutdown or isolation of various portions of the equipment; and
 - (d) Other steps to ensure that the escape of gas or liquid is promptly cut off or reduced as much as possible;
- (iii) The emergency procedures shall include procedures for recognizing an uncontrollable emergency and for taking action to achieve the following, namely: -
 - (a) Minimize harm to the personnel at the petroleum storage, handling and loading or unloading facilities and to the public;
 - (b) Provide prompt notification of the emergency to the appropriate local officials, including the possible need to evacuate persons from the vicinity of petroleum installation;
 - (c) The emergency procedures shall include procedures for coordinating with local officials in the preparation of an emergency evacuation plan that sets forth the steps necessary to protect the public in the event of an emergency, including the following, namely: -
 - (i) Quantity and location of fire equipment throughout the petroleum installation;
 - (ii) Potential hazards at the petroleum installation; and
 - (iii) Communication and emergency-control capabilities at the petroleum installation.

11.14 **Incident Investigation and Analysis:**

Procedures for investigation of all incidents as per the Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010 shall be developed. Incident investigations should be initiated as promptly as possible, considering the necessity of securing the incident scene and protecting people and the environment. The intent of the investigation should be to learn from the incident and help to prevent similar incidents. A corrective action program should be established based on the findings of the investigation to prevent recurrence.

11.15 **Compliance Audit:**

Safety Audits are the periodic examination of the functioning of safety system and it gives an idea about how effectively the safety system is implemented and how they are being accomplished and it is the feedback mechanism that provides management with the status and measurement of effectiveness of the various safety system elements and activities and leads to the appropriate control over such efforts. The audit program and procedure should cover the following, namely: -

- (i) The activities and areas to be considered in audits;
- (ii) The frequency of audits
 - a. Internal Audit : Every year (including those years in which External Audit is undertaken);
 - b. External Audit : Once in three year;
- (iii) The audit team;
- (iv) How audits will be conducted; and
- (v) Audit Reporting;

and the findings and conclusions of the audit should be provided to the management and the management should establish a system to determine and document the appropriate response to the findings and to assure satisfactory resolution. The audit report should be retained at least until the completion of the next audit.

11.15.1 Internal and External Safety Audits:

Audit conducted by Internal Audit teams of the organization shall be categorized as Internal Safety Audit. Internal Safety Audits shall be coordinated by local management under the overall direction from the respective Corporate Offices. External Safety Audits shall be carried out through PNGRB empanelled third party agency or multidisciplinary team constituted by PNGRB.

¹[PART J:

[Aviation Fueling Station (AFS)]

12.0 Applicability:

For Aviation Fuel Stations across the country falling under the scope of these regulation; Part A, Part B, Part C, Part E and paragraph 10.1.1 of Part H (that is to say Qualification of Driver) shall be superseded by Part J and remaining parts that is to say Part D, Part F, Part G, Part H, Part I shall hold good except Clause 10.1.1 of Part H.

The paragraphs of this Part are applicable for such Aviation Fuel Station or installation, where aggregate above ground storage capacity is equal to or more than 1000 KL.

12.1 Scope:

This Part lays down minimum safety requirements in layout, design, fire protection system, hydrant refueling system and supply and handling of aviation product in barrels or packed conditions, keeping in view specific requirements for AFS and availability of a reliable fire fighting support from the airport operator.

12.2 Installation layout:

12.3 Layout Philosophy:

Following philosophy should be adopted in layout of an Aviation Fuel Station, namely: -

- (a) **Identify and size the facilities needed for receipt, storage and delivery of Class B (ATF) in bulk, based on the business and process requirements and with a provision for future expansion. Facilities for receipt, storage and dispensing of Class A (Av gas) shall be designed and segregated from ATF.**
- (b) **Physical segregation or demarcation of hazardous and non-hazardous areas shall be provided. Layout indicating hazardous and non-hazardous area segregation or demarcation shall be available. Hazardous area segregation or demarcation shall be as per latest IS 5572.**
- (c) **AFS facilities should be located based on the following, namely:-**
 - (i) De-licensed area consisting of admin building, security cabin and utilities should be nearer to the entry or exit gates to minimise movement of personnel in licensed premise.
 - (ii) TT unloading, refuellers loading area and refuellers parking shall be located in such a way that vehicular movement is minimised; and
 - (iii) Facilities should be laid such that length of drain leading to OWS is minimal.
- (d) ***Risk Analysis or Assessment shall be carried out at the layout stage with an objective to arrive at any specific mitigation measures required for the Hazards identified. Risk reduction or mitigation measures shall be given due credit. The outcome of risk assessment shall guide in preparation of onsite and off-site emergency plan. Quantitative Risk Assessment (QRA) shall be done whenever major additions in facilities or major changes in the surrounding areas, operating parameters, product grade takes place or once in every five years ,whichever is earlier.***
- (e) **Minimum two approaches from the major road should be provided, one for normal movement and another for emergency exit. Both these approaches should be available for receipt of assistance in emergency.**

¹ Ins. by cl. (vii) of reg (2) the Petroleum and Natural Gas Regulatory Board (Technical Standards and Specifications including Safety Standards for Petroleum Installations) Amendment Regulations, 2023 (w.e.f. 29.03.2023)

- (f) **Roads inside the hazardous area of an AFS shall be restricted to vehicles required for operational, maintenance and safety or security reasons and are to be allowed only with proper safety fittings and authorization from location in-charge or designated safety officer or Shift In-charge.**
- (g) **Road widths, gradient and turning radii at road junctions shall be designed to facilitate movement of the fire-fighting vehicle envisaged in the event of emergency.**
- (h) **The access of facility should be available from two approaches.**
- (i) **Layout should consider the space requirements for the following, namely:-**
 - (i) Maintenance and inspection of each equipment or facility;
 - (ii) Dedicated area for construction activities;
 - (iii) Future expansion for addition of facilities;
 - (iv) Parking of refuellers or hydrant dispensers and other vehicles; and
 - (v) TT Parking area based on expected fleet size.
- (j) **Vehicles with spark ignition engine shall not be allowed inside hazardous area. Vehicles with internal combustion engine (compression ignition) such as refuellers and tank truck required to be permitted for business shall have Petroleum and Explosives Safety Organization (PESO) approved spark arrestor fitted on the vehicle.**
- (k) **The maximum height of structure at the AFS shall not exceed the maximum permissible height specified by the local airport authority or operator.**

12.3.2 Layout of facilities:

To prepare a layout, information should be collected on all applicable aspects and not limiting to following, namely:-

- (a) **Storage tanks, utility requirements**
- (b) **Product receipt or dispatch and mode of transport (by Road and Pipeline).**
- (c) **Warehouses, DP Shed (for storing Avgas 100LL or Methanol) and other open storage areas like scrap yards.**
- (d) **Chemical storage, hazardous waste storage or disposal facilities.**
- (e) **Service buildings and allied facilities.**
- (f) **Site topography including elevation, slope and drainage.**
- (g) **Seismic data and probability of tsunami in coastal areas.**
- (h) **Highest flood level in the area, water table, natural streams or canals.**
- (i) **Approach roads for functional areas.**
- (j) **Aviation considerations like height restrictions and distance from flight path.**
- (k) **Environmental considerations.**
- (l) **Statutory requirements, airport operator's requirements, local bye-laws.**

12.3.3 General Considerations:

While locating the various facilities the following should be considered, namely: -

- (a) **Tank farm, loading or unloading gantry, utilities, and approach roads should be suitably constructed to prevent flooding.**
- (b) **Operations Control Room, SCADA and server room should be located in a non-hazardous area, upwind (Majority of the year) of hydrocarbon storage and handling facilities and at a distance from potential leak sources. It shall not be located on a lower level than surrounding plants and tank farms.**
- (c) **The control room for Pipeline receipt (if applicable) can be co-located with the SCADA or server room for the AFS.**
- (d) **Utility blocks shall be located outside the hazardous area.**
- (e) **Overhead power transmission lines shall not pass over the AFS including the tank truck parking areas. Horizontal clearance shall be in line with the Indian Electricity Rules.**
- (f) **High Tension (HT) line and HT sub-stations shall be terminated or located outside the hazardous area.**

- (g) Tank truck or refuellers movement inside the AFS shall be kept to minimum. The truck or refuellers loading or unloading facilities should be located at a safe distance near the gate meant for its movement and should be oriented to provide one-way traffic pattern for entrance and exit. Tank truck or refuellers in the gantry shall be in drive out position for easy escape in case of emergency.
- (h) For AFSs with above ground product storage tank having capacity more than 1000 KL, drain shall be provided around the Tank farm, TT or Refuellers loading or unloading area to collect product due to accidental spill over or leakage and shall be routed to OWS or pits. The drains shall always be maintained clean.
- (i) Roads should be provided in a manner to the extent possible to serve all areas requiring access for the operation, maintenance and firefighting.
- (j) Smoking booths shall not be provided inside an Aviation Fuel Station.
- (k) Firewater storage and firewater pump house, wherever applicable, should be located upwind of hydrocarbon storage area with straight approach from outside area to enable easy receipt of mutual aid and make up water.
- (l) The provision should be made to receive the water from other sources including mutual aid or sharing of water into fire water storage tanks.
- (m) All buildings which are not related to AFS operation should be located at upwind of hydrocarbon storage and handling facilities and they shall be located outside the hazardous area, and such areas include administration, canteen with a separate entry and special care should be taken for canteen location where any spark or open flame is likely to exist.
- (n) Congestion inside the hazardous area because of buildings, structures, pipelines, trees, should not be allowed. The location of addition of facilities in existing AFS shall be decided based on Risk Assessment.
- (o) Room for storing hydro carbon samples shall be provided with bottom exhaust for release of flammable vapours. Electrical fittings as well as electrical equipment shall be flame proof. Adequate number of fire extinguishers should be placed, wherever required.
- (p) Electrical equipment or fittings of type suitable for respective area classification (Zone-0,1,2) to be ensured. Electrical fittings as well as electrical equipment in hazardous areas shall be of approved type.
- (q) The additives shall be stored at the designated or segregated area as per respective Material Safety Data Sheet.
- (r) Unlicensed area shall be suitably demarcated by fencing.

12.3.4 Layout of Storage Tanks:

12.3.4.1 Dyked Enclosures:

- (a) Above ground ATF storage tanks shall be located in dyked enclosures. Facility shall be accessible from atleast two sides. Aggregate capacity (combined safe capacity) of tanks located in one dyked enclosure shall not exceed 60,000 KL for a group of fixed roof tanks.
- (b) Dyked enclosure shall be able to contain the complete contents of the largest tank in the dyke in case of any emergency. A free board of minimum 200 mm above the calculated liquid level or 10% of calculated dyke capacity, whichever is higher, shall be provided for fixing the height and capacity of the dyke.
- (c) Enclosure capacity shall be calculated after deducting the following volumes, namely:-
 - (i) Volume of the tanks other than largest tank up to enclosure height without free board;
 - (ii) Volume of all tank pads, supports and RCC rings as applicable;
 - (iii) Volumes of fire break walls; and
 - (iv) Volume of pipes, supports and steps.
- (d) The height of tank enclosure dyke (including free board) shall be at least 1.0 m and shall not be more than 2.0 m above average inside grade level.
- (e) The dyke wall made up of earth, concrete or solid masonry shall be designed to withstand the hydrostatic load and shall be impervious.
- (f) Dyke enclosure area (inside area of the dyke) shall be also impervious to prevent the ground water pollution. Dyke enclosure (entire area of the dyke) shall have impervious layer of suitable material such as EPDM (ethylene propylene di- monomer) liner or polyethylene sheet

to prevent the ground water contamination in addition to brick or stone pitching or PCC. For existing facilities, imperviousness of dyke enclosure should be ensured using any suitable technology.

- (g) **The dyke and the enclosures shall be inspected for cracks, visible damage. every six months (pre and post monsoons) and after every major repair in the tanks or dykes, so as to keep it impervious.**
- (h) **Pump stations and piping manifold should be located outside dyke areas.**
- (i) **Piping through dyke wall, if any, shall be properly sealed to make dyke impervious.**
- (j) **The dyke area shall have proper slope outward of tank pad towards the inner periphery of the dyke enclosure to prevent reverse flow.**
- (k) **Earth-pits shall be provided outside of Dyke area and strips buried under the earth except at termination points from a shortest possible distance. The earthing lay out diagram shall be displayed for reference.**
- (l) **Horizontal above ground tanks mounted on pedestals shall meet separation distances and shall have dyked enclosure.**
- (m) **Inter distance between dyke wall and tank shell shall be minimum half the height of the tank.**
- (n) **Construction of dyke exceeding 2 m may be considered where there is severe constraint on space availability, subject to approval of PESO. In such case, following conditions shall be ensured ,namely:-**
 - (i) Total dyke capacity shall be based on containment of largest tank capacity;
 - (ii) Monitors on raised platforms shall be provided so that throw of the monitors are not restricted;
 - (iii) All tanks in such a dyke shall be provided with sprinkler system for AFSs storing more than 1000 kl in above ground storage tanks; and
 - (iv) Suitable railing for fall protection to be provided at cross over in case of dyke height is more than 1.5 metre.
- (o) **In case of buried tanks - Under Ground (UG or buried) and Semi-buried (SB) tanks:**
 - (i) Semi-buried tanks are treated as underground storage tanks for calculation of inter-distance between the facilities;
 - (ii) Kerb wall of minimum 300 mm height should be provided in the UG or SB tank Farm Area to contain accidental overflow.;
 - (iii) A minimum of 1.5 m clear distance from the tank shell shall be maintained from structures or boundary;
 - (iv) Vents shall be located or terminated at a distance of 4 m from hazards and shall be at minimum 4 m height from the ground level;
 - (v) The open end of vent pipe shall be covered with non-corrodible metal wire gauge preferably SS having 60 meshes and shall be further protected from rain by hood or by suitably bending it downward;
 - (vi) Aviation fuels shall enter a tank through closed piping system or coupled electrically continuous and sound hose; and
 - (vii) The manholes, dip hatch, floating suction inspection hatch and pipelines should be minimum 300 mm above the grade level of the tank farm.
- (p) **Corrosion control measures such as wrapping- coating for buried pipelines and tanks, Internal epoxy lining of tanks and hydrant pipelines, provision of Cathodic protection for hydrant pipelines shall be undertaken.**

12.3.4.2 Grouping of Tanks:

- (a) **Tanks shall be arranged in maximum two rows so that each tank is approachable from the road surrounding the enclosure.**
- (b) **Tanks having 50,000 KL capacity and above shall be laid in single row.**

12.3.4.3 *Fire walls inside dyke enclosure for above ground tanks:*

- (a) **In a dyked enclosure where more than one tank is located, firewalls of minimum height 600 mm shall be provided to prevent spills from one tank endangering any other tank in the same enclosure.**
- (b) **A group of small tanks each not exceeding 9 meters in diameter and in all not exceeding 5,000 KL in capacity shall be treated as one tank for the provision of firewall.**

12.3.4.4 *General:*

- (a) **For aboveground vertical storage tanks, the tank height shall not exceed one and half times the diameter of the tank or maximum 20 m, whichever is less.**
- (b) **All Piping from or to any tank including connected sprinkler or foam line shall comply with the following, namely:-:**
 - (i) They shall not pass through any other dyked enclosure;
 - (ii) They shall run directly to outside of dyke to minimise piping within the enclosures; and
 - (iii) They should not pass-through other tank areas or fire walls.
- (c) **Piping design inside tank dyke area should ensure easy accessibility for any operations in the tank farm and wherever necessary well-designed cross-overs shall be provided to cross the pipelines running within the dyke area. Elevated catwalks above the height of the dyke wall shall be provided for safe access and exit in case of normal or emergency situations. The catwalks shall run at the same level and terminate directly outside the dyke.**
- (d) **No part of the dyked enclosure should be below the level of surrounding ground immediately around the outside of dyke area.**
- (e) **Minimum distance between a tank shell and the inside toe of the dyke shall not be less than half the height of the tank**

12.3.5 Protection of Facilities:

- 12.3.5.1 *Proper approach towards various facilities should be provided within the AFS for smooth access of fire tenders in case of emergency, for AFSs storing more than 1000 KL in above ground tanks.*
- 12.3.5.2 *For AFSs located outside airport or defence premises, the boundary wall should be constructed as per the directives of the Government of India, in the Ministry of Home Affairs or any other Central Government directive. In any case the boundary wall shall be of minimum 3m height with V or Y or X shaped barbed wire fencing on the wall with 600 mm diameter concertina coil on top.*
- 12.3.5.3 *The emergency gate should be away from the main gate for evacuation of vehicles and personnel in emergency and should always be kept available and free from obstruction.*
- 12.3.5.4 *CCTV shall be installed in AFSs, other than defence, with aggregate above ground storage tank capacity more than 5,000 KL. The CCTV shall cover entry and exit gate, periphery of installation and all critical operating areas such as tank farm, loading or unloading area, which should be monitored continuously. The CCTV monitoring station should be provided in SCADA, or SHIFT room, security cabin and Location In-charge room.*

12.3.6 Separation Distances:

- 12.3.6.1 *Minimum separation distances between various facilities described above shall be as per Tables- 1, 2 and 3 of these part . Every table of these part shall be read in conjunction with the notes specified with the table.*
- 12.3.6.2 *The layout shall also take into account findings and recommendations of HAZOP or Quantitative Risk Assessment study, which shall be carried out at all the stages of facility development process.*
- 12.3.6.3 *For large AFS, minimum separation distances are specified in Table- 1. The table is applicable where total storage capacity for ATF in above ground tanks is more than 5000 KL.*
- 12.3.6.4 *For medium sized AFS, minimum separation distances shall be as specified in Table-2. This table is applicable where total above ground storage capacity for ATF is above 1000 KL but less than or equal to 5000 KL.*
- 12.3.6.5 *For other category AFSs, minimum separation distances shall be as specified in Table-3. This table is applicable where total above ground storage capacity is equal to 1000 KL or where AFSs are having buried or semi-buried tanks irrespective of storage capacity.*
- 12.3.6.6 *In case of an existing AFS where inter-distances between various facilities are not conforming to the Table- 1 or 2 or 3 of these part (as applicable), then QRA or HAZOP study shall be conducted and suggested mitigation measures shall be implemented.*

TABLE – 1
Separation Distances Between Facilities for Large AFSs with Above Ground Tankage > 5000 Kl

S.No.	From / To	1	2	3	4	5	6	7	8	9	10	11
1	Storage Tank- Class B	(D+d)/4 or 10 min	15	30	0.5D or 15 Min	30	30	30	8	30	15	15
2	Tank vehicle loading or unloading for petroleum Class B	15	X	30	20	30	30	30	8	30	15	15
3	Fire water tanks and Pump House	30	30	x	X	12	30	6	30	12	30	X
4	Boundary wall around AFS	0.5 D or 15 min	20	X	X	X	1.5	X	X	X	15	X
5	Service or office buildings or workshop	30	30	12	X	X	30	X	8	X	15	3
6	OWS or pits	30	30	30	1.5	30	X	30	X	30	30	15
7	Electrical Panel Room (PMCC or DG room) or Electrical Sub station	30	30	6	X	X	30	x	8	X	15	X
8	FLP Electric Motors	8	8	30	X	8	X	8	x	8	8	15
9	SCADA or Server Room	30	30	12	X	X	30	X	8	X	30	X
10	DP shed (Class A in packed condition)	15	15	30	15	15	30	15	8	30	X	15
11	Non-FLP Motors	15	15	X	X	3	15	X	15	X	15	X

General Notes to Table-1:

All distances are in metre and the table specified the minimum requirement.

- (a) “D” indicates the diameter of the larger tank.
- (b) All distances shall be measured between the nearest points on the perimeter of each facility except in case of tank vehicle loading or unloading area where the distance shall be from the centre of nearest bay.
- (c) Service building shall have minimal manning and normally no hot work would be done there.
- (d) “X” means any distance suitable for constructional or operational convenience.
- (e) Safety distances between tanks are not applicable (other than boundary wall) for double walled above ground storage tanks. No dykes are required for such tanks.
- (f) Pig launcher or receiver at liquid hydrocarbon handling pipeline installations should be located at least 5 m from boundary.

Specific notes to Table-1:

1. OWS or Pits shall be minimum 1.5 m from boundary wall. However, OWS or Pits in this case shall have permanent covers with venting arrangement located at minimum 4 m from boundary wall and other hazard.
2. Refuellers parking space should be demarcated and a minimum distance of 4m distance to be maintained from the centre line of the nearest refuellers to the boundary wall.
3. Fixed type Proving Measure should be at a minimum distance of 4 m from hazard or source of ignition.

TABLE – 2

Separation distances between tank/ offsite facilities for AFSs with Above Ground Tankage >1000KL and ≤5000KL

S. No.	From / To	1	2	3	4	5	6	7	8	9	10	11
1	Storage - Class B	0.5D	4.5	D or 4.5 min	D or 4.5 min	4.5	4.5	3	9	30	4.5	D min
2	Tank vehicle decantation or Topping-up	4.5	X	4.5	4.5	4.5	4.5	1.5	9	30	9	9
3	Boundary wall around AFS	D or 4.5 Min	4.5	X	X	X	X	X	9	X	1.5	X
4	Service or office buildings or workshop	D or 4.5 Min	4.5	X	X	X	X	X	9	12	9	x
5	Non-FLP motors	4.5	4.5	X	X	X	X	3	9	X	9	x
6	Electrical Panel Room (PMCC or DG room) or Electrical sub statin	4.5	4.5	X	X	X	X	3	9	X	9	x
7	FLP Electric Motors	3	1.5	X	X	3	3	X	3	30	X	3
8	DP shed (Class A in packed condition)	9	9	9	9	9	9	9	x	30	9	9
9	Fire water tanks and Pump House	30	30	X	12	X	X	30	30	X	30	12
10	OWS or Pits	4.5	9	1.5	9	9	9	X	9	30	x	9
11	SCADA or Server Room	D min	9	X	X	X	x	3	9	12	9	x

Notes:

Safety distances between tanks are not applicable (other than boundary) for double walled above ground storage tanks. No dykes are required for such tanks. Notes given under Table -1 are also applicable for Table- 2.

TABLE – 3

Separation Distances between tank for AFS with Above Ground tankage =1000KL or buried/semi-buried tanks irrespective of capacity

S.No.	From / To	1	2	3	4	5	6	7	8	9
1	Storage - Class B	0.5D (note b)	4.5	D or 4.5min (note b)	D or 4.5 min	4.5	3	9	4.5	4.5
2	Tank vehicle decantation or Topping-up	4.5	X	4.5	4.5	4.5	1.5	9	4.5	4.5
3	Boundary around AFS	D or 4.5 min	4.5	X	X	X	X	9	X	X
4	Service or office buildings or workshop	D or 4.5 min	4.5	X	X	X	X	9	X	X
5	Electrical Panel Room (PMCC or DG room)	4.5	4.5	X	X	X	3	9	X	X
6	FLP Electric Motors	3	1.5	X	X	3	X	9	X	3
7	DP shed (Class A in packed condition)	9	9	9	9	9	9	X	9	9
8	Non-FLP motors	4.5	4.5	X	X	x	X	9	X	X
9	SCADA/Server Room	4.5	4.5	X	X	X	3	9	X	X

General notes to Table –3:

- (a) All distances are in metre and the table specifies the minimum requirement.
- (b) Distance norms between buried or semi buried tanks will not be applicable. The distance between buried or semi buried tanks and boundary shall be minimum 1.5 m.
- (c) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements.
- (d) “D” indicates the diameter of the larger tank.
- (e) Distances given for the tanks are shell to shell in the same dyke.
- (f) Where alternate distances are specified (like $0.5 D / 6.0$), the minimum thereof shall be used.
- (g) All distances shall be measured between the nearest points on the perimeter of each facility except in case of tank vehicle loading or unloading area where the distance shall be from the centre of each bay.
- (h) Pig launcher or receiver should be located at least 5 m from boundary.
- (i) Safety distances between tanks and other facilities (other than boundary are not applicable for double walled above ground storage tanks. No dykes are required for such tanks.

For Aviation Fuel Stations:

1. For underground and semi buried tanks, the separation distance between Tank Vents and hazard should be minimum 4 m. The vertical separation should be minimum 4 m from the grade level.
2. Separation distance of 1.5 m to be maintained from underground and semi buried tanks to nearby structures and boundary wall. For above ground tanks Table -3 to be followed.
3. Refuellers parking space should be demarcated and a minimum distance of 4m distance to be maintained from the centre line of the nearest refuellers to the boundary wall.
4. Fixed type Proving Measure should be at a minimum distance of 4 m from hazard or source of ignition.

12.4 Design Considerations:

12.4.1 Design of storage tanks

12.4.1.1 Tank design:

- (a) All horizontal tanks ,above ground, underground and semi buried, shall be as per IS 10987 or any equivalent industry standard. Semi-buried tanks are considered as underground storage tanks for all purposes.
- (b) atmospheric pressure tanks shall be designed as per, API 650 or IS 803 or any other equivalent standard.
- (c) Selection of type of tank generally depends on ambient conditions, site requirement and the volume of product to be handled.
- (d) Tank bottoms should be cone down with a continuous slope towards centre sump for vertical tanks as per relevant standards and horizontal tank should be installed with a continuous slope of 1:60 minimum.

12.4.1.2 Tank Appurentences:

- (a) Individual above ground vertical and horizontal tanks shall be provided with access to the roof or tank top. A platform with railing should be provided from the top of the stairway to gauge well, vents and floating suction check point.
 - (b) Stairs should be made of grating. All staircases shall have resting or landing platform for a height not exceeding 5m.
 - (c) Minimum two number of roof manholes and 2nos. of shell manholes shall be provided in all vertical tanks. For horizontal tanks minimum two numbers of manholes shall be provided.
 - (d) Walkway with hand rail on the roof of the tank should be provided to facilitate inspection or checking of vents, so that movement of personnel on roof is safer. Anti-slippy path on the roof should be provided for this purpose.
 - (e) All ATF tanks shall be provided with floating suction of size depending on the tank capacity and discharge flow rate, with an inspection hatch at the top of the tank.
 - (f) Sampling sump shall be provided in all types of Aviation tanks.
 - (g) For vertical tanks minimum one no. sampling draw off line or one water draw off line should be provided.
 - (h) Flash Back Arrester (Flame arrester) vents where fitted should be as per IS 11006 or adequately sized free vents should be provided for ATF tanks as API 2000 and also considering the following , namely :-
 - (i) Maximum and minimum ambient temperatures;
 - (ii) Vapour pressure of the product at operating or design temperature;
 - (iii) Maximum pumping in and out rates.
- (i) Free Vents shall be provided with Screens made of stainless steel to prevent the ingress of foreign bodies and shall have a coarse mesh with approximately 60 mesh size or finer.

12.4.2 Tank farms and manifolds:

12.4.2.1 Tank Farm Drains for AFS with storage capacity more than 1000 KL:

- (a) The dyke drain shall be provided along the inside periphery of the dyke enclosure wall. In case circular drain around tank pad is provided, the same needs to be connected to the peripheral drain.
- (b) The outlet from dyke shall have the provision to divert to the OWS or Pits or to main storm water drain.
- (c) In case of AFS with total tankage of more than 5000 KL in above ground tanks, the dyke drain valves shall be provided with position indication and alarm system.
- (d)

12.4.2.2 Tank Manifold:

- (a) The number of inlet or outlet connections to the tank shell should be kept minimum.
- (b) Tank body valve of above ground tanks shall be manually operated valve or motor operated or remote operated shut off valve type.
- (c) The second valve on above ground tanks should be motor operated valve (MOV) on inlet and outlet lines for locations having hydrant refuelling system. For other AFSs where HRS system is not installed, in place of MOV, manual operated valve may be provided. This second valve should be located outside the dyke area.
- (d) All AFSs with above ground storage capacity more than 5000 KL shall have over-fill protection system.
- (e) Hammer blind valves of any type shall not be used in AFSs.
- (f) MOV should have open and close remote operation from SCADA or shift room and at field outside of dyke. ROSOV wherever provided shall be fail safe and fire safe (shall close in case of signal failure) and the actuator shall be failsafe. The cables leading to the control room shall be fire resistant. ROSOV shall have only close operation from control room or at a strategic remote location.
- (g) In addition, open, close and stop feature should be available for local operations, close to the valve.
- (h) Tank manifold, if provided, should be located outside the dyke area. The floor underneath the manifold shall be paved and have Kerb walls and connected to oil water drainage system leading to OWS or Pits.
- (i) Thermal safety valve (TSV) or Expansion line should be provided in above ground tanks for blocked portion of pipe lines to take care of the thermal expansion of product due to rise of temperature.
- (j) TSV outlet line or expansion line should be connected back to above ground tank or tank inlet or outlet line before manually operated body valve with suitably positioned isolation valves. One isolation valve shall be installed close to the tank body or inlet or outlet line to the maximum extent possible.
- (k) In case the expansion line is connected at tank top, the line shall be extended inside up to the Tank bottom to avoid free fall through vapour space. However, at existing locations where ever the above provision does not exist in above ground tanks, the same shall be provided on all tanks during scheduled tank maintenance or cleaning.
- (l) Any electrical fittings and fixtures inside the dyke shall be as per the hazardous area classification. However, such fittings and fixtures except for actuators of MOVs should be above the dyke height.

12.4.2.3 Tank Settlement:

- (a) Tank Settlement should be effectively made up with proper slope to avoid rain water accumulation and subsequent corrosion of the bottom plate.
- (b) Where large settlement is anticipated, supporting arrangement for the connected piping shall be suitably designed to take care of the settlement.

12.4.3 Drain or sampling point:

12.4.3.1 Drain or sampling point in Above Ground tanks:

- (a) Arrangement should be provided in all above ground tanks for product sampling and water draw off from tanks. Number and details of the drains shall be as per the applicable tank design standard.
- (b) Each drain line shall have minimum two isolation valves and pipe extended beyond tank pad up-to drain point. One of these valves shall be of quick closing type. Ends of each drain point should have provision of blind flange or capping arrangement.

12.4.3.2 Drain or sampling point in Buried or Semi Buried tanks

- (a) **Arrangement should be provided in all buried and semi buried tanks for product sampling and water draw off from tank.**

12.4.4 Vent:

12.4.4.1 Open Vents: For sizing the vents API 2000, it shall be referred. Following basic guidelines should be followed while designing vent, namely:-

- (a) **Maximum and minimum ambient temperatures;**
- (b) **Vapour pressure of the product at operating or design temperature; and**
- (c) **Maximum pumping in and out rates.**

12.4.5 Dip Hatch or Sampling:

- (a) **Dip hatch or gauge hatch, used for gauging the height of the liquid in an above ground tank as well as to take out samples for testing, shall be provided. In underground and semi buried tanks, separate sampling hatch should be provided in addition to dip hatch for gauging purpose.**
- (b) **Gauge well pipe (with slots) should be provided for all types of tanks.**
- (c) **The gauge well should be properly supported by means of angles or strips with bottom plate of the tank.**

12.4.6 Instrumentation:

12.4.6.1 Level controls on Tanks shall be as follows, namely:-

- (a) **High Level (H): Between normal fill level and safe fill level;**
- (b) **High High Level (HH): At safe fill level ;**
- (c) **“H” and “HH” level switches shall have provision of audio and visual alarms on auto-actuation in the control room;**
- (d) **“HH” level switch shall have audio alarm on auto-actuation in the control room and auto actuation of shut off valve;**
- (e) **“L” alarm may be interfaced with pump for dry run protection ;**
- (f) **The above alarms shall be provided as given below in the table, namely:-**

AFS with total storage equal to 1000 KL above ground.	NIL requirement.
AFS with total storage 5000 KL and more (above ground tanks)	Hi, Hi-Hi alarm and ESD or ESB System.
AFSs with above ground storage tank of capacity 1000 KL and above but less than 5000 KL	Hi level alarm.

The above shall be applicable to all locations;

- (g) **There shall be exchange of signals between the receiving and dispatch location in case of receipt of product through cross country pipe lines. Provision shall be made for monitoring of level of the receiving tank along with pressure in the pipe line and MOV status and to ensure safe shut down of the system in case of any abnormal situation.**
- (h) **Adequate measures should be taken for tanks receiving product from cross country pipeline at high flow rates for surge pressures due to sudden closures of valves and accordingly where ever required, suitably designed Surge relief system or pump tripping should be provided.**

12.4.7 Piping or valves or flanges:

12.4.7.1 *Piping:*

- (a) **Piping:** should be designed for handling of Hydrocarbon liquid as per “ASME B 31.3: Process Piping” or ASME B 31.4 (for cross country pipelines only entering the AFS) or API 5L or equivalent as applicable.
- (b) Pipe joints should be welded as far as practicable with full penetration weld. Number of flanged or threaded joint should be kept to a minimum.
- (c) In case sampling point is provided on receipt line for operational requirement, the same should be provided outside of dyke in the manifold.
- (d) Sectionalizing of the pipe lines with isolation valves and arrangements for injection or draining of water shall be provided for facilitating hydro-testing of the pipe lines.
- (e) The product hydrant pipelines should be provided with low point and high point drains to facilitate emptying, sampling or hydro-testing. Ends of each drain point should have provision of blind flange or capping arrangement.
- (f) Buried piping shall be protected against physical damage and corrosion with suitable protective coating.

12.4.7.2 *Valves:*

- (a) Steel valves for handling aviation products should conform to relevant API or equivalent standards.
- (b) Cast iron valves shall not be used for handling aviation products.

12.4.7.3 *Fittings:*

- (a) Steel flanges and flanged fittings shall conform to relevant ASME or ASTM or ANSI or equivalent. Slip on or weld neck flanges should be used. Screwed flanges for sizes 50 mm or smaller may be used.
- (b) Steel unions shall have ground metal to metal seats. Gasket type unions shall not be used. Plugs shall be of steel. Cast iron or brass plugs shall not be used.
- (c) All flanges shall be connected for bonding for electrical continuity.

12.4.8 Bulk Loading or unloading operations:

12.3.8.1 Loading or unloading Pumps:

- (a) Pumps conforming to relevant API standards may be used.
- (b) Product pumps may be provided with suitable sized strainers on suction and NRVs on discharge lines. All drain points of strainers shall be provided with isolation valves and ends having provision for blind flange or screw capped.
- (c) Pumps shall be located in an exclusive paved area with drainage facilities routed to OWS or Pits for AFSs with above ground storage tank of capacity more than 1000 KL.
- (d) Pump house shall be positioned at an elevated platform and shall be well ventilated on all four sides. In case site condition does not allow for pump house at elevated level, suitable arrangement to be provided to ensure disposal of accumulated product.
- (e) Pump-motors shall be provided with suitable IP protection.
- (f) Unloading or loading pumps shall also be provided with additional flame proof switch located at the strategic location near the loading-unloading bays to switch off the pump in case of emergency such as over flow, fire or any other abnormal situation.
- (g) Suction and discharge lines at AFSs with above ground tanks shall be provided with thermal safety relief device to relieve pressure due to ambient temperature rise. When connected to tank, it (TSV) shall be provided with isolation valves, which shall be locked open. One isolation valve shall be installed close to the tank body to the maximum extent possible.

- (h) **In addition to above, locations having automation shall be provided ESD (Emergency shutdown) feature through automation system.**

12.4.8.2 Tank truck and Refuellers Loading Bays:

- (a) **Tank Truck and refuellers should be bottom loaded.**
- (b) **Loading unloading points shall have quick shut-off valves that is to say, Cast steel Plug or Ball Valves.**
- (c) **Automated locations may provide suitable overfill protection system to prevent any overflow and hazards arising out of that.**
- (d) **Loading hoses for Tank Trucks and refuellers shall be as per relevant API or EI or EN or BIS specifications.**
- (e) **Flameproof lighting or portable flame proof torches shall be provided for night time checking of bottom leaks of trucks and also for proper sealing and inspection wherever loading or unloading during night is required to be done.**
- (f) **Operating personnel of large size AFSs (storage more than 5000 KL) should be provided with intrinsically safe walkie-talkie sets.**
- (g) **AFSs with Tank Truck unloading or loading gantries shall be provided with safety harness to protect the operating crew against fall from height.**
- (h) **Swing type loading ladders with counter weight and hand railing, wherever provided, shall be light in construction. Neoprene packing shall be provided at the bottom rest to avoid spark generation due to impact. Alternatively, Swing type hydraulic loading platforms without counter weight can also be provided.**
- (i) **Proper handrail arrangement should be provided on platforms and stairs for safe movement of personnel.**
- (j) **Provision shall be made for quick isolation of main product headers in case of emergency. For this purpose, suitable type hand operated valves or remote operated valves should be considered as per the site conditions.**
- (k) **Loading and unloading bay area shall be paved for smooth draining and collection of spillages into drains.**
- (l) **Open drains shall be covered with gratings so as not to endanger movement of personnel.**
- (m) **All tank trucks or refuellers, if not exempted by PESO, entering AFS shall be provided with PESO approved spark or flame arrestor at the exhaust. Vehicle confirming to BS IV and above are exempted for fitment of spark arrestor.**
- (n) **Oil and water collected from loading or unloading areas shall be routed to OWS or Pits for AFSs with above ground storage tank of capacity more than 1000 KL. A slop tank should be earmarked for storing separated oil.**
- (o) **The loading and unloading bays shall be designed such that movement of vehicle is smooth without criss-crossing.**

12.4.9 Design Layout for Handling of Slop

12.4.9.1 Drainage and Collection:

- (a) **A network of drainage system shall be provided to collect oil drains from various equipment, loading or unloading areas, pump houses and like other areas.. The drainage shall lead to OWS or Pits.**

12.4.9.2 OWS or Pits:

- (a) **The receiving sump of the OWS or Pits shall have suitable arrangement for skimming off upper layer of accumulated oil.**

12.4.10 Electrical Equipment:

12.4.10.1 Selection:

- (a) **Selection** Electrical equipment including the lighting system shall conform to hazardous area classification. The hazardous area shall be classified as per IS: 5572 and Petroleum Rules, 2002.
- (b) The electrical fittings or equipment in the respective classified area or zone shall be of a type suitable for the particular area or zone as per classification in line with IS: 5571.
- (c) Electrical equipment shall be selected, sized and installed so as to ensure adequacy of performance, safety, reliability and shall conform to relevant Indian Standards.

12.4.10.2 Protection:

- (a) The protection system shall be designed to ensure Protection of Personnel and plant equipment against damage which can occur due to internal or external short circuits, overloading, abnormal operating conditions, switching and lightning surges. Relays and protective devices shall be suitably selected and installed.
- (b) All the protective relays for the Generator, Transformer, Motors and Switchgears shall be tested at least once in a year and test records maintained.

12.4.10.3 Cables:

- (a) In order to avoid spread of fire due to cables, the outer PVC sheath of all cables including XLPE insulated cables used inside the dyke shall be flame retardant type conforming to category AF as per IS: 10810. The cable shall have a low smoke property.
- (b) All power and control cables in hazardous area shall have extruded inner and outer sheaths. Cables should be Aluminium or Copper Conductor PVC insulated, PVC sheathed and armoured type.
- (c) Instrument and signal communication cables shall not be laid in the same trench or tray along with electrical cables. The overall cable layouts shall be designed for minimum interference between signal and power cables.
- (d) Cable route markers shall be installed at every 30 metre intervals all along the cable routes and also at cable joints and locations where the direction of cable trench changes.

12.4.11 Emergency Feeder, for AFSs with more than 1000 KL above ground storage:

- (a) **Emergency Feeder shall host equipments such as fire water jockey pump, critical lighting, fire siren, bore well, gate barrier, safety instrumentation and interlocks, CCTV, UPS of automation and supply to essential firefighting equipment.**

12.4.12 Installation Earthing:

12.4.12.1 *AFS earthing design shall be carried out in accordance with the requirements of Central Electricity Authority (CEA) safety Regulations, 2010 and IS 3043 or equivalent system recognized by statutory authorities under the law in force relating petroleum and electricity and all earth connections should be visible for inspection for extent possible.*

12.4.12.2 *The earthing system shall have an earthing network with required number of earth electrodes connected to it. Earthing system shall be designed for the following, namely:*

- (a) **System neutral earthing;**

- (b) **Protective Equipment Earthing for personnel safety;**
- (c) **Protection against Static discharges;**
- (d) **Lightening Protection; and**
- (e) **Earthing for Data Processing system.**

12.4.12.3 Measurement of earth resistance:

- (a) **The testing of the earth pits shall be done six monthly one in dry and once in wet weather and records maintained. An earth resistance tester should be used for this purpose.**
- (b) **Removable link shall be provided to allow measurement of an earth electrode-resistance.**

12.4.12.4 Allowable Earth-Resistance values:

The resistance value of an earthing system to general mass of the earth should not exceed;-

- (a) **4 Ohms for electrical systems and metallic structures;**
- (b) **7 Ohms for storage tanks;**
- (c) **1 Ohm for main earth grid, and bonding connections between joints in pipelines and associated facilities; and**
- (d) **2 Ohms for each electrode to the general mass of the earth.**

12.4.12.5 Electrically independent earth electrodes:

- (a) **Earth electrodes shall be located at such a distance from each other so that the maximum current likely to flow through one of them does not significantly affect the potential of the other.**
- (b) **The Lightning Arrestor (LA) to be provided for Di Pole or Four Pole structures and shall be connected to two distinct earth pits. The strips shall run on insulators or isolators so as not to come in contact with the Pole structure. Connections shall be made to the pit directly and then pits will be connected to each other to form a grid. The Grid of LA shall be distinct and shall not be connected to any other earth Grid.**
- (c) **The Di Pole or Four Pole structure shall be earthed with two distinct earth connections. The Gang Operated Switch shall also be earthed.**
- (d) **Fencing of Di or Four Pole, Transformer yard shall be earthed and also electrical continuity between various structures, the fencing shall be ensured.**
- (e) **The Neutral of the Transformer shall be earthed with two distinct earth pits separately. Connections will be made to the pit directly and then, pits will be connected to each other to form a grid. This Grid shall be distinct and shall not be connected to any other earth Grid.**
- (f) **The Neutral of the Diesel Generator shall be connected to two distinct earth pits separately. Connections shall be made to the pit directly and then, pits will be connected to each other to form a grid. This Grid shall be distinct and shall not be connected to any other earth Grid.**
- (g) **The transformer body shall be earthed at two points separately leading to earthing system.**
- (h) **All Metallic non-current carrying parts of all electrical apparatus shall be earthed to ensure that the exposed metallic parts do not become dangerous by attaining high voltages in case of faults.**
- (i) **All the electrical equipment operating above 250 volts shall have two separate connections to the earth. (such as Sub Station Panels, Motors, FLP JB's).**

- (j) **All Steel structures, loading platform or gantries and like other devices, shall have two separate and distinct connections. Connections shall be made to the pit directly and then, pits shall be connected to each other to form a grid.**
- (k) **Storage Tanks shall have minimum two separate and distinct connections. Each connection will be made to the respective earth pit directly. Thereafter these earth pits should be inter-connected to form a dedicated grid for Tank Farm. All earth pits shall be located outside dyke area. The number of earth pits or connections should be increased for large tanks so that the distance between the connections shall not exceed 30 metre on the tank perimeter.**

12.4.12.6 Bonding:

- (a) **All flanged connections shall be effectively bonded by strips of suitable material.**
- (b) **Inside AFS, for the tank truck or Refueler Loading or Unloading bays minimum 6 mm Sq. braided copper wire with one end firmly bolted to the Loading Unloading Arm or hoses and the other end provided with G.I or Copper or Non corrodible metal crocodile clips are to be used, the crocodile clips being attached to the tank-truck or refuellers under loading or discharging. (For External Bonding of Loading unloading arms or hose with the Tank Truck).**
- (c) **For sampling devices to be inserted into product tanks, SS chain shall be used.**

12.4.12.7 Static Earthing:

- (a) **Static Earthing shall be provided at Tank Lorry or Refuellers loading or Decantation Gantries, to prevent building up of Static Charges.**
- (b) **The Static Earthing shall be segregated from electrical earthing to prevent it from getting energized to the same voltage level as it would exist on electrical fittings in case of fault. This earthing shall be independent of earthing system for automation.**

12.4.12.8 Lightning Protective System:

- (a) **Lighting protection shall be provided for the equipment, structures and buildings which are higher than 20 metre or as per the risk index analysis worked out as per IS 2309.**
- (b) **Self-conducting structures (having min thickness 4.8 mm) do not require lightning protection with aerial rod and down conductors. They shall be connected to the earthing system at two points of the base.**
- (c) **If lightning arrester is provided, an independent earthing network shall be provided for lightning protection.**

12.4.12.9 Earthing for Data Processing System:

- (a) **Low noise Earthing shall be provided for critical data processing equipment and shall be independent of any other Earthing of the Building.**
- (b) **Wherever isolation transformers are used, the output neutral of the transformer shall be independently earthed so as to ensure that the Earth-Neutral Voltage is less than 1 volt.**

12.4.12.10 Number of earth pits:

- (a) The minimum requirement of earth pits and additional earth pits shall be made as per paragraph 2.12.8 of Part B of this Schedule.
- (b) This is minimum requirement and additional earth pits shall be made such as to maintain Grid Values below 1 Ohm.

12.4.12.11 General:

- (a) Insulation mats as per IS-15652 standard shall be provided in the Sub Station, control panels.
- (b) Relays or Cables shall be tested once in a year and records maintained.
- (c) Transformer oil shall be tested once in a year and records maintained.
- (d) Size of conductor shall be selected based on the fault current that is required to be dissipated during emergency.
- (e) Fail safe interlock or changeover switch shall be provided between grid power and the DG power to ensure that equipment gets supply from one source only.

12.4.13 Installation lighting:

- (a) Sufficient lighting shall be provided so as to enable operators to move safely within the accessible areas of AFS and to perform routine operations. In the event of normal power failure, emergency lighting should be operational in critical areas.
- (b) Normal lighting system shall be on 415V or 240V AC supply, whereas critical emergency lighting will be DC based in critical areas like Sub-Station, D G Room, SCADA or Shift Room, Security cabin.
- (c) Under normal operation, both emergency and normal lighting shall be fed by normal power source. On failure of normal supply, critical emergency lighting, wherever available, may be transferred to emergency source, until the start of D.G. set.
- (d) Critical Emergency lighting (D.C. supply or UPS based) shall be normally kept 'ON'. During power failure, battery bank or UPS shall be used to provide power.
- (e) Lighting shall be provided for the various facilities in the AFS. The illumination levels in different areas shall be as per good engineering practice.
- (f) The Illumination in the operational areas including inside the dyke and manifold shall be such that adequate visibility is there at all times for emergency and normal operations.
- (g) Depending on the nature of job activities carried out, the minimum required illumination levels for various areas shall be ensured for safe movement or operations or emergency handling, as per the table given under Clause (10) of paragraph 2.13 of Part B of this Schedule.
- (h) The lighting fixtures on various circuits shall be suitably designed so that failures of any one circuit do not result in complete darkness.
- (i) Switches controlling the lighting fixtures and exhaust fan shall be installed outside the battery room.
- (j) Switches of lighting panels installed in hazardous area, shall have a pole to break the neutral, in addition to the poles for phases.

12.4.14 Design of Hydrant Refuelling System (HRS):

12.4.14.1 *Safety in Design of HRS:*

- (a) No electrical connection between the fuelling vehicle and the hydrant pit should be made. If lanyards are attached to vehicle-mounted reels, the reels should be electrically isolated from the vehicle.
- (b) All new hydrant pit valves shall be as per EI1584 specifications and they shall be compatible with hydrant servicer intake couplings.
- (c) Hydrant lines should preferably be internally epicoated. Before being put into operation, they shall be cleaned by flushing with the product, which the line will eventually carry, until all traces of rust and other impurities completely disappear from samples drawn at delivery points.
- (d) Hydrant pit valves should have isolation valves.
- (e) All the hydrant systems shall be provided with equipment that allows the fuel flow to be shut down quickly in an emergency. The preferred hardwired fixed system consists of Emergency Stop Buttons which, when activated, shut down the hydrant pumps (and valves where the pressure head results in continued fuel flow with pump shut down.)
- (f) Emergency Stop Buttons (ESBs) or Emergency Shut Down (ESD) shall be located close (maximum 80 metre) to fueling bays. They shall be clearly identified and easily accessible. High visibility identification signs, emergency instructions should be mentioned such that they remain visible at all times.
- (g) All hydrant pit covers shall be tethered or permanently connected to pits to prevent them from being picked up by jet blast.
- (h) All hydrant low point drains shall be clearly identified.
- (i) All hydrant pits, high and low points and dead-end points shall be numbered clearly. These facilities should be located at a minimum distance of 4.5 m from any other hazard.
- (j) Larger hydrants should be split into sections, which can be isolated for emergencies and testing and repairs. Isolation should be by Gate Valve or double block and bleed valves (DBBV).
- (k) All color coding shall be in line with Aviation Quality Control and Assurance Manual. All pipelines leading to or from tanks, fittings such as valves, flanges, filters, strainers, delivery or discharge hoses, shall be properly color coded to the grade of fuel to which they are dedicated.
- (l) Hydrant pipelines should be sized to handle the fully developed peak design capacity of the system at flow velocities that would not generate unacceptable surge pressures in the event of rapid and simultaneous closure of aircraft tank valves. Hydrant system shall be designed in conjunction with site levels, the products to be handled, the operating temperature range and the design characteristics of all items affecting pressure and flow, including-
 - (i) Tanks;
 - (ii) Pumping sets;
 - (iii) Automatic control systems;
 - (iv) Filtration equipment;
 - (v) Hydrant pit valves;
 - (vi) Shock alleviators;
 - (vii) Hydrant servicers (pipe systems and components), flexible hoses; and
 - (viii) Aircraft fuel systems (pressure and flow rate limitations).
- (m) Cathodic protection:
- (n) Cathodic protection meeting local or national standards should be installed to prevent the corrosion of underground pipeline systems feeding fuel to hydrants.

12.4.14.2 External coating of pipeline:

- (a) **When CS pipes are installed below ground, they should be appropriately protected against corrosion.**
- (b) **Joints made during installation should be protected by an appropriate wrapping system.**
- (c) **The integrity of the external coating and wrapping of buried pipes should be verified, and any defects should be rectified before the trenches are backfilled..**

12.4.14.3 Hydrant Pits:

Hydrant pits are positioned in the areas where aircraft are parked and they should embody the features described as below, namely:-

- (a) **Pits should be capable of accommodating the equipment.**
- (b) **Pits should be provided with suitable flush fitting covers sealing against rainwater. The design of covers should be such that they can be safely lifted by one person. Materials used for pit covers should not produce sparks when struck. Covers should be hinged or tethered or permanently connected to pits to prevent them being carried away by jet blast or propeller vortex. Each hydrant pit box should be designed to effectively isolate from its hydrant riser by means of a sealing arrangement that can accommodate both lateral and vertical differential movement, in case transmission of any loadings to hydrant risers (to which the hydrant pit valve is fitted) from aircraft wheels, tugs, other service vehicles or from settlement or movement of adjacent aprons.**
- (c) **Pits should be installed so that they project at least 25 mm (1 inch) above the apron level to prevent the entry of surface water. Concrete surrounds should be ramped up at a gradient between 30 and 50 to the top of pits.**
- (d) **Isolating valve should be installed between the riser flange and the hydrant pit valve.**

12.4.14.4 Hydrant pit valves:

- (a) **Hydrant pit valves should be of the 'quick release' type designed to close at a controlled rate so that during closure the build-up of shock pressure in the hydrant line is minimized.**
- (b) **As a minimum, the pilot device controlling the operation of the valve should be fitted with a manual means of opening and closing and the closing action being made possible by pulling on a lanyard. However, an air-operated pilot device to be installed with the pit valves.**
- (c) **The lanyard should always be of fire-resistant material of adequate strength to enable the valve to be operated remotely and an emergency should occur during the fuelling operation and should preferably be red in colour.**
- (d) **Where a dual closure device is provided, the air-operated pilot device should be fitted with a lanyard (as per latest API or EI 1584).**
- (e) **A self-sealing male adaptor with tethered or permanently connected dust cap should be incorporated in the hydrant pit valve outlet to which the female coupling of the hydrant inlet hose is attached. It should be so designed that the hydrant hose can be connected or disconnected without spillage of fuel.**
- (f) **Hydrant pit valves should be fitted API standard hydrant pit outlet adaptors. The hydrant pit assembly arrangement should conform to API or EI 1584.**

12.4.14.5 Emergency Shut Down (ESD) Controls for HRS System:

- (a) **Wired or Wireless system shall be installed for shutting down the hydrant refueling system (HRS). Emergency Stop Buttons (ESBs) or Emergency Shut Down (ESD) shall be located close to fueling bays and shall be clearly identified and easily accessible.**
- (b) **High visibility identification signs and emergency instructions should be displayed at prominent locations.**

12.5 Safe Operating Practices:

12.5.1 General:

- (a) AFS SCADA room where ever provided shall be manned on continuous basis during operations and in emergency.
- (b) Site Specific, Standard Operating Procedures (SOPs) shall be developed. Such procedures shall be periodically reviewed, updated and records maintained especially whenever any changes or modifications to the facilities are made as per Management of Change procedure (MOC).
- (c) The critical operating steps based on “SOPs” shall be displayed on the board near the location where applicable.
- (d) VHF handsets provided to operating personnel shall be of intrinsically safe type.
- (e) All operations shall be carried out under supervision of a responsible operating personnel.
- (f) The pipeline transfer should preferably be commenced during day light. Due to urgency if operation requires to be carried out or extended in night time, the same to be carried out under supervision of trained and experienced staff.
- (g) Manning level in the shift should be adequate to ensure coverage for normal and emergency operations.
- (h) For locations with above ground storage tanks having aggregate capacity more than 5000 KL, the tank farm management system should be integrated with electronic data services repository. Provision of recording of TFMS inventory levels should be made on electronic data services repository.
- (i) For locations with above ground storage tanks having aggregate capacity more than 5000 KL, suitable interlocks shall be provided for tripping or alarm or MOV operation based on the events high level, high high level and likewise.
- (j) The contents of the dyke drain generated from draining of tanks and any other spillage or effluent containing oil shall be diverted to Oil Water separator (OWS) for safe disposal.
- (k) Personnel protective equipment such as safety shoes, hand gloves, apron, safety goggles, safety belt, helmet, ear muff, bump caps, self-contained breathing apparatus (SCBA), resuscitator. as applicable shall be worn while carrying out operations in normal and emergency situations. Personnel protective equipment (PPE) are equipment designed to offer protection against potential hazards, fire, toxicity, accidental fall, during normal and emergency operations.
- (l)
- (m) **Bulk Handling for movement by Road:**
- (n) For movement of refuellers, sampling or pit cleaning vehicles and hydrant dispensers, inside airport premises, the relevant Motor vehicle Rules, local airport operator's requirement and Civil Aviation Requirements shall be followed.
- (o)

12.5.2 Safety Precautions during Tank Truck or Refuelers Loading or Unloading in Aviation Fuel Station:

Following precaution shall be taken due to associated hazards during transfer of Petroleum products to or from a tank truck, namely:-

- (a) **Open source of ignition shall not be allowed in the area where product transfer operations are carried out.**
- (b) **Vapour space shall not be less than 3% in each tank truck and refuellers in respect of Class A and Class B petroleum products.**
- (c) **Fire extinguishers shall be placed near the tank trucks during operations in a designated marked place.**
- (d) **The master switch shall be put off immediately after parking the truck in position. No electrical switch on the vehicle shall be turned "on" or "off" during the transfer operation.**
- (e) **The first operation after positioning the truck or refuellers shall be to provide proper earthing or bonding. Earthing or bonding shall be disconnected just before the release of the truck.**
- (f) **All Refueling Hoses shall conform to EI-1529 or IS 1825 or equivalent standard and shall be handled with care and hydrostatically tested once in 6 months.**
- (g) **No repairs shall be made on the truck or refuellers while it is in the loading or unloading area.**
- (h) **Personnel shall wear applicable Personal Protective equipment.**
- (i)
- (j) **Filling or transfer operations should be suspended immediately in the event of –**
 - (i) Uncontrolled leakage occurring;
 - (ii) A fire occurring in the vicinity; and
 - (iii) Lightning and thunderstorm

12.5.3 Procedure for Loading or Topping up of Refuelers:

12.5.3.1 *Following checks shall be done in a tank truck or Refuellers before accepting it for loading or unloading, namely: -*

- (a) **Presence of PV vent, emergency vent valve, master valve, spark arrestor and other safety fittings.**
- (b) **Fire screen between cabin and tank shall be provided. For this purpose, cabins with metallic back cover without any opening will be considered as fire screen.**
- (c) **Each tank truck shall be provided with 2 nos. of Fire Extinguishers of ISI mark (1 no. 10 or 9 kg DCP and 1 no. 1 kg CO₂ or equivalent approved fire extinguisher in driver's cabin).**
- (d) **Each refuellers shall be provided with 3 nos. of Fire Extinguishers of ISI mark (2 no. 10 or 9 kg DCP and 1 no. 1 kg CO₂ or equivalent approved fire extinguisher in driver's cabin).**
- (e) **Spark arrestors, unless exempted by PESO, shall be welded on the exhaust.**
- (f) **No leakage in exhaust silencer pipe.**
- (g) **Valid Explosive License with PESO approved drawing and RTO registration certificate is available.**
- (h) **Availability of brazed copper strips for earthing and bonding connection.**

- 12.5.3.2 *Move vehicle to the loading or topping up bay.*
- 12.5.3.3 *Place the truck or refuellers on loading or topping up bay and place wheel chokes at front and rear wheels. Keep the truck or refuellers in neutral mode with hand brakes "ON".*
- 12.5.3.4 *Stop the engine and switch off all electrical equipment.*
- 12.5.3.5 *All persons should leave the driver's cabin.*
- 12.5.3.6 *Provide earthing connections of the vehicle at specified point to the fixed grounding system.*
- 12.5.3.7 *Ensure that tank vent valve is open and fire extinguisher is readily available near loading point.*
- 12.5.3.8 *Start the loading or topping up operations.*
- 12.5.3.9 *The quantity loaded into the truck or refuellers can be assessed by -Liquid recorded through manual dipping or dial gauge reading.*

12.5.4 Procedure for Unloading of Refuelers:

- (a) **Necessary steps described under clause B should be carried out.**
- (b) **Test the connections for leaks**
- (c) **Start the Unloading operations**
- (d) **Before releasing the trucks, it shall be ensured that valves are closed and ends are capped.**
- (e) **An authorized person of the company shall supervise the unloading operation and respond immediately in the event of an emergency.**

12.5.5 Tank Farm Operations:

- (a) **Whenever operations are not in progress, 100% closure of all the operating valves must be ensured and they shall not be left in partial open condition.**
- (b) **All electrical fittings shall be maintained to ensure its integrity and type of protection.**
- (c) **The tank farm shall be kept clean and free from vegetation.**
- (d) **Tanks shall be periodically checked for leakages or sweating and repairs must be immediately carried out whenever scaling or pitting are observed.**
- (e) **Proper earthing and bonding shall be maintained and ensured at all times for the tank body.**
- (f) **Dyke drain valve shall be in closed condition and shall be operated only under supervision of an authorized person and log book maintained.**
- (g) **Isolation Valves on expansion lines or TSV vent lines shall be always kept open except under requirement during location specific operations to take care thermal expansion.**
- (h) **No gauging or sampling of tanks shall be undertaken during thunder or hail storms.**
- (i) **Flow velocity at tank inlet shall not exceed 1 m/s until the inlet is completely submerged. For easy reference, permissible flow rate for initial filling are given below, namely: -**

Size (in mm) of Inlet pipe	Max. Flow Rate (Kl/Hr)
300	246
250	168
200	109
150	59
100	27
80	25.5

- (j) Safety shoes and PPEs shall be worn by the operating staff in the operational area.
- (k) Tank dip pipes shall be extending to tank bottom. If dip pipes are not provided, give a relaxation time of 30 minutes before sampling or gauging.
- (l) Synthetic fibre cord shall not be used for sampling or gauging. If the sampling or gauging equipment is a conductor, the cord must be conductive, that is to say, a metal wire or chain. Proper bonding to be provided in this case.
- (m) While cleaning the tanks, care shall be taken to avoid generation of static electricity.
 - (i) Cleaning of tanks by gas oil spray shall not be permitted.
 - (ii) Cleaning of tanks by steaming shall not be permitted for Class A and Class B products.
- (n) Earthing and bonding connections shall be ensured during the entire operating process.

12.5.6 Pipeline Transfer Operations:

12.5.6.1 *A mass flow meter or flow meter with integrator shall be installed on receipt pipeline in AFS, if applicable. Signals shall be provided in the control rooms of both dispatching and receiving companies for monitoring.*

12.5.6.2 *The following safe practices to be followed, namely:*

- (a) Gauging procedure shall be completed and line shall be made through.
- (b) Physical inspection shall be carried out up to the exchange manifold for any leakage or damage.
- (c) Line up shall be started from the exchange pit end.
- (d) Pressure relief lines of receipt nozzles of product tanks connected to the same common receipt header shall be sealed.
- (e) After ensuring that there are no leaks, pumping shall be commenced.
- (f) Pumping shall be commenced initially at low flow rate and only after stabilizing of flow, the flow rate may be increased.
- (g) Product shall not be pumped beyond safe filling height of the tank.
- (h) After completion of the receipt, pumps shall be stopped.
- (i) In case of Emergency Shutdown, care shall be taken so that back pressure is not developed in the pipelines and pump head.
- (j) Sampling shall be carried out as per provisions of DGCA approved Quality Control Manual.
- (k) Pipe Line transfer (PLT) from a pipeline shall not be taken simultaneously in more than one tank.
- (l) In case product is required to be taken into more than one tank, tank should be switched over after completion of operation in first tank, close all valves to the first tank, make line through for the second tank as per procedure.
- (m)

12.5.7 Methanol Handling at AFS:

- (a) Containers used for storage of De-ionized Water shall be of high-density polythene (HDPE) or stainless steel and shall be flushed clean before use.
- (b) High density Polythene (HDPE) pipes shall be used for transferring De-ionized Water from one container to another.
- (c) The HDPE container shall be handled with due care to avoid damage.
- (d) The container shall always be kept closed and in a clean condition.

- (e) **DP Shed of required dimensions duly approved by PESO shall be provided for storage of Power Boost Methanol (PBM).**
- (f) **Blending of PBM and Methanol Water Mixture shall be carried out in blending unit kept in a ventilated area.**
- (g) **Only polythene pipes and stainless-steel pipes shall be used for suction of PBM and De-ionized Water.**
- (h) **All sampling procedures and tests shall be carried out as per Quality Control Manual.**
- (i) **All precautions taken during normal refueling shall be ensured for MWM refueling also.**

12.5.8 Safety in Barrel Operations:

12.5.8.1 Receipt of Aviation Fuel in barrels:

- (a) **The loading location shall comply with the quality control and safety requirements, while loading and transporting the stocks in drums.**
- (b) **Adequate measures should be taken, to ensure that the drums are not damaged during unloading.**
- (c) **The drums should be unloaded using an unloading ramp.**
- (d) **The drums should be stacked in the place earmarked for this purpose. All drums carrying "DP" products shall be stacked in DP shed.**
- (e) **It shall be ensured that the license of the DP shed is valid and the storage does not exceed the authorised capacity.**

12.5.8.2 Storage:

- (a) **For each consignment, placard indicating the grade of product, Batch Number and date of Test Report shall be exhibited.**
- (b) **Each consignment shall be stacked separately to facilitate delivery of stocks on first in first out basis.**
- (c) **All the barrels when stored shall be kept only in sealed condition.**
- (d) **The barrels shall be visually inspected at least once in a day for any leaks and the observations recorded in the shift log.**
- (e) **During monsoon, adequate precautions shall be taken to prevent ingress of water into the drums. When drums are stored in the open over dunnage with a tarpaulin cover, the water stagnated over the tarpaulin cover shall be removed on priority.**
- (f) **Barrels shall be stored in 3 o'clock – 9 o'clock position on a thick wooden plank of minimum thickness 2".**

12.5.8.3 Loading of Barrels:

Following procedures shall be followed, namely: -

- (a) The barrels shall be selected in the following order of priority, **namely: -:**
 - (i) New Barrels.
 - (ii) Barrels having stored similar aviation fuel previously Once used .
 - (iii) PBM barrels.
- (b) **Lube oil or Black oil drums shall not be selected for filling Aviation Turbine fuel. The drum-filling operations shall be taken up only in the licensed area.**
- (c) **Before flushing, it should be ensured, that each drum is clean and dry.**

- (d) Each barrel shall be flushed with a minimum of 5 litres of the grade to be filled or till such time, a clear and bright sample is obtained. The flushed quantities shall be downgraded to a similar non-aviation grade.
- (e) The electrical bonding connection shall be established between the filling nozzle and the barrel. In case the drums are filled over, a wooden platform instead of ground proper bonding connection shall be established between the drum and the filling source.
- (f) While filling, it shall be ensured that adequate space to be left in the barrel depending upon the class of petroleum product. For 'A' class minimum 5% space to be left and for 'B' Class minimum 3% space to be left as vapour space for safety reasons.
- (g) The barrels shall be sealed tight, using bungs with washers.
- (h) It shall be ensured that the barrels are stacked in a vertical position in a single tier in the truck properly covered with tarpaulin.
- (i) Fire extinguishers of adequate capacity shall be carried along with the drums.
- (j)
- (k) Before filling the containers of the customer, it shall be ensured that the customer furnishes a certificate that the product shall be used for bonafide aviation use.
- (l) The Explosives License authorising the customer to transport and store the fuel shall also be produced before requesting for fuel.
- (m) The filling of container shall be taken up only after satisfying conditions mentioned above.
- (n) The quantity to be delivered shall not exceed the quantity indicated in the license.
- (o) All the precautions and procedures given above shall be adhered to. Containers not fit for Aviation use shall be rejected.
- (p) The flushed quantities shall be collected in a drum and downgraded to a similar non-aviation grade. However, this downgraded product shall not be handed over to the customer.

12.6 Fire Protection and Prevention Facilities:

12.6.1 Fire Protection:

12.6.1.1 Depending on the nature of risk, following fire protection facilities shall be provided, in AFSs with aggregate above Ground storage tank capacity more than 1000 KL, namely:-

- (a) Fire Water System - (storage, pumps, distribution piping network with hydrant and monitors).
- (b) Fixed Spray System.
- (c) Foam System.
- (d) First Aid Fire Fighting Equipment.
- (e) Trolley mounted or Mobile Fire Fighting Equipment.
- (f) Carbon Dioxide System.
- (g) Dry Chemical Extinguishing System
- (h) Fire Alarm, Actuation and Communication System.

12.6.1.2 For AFSs storing 1000 KL aggregate product, the following fire protection facilities shall be provided, namely:-

- (a) **First Aid Fire Fighting Equipment .**
- (b) **CO2 extinguishers for electrical fire .**
- (c) **Dry Chemical Extinguishers .**
- (d) **Fire Siren .**

12.6.2 Design Criteria for Fire Protection System for AFSs with Above Ground Storage Tank Capacity more than 1000 KL :

- (a) Facilities shall be designed on the basis that city fire water supply is not available close to the installation.
- (b) The fire water pumps shall be provided with auto start facility with pressure drop in fire water network.
- (c) The fire water system shall be based on single contingency for locations where total storage capacity is up to 30,000 KL. Fire water storage shall be sufficient for minimum 4 hours aggregate rated capacity of fire water main pumps. Wherever water replenishment @ 50% or more is available, the storage capacity can be reduced to 3 hours aggregate rated capacity of main pumps.
- (d) The fire water system shall be provided based on two largest fire contingencies simultaneously for locations where total storage capacity is above 30,000 KL. Wherever water replenishment @ 50% or more is available, single fire contingency shall be considered for Fire water storage.
- (e) The hazardous areas shall be protected by a well laid combination of hydrants and monitors.
- (f) ATF above ground Petroleum storage tanks (fixed roof) of diameter larger than 30 m shall be provided with fixed water spray system.
- (g) Fixed foam system or Semi-fixed foam system shall be provided on all tanks (fixed roof) exceeding 18 m diameter storing ATF (Class B).
- (h) In case of an existing AFS where inter-distance between various facilities are not conforming to the Table -1 or Table-2 or Table-3 specified in the Part –A of this Schedule (as applicable), then QRA or HAZOP study shall be conducted and suggested mitigation measures shall be implemented.
- (i) Tank Truck (TT) or Refuellers or unloading facilities, manifold area of product pump house and exchange pit shall be fully covered with alternate double hydrant and variable flow (pattern) water cum foam monitors having multipurpose combination nozzles for jet, spray and fog arrangement and located at a spacing of 30 m on both sides of facilities ensuring min foam application rate of 6.5 lpm/sq.m (in line with NFPA-11 for spill fire more than 1 inch deep) to the target zone of the relevant facility.
- (j)
- (k) The high-volume long range (HVLR) water cum foam monitors (variable type) shall be provided as under, namely:

- (i) AFSs with above ground storage tank of capacity more than 1000 KL and meeting the safety distance norms as per these regulations, minimum one no. trolley mounted mobile type water cum foam HVLR monitor shall be placed for covering the above ground tank farms storing Class B products based on single largest tank diameter to be catered @ 8.1 lpm/m².

-

- (ii) For existing AFSs with above ground storage tank of capacity more than 1000 KL and not meeting the safety distance norms as per this regulation, 2 nos. trolley mounted HVLR monitors shall be provided for tank farms. Requirement of HVLR monitors shall be calculated for full surface fire scenario of the largest tank @8.1 lpm/sq m.
- (iii) Provision for connecting or hooking the portable monitor shall be made in the hydrant system around the fixed roof tanks at various strategic points.
- (iv) Well laid procedures and plans shall be made and put into use for use of mobile HVLRs to combat emergencies without loss of much time.
- (v) The location of HVLRs to be planned in such a way that the very purpose of these monitors is served and throw of the monitors is safely delivered at the aimed object. These high-volume long-range monitors shall be located at a minimum distance of 15m subject to:
 - (A) Monitors shall be positioned in such a way that throw of monitors are safely directed to the target tank under full surface fire without damaging tank shell, tank pad and other objects.
 - (B) The throw shall be directed on the inner upper surface of the tank and not in the middle of the tank to prevent splash over.
- (vi) For determining the total foam solution requirement, potential foam loss from wind and other factors shall be considered while designing.
- (vii) Adequate foam drum or tank or reliable replenishment for foam induction system shall be provided near the hook up points of mobile HVLRs with the hydrant system.

12.6.3 Fire Water System Design (applicable for AFSs with aggregate above ground storage tank of capacity more than 1000 KL):

- (a) **Fire water system shall be designed for a minimum residual pressure of 7 kg/cm² at hydraulically remotest point in the AFS considering the design flow rate.**
- (b) **A fire water ring main shall be provided all around perimeter of the location facilities with hydrants or monitors spaced at intervals not exceeding 30 m when measured aerially. Fire hydrants and monitors shall not be installed within 15 m from the facilities or equipment to be protected.**
- (c) **The AFS shall have facilities for receiving and diverting all the water coming to the installation to fire water storage tanks in case of an emergency.**
- (d) **For AFSs located in areas where ambient temperature is subzero during the year, the firefighting lines should be emptied. Alternatively, a suitably designed mechanism should be provided to prevent freezing of fire water.**
- (e)

12.6.3.1 Fire Water Design Flow Rate:

- (a) **The fire water system shall be provided based on single largest fire contingency for all locations where total tankage in the AFS with total above ground tankage of capacity more than 1000 KL and up to 30,000 KL.**
- (b) **The fire water system shall be provided based on two largest fire contingencies simultaneously for all locations where total tankage in the AFS is more than 30,000 KL**
- (c)
- (d) **For water flow calculations, all tanks' farms having class B petroleum storage (above ground) of capacity more than 1000 KL shall be considered irrespective of diameter of tanks and whether fixed water spray system is provided or not.**
- (e) **Fire water flow rate for a tank farm shall be aggregate of the following, namely: -**
 - (i) Water flow calculated for cooling a tank on fire at a rate of 3 lpm/sqm of tank shell area,;
 - (ii) Water flow calculated for exposure protection for all other tanks falling within a radius of (R+30) m from centre of the tank on fire (R-Radius of tank on fire) and situated in the same dyke at a rate of 3 lpm/m² of tank shell area;
 - (iii) Water flow calculated for exposure protection for all other tanks falling outside a radius of (R+30) m from centre of the tank on fire and situated in the same dyke at a rate of 1 lpm/m² of tank shell area;
 - (iv) Water flow required for applying foam on a single largest tank by way of fixed foam system, where provided, or by use of water or foam monitors whichever is higher;
 - (v) Foam solution applicable rate for cone roof tanks shall be taken as 5 lpm/ m²;
 - (vi) Various combinations which shall be considered in the tank farm for arriving at different fire water flow rate and the largest rate to be considered for design;
 - (vii) Design flow rate which shall be based on the combination of the above; and
 - (viii) Supplementary water: Fire water flow rate for supplementary streams which shall be based on using 4 single hydrant outlets simultaneously. Capacity of each hydrant outlet as 36 kl/hr shall be considered at a pressure of 7 kg/cm². The supplementary water stream requirement shall be in addition to the design flow rates.

12.6.3.2 Fire Water Storage:

- (a) **Water for the firefighting shall be stored in easily accessible surface or underground or above ground tanks of steel, concrete or masonry.**
- (b) **The effective capacity of the reservoir or tank above the level of suction point shall be minimum 4 hours aggregate rated capacity of pumps.**
- (c) **Fresh water should be used for firefighting purposes. In case sea water or treated effluent water is used for firefighting purposes, the material of the pipe selected shall be suitable for the service.**
- (d) **Storage reservoir (RCC) shall be in two equal interconnected compartments to facilitate cleaning and repairs. In case of steel tanks there shall be minimum two tanks and all the tanks shall be of equal height or depth to prevent any migration or overflow due to difference in height or depth. During maintenance of water tanks, availability of at least 50% of the water capacity shall be ensured.**
- (e) **Large natural reservoirs having water capacity exceeding 10 times the aggregate fire water requirement can be left unlined.**
- (f) **In case existing land area is insufficient to have additional water tanks as per requirement and water replenishment rate from the local airport operator or AAI may be added to existing water storage capacity to fulfil the net requirement.**

12.6.3.3 *Fire Water Pumps:*

- (a) Fire water pumps having flooded suction shall be installed to meet the design fire water flow rate and head. If fire water is stored in underground tanks, an overhead water tank of sufficient capacity shall be provided for flooded suction and accounting for leakages in the network, if any. Pumps shall be provided with suitable sized strainers on suction and NRVs on discharge lines.
- (b) The pumps of same capacity shall be capable of discharging 150% of its rated discharge at a minimum of 65% of the rated head. The Shut-off head shall not exceed 120% of rated head for horizontal centrifugal pumps and 140% for vertical turbine pump.
- (c) At least one standby fire water pump shall be provided up to 2 nos. of main pumps. For main pumps 3 nos. and above, minimum 2 nos. standby pumps of the same type, capacity and head as the main pumps shall be provided. Fire water pumps shall be of equal capacity and head.
- (d) The fire water pumps including the standby pumps shall be of diesel engine driven type. Where electric supply is reliable, 50% of the pumps can be electric driven. The diesel engines shall be quick starting type with the help of push buttons located on or near the pumps or located at a remote location. Each engine shall have an independent fuel tank adequately sized for 6 hours continuous running of the pump. Fuel tank should be installed outside of fire pump house. If tanks are located inside the pump house, the vent shall have provision for venting outside the pump house.
- (e) Fire water pumps and storage shall be located far away from the potential leak sources or tankage are and shall be at least 30 m (minimum) away from equipment or where hydrocarbons are handled or stored.
- (f) Fire water pumps shall be exclusively used for firefighting purpose only.
- (g) Suction and discharge valves of fire water pumps shall be kept full open all the times.
- (h) Jockey pump shall be provided for keeping the hydrant system or line pressurized at all times. The capacity of the pump shall be sufficient to maintain system pressure in the event of leakages from valves, Besides the main jockey pump, the stand by pump of same capacity and type shall be provided.
- (i) Auto cut-in and cut-off facility should be provided for jockey pumps to maintain the line pressure.
- (j) The fire water pumps shall be provided with auto start facility which shall function with pressure drop in hydrant line and specified logic even if initial pump does not start or having started, fails to build up the required pressure in the fire water ring main system, the next pump shall start and so on.

12.6.3.4 *Fire Hydrant Network:*

- (a) **Looping:** The fire water network shall be laid in closed loops as far as possible to ensure multi- directional flow in the system. Isolation valves shall be provided in the network to enable isolation of any section of the network without affecting the flow in the rest. The isolation valves shall be located normally near the loop junctions. Additional valves shall be provided in the segments where the length of the segment exceeds 300 M.
- (b) Fire hydrant ring main shall be laid above ground ensuring that-

- (i) pipe line shall be laid at a height of 300 mm to 400mm above finished ground level;
- (ii) the pipe support shall have only point contact. The mains shall be supported at regular intervals;
- (iii) for pipeline size less than 150 mm, support interval shall not exceed 3 metre;
- (iv) pipe line size 150mm and above support interval shall not exceed 6 metre or design approved;
- (v) the system for above ground portion shall be analysed for flexibility against thermal expansion and necessary expansion loops were called for shall be provided;

(c) Fire hydrant ring main may be laid underground at the following places, namely: -

- (i) At road crossings.
- (ii) Places where above ground piping is likely to cause obstruction to operation and vehicle movement.
- (iii) Places where above ground piping is likely to get damaged mechanically.
- (iv) Where Frost conditions warrant and ambient temperature is likely to fall below zero deg. Centigrade underground piping at least 1 metre below the ground level should be provided. Alternatively, in such cases for above ground pipelines, water circulation should be carried out.

(d) Fire water ring main laid underground shall ensure the following, namely: -

- (i) Pipes made of composite material shall be laid underground.
- (ii) The Ring main shall have at least one metre earth cushion in open ground, 1.5 m cushion under the road crossings and in case of crane movement area pipeline shall be protected with concrete or steel encasement as per design requirement and in case of rail crossing, provisions stipulated by Indian Railways shall be complied.
- (iii) The Ring main shall be suitably protected against soil corrosion by suitable coating or wrapping with or without cathodic protection.
- (iv) In case of poor soil conditions, it may be necessary to provide concrete or masonry supports under the pipe line.

(e) Size of Hydrant Pipeline

- (i) The hydraulic analysis of network shall be done at the design time. Also, whenever fire water demand increases due to addition of facilities or extensive extension of network, fresh hydraulic analysis shall be carried out.
- (ii) The velocity of water shall not exceed 5 metre per second in fire water ring main.
- (iii) Fire water ring main shall be sized for 120% of the design water flow rate. Design flow rates shall be distributed at nodal points to give the most realistic way of water requirements in an emergency. It may be necessary to assume several combinations of flow requirement for design of network.
- (iv) The stand post for hydrants and monitors shall be sized to meet the respective design water flow rates.

(f) General:

- (i) Fire water mains shall not pass-through buildings or dyke areas. In case of underground mains, the isolation valves shall be located in RCC or brick masonry chamber of suitable size to facilitate operation during emergency and maintenance.
- (ii) Associated Sprinkler, foam riser or branch connections meant for storage tanks, if applicable, shall be taken directly to the outside of tank dyke and shall not pass-through fire wall of any adjacent tanks.
- (iii) The riser connections shall be taken directly from the mains and provided with separate isolation valve outside of dyke.
- (iv) Suitable strainer shall be provided on sprinkler branch connection and shall be located outside of dyke.

(g) Hydrant or Monitors:

- (i) Hydrants or monitors shall be located considering various fire scenario at different sections of the premises to be protected and to give most effective service.
- (ii) At least one hydrant post shall be provided at every 30 m. of external wall measurement or perimeter of battery limit in case of high hazard areas. For non-hazardous area, they shall be spaced at 45 m. intervals. The horizontal range and coverage of hydrants with hose connections shall not be considered beyond 45 m.
- (iii) Hydrants shall be located at a minimum distance of 15 m from the periphery of storage tank or equipment under protection. In case of buildings this distance shall not be less than 2 m and not more than 15 m from the face of building.
- (iv) Provision of hydrants within the building shall be provided in accordance with IS: 3844.
- (v) Hydrant or Monitors shall be located along road side berms for easy accessibility.
- (vi) Fixed water or water cum foam monitors on the network shall be provided with independent isolation valves and Double headed hydrants with two separate landing valves. Hydrants or Monitors shall be located with branch connection.
- (vii) Double headed hydrants and monitors on suitably sized stand post shall be used. All hydrant outlets or monitor isolation valves shall be situated at workable height of 1.2 metre above ground or hydrant or monitor operating platform level.
- (viii) Monitors shall be located to direct water on the object as well as to provide water shield to firemen approaching a fire. The requirement of monitors shall be established based on hazards involved and layout considerations.
- (ix) Hydrants and monitors shall not be installed inside the dyked areas. However, as an additional requirement, oscillating monitors may be provided in inaccessible area within the dyke with isolation valve outside the tank farm (In cases inter distances between tanks in a dyke or within dykes are not meeting the requirements).
- (x) TT or Refuellers loading and unloading facilities shall be provided with alternate hydrant or water cum foam monitor of suitable capacity and size to ensure adequate coverage and located at a spacing of 30 M on both sides of the gantry.
- (xi) The hydrants and monitors shall be located at a minimum distance of 15 M from the hazard (that is to say the TT loading or unloading facilities) to be protected.

12.6.3.5 Material Specifications

The materials used in fire water system shall be of approved type as indicated below, namely: -

- (a) **Pipes:** Carbon Steel as per IS: 3589 or IS: 1239 or IS: 1978 or Composite Material or its equivalent for fresh water service. In case saline, blackish or treated effluent water is used, the fire water ring main of steel pipes, internally cement mortar lines or glass reinforced epoxy coated or pipes made of material suitable for the quality of water able to withstand the temperature and pressure shall be used. Alternately, pipes made of composite materials shall be used. The composite material to be used may be as per API 15LR or API 15HR or IS:12709. In case composite pipes are used they shall be used underground.
- (b) **Isolation Valves:** Gate valve or quick shut off type isolation valves made of Cast Steel having open or close indication shall be used. Other materials such as cupro-nickel for saline or blackish water can be used. The material of the valve shall be suitable for the service.
- (c) **Hydrants post:**

Stand post - Carbon Steel

Outlet valves – Gunmetal or Aluminum or Stainless or Steel or Al-Zn Alloy

- (d) **Monitors or High Velocity Long Range Water cum Foam Monitors (HVLRL):**
 - (i) Approved or listed by international certifying agencies like UL or FM or VdS or LPC or equivalent Indian certifying agencies.
 - (ii) The electrical or hydraulic remote-control mechanism shall be in line with Hazardous Area Classification.

(e) Fire Hoses:

- (i) Reinforced Rubber Lined Hose shall be as per IS 636 (Type A) or Non-percolating Synthetic Hose (Type B) or UL or Equivalent Standard.

(f) Painting:

- (i) Fire water mains, hydrant and monitor stand posts, risers of water spray system shall be painted with “Fire Red” paint as per IS: 5.
- (ii) Hose boxes, water monitors and hydrant outlets shall be painted with “Luminous Yellow” paint as per IS: 5.
- (iii) Corrosion resistant paint shall be used in corrosion prone areas.

(g) Fixed Water Spray System

- (i) In case the system is manually actuated, the isolation valve shall be located outside the dyke for ease of access and operation.
- (ii) Spray nozzles shall be directed radially to the tank at a distance not exceeding 0.6 m from the tank surface.
- (iii) For Tank Truck or refuellers loading gantries specifically for those cases which have obstructions in water throw, sprinklers should be provided.

12.6.4 FOAM SYSTEMS:

12.6.4.1 Foam Protection

(a) Fixed Roof Tank Protection:

Foam conveying system shall have a vapour seal chamber before the foam discharge outlet. Features of the foam system for fixed roof protection shall be as follows, namely:-

- (i) System shall be designed to create foam blanket on the burning surface in a reasonably short period.
- (ii) Foam shall be applied to the burning hazard continuously at a rate high enough to overcome the destructive effects of radiant heat.
- (iii) The vapour seal chamber shall be provided with an effective and durable seal, fragile under low pressure, to prevent entrance of vapour into the foam conveying piping system.
- (iv) Where two or more pourers are required, these shall be equally spaced at the periphery of the tank and each discharge outlet shall be sized to deliver foam at approximately the same rate. Tanks should be provided with foam discharge outlets or pourers as indicated below, namely: -

Tank Diameter in (Metre)	Requirement of Foam Pourer (Minimum Nos.)
Above 18 and up to 20	2
Above 20 and up to 25	3
Above 25 and up to 30	4
Above 30 and up to 35	5
Above 35 and up to 40	6
Above 40 and up to 45	8
Above 45 and up to 50	10

- (v) In case foam pourers are provided on tanks having diameter up to 18 m, minimum 2 nos. foam pourers shall be provided.
- (vi) The estimation of number of foam discharge outlet is based on pourer capacity of 1000 lpm at a pressure of 7 kg/sq.cm (g) upstream of educator. This can be suitably adjusted for different pourer capacity in accordance with above. Testing of foam pourer system shall be done by reversing the inlet so as to prevent ATF from entering the storage tank.

(b) Protection for Dyke area Spill Fire:

- (i) Portable monitors or foam hose streams shall be provided for fighting fires in dyked area and spills.
- (ii) In addition to above, medium expansion foam generators shall be provided to arrest vapour cloud formation. Two nos. portable foam generator shall be provided for each AFS.

12.6.4.2 Foam Application:

(a) Application Rate:

The minimum delivery rate for primary protection based on the assumption that all the foam reaches the area being protected shall be as indicated below, namely:-

- (i) For cone roof tanks containing liquid hydrocarbons, the foam solution delivery rate shall be at least 5 lpm/ sqm of liquid surface area of the tank to be protected.
- (ii) In determining total solution flow requirements, potential foam losses from wind and other factors shall be considered.

(b) Duration of Foam Discharge:

The equipment shall be capable of providing primary protection at the specified delivery rates for the following minimum duration, namely:-

- (i) Tanks (fixed roof) containing Class 'B' product: minimum duration shall be 65 minutes, and;
- (ii) Where the system's primary purpose is for spill fire protection such as dyked area and non dyked area (such as TT or refuellers,); the minimum duration shall be 30 minutes.

(c) Water for Foam Making:

- (i) Water quantity required for making foam solution depends on the percent concentration of foam Compound. Foams in normal use have a` 1% to 6% proportioning ratio. However, foam supplier data shall be used for determining water requirement.

(d) Foam Quantity Requirement:

Foam quantity requirement shall be calculated as given below, namely:-

- (i) For locations aggregate capacity upto 30,000 kl (Single contingency):
Foam solution application at the rate of 5 lpm/ sqm for the liquid surface of the single largest cone roof tank.
- (ii) For locations aggregate capacity more than 30,000 kl (Double contingency).
(Assume, two cone roof tank farm are the two largest simultaneous fire risk in a double contingency Installation for the purpose of foam requirement);

A. Foam solution application at the rate of 5 lpm/ sqm for the liquid surface of the single largest cone roof tank.

B. Two hose streams of foam each with a capacity of 1140 lpm of foam solution.

(e) Foam Compound Storage:

- (i) Foam compound should be stored as explained in IS-4989 or UL-162. Alcohol Resistant Foam shall be used for handling methanol, ethanol or furfural fires. Minimum 1000 litres of Alcohol Resistant Foam compound shall be maintained at the AFSs handling methanol.
- (ii) Shelf life of foam compound shall be taken from manufacturer's data. Foam compound shall be tested periodically as per OEM guidelines to ensure its quality and the deteriorated quantity replaced. The deteriorated foam compound can be used for fire training purposes.
- (iii) Care shall be taken to avoid mixture of two or more different grades or batches of foam in a foam storage tank. In such cases foam shall be tested on yearly basis to check its efficacy and record maintained.
- (iv) For details of type of tests and their periodicity, refer IS 4989 or UL-162 or Equivalent Standard.
- (v) Quantity of foam compound equal to 100% of requirement as calculated as per method applicable should be stored in an AFS.

12.6.5 SCADA or SERVER Room Protection:

- (a) **SCADA or server room provided for location having pipeline receipt should be protected by Clean Agent Fire Extinguishing System.**
- (b) **Persons should be evacuated from the areas before the clean agent fire extinguishing system comes into operation.**
- (c) **Each hazard area to be protected by the protection system independently. The time needed to obtain the gas for replacement to restore the systems shall be considered as a governing factor in determining the reserve supply needed. 100% standby containers shall be considered for each protected hazard. Storage containers shall be located as near as possible to hazard area, but shall not be exposed to fire. Storage containers shall be carefully located so that they are not subjected to mechanical, chemical or other damage.**
- (d) **All the components of the system shall be capable of withstanding heat of fire and severe weather conditions.**

12.6.6 First Aid and Fire Fighting Equipment :

12.6.6.1 Emergency Trolley and Emergency kit:

- (a) **A trolley containing Fire Proximity Suit, BA Set, Water Jel Blanket, Resuscitator, First Aid Box, Stretcher with blanket, Spare fire hoses, Special purpose nozzles, Foam branch pipes, Explosive meter, Emergency trolley shall be provided at AFSs.**
- (b) **The aforesaid emergency trolley and emergency kit- emergency shall be readily available at AFSs at the Aviation Fuel Station. All the items of the kit shall be kept on a trolley specifically designed for the purpose.**
- (c) **For all other AFSs, Fire Proximity Suit, Water Gel Blanket, Resuscitator, First Aid Box, 2 nos. 10 or 9 kg DCP fire extinguishers, Safety helmets, Fire buckets, shall be placed at an easily accessible location inside the AFS.**

12.6.6.2 Portable Fire Extinguisher Specification:

- (a) All fire extinguishers shall conform to respective IS or UL or equivalent codes, that is to say 10 or 9 Kg DCP Type (IS: 15683 or UL 299), 4.5, 6 or 8 Kg CO₂ Type (IS: 2878 or UL 154) and 25, 50 or 75 Kg DCP Type (IS: 10658 or UL 299) and bear ISI or UL mark. BIS or UL or Equivalent certificates of all extinguishers shall be maintained at the location.
- (b) Extinguisher should be selected, based on factors like flow rate, discharge time and throw in line with IS: 2190.
- (c) The Dry Chemical Powder used in extinguisher and carbon dioxide gas used as expelling agent shall be as per relevant IS or UL or equivalent code.
- (d) Dry chemical powder, should be selected based on the typical properties such as Apparent Density (0.65 ±0.05), Fire Rating (144B), Thermal Gravimetric Analysis (with decomposition at around 250°C) and foam compatibility.
- (e) Spare CO₂ cartridges and DCP refills or buffer stocks of stored pressure vessel type fire extinguishers as required based on their shelf life should be maintained. However, minimum 10% of the total charge in the extinguishers should be maintained at the location.
- (f) Portable fire extinguishers shall be located at convenient locations and are readily accessible and clearly visible at all times.
- (g) The sand buckets shall have round bottom with bottom handle having 9-liter water capacity conforming to IS: 2546 or equivalent specifications. The sand stored in bucket shall be fine and free from oil, water and rubbish.
- (h) Rain protection of suitable design should be provided for all extinguishers and sand buckets.
- (i) The maximum running distance to locate an extinguisher shall not exceed 15 m.
- (j) The extinguisher shall be installed in such a way that its top surface is not more than 1.5m above the floor or ground level.
- (k) The number of extinguishers at various locations shall be provided as per paragraph 5.5 of Part E of this Schedule..

12.6.6.3 Wheeled Fire Fighting Equipment

For AFSs having above ground product storage tanks of diameter larger than 9 m, following firefighting equipment shall be provided, namely: -

Size of AFS (In KL)	Water or Foam Monitor (Nos.)
Having aggregate capacity of 1000 KL	NIL
Having aggregate capacity up to 10,000 KL	Minimum 2 Number of suitable capacity
Having aggregate capacity more than 10,000 KL	More than 2 Numbers of suitable capacity

12.6.6.4 Foam compound trolley 200 or 210 liters shall be provided as under, namely: -

Tank diameter (In m)	Water or Foam Monitor (Nos.)
Up to 24 m	1 no.
24 m - 30 m	2 nos.
Above 30 m	3 nos.

12.6.6.5 *Other Safety and PPE Gadgets required for the locations:*

Minimum fire accessories to be provided in a location without fire hydrant system are as follows, namely:-

Sand drum with scoop	: 4 Nos.
Safety helmet	: 1 No. per person.
Stretcher with blanket	: 2 Nos.
First Aid box	: 1 No.
Rubber hand gloves	: 2 Pairs.
Explosimeter	: 1 No.
Fire proximity suit	: 1 Suit.
Resuscitator	: 1 No.
Electrical siren (3Km range)	: 1 No.
Hand operated siren	: 1 No.
Water jel blanket	: 1 No.
Red & Green flag-fire drill	: 2 Nos. in each colour.
Self-Carrying Breathing Apparatus Set (30 minute capacity):	2 set with spare cylinder.

12.6.7 Emergency shut Down (ESD)or Emergency Shutdown Button (ESB) system :

12.6.7.1 *The ESD or ESB shall be provided in SCADA room as well as at strategic location. ESD or ESB system shall be operated through push buttons or wireless connection. While ESD will actuate overall shutdown for location having Hydrant Refueling system and ESBs shall actuate shutting down of Product pumps and compressors.*

12.6.7.2 *Actuation or pressing of any ESD shall initiate following actions, namely:-*

- (a) **Shutdown of all operations.**
- (b) **Power Shutdown.**
- (c) **Process Shutdown shall include the following, namely:-**
 - (i) To stop all unloading and delivery pumps;
 - (ii) Barrier gates and access control system to open; and
 - (iii) All MOVs to close.

12.6.7.3 *Power Shutdown shall initiate the following, namely:-*

- (a) **Trip all the panels other than Emergency panel. The Emergency panel should host Siren, bore wells, critical High Mast tower lights outside the licensed area, security cabin, critical lights in unloading or Refuellers loading area, Admin block, MCC room and power to the control room or Automation system.**
- (b) **There should be interlock between ESD for operations shut down and ESD for Power shut down so that full power shut down takes after a time lag required for closing the MOVs and full closure of valves shall be ensured. The time lag shall be location specific.**

- (c) **At pipe line receipt locations alarm signal should be exchanged between the two control rooms so that necessary actions are taken by the operating personnel at both ends.**

12.6.7.4 Inspection and Testing: The system shall be checked during each fire drill conducted with full system shut down and records shall be maintained.

12.6.8 Fire Protection system: Inspection and Testing:

- (a) The fire protection equipment shall be kept in good working condition all the time.
- (b) The fire protection system shall be periodically tested for proper functioning and logged for record and corrective actions.

12.6.8.1 Fire water pumps:

- (a) **Every pump shall be test run for at least half an hour or as per OEM guidelines, whichever is higher twice a week at the rated head and flow.**
- (b) **Each pump shall be checked, tested and its shut-off pressure shall be observed once in a month.**
- (c) **Each pump shall be checked and tested for its performance once in six months by opening required numbers of hydrants or monitors depending on the capacity of the pump to verify that the discharge pressure, flow and motor load are in conformity with the design parameters.**
- (d)
- (e) **Each pump shall be test run continuously for 4 hours at its rated head and flow using circulation line of fire water storage tanks and observations relating thereto shall be logged once a year.**
- (f) **The testing of standby jockey pump, if provided shall be checked weekly. Frequent starts and stops of the pump indicate that there are water leaks in the system which should be attended to promptly.**

12.6.8.2 Fire water ring mains:

- (a) **The ring main shall be checked for leaks once in a year by operating one or more pumps and keeping the hydrant points closed to get the maximum pressure.**
- (b) **The ring mains, hydrant, monitor and water spray header valves shall be visually inspected for any missing accessories, defects, damage and corrosion every month and records thereof shall be maintained.**
- (c) **All valves on the ring mains, hydrants, monitors and water spray headers shall be checked for leaks, smooth operation and lubricated once in a month.**

12.6.8.3 Fire water spray system:

- (a) **Water spray system shall be tested for performance that is to say its effectiveness and coverage once in six months.**
- (b) **Spray nozzles shall be inspected for proper orientation, corrosion and cleaned, if necessary, at least once a year.**

- (c) **The strainers provided in the water spray system shall be cleaned once in a quarter and records thereof shall be maintained.**

12.6.8.4 *Fixed and semi fixed foam system:*

- (a) **Fixed or Semi fixed foam system on storage tanks should be tested once in six months and such testing shall include the testing of foam maker or chamber.**
 (b) **The foam maker or chamber should be designed suitably to facilitate discharge of foam outside the cone roof tank and after testing foam system, piping should be flushed with water.**

12.6.8.5 *Clean agent system:*

Clean agent fire extinguishing system should be checked as below, namely: -

- (a) **Agent quantity and pressure of refillable containers shall be checked once every six months; and**
 (b) **The complete system should be inspected for proper operation once every year (refer latest NFPA for details of inspection of various systems).**

12.6.8.6 *Hoses:*

Fire hoses shall be hydraulically tested once in six months to a water pressure as specified in relevant IS or UL or equivalent codes.

12.6.8.7 *Communication system:*

Electric and hand operated fire sirens should be tested for their maximum audible range once a week.

12.6.8.8 *Fire water tank or reservoir:*

- (a) **Above ground fire water tanks should be inspected externally and internally.**
 (b) **The water reservoir shall be emptied out and cleaned once in 3 years, but floating leaves, material or algae, if any, shall be removed once in 6 months or as and when required.**

12.6.8.9 *Fire extinguishers:*

Inspection, testing frequency and procedure for fire extinguishers should be in line with design standard.

12.6.9 **ERDMP (Emergency Response and Disaster Management Plan):**

12.6.9.1 *A comprehensive ERDMP shall be developed in accordance to the Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010 (PNGRB ERDMP Regulations, 2010) and the copies of the ERDMP shall be available to all personnel in the installation.*

12.6.9.2 *Mock drills and Mutual aid:*

- (a) **Written mutual aid arrangements shall be worked out by locations to facilitate additional help in the event of Level-II and level-III emergencies by way of rendering manpower, medical aid or fire fighting equipments, as per Petroleum and Natural**

Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan) (ERDMP) Regulations, 2010 as amended from time to time.

- (b) **The mutual aid arrangement shall be such that the incident controller of the affected installation shall be supported by neighboring industries on call basis for the support services materials and equipment already agreed. Further, all such services deputed by member industry shall work under the command of the site incident controller of the affected installation.**
- (c) **Mutual aid associations shall conduct regular meetings, develop written plans and test the effectiveness of their plans by holding drills.**
- (d) **Fresh agreement shall be made on expiry of 2 years or whenever there is change in the signatories to the agreement.**
- (e) **Quarterly meeting of Mutual Aid members shall be conducted and the minutes shall be recorded and the minutes shall be reviewed in the subsequent meetings.**
- (f) **Arrangement of mutual aid scheme with the local airport operator or authority and sharing of firefighting with neighboring agencies should be ensured.**

12.6.10 Combined AFS With LPG or POL Facilities or Retail Outlets in the same premises:

The common water storage facility for fire-fighting purpose may be shared between AFS, POL terminal or depot under following conditions, namely:-

- (a) **AFS located within POL or LPG facility shall meet the design, layout and fire protection system requirements of combined facilities and have common boundary wall and ownership of both the facilities under same company.**
- (b) **In case AFS is an integral part of the LPG installation, then the fire-fighting facilities shall be adequate to meet the respective fire-fighting requirements of LPG and AFS regulations.**
- (c) **The responsibility of maintenance of these tanks and maintaining the water level in the storage tank at all the time shall rest with occupier of POL or LPG or Retail Outlet with whom AFS will be located facility.**
- (d) **For AFSs located adjacent to an existing LPG bottling plant, POL terminal or depot or retail outlet requirement of fire-fighting facilities, safety distances shall be guided as per details given in these regulations. The common water storage facility for firefighting purpose may be shared between AFS and LPG bottling plant.**
- (e) **The fire pump house may be common or separate.**

12.7 Vehicle Management System:

12.7.1 Qualification of Driver:

- (a) **The drivers shall hold a valid driving license for type of vehicle to be driven and they shall be authorized to drive vehicle carrying specific class of product under local dangerous goods regulations.**
- (b) **The regulations of airport with regard to qualification and experience of driver shall prevail.**

“PART K:

(Lube manufacturing and filling plants)

13.0 Applicability:

For Lube manufacturing and filling plants across the country falling under the scope of these regulations: Part A (Design and Layout), Part B (Design Considerations), Part C (Safe Operating Practices), Part E (Fire Protection and Prevention Facilities) and Part F (Maintenance and inspection) of this schedule shall be superseded by this Part and remaining parts that is to say, Part D (Commissioning or De-commissioning of facilities), Part G (Competence Assurance and Assessment), Part H (Vehicle Management System) and Part I (Safety Management System) shall hold good.

13.1 Scope:

This part lays down minimum safety requirements in design, layout, automation, storage, loading or unloading, packaging, inspection and maintenance, fire protection of lube manufacturing and filling plants including standalone packing and fillings units with or without blending facilities.

13.2 Installation Layout:

13.2.1 Layout Philosophy:

Following philosophy should be adopted in layout of a Lube manufacturing and filling Plant, namely:-

- (a) **Quantitative Risk Assessment** should be carried out at the layout stage with an objective to arrive at any specific mitigation measures required for Hazards identification. Risk reduction or mitigation measures should be given due credit.
- (b) Risk assessment should include societal risk (if any). The outcome should guide in preparation of onsite or off-site emergency plan. Further, emergency response disaster management plan (ERDMP) should be made in line with requirement of PNGRB ERDMP Regulations, 2010 and its latest amendments.
- (c) **Quantitative Risk Assessment (QRA)** should be done whenever major additions in facilities (such as addition of major storage facility, new process unit block) or major demographic changes in the surrounding of plant areas takes place.
- (d) Two approaches from the highway or major road should be provided, one for normal movement and other for emergency exit. Both these approaches should be available for receipt of assistance in emergency. Minimum road width should be 3.5 m for one-way vehicular movement.
- (e) **Alternative access** should be provided for each block so that it can be approached for firefighting in the event of blockage on one route.
- (f) Road widths, gradient and turning radius at road junctions should be designed to facilitate movement of the largest fire-fighting vehicle envisaged in the event of emergency.
- (g) **Physical segregation** should be provided between operating and non-operating area. Segregation should be minimum 1 m height either in the form of chain link fence or brick wall or combination of both. Entry to operating area should be through security access control only, that may be either manual or using technology.
- (h) Various additives should be stored within the blocks in separate demarcated area with required fire protection as per MSDS.

13.2.2 Layout of Facilities:

To prepare a layout, information should be collected on all applicable affecting aspects and not limiting to following, namely:-

- (a) **Storage tanks and utility requirements.**
- (b) **Product receipt or dispatch and mode of transport (Rail, Road, Pipeline, Tanker or Barge).**
- (c) **Warehouses, storage areas for additives, containers, packaging bitumen or asphalt, and other open storage areas like scrap yards and dumping ground.**
- (d) **Chemicals or Toxic chemicals storage, Sludge, hazardous waste storage or disposal facilities.**
- (e) **Service buildings, fire station and allied facilities.**
- (f) **Site topography including elevation, slop, and drainage.**
- (g) **Meteorological data.**
- (h) **Bathymetric data (such as high tide level, surge wave height) for installations in coastal areas.**
- (i) **Seismic data and probability of Tsunami in coastal areas.**
- (j) **Highest flood level in the area, water table, natural streams or canals.**
- (k) **Approach roads for functional areas.**
- (l) **Aviation considerations to and from adjacent facilities.**
- (m) **Environmental considerations.**
- (n) **Statutory requirements.**

13.2.3 General Consideration

While locating the various facilities, the following should be considered, namely:-

- (a) **Layout of blocks or facilities should be in sequential order of process flow.**
- (b) **The process operations like blending, and packaging operation should be carried out under the common block or shed. Separate block for boiler or heating unit should be provided. Refer Table -1 in Part J of this Schedule- for separation distance between blocks and between units within the block.**
- (c) **Plant elevation should be higher than the outside boundary surroundings and approach roads inside the plant area should be on higher ground to avoid flooding.**
- (d) **Process units, tank farm, bulk loading or unloading gantry or platform, filling, boiler unit or other heating unit, solid storage, additive storages, Effluent Treatment Plant (ETP) or OWS and utilities should be located on high ground to avoid flooding.**
- (e) **Fire control room should be earmarked or located in non-operating area, upwind (Majority of the year) of lube oil storage, handling, blending, filling or storage area and at a distance (refer table) from potential leak sources. It should not be located on a lower level than surrounding plant area and tank farms. Fire control room may be in the security room or administrative building.**
- (f) **Utility facilities should be located in separate blocks. However, air compressor can be installed in the boiler house in same block.**
- (g) **Overhead power transmission lines should not pass over the plant processing and operating areas including the truck parking areas. In case, the power transmission lines are passing through non- operating areas, horizontal and vertical clearance should be in line with the Central Electricity Authority.**
- (h) **High Tension (HT) line and HT sub-stations should be terminated or located outside the operating area.**

- (i) Truck (bulk and packed) movement inside the plant should be kept minimum and for this purpose the truck loading or unloading facilities should be located at a safe distance near the gate meant for its movement and should be oriented to provide one-way traffic pattern for entrance and exit. Positioning of truck at loading unloading facilities inside the plant should be in drive out position for easy escape in case of emergency.
- (j) A designated platform should be provided suitably at the main entrance exit gate, inside the location, for the purpose of checking road taker safety fittings or documents to avoid any obstruction for other vehicular movement in normal or emergency situation.
- (k) Surface drainage should be provided in the plant and drainage from each operating blocks or facility should be routed to OWS or ETP. The drains should always be maintained operable and clean.
- (l) Effluent Treatment Plant should be located at a distance as per Table -2 in Part -J of this Schedule-. This should be closer to disposal point (to outside storm drain) by the side of the boundary and at lower grade to facilitate gravity flow of effluent from other operating facilities.
- (m) Roads should be provided in a symmetric manner to serve all areas requiring access for the operation, maintenance, and firefighting. At least two approaches should be provided for each operating area.
- (n) Smoking booths shall not be allowed inside the plant area.
- (o) Firewater storage and firewater pump house should be located upwind of lube or hydrocarbon storage and handling facilities with straight approach from non-operating area to enable easy receipt of mutual aid and make up water assistance or replenishment.
- (p) The provision shall be made to receive the water from other sources including mutual aid or sharing of water directly into fire water storage tanks. Provision should also be made to receive water in an underground tank and lifting or diverting to main water storage tanks.
- (q) All buildings which are not related to direct plant operation should be located at upwind of lube or hydrocarbon storage and handling facilities. These should be located outside the operating area. These areas include administrative building, canteen, security or access control gate, emergency control room. Location of such facilities shall be based on Risk Assessment.
- (r) Congestion inside the plant area because of buildings, structures, pipelines, trees shall not be allowed. Such addition of facilities in existing plant shall be decided based on Quantitative Risk Assessment.
- (s) While selecting location of laboratory, due consideration shall be given for hazards from main plant or unit facilities assessed through Risk Assessment. Floor should be resistant to fire and chemicals and made anti-skid. There should be no fittings on the floor that would hinder or obstruct free movement. Sinks and drains should be made of chemically resistant material and the drains should be properly trapped and vented. Final discharge to storm water drain shall be through neutralization pitend-
 - (i) The laboratory shall have segregated storage of materials in various categories such as inflammable hydrocarbon samples in -bulk, toxic, reactive such as chemicals and re-agents, retention samples in non-bulk. Compressed gas cylinders shall be chained or strapped and placed outside the laboratory in a well-ventilated shed. This area shall be readily approachable for material handling or firefighting.
 - (ii) Effective ventilation that is to say, forced ventilation or air turbo ventilation and single pass once through type shall be considered with about 10-12 changes of whole air per hr. Emergency exits shall be provided at strategic locations. Each laboratory shall have two easily accessible, hindrance free exits. Doors shall open in the direction of the exit.
 - (t) Turbo or forced ventilation shall be considered for enclosed or confined process or utility blocks.
 - (u) Various additives (non-bulk), within blocks, shall be stored at the

demarcated area based on requirement of fire protection system and application as per respective Material Safety Data Sheet. Additives falling under Class A or Class B shall be stored separately (duly marked) with suitable fire protection.

- (v) Electrical fittings and fixtures for empty package storage area (HDPE or PE or PET or PFTE) containers, cartons and labels should be flame proof type. Laboratory storing inflammable materials shall have designated or demarcated area for storage of hazardous products.
- (w) All electrical cables shall be laid through conduit or cable trench. The designated cable route should be having route markers as per applicable Rules.
- (x) Storage of sludge inside the plant or its disposal strictly should be as per concerned State Pollution Control Board's norms.

13.2.4 Layout of Storage Tanks:

13.2.4.1 Dyke Enclosure:

- (a) Storage tanks for excluded petroleum product shall be located in dyked enclosures. Each dyke shall have roads all around for access for normal operation and maintenance as well for emergency handling.
- (b) For excluded product, the capacity of the dyked enclosure should be based on spill containment and not for containment on tank rupture. The minimum height of dyke wall shall be 600 mm.
- (c) Where Petroleum class-C is stored in separate dyke or along with excluded product, the enclosure capacity shall be constructed for containment of the largest tank content. The height of the enclosure wall shall be not less than one metre.
- (d) The dyke wall made up of earth, concrete or solid masonry shall be designed to withstand the hydrostatic load.
- (e) The dyke enclosure wall and dyke inside area shall be constructed leak proof or impervious to prevent ground pollution.
- (f) Dyke enclosure (entire area of the dyke) should have impervious layer of suitable material such as EPDM (ethylene propylene di-monomer) liner or polyethylene sheet or PCC or RCC to prevent the ground water contamination.
- (g) The dyke and the enclosures shall be inspected for cracks, visible damage every six months (pre and post monsoons) and after every major repair in the tanks or dykes so as to keep it impervious. Following should be done, namely:–
 - (i) Piping through dyke wall, if any, shall be properly sealed to make dyke impervious.
 - (ii) The dyke area shall have proper slope outward of tank pad towards the inner periphery of the dyke enclosure to prevent reverse flow.
- (h) Earth-pits shall be provided outside of Dyke area and strips buried under the earth except at termination points from a shortest possible distance. The earthing lay out

diagram of each facility should be displayed near the facility for ease of understanding.

- (i) **Pumps and pipe racks should be located outside dyke areas by the side of roads. The same shall not be applicable for excluded products.**
- (j) **Horizontal above ground tanks, irrespective of product class, mounted on pedestals shall meet the following, namely: -**
 - (i) Dyked enclosure shall contain the largest tank capacity.
 - (ii) Separation distance between adjacent tanks shall be $(D+d)/4$ or minimum 3 m whichever is higher.
 - (iii) Separation distance from adjacent facility or boundary shall be minimum 15 m.
 - (iv) Minimum two manholes having minimum size of 600 mm.
 - (v) All tanks shall have either individual or common stairs with toe guards and hand railing. Emergency exit or stair should be considered.
 - (vi) Drain from dyked enclosure shall be routed to ETP or OWS.
 - (vii) Vents shall be located or terminated at a minimum height of 4 m from the ground level.
 - (viii) The open end of free vent pipe shall be covered with two layers of non-corrodible metal wire gauze having not less than 11 meshes per liner centimetre and shall be further protected from rain by hood or by suitably bending it downward.
 - (ix) The petroleum product shall enter a tank through closed piping system or coupled electrically continuous and sound hose.
- (k) **Under Ground Tanks, irrespective of product class, shall meet the following, namely: -**
 - (i) Inter tank distance for UG tanks shall be $(D+d)/4$ or minimum 1.5 m, whichever is higher.
 - (ii) A minimum of 3 m clear distance around the tank shall be maintained (from structures or boundary wall).
 - (iii) Minimum burial depth under the earth should be 300 mm and the manholes or gauge pipe should be 300 mm above the ground level.
 - (iv) Minimum two manholes having minimum size of 600 mm.
 - (v) Embankment wall of minimum 300 mm height shall be provided in the UG tank farm area to contain accidental overflow or spillage and area shall be paved.
 - (vi) Drain from UG tank farm shall be routed to ETP or OWS.
 - (vii) Vents shall be located or terminated at a minimum height of 4 m from the ground level.
 - (viii) The open end of free vent pipe shall be covered with two layers of non-corrodible metal wire gauze having not less than 11 meshes per liner centimeter and shall be further protected from rain by hood or by suitably bending it downward.
 - (ix) The petroleum product shall enter a tank through closed piping system or coupled electrically continuous and sound hose.
- (l) **Depending upon saline or corrosive nature of water or weather, suitable corrosion protection measures shall be considered for storage tanks, pipelines and other facilities.**

13.2.4.2 Grouping of Tanks:

- (a) **Grouping of tanks in a dyke: Storage tanks should be grouped in a dedicated dyke according to their respective classification of petroleum product. For example,**

excluded product and other than excluded products should be stored in separate dyked enclosure.

- (b) In case, different class of products are stored in any combination of product classification, then, when excluded petroleum is stored with other class of product in same dyke, applicable fire protection shall be considered based on flash point of different class of products and fire protection for lower flash point product shall be applicable for all other tanks in that dyked enclosure
- (c) Tanks should be arranged in maximum two rows so that each tank is approachable from the road around the tank farm enclosure. This stipulation is not applicable for tanks storing excluded products, however, tanks in middle rows not covered by hydrant, or monitors from outside of dyke, shall be considered with elevated monitors or oscillating monitors for adequate water coverage.
- (d) To meet the objective, the peripheral drain of the plant shall be provided with sluice gates at the exit point where from drain goes outside of boundary. Pipelines if any entering or exiting the plant boundary shall be sealed properly.

13.2.4.3 *Fire Break Walls Inside Dyke Enclosure:*

- (a) In a dyked enclosure where more than one tank is located, fire break walls of minimum height shall be provided to prevent spills from one tank endangering any other tank in the same enclosure as per following, namely: -
 - (i) For excluded petroleum product storage and for the provision of firewall, a group of small tanks with aggregate capacity not exceeding 5000 kl shall be treated as one tank for the provision of firewall. The height of fire wall should be minimum 300 mm.
 - (ii) For other than excluded product storage, a group of small tanks each not exceeding 9 m diameter and in all not exceeding 5000 kl in capacity shall be treated as one tank for the provision of fire wall. The height of fire wall should be minimum 600 mm.
- (b) Drains inside the dyke area, if passes through fire break wall, shall be isolated suitably by providing valve.

13.2.4.4 *General:*

- (a) The tank height shall not exceed one and half times the diameter of the tank or 20 m whichever is less.
- (b) All Piping from or to any tank shall run directly to outside of dyke to minimize piping within the enclosures.
- (c) Piping design inside tank dyke area should ensure easy accessibility for any operations in the tank farm. Elevated Catwalks above the height of the dyke wall shall be provided for safe access and exit in case of normal or emergency situations. The catwalks shall run at the same level and terminate directly outside the dyke.
- (d) No part of the dyked enclosure shall be below the level of surrounding ground immediately around the outside of dyke area.
- (e) The minimum distance between a tank shell and the inside toe of the dyke wall shall not be less than half the height of the tank.

- (f) **Properly laid out road shall be provided for easy access on all four sides of each dyke for normal and emergency use.**

13.2.5 Layout of Sub-station:

- (a) **The main sub-station floor shall be raised above grade level and the space below the sub-station floor (cellar) shall be utilized for installation of cable trays. The bottom of cable trench entering the cable cellar shall be kept minimum 150 mm grade level. In case the cable cellars provided from top, the cable tray entering the substation shall have provision to arrest rainwater from outside. Every substation shall have a minimum of two.**
- (b) **exits. These exits shall be located at opposite ends of the building, to prevent the possibility of operating personnel being trapped in case of fire. The doors should open outward and be equipped with exit signs. For existing plants, all effort shall be made to meet the guidelines, provided in this paragraph 13.2.5.**
- (c) **The roof shall be given adequate water proofing treatment to ensure that rainwater does not seep into the sub-station.**

13.2.6 Protection of Facilities:

- (a) **Properly laid out roads around various facilities shall be provided within the plant for smooth access of fire tenders, in case of emergency.**
- (b) **The boundary wall shall be constructed as per the directives of the government of India, in the Ministry of Home Affairs or any other Government directive. In any case the boundary wall shall be of minimum 3m height with V or U or X shaped barbed wire fencing on top of the wall with 600 mm diameter concertina coil on top (in V or U or X shaped fencing).**
- (c) **The emergency gate shall be away from the main gate for evacuation of vehicles and personnel in emergency and shall always be kept available and free from obstruction.**
- (d) **CCTV shall be installed in plant area covering entry or exit gate, periphery of installation and all critical operating areas which should be monitored continuously. CCTV monitoring station shall be provided in control room, Security cabin and in-charge room.**
- (e) **The storage tank bottoms may be protected against soil corrosion by providing suitable cathodic protection system based on requirement and maintained (if provided) in sound working condition.**
- (f) **Truck parking area based on fleet size shall be provided adjacent to the plant gate with following facilities, namely:-**
 - (i) Segregation of parking area through chain link fence or boundary wall.
 - (ii) Separate entry and exit gate with security control.
 - (iii) Parking lane demarcation or slotting to ensure independent drive out position parking for quick evacuation in the event of emergency.
 - (iv) Suitable fire protection facility through hydrant or monitors shall be considered at least from two sides of the parking lot.

13.2.7 Separation Distances :

13.2.7.1 *Between Storage Tanks and Offsite Facilities*

- (a) **For lube manufacturing plant storing excluded products, minimum separation distances between various facilities shall be as per Table-1. The table shall be read in conjunction with the notes specified with the table.**
- (b) **For Class-C petroleum, if stored in separate dyke or along with excluded product, in lube manufacturing and filling plant, Table-1 of this part shall be applicable for the purpose of separation distances between various facilities.**

- (c) Separation distances between the nearest tanks located in separate dykes shall not be less than the diameter of the larger of the two tanks or 30 metre, whichever is more.
- (d) For facilities where inter distance is not meeting in existing locations, necessary Quantitative Risk Assessment (QRA) carried out and suggested control or mitigation measures shall be implemented.
- (e) The layout shall also take into account findings or recommendations of Risk Analysis or Assessment study, which should be carried out at all the stages of facility development process.

13.2.7.2 Between Other Blocks or Equipment:

Table -2 of this Part shall be followed for inter-distances between various facilities within the Process Block. The said Table shall be read in conjunction with the notes specified with the Table.

Table-1

Separation distances between various facilities (between storage tanks and offsite facilities):

#	From / To	1	2	3	4	5	6	7	8	9	10	11	12	13
1	Process Block	30 (Note4)	15	15	30	30	20	30	15	30	15	15	30	15 or 6(Note-5)
2	Storage tanks in tank farm area (Excluded/ Class C)	15	x	15	30	15* 30* *	0.5 D or min 20	20 * 30 **	15	30	15	15	30	15
3	Bulk loading, unloading gantry (excluded, class C)	15	15	X	30	15* 30* *	20	20 * 30 **	15	30	15	15	30	15
4	Fire Engines, water tanks	30	30	30	X	30	6	6	6	30	X	6	X	15
5	Boiler house	30	15* 30* *	15* 30* *	30	X	15	15	6	30	6	15	30	X
6	Boundary wall	20	0.5 D or min 20	20	6	15	X	X	6	15	X	X	X	15

#	From / To	1	2	3	4	5	6	7	8	9	10	11	12	13
7	Admin Building, Fire Control Room, Canteen	30	20* 30* *	20* 30* *	6	15	X	X	15	15	X	X	X	15
8	Cooling Tower DM, RWTP	15	15	15	6	6	6	15	X	6	6	15	6	15
9	OWS, API separator or Sludge pit	30	30	30	30	30	15	15	6	X	15	15	15	15
10	Electrical sub station	15	15	15	X	6	X	X	6	15	X	X	X	15
11	Warehouse	15	15	15	6	15	X	X	15	15	X	X	6	15
12	Fire Station (Fire tender, Ambulance and like other devices)	30	30	30	X	30	X	X	6	15	X	6	X	15
13	Thermic Fluid Heater	15 or 6(Not e-5)	15	15	15	X	15	15	15	15	15	15	15	X
* Indicates inter distance for excluded Class. ** Indicates inter distance for Class- C.														

Table-2
Inter-distances between various facilities within the Process Block:

#	From / To	1	2	3	4	5	6	7	8	9
1	Process control room	X	X	6	6	3.5	3.5	6	6	6
2	QC Lab	X	X	6	6	3.5	3.5	6	6	6
3	Blending Kettles	6	6	3	3.5	3.5	3.5	6	6	6

				(Note -3)						
4	Intermediate or Finished Product storage	6	6	3.5	X	3.5	3.5	6	3.5	6
5	Filling Nozzle	3.5	3.5	3.5	3.5	X	3.5	3.5	3.5	6
6	Drum Empty Unit	3.5	3.5	3.5	3.5	3.5	X	3.5	3.5	3.5
7	Packaging Material	6	6	6	6	3.5	3.5	3.5 (Note- 3)	3.5	6
8	Packed Material Storage	6	6	6	3.5	3.5	3.5	3.5	X	6
9	Package Container Loading	6	6	6	6	6	3.5	6	6	X

NOTE:

General Note to Tables -1 and 2

1. All distances are in metre. "X" indicates any suitable distance for constructional, operational and maintenance requirement as per good engineering practice.
2. All distances shall be measured between the nearest points on the perimeter of each facility except (i) in case of tank vehicle loading or unloading area where the distance shall be from the Centre of nearest bay. (ii) The distances given in case of storage tanks are from the shell of the tank.
3. The distance specified is between two sub-units or facilities in the same Process Block.
4. Separation distances between two Process Blocks shall not be less than 30 m. In case of space constraints, the distance can be reduced, provided hydrants are placed at a minimum distance of 20m from the respective process Blocks on both sides.
5. Thermic fluid unit within the process block shall have clear distance of 6 m from other facilities in the same process unit. Thermal fluid heater unit and Boiler unit can be in the same block.

Specific note to Tables – 1 and 2:

1. For a process control room attached to single process unit like lube blending unit, the minimum separation distance shall be 6 m from the nearest vessel. Each process control room shall have separate emergency exit.
2. The distance specified in Tables above is minimum.
3. Building within the blocks for operational or maintenance requirements shall not be considered as administrative building for the purpose of inter-distances.
4. Mezzanine floor is provided for storage of input packaging material and to feed the same to filling nozzles. The Mezzanine floor, if required can be constructed above the can filling machine or nozzles. In such cases, electrical fittings inside the cellar above the Mezzanine floor should be flame proof type. Necessary fall arresting protection such as railings or guards, shall be in place to avoid any accidental fall of personnel while working inside the cellar above the Mezzanine floor.

13.3 Design Considerations:

13.3.1 Design of Storage Tanks:

13.3.1.1 Tank Design:

- (a) **Selection of type of tank generally depends on ambient conditions and the product handled.**
- (b) **For designing of storage tanks API STD 650 or API 620 or IS 803 or IS 10987 shall be followed based on the type of the tank.**
- (c) **Tank bottoms should be of cone up or cone down ("Apex down") based on requirement and product handled.**

13.3.1.2 Tank Appurtenances:

- (a) **Handrails and toe guards shall be provided around the roof for safe movement of personnel for tank dipping, inspection, maintenance.**
- (b) **Above ground or horizontal tanks shall have access to their roofs by means of a ladder or staircase constructed and attached to the outer tank shell. An alternate, emergency access or escape ladder or staircase may be constructed based on site specific or user requirement.**
- (c) **Stairs should be made of grating. All staircases shall have resting or landing platform for every 5 m height. The landing platform as well as individual stairs or ladders shall be provided with toe guard. The stairs or ladders shall have suitable hand railings on both sides.**
- (d) **Number of manholes shall depend on diameter of the tank and code followed for construction of tanks. Each manhole shall be of suitable sized and provided with hold down handle for ease of handling for maintenance.**
- (e) **Two isolation valves shall be installed on each product or water draw off lines.**

13.3.2 Tank Farms or Manifolds:

13.3.2.1 Tank Farm Drains:

- (a) **The dyke drain shall be provided along the inside periphery of the dyke enclosure wall. In case circular drain around tank pad is provided, the same needs to be connected to the peripheral drain. The outlet from dyke shall have the provision to either divert to the effluent Treatment plant or OWS or to main storm water drain.**
- (b) **Dyke drain Valves shall be provided with position indicator. Audio alarm and visual indication should be provided in the control room to monitor open or close status of dyke valve.**

13.3.2.2 Tank Manifold:

- (a) **The number of inlet or outlet connections to the tank shell should be kept minimum. Each product line nozzle connected to tank, shell shall have minimum two valves. 1st tank body valve on inlet or outlet lines should be motor operated valve (MOV) or Pneumatic operated valve (POV) and 2nd valve can be hand operated valve or MOV or POV as decided by the user. This clause is applicable for above ground tanks having capacity above 500 kl (nominal capacity). Water or product drain lines or recirculation line shall be provided with at least two manual operated isolation valves. The above stipulation is not applicable for utilities or instrumentation lines entering the tanks.**
- (b) **The Close push buttons of MOV or POV shall be provided in field that is to say, just outside the dyke. Open feature can be near the valve inside the dyke and these push buttons should have distinctive feature so that opening is different than action required for closing (that is to say, pull type and push type). Motor operated valve (MOV) or Pneumatic operated valve (POV) should have provision for local manual over-ride.**
- (c) **The push button assembly shall be mounted at a place, easy accessible to the operator and would be visible. MOV should have close remote operation from control room also.**
- (d) **Tank manifolds for excluded products, if provided, may be located inside the dyke. Manifold for class – C, if considered ,shall be provided outside the dyke area. The floor underneath the manifold shall be paved and have embankment wall and connected to oil water drainage system leading to ETP or OWS.**
- (e) **Thermal safety valve (TSV) or Expansion line should be provided for blocked portion of pipe line to take care of the thermal expansion of product due to rise of temperature.**
- (f) **TSV outlet line or expansion line shall be connected back to tank shell or tank inlet or outlet line suitably. TSV or expansion line shall have provision of NRV before termination to tank shell or inlet or outlet line. Isolation valves shall be installed on both sides of NRV for ease of maintenance or inspection of NRV.**

13.3.2.3 Tank Settlement:

Tank Settlement should be effectively made up with proper slope to avoid rain water accumulation and subsequent corrosion of the bottom plate. Where large settlement is anticipated, supporting arrangement for the connected piping shall be suitably designed to take care of the settlement.

13.3.3 Tank Heaters or Mixers:

13.3.3.1 Heaters:

Tank heating either by steam heating or electric tracing or hot oil circulation should be used. Heating flues using fired burners is not permitted.

13.3.3.2 Design Criteria:

Tank heaters shall be designed to hold the product at the specified storage temperature when tank is filled up to safe filling height.

13.3.3.3 Steam Heating (low pressure steam):

- (a) **Man way heater should be designed so that its removal can be done without the requirement of person entering in the tank.**
- (b) **Steam coils should have no flange connections inside the tank.**
- (c) **Provision should exist in condensate outlet lines to check for oil leak.**
- (d) **Gradient of the coil bundle inside the tank should be such that condensate accumulation is avoided.**
- (e) **The Inlet and outlet nozzle height of steam coil should be such that the same should always be immersed in the dead level of storage tank during normal operations.**
- (f) **Due to operational reason, if product level is brought down below the steam coils, the steam input thru coils should be avoided or restricted and monitored for maximum temperature limit.**

13.3.3.4 Hot Oil system:

- (a) **Necessary remote temperature indicators and control valves are required for the system.**
- (b) **Isolation and sampling facilities are to be provided at each tank to check leaks.**
- (c) **Heating oil tank level should be monitored with indicators and alarms.**

13.3.3.5 Electric Heating:

The classification and thermal rating of electric heat tracing should be verified before application. The electric conduits and cabling should conform to Classification of Areas for Electrical Installations.

13.3.4 Drains From the Tanks:

13.3.4.1 Bottom Drains:

Drains should be provided in all tanks for draining water and also for emptying out the tank for cleaning. Besides, these are also useful for draining water after a hydro test or initial flushing during a start-up operation. Number and details of the drains shall be as per the applicable tanks design standard.

13.3.4.2 Drain line:

Each drain line shall have minimum two isolation valves and pipe extended beyond tank pad up-to drain point. One of these valves shall be of quick

closing type. Ends of each drain point should have provision of blind flange or capping arrangement.

13.3.5 Vents:

Number of vents shall be provided as per applicable standard. For sizing the vents API STD 2000 is to be referred. However, following are the basic guidelines need to be considered, namely:-

- (a) **Maximum and minimum ambient temperatures.**
- (b) **Vapour pressure of the product at operating or design temperature.**
- (c) **Maximum pumping in and out rates.**
- (d) **Blending components likely to be handled in the tank.**

13.3.6 Dip Hatch:

Dip hatch or gauge hatch used for gauging the level of the liquid in a tank as well as to take out samples for testing shall be provided. Gauge hatch cover shall be self-closing type. Suitable barrier shall be provided on roof around half of the neck of gauge hatches at downside to prevent any spread of spill owing to the gauging or sampling.

13.3.7 Instrumentation:

13.3.7.1 *Level instrument for storage tanks:*

- (a) **This paragraph 13.3.7.1 is applicable for above ground tanks having nominal capacity above 500 kl. Level instrument on the tank should be provided as under, namely:-**
 - (i) Minimum one reliable level instrument shall be provided in each above ground tank.
 - (ii) High Level (H) alarms: The tank level instrument shall have provision for sending audio visual alarms to the process control room.
 - (iii) Level for “H” alarm shall be decided based on site specific operating parameter that is to say, diameter of tank, flow rate and operator’s response time for corrective measures to stop product level reaching curb angel. However, this level shall be below the level corresponding to tank safe filling capacity.
 - (iv) An independent level switch shall be provided at the “HH” level which in any case shall not be above the level corresponding to safe filling capacity of the tank. This level switch shall enable initiation of action for closure of the respective tank inlet line MOV or POVs that is to say , 1st tank body valve so that the entire receipt operation closes on safe mode and the product does not overflow.

13.3.7.2 *Adequate measures should be taken for tanks receiving product from ships at high flow rates for surge pressures due to sudden closures of valves and accordingly wherever required, suitably designed surge relief system to be provided. Timely closure of transfer operations to be ensured through effective communication system. Closure of pump should be based on pressure development philosophy in the outlet line in case of transfer from other locations.*

13.3.7.3 *Temperature and Insulation:*

- (a) **When product storage temperatures are likely to be higher than 100-degree C, a remote temperature indicator with alarm should be provided in addition to local indicators. The location of the temperature indicator shall be 500 mm above the inlet or outlet nozzle so as not to sense the direct heat of the coil.**
- (b)
- (c) **Suitable insulation shall be provided for heat conservation. The storage tanks or process tanks having higher surface temperature shall have insulation up-to minimum 2 m high for personal protection. Also, patch insulation should be provided on the shell along with spiral stairway or ladders.**

13.3.8 Piping or Valves or Flanges:

13.3.8.1 *Pipping:*

- (a) **Piping should be designed for handling of Hydrocarbon liquid as per “ASME B 31.3: Process Piping” or ASME B 31.4 (for cross country pipelines only entering the terminal) or API 5L or equivalent as applicable. Piggable pipelines shall be as per DIN standard or as per manufacturer’s recommendations so as to meet the operational requirements of pigging operations.**
- (b) **Pipe joints should be welded as far as practicable with full penetration weld. Number of flanged or threaded joints should be kept to a minimum.**
- (c) **In case sampling point is provided on receipt line for operational requirement, the same should be provided outside of dyke in the manifold.**
- (d) **Sectionalizing of the pipelines with isolation valves and arrangements for injection or draining of water shall be provided for facilitating hydro-testing of the pipelines.**
- (e) **Buried piping shall be protected against physical damage and corrosion with suitable protective coating.**
- (f) **At road crossings, in addition to protective coating, pipes should pass through secondary encasing with properly sealed at both the ends.**
- (g) **The pipelines should be provided with low point’s drains and high point vents to facilitate emptying or hydro-testing. Ends of each drain point shall have provision of blind flange or capping arrangement.**

13.3.8.2 *Valves:*

Steel valves conforming to relevant API standards shall be used. Cast iron valves shall not be used for class C or excluded Petroleum products.

13.3.8.3 *Flanges or Fittings:*

- (a) **Steel flanges and flanged fittings shall conform to relevant ASME or ASTM or ANSI or equivalent standards.**
- (b) **Slip on or weld neck flanges should be used.**
- (c) **Screwed flanges for sizes 50 mm or smaller may be used**
- (d) **Steel flanges should conform to the applicable provisions of ASME B 16.5 or equivalent.**
- (e) **Steel screwed fittings and couplings shall conform to ASME B 16.11 or equivalent.**

- (f) Steel unions shall have ground metal to metal seats. Gasket type unions shall not be used.
- (g) Plugs should be of steel. Cast iron or brass plugs shall not be used.
- (h) All flanges shall be connected for bonding for electrical continuity.

13.3.9 Bulk Loading or Unloading Facility:

13.3.9.1 Loading or Unloading Pumps:

- (a) Pumps conforming to relevant API standards or equivalents shall be used.
- (b) Product pumps shall be provided with suitable sized strainers on suction and NRVs on discharge lines. All drain points of strainers shall be provided with double isolation valve and ends having provision for blind flange or screw capped.
- (c) Pumps shall be installed on paved area above the ground level with drainage facilities routed to OWS or ETP.
- (d) Pump house shall be well ventilated.
- (e) To avoid wide variation in pressure, leading to a 'kick' or 'hammering' in header and hoses, it is necessary to choose pumps with flat characteristic curves.
- (f) Loading pumps should also be provided with additional remote stop switches at the strategic point close to loading area to switch off the pump in case of emergency such as overflow, fire, or any other abnormal situation.
- (g) Automated plants alternately, can install ESD at strategic points for total shutdown.
- (h) Suction and discharge lines should be provided with thermal safety relief device to relieve pressure due to ambient temperature rise. Thermal Safety relief device may vent into a tank or piped to OWS located in safe area. When connected to tank, it (TSV) shall be provided with isolation valves. One isolation valve shall be installed close to the tank shell to the maximum extent possible.
- (i) Pump delivery shall have bypass to facilitate loading operations in peak and lean periods.

13.3.9.2 Tank truck loading Gantry:

- (a) Loading points shall have quick shut-off valves such as Cast steel or Ball Valve.
- (b) In case of loading hoses, only neoprene impregnated hoses having electrical continuity between nozzle and flange shall be used.
- (c) Proper lighting shall be provided.
- (d) Loading gantry shall be provided with at least one suitable telephone or walkie talkies for effective communication with pump house in normal and emergency operations.
- (e) Tank truck loading gantry shall be suitable for all weather conditions.
- (f) Tank Truck loading gantry shall be provided with safety harness to protect the operating crew against fall from height.
- (g) Swing type loading platforms with counterweight and hand railing shall be provided and should be light in construction.
- (h) Proper handrail arrangement shall be provided on platforms and stairs for safe movement of personnel. Stairs and platforms shall be constructed of gratings. Minimum width of stair shall be 610 mm.
- (i) At one emergency escape ladder shall be provided at rear middle of 8 bays gantry for emergency use. Minimum width of emergency ladder stairs should be 610 mm. Escape ladders shall be prominently identified from distant view. A safety cage shall be provided around top portion of the escape ladder.

- (j) **Provision shall be made for quick isolation of main product headers in case of emergency. For this purpose, suitable type hand operated valves or remote operated valves shall be considered as per the site conditions and overall automation system in the installation. Isolation valves shall be located at least 15 m away from the gantry and easy accessible location.**
- (k) **Drain in front and rear side of the loading or unloading gantry shall be provided. Open drains along gantry shall be covered with gratings so as not to endanger movement of personnel.**
- (l) **Loading gantry area shall be paved for smooth draining. Oil and water collected from loading or unloading areas shall be routed to Oil water separator system or Effluent Treatment Plant or similar facility.**
- (m) **The tank truck gantry shall be so designed that all the compartments of the tank truck are filled at one bay only. The layout shall ensure that all operations are planned in a manner so that no zigzag movement of the tank truck around the gantry should take place.**
- (n) **All trucks entering the plant shall have safety fittings as required.**

13.3.10 Blending Vessel Pumps:

Installation of pumps should not be directly beneath the blending vessels. Spillage from the process vessels directly on heated or overheated pumps may cause safety or fire hazard.

13.3.11 Pipeline Pigging system and pigging Manifold:

- (a) **Interconnecting the large number of source tanks with different possible destinations (such as blending, filling and bulk loading has always been a major challenge of Lube blending plants.**
- (b) **Pipeline Pigging system should be provided where a large variety of products are transferred primarily for optimization of installation cost by reducing the number of pipelines.**
- (c) **The pigging system or manifold must be a closed system to ensure safe interconnection without cross-contamination and product loss.**

13.3.12 Design Layout for Handling of Slop:

(a) **Collection and Drainage:**

- (i) A network of drainage system shall be provided to collect Oil drains from various equipment, storage area, filling plant, gantry areas, pump houses. They should also collect surface drains from places where Oil spillages are likely to occur. The drainage shall lead to OWS or ETP, as the case may be.

(b) **ETP or OWS:**

- (i) The receiving sump of the OWS shall have suitable arrangement for skimming off upper layer of accumulated Oil. Provision shall be made for directing the collected Oil to the slop tank.
- (ii) Final effluent discharge should be tested periodically to check the PPM content in order to meet the prescribed limit by Pollution Control Board (PCB).

13.3.13 Handling of Sick or Leaky Tank Trucks or Tank Wagon

Suitable provision shall be made for safe handling of sick or leaky tank trucks or tank wagons. These methods should include:-

- (a) **Arresting of leaks using suitable method as a first aid measure till the sick or leaky tank truck or tank wagon is unloaded safely at designated place. In no case such tank truck or tank wagon shall be used for transportation;**
- (b) **A drain header should be provided to drain out the content to an underground tank or sump from where it can be pumped out to storage tank or to the loading header; and**
- (c) **Either permanent facility or portable pump motor arrangements with suitable fittings to be used for quick disposal. Such products to be handled further as per IQCM (Industry Quality Control Manual).**

13.3.14 Electrical Equipment:

13.3.14.1 Selection:

- (a) **Electrical equipment shall be selected, sized and installed so as to ensure adequacy of performance, safety and reliability. The equipment in general shall conform to relevant Indian Standards and shall be suitable for installation and satisfactory operation in the service conditions envisaged.**
- (b) **Protection:**
- (c) **The protective system shall be designed to ensure Protection of Personnel and plant equipment against damage which can occur due to internal or external short circuits, overloading, abnormal operating conditions, switching, lightning surges and like other reasons accordingly, relays and protective devices shall be suitably selected and installed.**
- (d) **All enclosure for electrical equipment or panels or JB's or double entry glands for cable entries in process blocks, finished product and empty storage area should have Ingress Protection (IP 54 or IP 55).**
- (e) **All the protective relays for the Generator, Transformer, Motors and Switchgears shall be tested at least once in a year and test records maintained.**

13.3.14.2 Cables

- (a) **In order to avoid spread of fire due to cables, the outer PVC sheath of all cables used inside the plant operating area shall be fire retardant type conforming to category AF as per IS: 10810. The cable shall have a low smoke property. The minimum Oxygen Index should be 29.**

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- (b) **All power and control cables shall have extruded inner and outer sheaths. Cables should be Aluminium or Copper Conductor PVC insulated, PVC sheathed and armoured type.**
- (c) **Instrument signal communication cables shall not be laid in the same trench or tray along with electrical cables. The overall cable layouts shall be designed for minimum interference between signal and power cables.**

- (d) **Cable route markers shall be installed at every 30 metres intervals all along the cable routes and also at cable joints and locations where the direction of cable trench changes.**

13.3.15 Installation Earthing :

13.3.15.1 Installation earthing design shall be carried out in accordance with the requirements of Indian Electricity Rules and IS: 3043 or equivalent system recognized by statutory authorities under the Petroleum Act and Electricity Act. All earth connections (termination) should be visible for inspection to the extent possible. Termination joints inside the earth pit shall be at workable depth to facilitate testing and like other procedure. Earthing system shall be designed for the following, namely:-

- (a) **System neutral earthing.**
- (b) **Protective Equipment Earthing for personnel safety.**
- (c) **Protection against Static discharges.**
- (d) **Lightening Protection.**
- (e) **Earthing for Data Processing system.**

13.3.15.2 The earthing system shall have an earthing network with required number of earth electrodes connected to it. The following shall be earthed, namely:-

- (a) **System neutral.**
- (b) **Current and potential transformer secondary neutral.**
- (c) **Metallic non-current carrying parts of all electrical apparatus such as transformers, switch gears, motors, lighting or power panels, terminal boxes, control stations, lighting fixtures, receptacles and like other devices.**
- (d) **Steel structures, loading platform and like other devices.**
- (e) **Cable trays and racks, lighting mast and poles.**
- (f) **Storage tanks, vessels, columns and all other process equipment.**
- (g) **Electrical equipment fencing (that is to say, transformer, yard etc.)**
- (h) **Cable shields and armour.**
- (i) **Flexible earth provision for truck.**
- (j) **Pump handling hydrocarbon if its base plate is separate from motor's base plate.**

13.3.15.3 Measurement of earth resistance:

- (a) **The testing of the Earth Pits shall be done half yearly basis, once in dry and once in wet weather and records shall be maintained in this regard.**
- (b) **Removable link shall be provided to allow measurement of an earth electrode-resistance independently.**

13.3.15.4 Allowable earth-Resistance Values:

The resistance value of an earthing system to general mass of the earth should not exceed, the following namely:-.

- (a) **4 ohm for electrical systems and metallic structures**
- (b) **7 ohm for storage tanks**
- (c) **1 ohm for main earth grid, and bonding connections between joints in pipelines and associated facilities.**
- (d) **2 Ohm for each electrode to the general mass of the earth (read in conjunction with note in succeeding clause).**
- (e) **Note: In areas with high soil resistivity (that is to say, Granite or rocky area), allowable resistance for individual electrode to the general mass of the earth is acceptable up-to 5 ohm, but grid resistance value shall no way exceed 1 ohm.**

13.3.15.5 *Electrically independent earth electrodes:*

- (a) Earth electrodes should be located at such a distance from each other so that the maximum current likely to flow through one of them does not significantly affect the potential of the other.
- (b) The Lightning Arrestor (LA) of the Two Pole or Four Pole structure shall be connected to two distinct earth pits. The strips shall run on insulators or isolators so as not to come in contact with the Pole structure. Connections shall be made to the pit directly and, then, pits shall be connected to each other to form an independent earthing network. This independent earthing network or grid shall be connected with main earthing grid below the ground (at a depth of minimum 500 mm), minimum at two points.
- (c) The use of rod or pipe or strip electrodes is permissible. Their choice will depend upon site conditions, soil resistivity and economic considerations. The material of earth electrodes shall be galvanized iron.
- (d) The whole of lightning protective system including any earth ring shall have a combined resistance to earth not exceeding 10 ohm without taking account of any bonding.
- (e) The Two Pole or Four Pole structure shall be earthed with two separate earth connections from grid. The Gang Operated Switch shall also be earthed.
- (f) Fencing of two Pole or four Pole, Transformer yard shall be earthed and also electrical continuity between various structures, the fencing shall be ensured.
- (g) The Neutral of the Transformers shall be earthed with two distinct earth pits separately. Connections shall be made to the pit directly and, then, pits shall be connected to each other to form a grid. This independent earthing network or grid should be connected with main earthing grid below the ground (at a depth of min. 500 mm), minimum at two points.
- (h) The Neutral of the Diesel Generator shall be connected to two distinct earth pits separately. Connections shall be made to the pit directly and, then, pits will be connected to each other to form a grid. This independent earthing network or grid should be connected with main earthing grid below the ground (at a depth of minimum 500 mm), minimum at two points.
- (i) The transformer body shall be earthed at two points separately leading to earthing system.
- (j) All Metallic non-current carrying parts of all electrical apparatus shall be earthed to ensure that the exposed metallic parts do not become dangerous by attaining high voltages in case of faults.
- (k) All the electrical equipment operating above 250 volts shall have two separate and distinct connections to the earth grid.
- (l) All Steel structures, loading platform or gantry and like other devices, shall be earthed with two separate connections from main earthing grid.
- (m) Each Product Storage tank shall have one separate earth connection at every 30 m of the tank perimeter from main earthing grid. However, minimum two connections shall be provided for smaller tanks.

13.3.15.6 *Bonding:*

- (a) **Flanges:** All joints in pipelines, valves, storage tanks and associated facilities and equipment for petroleum shall be made electrically continuous by bonding. The resistance value between joints shall not exceed 1 ohm.
- (b) **Tank Truck Loading and Unloading Gantry:** For the gantry 6 mm Sq. braided copper wire with one end firmly bolted to the Loading or Unloading Arm or hoses and the other end provided with G.I or Copper or Non corrodible metal crocodile

clips should be used, the crocodile clips being attached to the tank-truck under loading or unloading. (For External Bonding of Loading or unloading arms or hose with the Tank Truck).

13.3.15.7 Static earthing:

- (a) **Static Earthing** (earthing for static charge dissipation) shall be provided at Tank Lorry filling or decantation Gantries, to prevent building up of Static Charges.
- (b) **The earthing for static dissipation, electrical system and automation system shall be separate and can be taken from main grid below the ground.**

13.3.15.8 Lightning protection for structure and building:

- (a) **Lighting protection shall be provided for the structures and buildings which are higher than 20 metre or as per the risk index analysis worked out as per IS 2309.**
- (b) **Self-conducting structures having metal thickness of more than 4.8 mm may not require lightning protection with aerial rod and down conductors. They shall, however, be connected to the earthing system, at least, at two points at the base.**
- (c) **Non-conducting chimneys or stacks whose overall width or diameter at top is up-to 1.5 m shall be provided with one aerial rod and down conductor and chimneys with overall width of diameter at top more than 1.5 m shall be provided with 2 Nos. aerial and down conductors.**
- (d) **In case, lightening arrester is provided for any structure or building or stack, an independent earthing network shall be provided for grounding the lighting protection system. This independent earthing network or grid shall be connected with main earthing grid below the ground (at a depth of minimum 500 mm), minimum at two points.**

13.3.15.9 Earthing for data processing system:

- (a) **Low noise Earthing shall be provided for critical data processing equipment which shall be independent of any other Earthing of the Building.**
- (b) **Wherever isolation transformers are used, the output neutral of the transformer shall be independently earthed so as to ensure that the Earth-Neutral Voltage is less than 1 volt.**

13.3.15.10 Minimum Permissible Sizes of the Earthing Conductors:

- (a) **Size of the conductor shall be selected based on the fault current that is required to be dissipated during emergencies, as specified below, namely:-**

Equipment	Size of the conductor
Main Earthing Grid	50 mm x 6 mm GI strip.
Lightening Arrester of the 2 or 4 Pole Structure	50 mm x 6 mm GI strip.
2 or 4 Pole structure, Sub-Station equipment's, VCB and like other devices	50 mm x 6 mm GI strip.
Fence of the 2or 4 pole structure, transformer yard	25 mm x 3 mm GI strip.
Power Transformer Neutral	50 mm x 6 mm GI strip.
Power Transformer Body	40 mm x 5 mm GI strip.
Fire Water Pump House	25 mm x 3 mm GI strip.
Building or Structure Columns	50 mm X 6 mm GI Strip.
Storage Tanks	50 mm X 6 mm GI Strip.
Push Button Stations	No. 8 SWG Solid GI Wire.
Street Light Poles	10 mm (3 or 8") GI Wire Rope.
Small Equipment and Instruments	No. 8 SWG Solid GI Wire.
Bonding of Pipes	25 mm square copper strip / braided flexible cable.
Motors up to 3.7 Kw	No. 8 SWG Solid GI Wire.
Motors above 3.7 Kw up to 30Kw	10 mm (3 or 8") GI Wire Rope.
Static Earth at Tanker, Wagon loading or Unloading gantry	50 mm x 6 mm GI strip..
Flexible cable for Static Earth	10 Sq mm Copper flexible cables with lugs at one end and crocodile clip at other end.

- (b) **Facility or equipment wise recommended minimum Nos. of earth pits or connections which should be bonded in main earthing grid.**

The minimum requirement of earth pits and additional earth pits shall be made as per paragraph 2.12.8 of Part B of this Schedule.

This is minimum requirement and additional earth pits shall be made such as to maintain Grid Values below 1 ohm.

13.3.15.11 Electrical safety for laboratories:

- (a) **Hazardous are classification within laboratory building, which should be carried out in line with IS: 5572. Accordingly, the electrical equipment or fittings should be selected in line with IS:5571.**
- (b) **Following aspects should be considered for electrical equipment or fittings in the laboratory, namely:-**
- (i) Layout of electrical switch room shall have spacing as per Indian electricity rules.
 - (ii) Plugs, having multiple outlets, should not be used. Industrial type closed or tight metal clad fittings for plug and socket assembly should be used.
 - (iii) ELCB or MCB shall be installed in the main power switchboard.

13.3.15.12 General:

- (a) **Fail safe Interlock or change over switch shall be provided between the normal supply and the DG power to ensure that the equipment get supply from one source only.**
- (b) **Insulation mats shall be provided in the Sub -Station, control panels and like other places.**
- (c) **Relays or Cables insulation shall be tested once in a year and records maintained.**
- (d) **Transformer oil shall be tested once in a year and record maintained in this regard. Transformer Oil filtration should be done based on test results as and when required.**
- (e) **Variable Frequency Drives (VFDs): In case VFDs are used for motors the motors, should be inverter grade or equivalent as VFDs require Insulation class F motor and additional cooling of winding or bearings at lower RPM.**

13.3.16 Plant Lighting:

- (a) **Sufficient lighting shall be provided so as to enable Plant operators to move safely within the accessible areas of installation and to perform routine operations. In the event of normal power failure, emergency lighting shall be provided in critical areas.**
- (b) **Normal lighting system shall be on 415 or 240V AC supply, whereas critical emergency lighting will be DC based in critical areas like Sub-Station, D. G. Room, Control Room and Security cabins.**

- (c) **Under normal operation, both emergency and normal lighting should be fed by normal power source. On failure of normal supply, emergency lighting should be transferred to emergency source until the start of D.G. set within 15 seconds.**
- (d) **Critical Emergency lighting (D.C. supply based) shall be normally kept 'ON'. during power failure, battery bank shall be used to provide power.**
- (e) **Lighting shall be provided for the various facilities in the Lube manufacturing and filling plants. The illumination levels in different areas should be as per good engineering practice.**
- (f) **The Illumination in the operational areas including inside the dyke and manifold shall be such that adequate visibility is there at all times for emergency and normal operations.**
- (g) **Lighting requirements provided during the failure of power supply is intended broadly to-**
 - (i) facilitate carrying out of specified operations, for safe shutdown of the installation.
 - (ii) gain access and permit ready identification of firefighting facilities such as fire water pumps, fire alarm stations and like other devices .
 - (iii) to gain access to escape route for safe evacuation of operating personnel.
- (h) **Depending on the nature of job activities carried out, the minimum illumination levels for various areas be ensured for safe movement or operations or emergency handling as per clause(10) of paragraph 2.13 of Part B of this Schedule. Following shall also be ensured, namely: -**
 - (i) Low pressure sodium vapour lamps shall not be installed in hazardous areas.
 - (ii) The lighting fixtures on various circuits shall be suitably designed so that failures of any one circuit do not result in complete darkness.
 - (iii) Switches controlling the lighting fixtures and exhaust fan shall be installed outside the battery room.
 - (iv) Switches of lighting panels installed in hazardous area, shall have a pole to break the neutral, in addition to the poles for phases.
 - (v) Minimum One number calibrated lux meter shall be kept in the location.

(i) Emergency lighting panel:

- (i) Emergency lighting panel shall have provision of power input both from normal supply and DG supply independently with a provision of failsafe interlock. In the event of failure of normal supply or emergency or maintenance, emergency panel shall be receiving alternate supply from DG set. Emergency lighting panel shall host the equipment specified in the succeeding clause(ii)
- (ii) Jockey Pump, Critical lighting (one or two high mast, minimum lighting for fire pump house, security room, control room, administrative building, operating facilities and like other devices), Fire Siren, Electrical pumps for fire water replenishment, Gate Barrier, safety instrumentation and interlocks such as CCTV, smoke or heat detectors, Dyke drain valve system, UPS of automation and supply to essential firefighting equipment.

13.3.17 Air Turbo Ventilation System in Lube Manufacturing And Filling Plants:

- 13.3.17.1 *The ventilation not only provides pleasant, healthy working atmosphere in workplaces but also maintains hygienic condition. In emergency like fire, it also extracts smokes or fumes which enables easy escape of personnel working there and fire fighters to reach the fire site. Construction material should be weatherproof.*
- 13.3.17.2 *Thus, effective ventilation is desirable for 7 x 24 hrs at lube blending blocks, laboratory, boiler house, workshop and other working places, wherever required. Design of ventilation system shall be such that it provides single pass once –through type and considered with about 10-12 changes of whole air per hr.*
- 13.3.17.3 *Air turbo ventilation system is preferable as this ventilation works on natural wind energy without any electricity or generator. It can be installed on roof or slopes on sheds.*
- 13.3.17.4 *Salient features of the ventilation system should be -*
- (a) **7 x 24 hrs. availability.**
 - (b) **Noiseless operation.**
 - (c) **Cost effective.**
 - (d) **Capable of extracting heat, humidity, smoke, fumes , dust and like other requirements.**
 - (e) **Maintains hygienic condition.**
- 13.3.17.5 *Flooring:*
- (a) **Flooring of blocks shall be non-skid type and having proper slope for necessary drainage.**
 - (b) **Any level difference on floor in account of operational requirement or equipment layout should be clearly demarcated so as to ensure safe movement of persons.**
- 13.3.17.6 *Stairs And Platforms:*
- (a) **All platforms or stairs shall be of non-skid type surface preferably made of gratings.**
 - (b) **Toe guards and suitable railing shall be provided all around the elevated platform.**
 - (c) **Alternate access or emergency escape shall be considered for each elevated platform.**

13.3.17.7 Ladders:

(A) Material construction of ladder

Metal ladder may be either of steel complying with IS 1977 or of Aluminium alloy complying with the suitable grade of IS 617. Wooden ladder or rope ladder should not be used except usages around electrical equipment or circuits of any kind where there is a possibility of coming in contact with the current. Wooden ladders should be either of timber or of bamboo.

(B) General requirements:

- (i) All ladders shall be constructed to carry their intended loads safely.
- (ii) Side rails of metal ladders should be of sufficient cross-section to prevent excessive deflection in use.
- (iii) Ladders which are to remain as a part of the permanent structure should conform to any local, state or municipal bye laws which may be applicable.
- (iv) Top and bottom of each built up ladder should be securely fastened.
- (v) All surfaces of the ladder should be planed, free of splinters and edge of handrails used should be beveled.
- (vi) Rung spacing should be uniform and not over 300 mm on centers. Rungs should be recessed at least 12 mm into rails.
- (vii) Safety shoes, lashing or other effective means shall be used to avoid danger of slipping

13.3.17.8 *Stacking of Drums or Packed Products:*

- (a) **Stacking of drums or packed lubes should be on racks or pallets or reapers and above the grade levels.**
- (b) **Stacking should be max in 4 rows, 5 tier height and 25 m length. A minimum access path should be provided which should be minimum of forklift turning radius plus 0.5 m between two groups of stacks.**
- (c) **Light fittings on the ceiling should be fixed in between two stack lines. Suitable cage type protection should be provided so as to avoid external damage.**
- (d) **The drum or packed storage space should be properly marked or painted on the flooring.**

13.3.17.9 *Boiler:*

- (a) **The steam boilers intended for use in lube manufacturing and filling plants shall be governed by the regulation of Indian Boilers Act, 1923 and latest amended Rules.**
- (b) **The design and drawings of the boiler or boiler component, as the case may be, and the materials, mountings and fittings used in the repair of such boiler or boiler component shall conform to the applicable regulations.**

13.3.17.10 *Steam Trap:*

- (a) **Suitable steam traps shall be provided at outlet of steam lines.**

13.3.17.11 *Thermal or Steam Insulation:*

Thermal energy inputs could be reduced through the proper insulation of the blending kettles, steam lines, tanks (deemed fit), equipment and like other devices to prevent heat losses. Effective insulation protects the personnel from burn injury, thus insulation always to be maintained in healthy condition.

13.3.17.12 *Compressor:*

Compressed air:

- (a) The quality of instrument air shall conform to the requirements as recommended by the manufacturers of instruments or equipment.
- (b) If one compressor is envisaged to run normally, another standby compressor of 100% capacity shall be provided. When more than one compressor running is envisaged, 50% standby capacity shall be provided.

13.3.17.13 *Service Water for Plant Operations:*

- (a) Service water is required for the plant operations such as, Boiler use, cooling tower, compressor cooling and in hose stations for washing and like other activities, water may be provided at a pressure of about 3 Kg/sq.cm. g. If one pump is envisaged to run normally, another pump with 100% capacity shall be provided as a standby. Where more than one pump running is envisaged, 50% capacity as standby shall be provided.
- (b) Water Quality should be of potable quality conforming to IS: 10500 - Specification for Drinking Water.

13.3.17.14 *Cooling Tower:*

- (a) Cooling Tower should be located on the downwind side of the Plant, control room and administrative buildings. Product Pipe rack or track should be located minimum 6m from cooling tower to avoid corrosion due to drift. Suitable dosing system should be provided for corrosion, scale and micro-biological control.

13.3.17.15 *Induction Sealing System:*

The container sealing shall have auto cut-off in case of no or slow movement of containers. It shall also enable auto cut-off in case of no containers.

- 13.3.17.16 *Storage Space for Empty Packages, Packed Additives, and Packed Finished Product:*
The storage area should be designed for supporting adequate inventories for peak production capacity to ensure safe storage, handling and smooth operation.
- 13.3.17.17 *SRV for Vessels or Kettles in Conformity to ASME Section VIII Div. 1:*
Pressure vessels or kettles with internal coils or limpet coils or jackets shall have SRVs, set at 110% of the maximum operating or working pressure.
- 13.3.17.18 *Pressure Regulation for Low Pressure Steam:*
Pressure reducing station should be provided, as applicable, for ensuring supply of low pressure (LP) steam.
- 13.3.17.19 *Transfer or Filling Hoses:*
Special type hoses should be used for transfer or filling operations to ensure spill free operations in lube manufacturing and filling plant. Hoses intended to be used for special products or chemicals or liquids in a lube manufacturing and filling plant should be selected in conformity to the type or pressure rating required to serve the intended purpose.
- 13.3.17.20 *Auto Cut-Off Facility:*
Lube filling machines preferably should have automatic features like auto filling, auto cutoff, auto pick up and like other features.

13.4 Safe Operating and Handling Practices in Lube Manufacturing and Filling Plant Operations:

13.4.1 General:

- (a) **This section deals with the safe operating practices and provisions applying to loading, unloading and storage of bulk Petroleum Products at installations. There should be strict compliance with respect to selection, deployment of proper skilled manpower for effective operation and maintenance.**
- (b) **Plant process control room wherever provided shall be manned on continuous basis during operations and in emergency.**
- (c) **Site specific Standard Operating Procedures (SOPs) shall be developed.**
- (d) **These must be made with the involvement of users and approved by the competent authority. Such procedures shall be periodically reviewed, updated and records maintained in this regard especially whenever any changes or modifications to the facilities are made as per Management of Change (MOC) procedure.**
- (e) **The critical operating steps based on "SOPs" shall be displayed on the board near the location where applicable.**
- (f) **POV shall be in fail safe mode (that is to say, with loss of pressure, the valve shall shut off). After end of operations, all operating valves shall be in closed position.**
- (g) **VHF or UHF handsets of appropriate type shall be provided to all operating personnel working in critical areas.**
- (h) **Check list for operators for checking safety system and equipment shall be prepared and check records kept in safe custody.**
- (i) **All operations shall be carried out under supervision of a responsible officer. Only in serious exigencies, permission can be granted by authorized personnel subject to obtaining a reliever forthwith. The person leaving site shall only be allowed on a valid authorization issued by the immediate officer and records maintained.**

- (j) The pipeline transfer should preferably be commenced during day light. Due to urgency if operation requires to be carried out or extended in night time, the same to be carried out under supervision of adequately trained and experienced staff.
- (k) Manning level in the shift shall be adequate to ensure coverage for normal and emergency operations.
- (l) Suitable interlocks shall be provided for tripping or alarm of MOV operation based on the events that is to say , low level, high level, high high level, high pressure, low pressure and like other events.
- (m) The contents of the dyke drain generated from draining of tanks, any other spillage or effluent containing oil, shall be diverted to Oil Water separator (OWS) or Effluent Treatment Plant (ETP) for safe disposal.
- (n) Personnel protective equipment such as safety shoes, hand gloves, apron, safety goggles, safety belt, helmet, earmuff, dust respirator, self-contained breathing apparatus (SCBA), fire proximity suit, resuscitator and like other equipments as applicable shall be worn while carrying out operations in normal and emergency situations.

13.4.2 Bulk Handling for Movement By Road:

- (a) Transportation of petroleum products by road is regulated by the Motor Vehicle Act, 1988.
- (b) Containers and tank trucks should be fabricated in accordance with applicable statutory requirement.
- (c) All TTs to be fitted with Antilock Braking System (ABS) as per RTO regulations.

13.4.3 Safety Precautions During Tank Vehicle Loading Or Unloading In Bulk:

Following precaution shall be taken due to associated hazards during transfer of Petroleum products to or from a tank truck, namely:-

- (a) Open source of ignition shall not be allowed in the area where product transfer operations are carried out.
- (b) Similarly, minimum 3% vapour space shall be kept in containers and 2% vapour space in tank trucks in respect of petroleum Class C or excluded product.
- (c) Fire extinguishers shall be placed near the tank trucks during operations in a designated marked place.
- (d) The Double pole master switch shall be put off immediately after parking the truck in position. No electrical switch on the truck shall be turned "on" or "off" during the transfer operation.
- (e) The first operation after positioning the truck shall be providing wedge or stopper and earthing. They shall be removed or disconnected just before the release of the truck.
- (f) Hoses shall be handled with care and inspected periodically.
- (g) No repairs shall be made on the truck while it is in the loading or unloading area.
- (h) Personnel shall wear applicable Personal Protective equipment.
- (i) Filling or transfer operations shall be suspended immediately in the event of –

- (i) Uncontrolled leakage occurring;
- (ii) A fire occurring in the vicinity; and
- (iii) Lightning and thunder storm.

13.4.4 Safe Procedures During Operation:

13.4.4.1 Loading operations:

- (a) **Check for following in a tank truck as per statutory regulations before accepting it for filling, namely:-**
 - (i) Provision of PV vent, emergency vent, Master valve and other safety fittings.
 - (ii) Fire screen between cabin and tank is provided. For this purpose, cabins with metallic back cover without any opening will be considered as fire screen.
 - (iii) Provision of 2 nos. of Fire Extinguishers of ISI mark (1 no. of 9 kg DCP and 1 no. of 1 kg CO2 or DCP or equivalent approved fire extinguisher).
 - (iv) Spark arrestors should be properly bolted or welded on the exhaust.
 - (v) No leakage in exhaust silencer pipe.
 - (vi) Availability of valid RTO certificate.
 - (vii) Availability of brazed copper strip for Earthing or bonding connection.
- (b) **Drive the truck at stipulated speed to the loading bay.**
- (c) **Place the truck on loading bay and place wheel wedge or stopper or chokes at front and rear wheels. Keep the truck in neutral mode with hand brakes "ON".**
- (d) **Stop the engine and switch off all electrical equipment.**
- (e) **All persons should leave the driver's cabin.**
- (f) **Provide earthing connections of the vehicle at specified point to the fixed grounding system.**
- (g) **Start the loading operations.**
- (h) **The quantity loaded into the truck can be assessed by –**
 - (i) Liquid level through manual dipping; and
 - (ii) Filling through Flow meter.

13.4.4.2 Unloading operations:

- (a) **Operations described under clause 6.4(A) should be selectively carried out.**
- (b) **Test the connections for leaks.**
- (c) **Start the unloading operations.**
- (d) **Before realizing the trucks ensure that valves are closed or ends are capped.**
- (e) **An authorized person of the company shall supervise the transfer operation and respond immediately in the event of an emergency.**
- (f) **Checklist for bulk or packed lube or additive trucks at loading or unloading locations is given at Annexure-1 to this Part.**

13.4.5 Handling of Sick Bulk Truck or Tank Wagon:

- 13.4.5.1 *When a truck or wagon is found leaking during or after loading, provision should be kept for unloading the content safely. A drain header should be provided to drain out the content to an underground tank or sump from where it can be pumped out to storage tank or to the loading header. Alternatively, in case, mobile pump is used for unloading sick truck, suitable type electrical motor and power connection should be provided.*

13.4.6 Pipeline Transfer Operations:

- 13.4.6.1 *Pipeline transfer of product is carried out for receipt or delivery of products to the plant from refinery or jetty pipeline within the same company or between the oil companies.*
- 13.4.6.2 *Wherever pipeline transfer is envisaged between various companies, a mass flow meter with integrator shall be installed on receipt line at both ends that is to say dispatch and receipt ends. Signal should be provided in the control rooms of both dispatching and receiving companies or plants for monitoring delivered quantity.*
- 13.4.6.3 *The following safe practices shall be followed, namely:-*
- (a) **Gauging procedure shall be completed, and line shall be made through.**
 - (b) **Physical inspection shall be carried out up to the exchange manifold for any leakage or damage and like other losses.**
 - (c) **Line up shall be started from the exchange pit end.**
 - (d) **Seal the pressure relief lines of receipt nozzles of product tanks connected to the same common receipt header.**
 - (e) **After ensuring that there are no leaks, pumping should be commenced.**
 - (f) **Pumping shall be commenced initially at low flow rate and only after stabilizing of flow, the flow rate may be increased.**
 - (g) **Product shall not be pumped beyond safe filling height of the tank.**
 - (h) **After completion of the receipt, pumps must be stopped.**
 - (i) **In case of Emergency Shutdown, care shall be taken so that back pressure is not developed in the pipelines and pump head.**
 - (j) **Sampling shall be carried out as per provisions of Industry Quality Control Manual (IQCM).**
 - (k) **Pipeline transfer (PLT) shall not be taken simultaneously in more than one tank.**
 - (l) **In case product is required to be taken into more than one tank, tank should be switched over after completion of operation in first tank, close all valves to the first tank, make line through for the second tank as per procedure. For flying switch over from one tank to another, a written down procedure to be in place and followed.**

13.4.7 Safety Precautions in Tank Farm Area Operations:

- (a) **At the end of day operations, 100% closure of all the operating valves must be ensured and they shall not be left in partial open condition.**
- (b) **All electrical fittings shall be maintained to ensure its integrity and type of protection.**
- (c) **The tank farm shall be kept clean and free from vegetation.**
- (d) **Tanks and tank aprons shall be periodically checked for damage, leakages, sweating and repairs.**
- (e) **Proper earthing and bonding shall be maintained for storage tanks and across the flange joints.**
- (f) **Dyke drain valve shall be positioned outside of dyke and kept normally in closed condition and shall be operated only under supervision of authorized person and log book maintained.**
- (g) **Isolation Valves on expansion lines or TSV vent lines shall be always kept open except under requirement during location specific operations to take care thermal expansion.**
- (h) **No gauging or sampling of tanks should be undertaken during thunder or hailstorms.**
- (i) **Flow velocity at tank inlet should not exceed 1 m/s until the inlet is completely submerged.**
- (j) **Safety shoes (Conductive type) shall be worn while gauging, sampling or taking temperatures.**

- (k) Ensure that gauge tapes with earthing provision are used for gauging.
- (l) Tank dip pipes shall be extending to tank bottom. If dip pipes are not provided, give a relaxation time of 30 minutes before sampling or gauging.
- (m) Synthetic fiber cord shall not be used for sampling, dipping, gauging and like other process. If the sampling, gauging, dipping, and like other process equipment is a conductor, the cord must be conductive, that is to say a metal wire. Metal chains should not be used instead.
- (n) Natural fibers such as sisal and manila have sufficient conductivity to prevent the operator from becoming charged by handling it, hence can also be used.
- (o) In case of large tank farms effective communication is essential. Apart from VHF, Pagers with loud hooters should be provided on roadside at various locations. This can also be utilized for communication during emergency like fire.
- (p) While cleaning the tanks, care should be taken to avoid generation of static electricity. Cleaning of tanks by gas oil spray shall not be permitted. Cleaning of tanks by steaming shall be permitted for Class C or excluded products, but not permitted for class-B products. Water washing is preferred.
- (q) If the tank has internal heating coils, steam to the coils should not be charged until the coils are fully submerged and condensate from these coils must be monitored for Oil content.
- (r) Side entry mixtures should be operated only when liquid level is above the blades.

13.4.8 Safety Instruction Regarding usage of Portable Ladders:

- (a) Before use, all ladders shall be tested for load test. For load test, a test load of 1.5 times the mass of worker plus the mass of 16 bricks shall be hung from each rung. The rung and ladder should not show any distress or noticeable bending. The lower rungs may be tested by reversing the ladder. Unless otherwise specified, the mass of worker should be taken as 68 kgs. Load testing shall be done when ladders are brought to the construction site and when damage to ladders is anticipated or observed on visual inspection.
- (b) No ladder having a missing or defective rung shall be used. Defective ladders shall be promptly and properly repaired or replaced.
- (c) Ladders leading to landing shall extend at least one metre above the landing and shall be secured at the upper end.
- (d) To prevent slipping, a ladder shall be secured at the bottom end, otherwise, a person shall be stationed at the base wherever it is used.
- (e) The pitch at which a lean-to-ladder is used shall be such that the horizontal distance of its foot from the vertical plane of its top shall be not more than one quarter of its length.
- (f) If the surface of the floor on which the ladder rests is smooth or sloping, the ladder shall be provided with non-slip bases.
- (g) If the use of ladder is essential during strong winds, it shall be securely latched in position.
- (h) No ladder shall be placed or leant against window panes, sashes or such other unsafe or yielding objects, nor placed in front of doors opening towards it. If set up in driveways, passage ways or public walkways, it shall be protected by suitable barricades.
- (i) When ascending or descending, the user shall face the ladder, use both his hands and place his feet near the ends of the rungs rather than near middle.
- (j) It is dangerous to lean more than 300 mm to side in order to reach a larger area from a single setting of the ladder. Instead, the user should get down and shift the ladder to the required position.
- (k) Metal ladders shall not be used around the electrical equipment or circuits of any kind where there is a possibility of coming in contact with the current. Metal ladders shall be marked with signs reading "CAUTION: DO NOT USE NEAR ELECTRICAL EQUIPMENT"

13.4.9 Precautions for Boiler Operations:

- 13.4.9.1 *Before starting the fires in a boiler, the attendant should-*
- (a) **check that there is sufficient water in the boiler, and that the gauge cocks are working freely;**
 - (b)
 - (c) **ease safety valves, or open cock on top of boiler to allow air to escape;**
 - (d) **check that the blow-off cock is fully closed and tight;**
 - (e) **check that the safety valves and feed check valve are free and workable;**
 - (f) **check that water is not leaking from any part of the boiler; and**
 - (g) **check that the feed pump is in working order.**
- 13.4.9.2 *Keep the gauge cocks perfectly tight and clean blowing through the test cocks frequently.*
- 13.4.9.3 *Pressure gauge should have a plain mark on it showing the highest pressure allowed for the boiler, and the dial should be kept clean so that the figures may easily be read.*
- 13.4.9.4 *Safety valve should be moved by hand every day so as to prevent them from sticking. It should never be opened by a sudden knock or pull. Safety valves must never be overloaded, and spring valves should have ferrules or other provisions against the valves being screwed down too far.*
- 13.4.9.5 *Steam pressure: Ordinarily the safety valve will prevent steam from raising much above the working pressure, but if the steam gauge shows so rapid an increase of pressure as to indicate danger of exceeding the highest limit, water should be immediately fed into the boiler and the dampers partially closed in order to diminish the effect of the fire. If, however, the water has fallen so low that there is danger of an accident from this cause, the fires should be withdrawn before feeding in water, the safety valves eased and if the engine is at rest, it should be started so as to reduce the pressure.*
- 13.4.9.6 *The Blow-off Cock: The blow-off should be used daily if the water is at all dirty or sedimentary, especially with Locomotive type and Vertical Boilers, as their narrow water spaces are liable to get choked with mud, which soon hardens into a solid mass. The amount of water to be blown out depends on the size of the boiler and can be determined only from experience. When blowing out, the best result is obtained if the water has been at rest for some time (say before the engine is started) thus giving the sediment time to settle. If the feed water is clean merely turn the cock round.*
- 13.4.9.7 *Re-ignition boiler: Before re-ignition of boiler, sufficient degassing should be done as per SOP to ensure nil hydrocarbon vapour presence.*

13.4.10 Forklift Operations:

- (a) **Load bearing test for the forklifts shall be done at a frequency in line with requirement of concerned Government Inspector of Factories and record maintained.**
- (b) **Vision test or eye test for the forklift operators shall be done at a frequency in line with requirement of concerned Government Inspector of Factories and record shall maintained in this regard.**
- (c) **Neither forklift nor the operator shall be engaged, if above statutory requirements are expired.**

13.4.11 Weigh Bridge:

- (a) **Calibration of Weigh Bridge shall be carried out as per concerned State Government Legal Metrology requirement.**
- (b) **Required quantity of weight should be kept at site as per requirement of Legal Metrology.**

13.5 Fire Protection and Prevention Facilities:

13.5.1 Fire Protection :

Depending on the nature of risk, required fire protection facilities shall be provided from the following, namely:-

- (a) **Fire Water System - (storage, pumps, distribution piping network with hydrant, monitors, elevated monitors).**
- (b) **First Aid Fire Fighting Equipment.**
- (c) **Trolley mounted Fire Fighting Equipment.**
- (d) **Carbon Dioxide System.**
- (e) **Dry Chemical Extinguishing System.**
- (f) **Clean Agent Protection System.**
- (g) **Detection and alarm systems.**
- (h) **Communication System.**

13.5.2 Design Criteria For Fire Protection System:

- 13.5.2.1 *Facilities shall be designed on the basis that city fire water supply is not available close to the installation.*
- 13.5.2.2 *The hydrant system shall be kept pressurized @ 7 kg/sq.cm by jockey pumps. The fire water pumps shall be provided with auto start facility with pressure drop in fire water network.*
- 13.5.2.3 *For lube manufacturing and filling plant storing mainly Class C or excluded products, the water requirement shall be based on 1 monitor of 144 kl/hr and 4 hose streams of 36 kl/hr that is to say, a total of 288 kl per hr for four hrs.*
- 13.5.2.4 *If Class –A or Class B products are stored in above ground tanks in the lube manufacturing and filling plants, applicable fire protection system in line with PNGRB T4S Petroleum installation regulation shall be provided. Class –A and or Class B storage tanks should be in separate dyke. If stored in common dyke with class –C or excluded storage in above ground tanks, the applicable fixed type spray system shall also be provided on all tanks as applicable in PNGRB T4S Petroleum installation regulation. However, this paragraph should not be applicable in case the class A, Class B or Class C product is stored in UG tanks. In such cases, fire protection facility as per Petroleum Rules shall be applicable.*
- 13.5.2.5 *The operating or hazardous areas shall be protected by a well laid combination of hydrants and monitors. The following plants are exempted from this provision, namely: -*
 - (a) **The plants having aggregate above ground storage capacity of less than 1500 KL, irrespective of class.**
 - (b) **Plants storing products in UG tanks, irrespective of class.**

- 13.5.2.6 Installations where inter distances between tanks (class C and above) in a dyke or within dykes are not conforming to the extant provisions of the standard, additional remedial measures (if any) need to be taken based on QRA report and recommendations.
- 13.5.2.7 The empty package storage area within blocks which stores flammable materials such as cans or small containers or cartons or labels or pails or buckets or HDPE barrels and like other storages, shall be covered by manually operated medium velocity fixed type spray system with application @ 10 lpm / sq.m area. Isolation valves on fixed type spray riser lines shall be provided at sufficient distance from the hazard that is to say, 15 m (minimum), preferably outside of shed. Alternate isolation valves should be considered from opposite side. However, for existing plants or plants under construction, in case it is not practically feasible to provide the fixed spray system due to space constraints or structural stability of the sheds, the double hydrant points should be provided outside the shed at nearest location of the empty package storage area so that any exigency can be mitigated.
- 13.5.2.8 The storage area should be divided in zones with maximum 150 sq.m size. For the purpose of fire water calculation 3 zones shall be considered at a time, the affected zone and adjacent two zones. For optimization of water consumption, the area may be divided into suitable sized zones. The total area of 3 zones shall be limited to 450 sq.m. In case area exceeds the above stipulation, the same shall have separation distance of minimum 3 m between two storage areas.
- 13.5.2.9 The smoke or heat detectors shall be installed overhead near carton storage area, process control room, warehouse and laboratory. These smoke or heat detectors, in the event of smoke or heat shall annunciate visual indication and audio alarm in the process control room at field and repeater panel in fire control room for action thereon.
- 13.5.2.10 Lube (bulk or packed) truck loading or unloading gantries or facilities, tank farm area (including product pump station and manifold area) shall be fully covered with alternate hydrant and water cum foam monitors having nozzle with jet, spray and fog arrangement and located at a spacing of 30 m at least at two sides of the facility.
- 13.5.2.11 Hydrant facility should not be laid inside the process blocks for example the blending process blocks. However, hydrant system should be laid all around the process blocks.
- 13.5.2.12 The hydrants and monitors shall be located at a minimum distance of 15 m from the hazard to be protected.
- 13.5.2.13 Portable monitors or foam hose streams shall be provided for fighting fires in dyke area and other plant area.
- 13.5.2.14 At least two Nos. trolley mounted water cum foam monitor of capacity 2400 lpm each shall be provided at lube manufacturing and filling plant.

13.5.3 Fire Water System Design:

- 13.5.3.1 Water is used for fire extinguishments, fire control, and exposure protection of equipment, foam application and personnel from heat radiation.
- 13.5.3.2 Header Pressure: Fire water system shall be designed for a minimum residual pressure of 7 kg/cm² (g) at hydraulically remotest point in the installation considering the design flow rate and -
- a fire water ring main shall be provided all around perimeter of the plant facilities with hydrants or monitors spaced at intervals not exceeding 30 m when measured aerially. Fire hydrants and monitors shall not be installed within 15 metre from the facilities or equipment to be protected.
 - the water replenishment arrangement either from bore well or natural or artificial reservoir should be at least 12.5 % of per hour design flow rate. Availability of fire water from above source should be 7 x 24 Hrs.
 - the installation shall have facilities for receiving fire water from external source in emergency and diverting them to the fire water storage tanks.

13.5.4 Fire Water Design Flow Rate:

13.5.4.1 *The design flow rate shall be any one of the maximum requirements of the following cases for four (4) hrs, namely:-*

- (a) **For lube manufacturing and filling plant storing exclusively Class C or excluded products, the water requirement shall be based on 1 monitor of 144 kl / hr and 4 hose streams of 36 kl/hr that is to say, a total of 288 kl per hr.**
- (b) **For Class-A or Class - B petroleum, if stored in the same plant, the water requirement should be based on requirement as stipulated in PNGRB T4S Regulation for Petroleum Installation, whether the fixed fire protection facilities are provided or not. Storage of class A or class -B product in non-bulk category shall comply Petroleum Rules.**
- (c) **Water requirement corresponding to 2 nos. of 2400 lpm water cum foam monitor.**
- (d) **The water requirement for fixed type water spray system (affected zone and adjacent zones).**

13.5.4.2 *Design flow rate shall be the maximum among as provided in preceding clauses (a), (b), (c) and (d) above.*

13.5.5 Fire Water Storage:

- (a) **Water for the firefighting shall be stored in easily accessible surface or underground or above ground tanks of steel or concrete.**
- (b) **The effective capacity of the reservoir or tank above the level of suction point shall be minimum 4 hours aggregate rated capacity of pumps.**
- (c) **Fresh water should be used for firefighting purposes. In case sea water or treated effluent water is used for firefighting purposes, the material of the pipe selected shall be suitable for the service.**
- (d) **Storage shall be in two equal interconnected compartments to facilitate cleaning and repairs. In case of steel tanks, there shall be minimum two tanks and all the tanks shall be of equal height or depth to prevent any migration or overflow due to difference in height or depth. During maintenance of water tanks, availability of at least 50% of the water capacity shall be ensured.**
- (e) **Large natural reservoirs having water capacity exceeding 10 times the aggregate fire water requirement can be left unlined.**
- (f)

13.5.6 Fire Water Pumps:

- (a) **Fire water pumps having flooded suction shall be installed to meet the design fire water flow rate and head. If fire water is stored in underground tanks, an overhead water tank of sufficient capacity shall be provided for flooded suction and accounting for leakages in the network, if any. Pumps shall be provided with suitable sized strainers on suction and NRVs on discharge lines. Isolation valve one each shall be installed on upstream of suction strainer and downstream of NRV on discharge line respectively.**
- (b) **The pumps shall be capable of discharging 150% of its rated discharge at a minimum of 65% of the rated head. The Shut-off head shall not exceed 120% of rated head for horizontal centrifugal pumps and 140% for vertical turbine pump.**
- (c) **At least one standby fire water pump shall be provided up to 2 nos. of main pumps. For main pumps 3 nos. and above, minimum 2 nos. standby pumps of the same type, capacity and head as the main pumps shall be provided. Fire water pumps shall be of equal capacity and head.**
- (d) **The fire water pumps including the standby pumps shall be of diesel engine driven type. Where electric supply is reliable, 50% of the pumps can be electric driven. The diesel engines shall be quick starting type with the help of push buttons located on or near the pumps or located at a remote location. Each engine shall have an independent fuel tank adequately sized for 6 hours continuous running of the pump. Fuel tank should be installed outside of fire pump house and shall have provision for venting. If tanks are installed inside the pump house, a safe distance from engine (3 m) to be maintained and the vent shall have provision for venting outside the pump**

house. Installation of fuel tank shall be such that tank bottom is at least 200 mm above the suction valve of the fuel injection pump or as specified by OEM.

- (e) Fire water pumps and storage shall be located away from the potential hazards and shall be at least 30 m (minimum) from periphery of hazards, equipment or where hydrocarbons are handled or stored.
- (f) Fire water pumps shall be exclusively used for firefighting purpose only.
- (g) Suction and discharge valves of fire water pumps shall be kept full open all the times.
- (h) Jockey pump shall be provided for keeping the hydrant system or line pressurized at all times. The capacity of the pump shall be sufficient to maintain system pressure in the event of leakages from valves and like other devices. Capacity of the jockey pump shall be 3% minimum and 5 % max of the designed fire water rate. Besides the main jockey pump the stand by pump of same capacity and type shall be provided.
- (i) Auto cut-in and cut-off facility should be provided for jockey pumps to maintain the line pressure.
- (j) The fire water pumps shall be provided with auto start facility which shall function with pressure drop in hydrant line and specified logic even if initial pump does not start or having started, fails to build up the required pressure in the fire water ring main system, the next pump shall start and so on. The detail operation of fire water pumps shall be as follows, namely:-
 - (i) The main fire pumps shall start automatically in set sequence in response to a low-pressure condition in the hydrant system.
 - (ii) Stand by fire water pumps shall start automatically, if the main pumps do not start or fail to build up the required pressure within 20 seconds.
 - (iii) Provision shall be made for manual starting of each pump at the pump house and from control room also. However, manual stop of each pump unit shall be only at pump house.

13.5.7 Fire Hydrant Network:

13.5.7.1 *Looping: The fire water network shall be laid in closed loops as far as possible to ensure multi- directional flow in the system. Isolation valves shall be provided in the network to enable isolation of any section of the network without affecting the flow in the rest. The isolation valves shall be located normally near the loop junctions. Additional valves shall be provided in the segments where the length of the segment exceeds 300 m.*

13.5.7.2 *Fire hydrant ring main shall be laid above ground ensuring that-*

- (a) **the Pipeline shall be laid at a height of 300 mm to 400mm above finished ground level.**
- (b) **the pipe support shall have only point contact. The mains shall be supported at regular intervals,-**

- (i) for pipeline size less than 150 mm, support interval should not exceed 3 m.
- (ii) for pipeline size 150mm and above, support interval should not exceed 6 m or design approved.

13.5.7.3 *The system for above ground portion shall be analyzed for flexibility against thermal expansion and necessary expansion loops where called for shall be provided.*

13.5.7.4 *Fire hydrant ring main may be laid underground at the following places, namely:-*

- (a) **At road crossings.**
- (b) **Places where above ground piping is likely to cause obstruction to operation and vehicle movement.**
- (c) **Places where above ground piping is likely to get damaged mechanically.**
- (d) **Where frost conditions warrant, and ambient temperature is likely to fall below zero deg. Centigrade, underground piping should be provided at least 1 metre below the ground level. Alternatively, in such cases water circulation to be carried out for above ground pipelines.**

13.5.7.5 *Fire water ring main laid underground shall ensure the following, namely:-*

- (a) **Pipes made of composite material shall be laid underground**

- (b) The Ring main shall have at least one metre earth cushion in open ground, 1.5 m cushion under the road crossings and in case of crane movement area pipeline shall be protected with concrete or steel encasement as per design requirement and in case of rail crossing, provisions stipulated by Indian Railways shall be complied.
- (c) The Ring main shall be suitably protected against soil corrosion by suitable coating or wrapping with or without cathodic protection.
- (d) In case of poor soil conditions, it may be necessary to provide concrete or masonry supports under the pipeline.

13.5.7.6 *Size of hydrant pipeline shall be as specified below, namely:-*

- (a) The hydraulic analysis of network shall be done at the design time. Also, whenever fire water demand increases due to addition of facilities or extensive extension of network, fresh hydraulic analysis shall be carried out.
- (b) The velocity of water shall not exceed 5 metre per second in fire water ring main.
- (c) Fire water ring main shall be sized for 120% of the design water flow rate. Design flow rates shall be distributed at nodal points to give the most realistic way of water requirements in an emergency. It may be necessary to assume several combinations of flow requirement for design of network.
- (d) The stand post for hydrants and monitors shall be sized to meet the respective design water flow rates.

13.5.7.7 *General:*

- (a) Fire water mains shall not pass-through buildings or dyke areas. In case of underground mains, the isolation valves shall be located in RCC or brick masonry chamber of suitable size to facilitate operation during emergency and maintenance.
- (b) Associated fixed spray or foam riser or branch connections meant for storage tanks, if applicable, shall be taken directly to the outside of tank dyke and shall not pass through fire wall of any adjacent tanks.
- (c) The riser connections shall be taken directly from the mains and provided with separate isolation valve outside of dyke. Suitable strainer should be provided on fixed spray riser connection and shall be located outside of dyke.

13.5.8 Hydrant or Monitors:

- (a) Hydrants or monitors shall be located considering various fire scenario at different sections of the premises to be protected and to give most effective service.
- (b) At least one hydrant post shall be provided at every 30 m of external wall measurement or perimeter of battery limit in case of high hazard areas. For non-hazardous area, they shall be spaced at 45 m intervals. The horizontal range and coverage of hydrants with hose connections shall not be considered beyond 45 m.
- (c) Hydrants shall be located at a minimum distance of 15 m from the periphery of storage tank or equipment under protection. In case of buildings this distance shall not be less than 2 m and not more than 15 m from the face of building.
- (d) Provision of hydrants within the building shall be provided in accordance with IS: 3844.
- (e) Hydrant or Monitors shall be located along roadside berms for easy accessibility.
- (f) Fixed water or water cum foam monitors (if applicable) on the network shall be provided with independent isolation valves and Double headed hydrants with two separate landing valves. Hydrants or Monitors shall be located with branch connection.
- (g) Double headed hydrants and monitors on suitably sized stand post shall be used. All hydrant outlets or monitor isolation valves shall be situated at workable height of 1.2 metre above ground or hydrant or monitor operating platform level.
- (h) Monitors shall be located to direct water on the object as well as to provide water shield to firemen approaching a fire. The requirement of monitors shall be established based on hazards involved and layout considerations.
- (i) Hydrants and monitors shall not be installed inside the dyked areas. However, as an additional requirement, oscillating monitors shall be provided in inaccessible area within the dyke with isolation valve or ROV outside the tank farm (In cases inter distances between tanks in a dyke or within dykes are not meeting the requirements).

- (j) **Bulk and packed truck loading and unloading facilities shall be provided with alternate hydrant or water monitors to ensure adequate coverage and located at a spacing of 30 m at least at two sides of the facility.**
- (k) **The hydrants and monitors shall be located at a minimum distance of 15 m from the hazard to be protected.**

13.5.9 Material Specifications

The materials used in fire water system shall be of approved type as indicated below, namely: -

- (a) **Pipes: Carbon Steel as per IS: 3589 or IS: 1239 or IS: 1978 or Composite Material or its equivalent for freshwater service. In case saline, brackish or treated effluent water is used, the fire water ring main of steel pipes, internally cement mortar lines or glass reinforced epoxy coated or pipes made of material suitable for the quality of water able to withstand the temperature and pressure shall be used. Alternately, pipes made of composite materials shall be used. The composite material to be used may be as per API 15LR or API 15HR or IS: 12709. In case composite pipes are used they shall be used underground.**
- (b) **Isolation Valves: Gate valve or quick shut off type isolation valves made of Cast Steel having open or close indication should be used. Other materials such as cupronickel for saline or brackish water can be used. The material of the valve shall be suitable for the service.**
- (c) **Hydrants post:**
 - (i) Stand post - Carbon Steel
 - (ii) Outlet valves – Gunmetal or Aluminium or Stainless or Steel or Al-Zn Alloy
- (d) **Monitors or Water cum foam monitors:**
 - (i) Approved or listed by any of the international certifying agencies like UL, FM, VdS or LPC.
 - (ii) The electrical or hydraulic remote-control mechanism shall be in line with Hazardous Area Classification.
- (e) **Fire Hoses:**
 - (i) Reinforced Rubber Lined Hose as per IS 636 (Type A) or Non-percolating Synthetic Hose (Type B) or UL or Equivalent Standard.
- (f) **Painting:**
 - (i) Fire water mains, hydrant and monitor stand posts, risers of water spray system shall be painted with “Fire Red” paint as per of IS: 5.
 - (ii) Hose boxes, water monitors and hydrant outlets shall be painted with “Luminous Yellow” paint as per IS: 5.
 - (iii) Corrosion resistant paint shall be used in corrosion prone areas.

13.5.10 Process Control Room (Having Console Or Monitor, Rack, Ups, Battery And Computers) Protection:

13.5.10.1 Smoke or heat detectors shall be installed in the process control room with alarm facility in control room and repeater panel in fire control room.

13.5.10.2 Control room should be protected by portable type Clean Agent Fire Extinguishers in addition to portable CO2 fire extinguishers.

13.5.10.3 Clean agent shall conform to the NFPA-2001 (Latest edition).

13.5.11 First Aid Firefighting Equipment:

Portable Fire Extinguishers

- (a) All fire extinguishers shall conform to respective IS or UL or Equivalent codes, for example 1, 2,3,4,6 and 9 Kg DCP portable type (IS: 15683 or UL 299) and 2, 3, 4.5 and 6 Kg CO2 portable type (IS:15683 or UL 154) and 25, 50, or 75 Kg DCP trolley mounted type (IS: 10658 or UL 299) and bear ISI or UL mark. BIS or UL or Equivalent certificates of all extinguishers shall be maintained at the location.
- (b) While selecting the Extinguisher, due consideration should be given to the factors like flow rate, discharge time and throw in line with IS: 2190 or UL 711.
- (c) The Dry Chemical Powder used in extinguisher and carbon dioxide gas used as expelling agent shall be as per relevant IS or UL or Equivalent code.
- (d) While selecting the dry chemical powder, due consideration should be given to the typical properties viz. Apparent Density (0.65 ±0.05), Fire Rating (144B), Thermal Gravimetric Analysis (with decomposition at around 250°C) and foam compatibility.
- (e) Siliconised Potassium bicarbonate DCP powder (IS 4308:2003) or Mono-ammonium phosphate based DCP powder (IS: 14609) can also be used for recharging DCP fire extinguishers.
- (f) Spare CO2 cartridges and DCP refills as required based on their shelf life should be maintained. However, minimum 10% of the total charge in the extinguishers should be maintained at the location.
- (g) Portable fire extinguishers shall be located at convenient locations and are readily accessible and clearly visible at all times.
- (h) The sand buckets shall have round bottom with bottom handle having 9-litre water capacity conforming to IS: 2546. The sand stored in bucket shall be fine and free from oil, water or rubbish.
- (i) Suitable weather protection shall be provided wherever the fire extinguishers or sand buckets are positioned outdoor.
- (j) The maximum running distance to locate an extinguisher shall not exceed 15 m.
- (k) The extinguisher shall be installed in such a way that its top surface is not more than 1.5m above the floor or ground level.
- (l) The minimum deployment of portable firefighting equipment at Lube manufacturing and filling plants shall be as per paragraph 5.5 of Part E of this Schedule.
- (m) Wheeled Fire Fighting Equipment inclusive of quantity specified elsewhere in these regulations shall be provided as under, namely: -
- (n)
- (o)

S. No	Type of equipment	Minimum Quantity
1	2400 lpm water cum foam monitor	Two.
2	250 litre foam compound trolley	Two.
3	75 kgs DCP	Three.
4	25 Kgs DCP	As per requirement of these regulations

13.5.12 Hoses, Nozzles And Accessories:

13.5.12.1 Hoses:

- (a) Reinforced rubber lined canvas or non-percolating synthetic fire hoses conforming to IS- 636 or UL 19 (Type A or Type B) should be provided.
- (b) The length and diameter of the hoses should be 15 m and 63 mm respectively fitted with instantaneous type male and female couplings of material as specified in IS 636 or UL 19. All fire hoses shall be tested @ 10 kgs/sq.cm once in every six months and record shall be maintained in this regard.
- (c) The number of hoses (in addition to hose box hose) stored in a lube manufacturing and filling plant shall be 30% of the number of hydrant outlets. The minimum No. of hoses stored, however, shall not be less than 10 numbers.
- (d) The hoses shall be stored at convenient and easily accessible location in the lube manufacturing and filling plant.

13.5.12.2 Nozzles:

In addition to one jet nozzle provided in each hose box, there shall be at least two nozzles in each category as per relevant IS or UL Codes and maintained in the plant as per following table, namely:-

S. No.	Item Description	Minimum Requirement
1	Jet Nozzle	2 Nos.
2	Fog Nozzle	2 Nos.
3	Universal branch pipe with nozzle	2 Nos.
4	Foam branch Pipe 1140 lpm	2 Nos.
5	Water curtain	2 Nos.

13.5.12.3 Accessories:

The following minimum no. of safety Instrument shall be provided as indicated against each item, namely:-

S. No.	Item Description	Minimum Requirement
1	Sand drum with scoop	4 Nos.
2	Electrical Siren (3 km range)	1 No.
3	Hand operated siren or MCP one each at strategic operating unit	No. at each operating area.
4	Multi gas detector with provision of airing % of Oxygen and HC detectors	1 No.
5	Red and Green flag for fire drill	2 Nos. in each color.

6	PA system	1 No.
7	Wind socks	1 No.

13.5.12.4 *Hose box and accessories:*

One hose box to be provided between two hydrant points. Each hose box shall contain 2 numbers of fire hoses and one no. jet nozzle.

13.5.12.5 *Personnel protective equipment:*

The following minimum no. of Personal Protective Equipment and First Aid Equipment shall be provided as indicated below against each item, namely:-

S.No.	Item description	Minimum requirement
1	Safety helmet	1 No. per person.
2	Safety shoe meant for use in plant and handling black oil or bitumen	As per plant requirement.
3	Plash goggles	As per plant requirement.
4	Rubber hand glove	2 Pairs.
5	Fire proximity suit	1 Suit.
6	SCBA Set (45-minute capacity) with spare cylinder	1 set.
7	Ear muff	As per plant requirement.
8	Suitable electrical hand gloves	As per plant requirement.
9	Resuscitator	1 No.
10	Safety shower and eye wash facility	1 set each.
11	Water jell blanket	1 No.
12	Stretcher with blanket	2 Nos.
13	Multipurpose detector (HC and Oxygen)	1 No.
14	Boiler suit	As per plant requirement.

S.No.	Item description	Minimum requirement
15	Apron at lab	As per lab requirement.
16	First Aid box	1 No.

Note:

- (a) The above guidelines are minimum requirement of each item and can be increased depending on the scale of operations or size of plant or as per requirement of statutory authorities.
- (b) A fire trolley containing Fire Proximity Suit, B. A. Set, and Stretcher with water Jel Blanket, Resuscitator, First Aid Box, Spare fire hoses, Special purpose nozzles, Foam branch pipes, foam, should be kept in a speculated place easily accesses-able on demand.
- (c) Explosive meter and P. A. System shall be readily available at the plant and positioned to have easy access to it during emergency situation.
- (d) In addition, an emergency kit shall be provided consisting of safety items as per the item list given below and shall be readily available at the terminals.

13.5.12.6 *Emergency kit items:*

- (a) **Emergency Kit consists of listed emergency equipment required for rescue and control or arresting leakage in case of emergency in lube manufacturing and filling plant. The equipment should be mounted on a compact light weight trolley. Emergency Kit should be consisting of the following emergency equipment, namely:-**

S. No	Item	Quantity	Remarks
1	Fire proximity suit	1 set	
2	Breathing apparatus set (45-minute duration)	2 sets	
3	Flame proof search light	2 nos.	Rechargeable type suitable for Explosive Environment.
4	Hand siren with stand	1 no	Approx. range of 1.6 kms.

S. No	Item	Quantity	Remarks
5	Fireman axe	1no	
6	First aid box	1 no.	
7	Manual resuscitator	1 no	Manually operated for artificial respirators consisting of adult size nose, mouth, face plate, air bulb with oxygen inlet connection, non-return, non-breathing human valves and first aid charge packed in a plastic bag.
8	Folding stretcher	1 no	Size 6 feet X 3 feet with tying belts and blanket.
9	Mechanical tool kit	1 set	
10	Cold or low temperature hand gloves	2 Pairs	
11	Electrical rubber hand gloves	2 pair	Suitable for Electrical jobs up-to 33000 Volts.
12	Electrical tester	1 no	
13	Chemical or oil splash proof goggles	2 nos.	ANSI or CE marked

- (b) **All the items of the kit shall be kept on a trolley specifically designed for the purpose. List of PPE's as mentioned in other elsewhere in these regulations should be merged with this list. Any item featuring more than in one list should be considered for one time only.**

13.5.13 Use of Foam and Storage:

AR-AFFF or AFFF or equivalent Foam shall be used and minimum quantity shall be stored for application of 2 x 2400 lpm capacity water cum foam monitors for 30 minutes or actual requirement for class-B tank (if applicable) whichever is higher. Potential foam loss to be considered due to wind or wastage. At coastal plants potential foam loss should be considered minimum 25% and that for noncoastal plants should be 15% of design requirement.

13.5.14 Smoke or Heat Detection and Annunciation, Dyke Drain Valve Annunciation System and Emergency Shut Down Logic:

13.5.14.1 *Smoke or Heat Detection and Annunciation System:*

- (a) **Combined or separate smoke or heat detection system should be installed near carton storage area, process control room, warehouse and laboratory. Smoke or heat detectors of proper type should be selected and maintained in sound working condition.**
- (b) **General:**

A reliable and continuous smoke detection system with alarm annunciation shall be installed to alert the operating personnel to take timely corrective action.

- (c) **Application:**

- (i) Smoke or heat detectors should be installed near carton storage area, process control room, warehouse and laboratory. These detectors should be placed in such a way that smokes are detected at the incipient stage of incident.
- (ii) The control panel with audio alarm and visual indication should be provided in the process control room and repeater panel at the fire control room.

- (d) **Power Supply:**

The supply to the system shall be through a reliable online Uninterrupted Power Supply (online UPS).

- (e) **Architecture Components:**

The main components of Smoke or heat detection and annunciation system shall be-

- (i) Smoke or heat detectors;
- (ii) Field Transmission units or Signal scanners;
- (iii) Control system or PC;
- (iv) Display;
- (v) Annunciation System; and
- (vi) Cables, hooters, repeater, Power Supplies.

- (f) **Smoke or Heat Detectors:**

The detectors shall be able to detect the presence of smoke or heat well below the limit.

- (g) **Annunciation System:**

Appropriate annunciation system shall be available to ensure that all the alarms generated, both, audio and visual are reported to the plant personnel at local and remote-control panel. The alarms both, audio and visual can be repeated at additional location to ensure that the corrective action is taken.

- (h) **Inspection and Testing:**

- (i) The system shall be checked by the safety officer on a daily basis.
- (ii) The system shall be thoroughly tested every month by suitable method to ensure that the Audio Video alarms are generated at local and remote panel and records maintained.

13.5.14.2 *Dyke Drain Valve Annunciation System:*

- (a) **All the tank dyke drain exit valves shall be fitted with a limit switch or sensor for indication of the position of the valve. The valves of the Dyke shall remain in closed position. In case any valve is open, then, Audio Visual alarms shall come at local and remote-control panel for suitable corrective measures.**
- (b) **In case of automated locations, existing PLC can be used. However, where the locations are not automated a standalone system should be provided.**
- (c) **Power Supply:**

The supply to the system shall be through a reliable online Uninterrupted Power Supply. (Online UPS).

- (d) **Architecture Components:**

- (i) The main components of Dyke Drain valve Annunciation system shall be-
 - (A) Proximity Switches or Sensors;
 - (B) Field transmitter unit or Signal Scanners;
 - (C) Control System or PC or TAS;
 - (D) Display;
 - (E) Annunciation System; and
 - (F) Cables, hooters, Mimic and Power Supplies.
- (ii) All the components installed in the hazardous area shall confirm to the Hazard Area Classification applicable and they shall be certified by Central Institute of Mining and Fuel Research (CIMFR) or Petroleum and Explosive Safety Organization (PESO) or Authorized lab by the country of the origin.

- (e) **Annunciation System:**

Appropriate annunciation system shall be available to ensure that all the alarms generated, both, audio and visual are reported to the installation personnel at local and remote-control panel on real time basis. The alarms both, audio and visual should be repeated at additional location to ensure that the corrective action is taken.

- (f) **Control system:**

- (i) The system shall be available at all times.
- (ii) The control equipment should have data logging facilities to provide print outs of the history of the events with date and time of open and close position of the valves.

(g) **Inspection and Testing:**

- (i) The system shall be checked by the safety officer on a daily basis.
- (ii) The system shall be thoroughly inspected every month by opening and closing the valves and verifying that the Audio Video alarms are generated at local and remote panel and the records shall be maintained in this regard.

13.5.14.3 Emergency Shut Down (ESD) And Manual Call Point (MCP) Logic For Plant Shutdown:

- (a) **The ESD at automated plants and MCP at non-automated plants shall be provided in process control room, fire control room as well as at various strategic locations. ESD or MCP system shall be only through push buttons with wired connection.**
- (b) **Annunciation of ESD or MCP shall initiate following actions , namely:-**

(i) Process Shutdown:

- (A) To stop loading pumps;
- (B) Barrier gates to open;
- (C) Tank lorry filling (TLF) operations through the batch controllers to stop; and
- (D) All MOVs or POVs to close.

(ii) Power Shutdown :

(A) Trip all the panels other than Emergency panel. The Emergency panel should host fire siren, bore wells, jockey pumps, critical High Mast tower lights, security cabin, fire control room and fire pump house, Critical lights in TLF, Admin block, MCC room and power to the control room or Automation system.

(B) There should be interlock between ESD for Process shut down and ESD for Power shut down so that full power shut down takes after a time lag required for closing the MOVs or POVs and full closure of valves shall be ensured. The time lag shall be plant specific.

- (c) **Alarm signal shall be exchanged between all control rooms so that necessary actions are taken by the operating personnel.**
- (d) **Inspection and Testing:**

The system shall be checked during each fire drill conducted with full system shut down and records should be maintained.

13.5.15 Fire Alarm and Communication System:

- (a) **Hand operated sirens: alternately fire call points shall be provided at strategic locations and clearly marked in the plant. Fire call points shall have combination of audio or visual alarm.**
- (b) **Main fire siren (3 km Range): switch shall be provided in fire control room or security room.**
- (c) **Electrical fire siren shall have alternate supply source both from normal panel or supply and through emergency panel or supply.**

- (d) **The tone of fire siren shall be different from shift siren.**
- (e) **The following fire or emergency siren codes shall be followed as per PNGRB ERDMP Regulations, 2010.**

13.5.16 Fire Safety Organisation And Training:

13.5.16.1 Organisation

A well-defined comprehensive shall be developed in accordance with the PNGRB (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010. The key action points of this comprehensive ERDMP shall be displayed at strategic locations in the installation for ready reference. The emergency response planning shall have clear written procedures for expected actions during anticipated emergencies and emergency response plan shall include operational and procedural requirements for various emergency scenarios that are relevant for the installation.

13.5.16.2 Training:

- (a) Training on safety, firefighting and rescue operation shall be compulsory for all officers, operators, security, TT drivers and contract workmen, and clericals who are likely to be present or working in the plant and record shall be maintained in this regard. The above training shall be imparted before induction.
- (b) Each employee shall undergo a refresher course once in every three years after initial training.
- (c) The training shall be conducted through an expert agency such as Fire Brigade or recognized training institute or Oil industry approved reputed agency. The training also includes usage of Personnel Protective Equipment.
- (d) All operating personnel shall be given training on Live Fire training at any of the reputed institutes having facilities for simulations representing fire scenarios likely to occur at plant. Security as first respondent may also be considered for above live fire training.
- (e) Every employee or authorized person of contractor working in the installation shall be familiarized with fire or emergency siren codes and the location of fire siren operating switch nearest to his place of work.
- (f) Instructions on the action to be taken in the event of fire, should be pasted at each siren point and familiarity with these instructions shall be ensured and recorded.
- (g) Monthly fire drills considering various scenarios shall be conducted regularly with full involvement of all employees of the installation. The mock drill should include the full shut down system activation once in six months.
- (h) The offsite disaster mock drills shall be conducted periodically as per local statutory requirements. The company should approach and coordinate with the district authority for conducting "Offsite Mock Drills".
- (i) The post drill analysis should be carried out and discussed emphasizing areas of improvements.
- (j) The record of such drills should be maintained at the location.
- (k) Mock drill scenarios shall include all probable scenarios and the key areas such as Tank Farm, Rim seal fire, Gantry, Pump House, Tank Wagon gantry, which shall be covered at least once in six months.
- (l) Security staff should be trained as first responders for firefighting and rescue operation along with plant operating personnel through oil industry approved reputed institute.

13.5.16.3 *Mutual aid:*

- (a) Installation shall have a 'Mutual Aid' arrangement with nearby industries to pool in their resources during emergency.
- (b) Mutual Aid agreements (valid for a maximum period of 2 years) shall be prepared and signed by all Mutual Aid members. Fresh agreement shall be made on expiry of 2 years or whenever there is change in the signatories to the agreement. Quarterly meeting of Mutual Aid members shall be conducted, and the minutes shall be recorded. The minutes shall be reviewed in the subsequent meetings.

13.5.17 Fire Emergency Manual:

- (a) A well-defined comprehensive Emergency Response and Disaster Management Plan (ERDMP) shall be developed in accordance with the PNGRB (Codes of Practices for Emergency Response and Disaster Management Plan (ERDMP)) Regulations, 2010 and the copies of the ERDMP shall be available to all personnel in the installation.
- (b) The key action points of this comprehensive ERDMP shall be displayed at strategic locations in the installation for ready reference.

13.5.18 Fire Protection System, Inspection And Testing:

13.5.18.1 *General:*

- (a) The fire protection equipment shall be kept in good working condition all the time.
- (b) The fire protection system shall be periodically tested for proper functioning and logged for record and corrective actions.
- (c) One officer shall be designated and made responsible for inspection, maintenance and testing of fire protection system.
- (d) The responsibilities of each officer shall be clearly defined, explained and communicated to all concerned in writing for role clarity.
- (e) In addition to the following routine checks or maintenance, the requirements of relevant standards in respect of periodic inspection, maintenance and testing of fire-fighting equipment shall be complied with.

13.5.18.2 *Fire water pumps*

- (a) Every pump shall be test run for at least half an hour or as per OEM guidelines, whichever is higher, twice a week at the rated head and flow.
- (b) Each pump shall be checked, tested and its shut-off pressure observed once in a month.

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- (c) Each pump shall be checked and tested for its performance once in six months by opening required nos. of hydrants or monitors depending on the capacity of the pump to verify that the discharge pressure, flow and motor load are in conformity with the design parameters.
- (d) Each pump shall be test run continuously for 4 hours at its rated head and flow using circulation line of fire water storage tanks and observations logged once a year.
- (e) The testing of standby jockey pump, if provided shall be checked weekly. Frequent starts and stops of the pump indicate that there are water leaks in the system which should be attended to promptly.

13.5.18.3 *Fire Water Ring Mains:*

- (a) **The ring main shall be checked for leaks once in a year by operating one or more pumps and keeping the hydrant points closed to get the maximum pressure.**
- (b) **The ring mains, hydrant, monitor and water spray header valves should be visually inspected for any missing accessories, defects, damage and corrosion every month and records shall be maintained in this regard.**
- (c) **All valves on the ring mains, hydrants, monitors and water spray headers should be checked for leaks, smooth operation and lubricated once in a month.**

13.5.18.4 *Fire Water Spray System (If Applicable):*

- (a) **Water spray system shall be tested for performance that is to say, its effectiveness and coverage once in six months.**
- (b) **Spray nozzles shall be inspected for proper orientation, corrosion and cleaned, if necessary, at least once a year.**
- (c) **The strainers provided in the water spray system shall be cleaned once in a quarter and records maintained.**

13.5.18.5 *Fixed Or Semi Fixed Foam System:*

Fixed or Semi fixed foam system on storage tanks should be tested once in six months. This shall include the testing of foam maker or chamber. The foam maker or chamber should be designed suitably to facilitate discharge of foam outside the cone roof tank. After testing foam system, piping should be flushed with water.

13.5.18.6 *Clean Agent System:*

Clean agent fire extinguishing system should be checked as under, namely: -

- (a) **Agent quantity and pressure of refillable containers shall be checked once every six months.**
- (b) **The complete system should be inspected for proper operation once every year [(Refer latest NFPA 2001(latest edition) for details of inspection of various systems)].**

13.5.18.7 *Hoses:*

Fire hoses shall be hydraulically tested once in six months to a water pressure as specified in relevant IS or UL or Equivalent codes.

13.5.18.8 *Communication System:*

Electric and hand operated fire sirens should be tested for their maximum audible range once a week.

- (a) **Fire Water Tank or Reservoir:**
- (b) **Above ground fire water tanks should be inspected externally and internally.**
- (c) **The water reservoir shall be emptied out and cleaned once in 3 years. However, floating leaves, material or algae, if any, shall be removed once in 6 months or as and when required.**
- (d) **Fire extinguishers Inspection, testing frequency and procedure should be in line with Gas Cylinder Rules and these Regulations.**

13.6 Maintenance And Inspection Of Equipment:

The required maintenance and inspection practices should be followed to ensure safe and trouble-free operation of various equipments.

13.6.1 Maintenance Schedules:

To facilitate the maintenance service to be rendered in a planned manner, a preventive maintenance schedule covering the necessary work to be done, mentioning the periodicity that is to say, daily, weekly, monthly, half yearly and yearly schedules, shall be worked out. Basic recommendations given by the manufacturers should be considered and modified bearing in mind the local conditions.

13.6.2 Personal Protective Equipment:

Personnel protective equipment such as safety shoes, hand gloves, apron, safety goggles, safety belt, helmet, ear muff, dust respirator, self-contained breathing apparatus (SCBA), resuscitator, as applicable, shall be worn while carrying out any maintenance activity. Such equipment shall be checked periodically and maintained for ready use in normal and emergency situations.

13.6.3 Work Permit System:

Any maintenance, inspection, disassembly or removal of fittings shall not be carried out without a proper work permit and approved procedure and-

- (a) **all maintenance and inspection jobs shall be carried out in line with OISD-STD-105 on "Work Permit System".**
- (b) **working at height shall be as per provisions of OISD-GDN-192.**

13.6.4 Inspection And Maintenance of Various Facilities In Installations:

13.6.4.1 Storage Tanks:

Inspection and maintenance of storage tanks shall be carried out as given below, namely: -

(a) Routine In-Service Inspection:

The interval of such inspection shall be consistent with conditions at a particular site, but shall not exceed one month. Operations personnel, who has knowledge of the storage tank operations, shall carry out this inspection.

(b) External Inspection:

- (i) All storage tanks shall be given a visual External Inspection at least once in a year by a qualified and experienced authorized person.
- (ii) The detailed External Inspection along with ultrasonic thickness survey of tanks shall be conducted as under, namely:-

S.N.	Fluid Stored	External Inspection Interval(Years)	
		With Corrosion Rate Based Assessment	Without Corrosion Rate Based Assessment

1	Class-B, LDO, Lube Oils	5	3
2	Furnace Oil, LSHS and slops	3	3

(c) **Internal inspection:**

All storage tanks shall be subjected to a detailed internal inspection after an interval as detailed below and where the inspection intervals are prescribed in the Quality Control Manual, the same shall override the table below, namely:-

S.N.	Fluid Stored	External Inspection Interval (Years)	
		With Corrosion Rate Based Assessment	Without Corrosion Rate Based Assessment
1	Class-B, LDO, Lube Oils, Furnace Oil	Years determined by Corrosion Rate and Integrity Assessment or 15 years, whichever is lower	10.
2	Slops	-do-	8.

13.6.4.2 Underground Storage Tank:

- Prior to entering an underground tank, it shall be cleaned internally of its product and adequate air circulation is provided. The man entry should be preceded by ensuring that the tank is Hydrocarbon and gas free. The tank shall be visually inspected for general corrosion or pitting or deterioration on internal surfaces.**
- Ultrasonic thickness measurements shall be carried out on shell plates, end plates and nozzles from inside the tank once in ten-years period or to meet industry's quality control requirements, whichever is less. The external inspection of the underground tank shall be performed once in twenty-years period or to meet industry's quality control requirements, whichever is less.**
- After the repairs, the tank shall be hydrostatically tested of at test pressure of 0.75 kg/sq.cm. g- or as specified in the design code and checked for leaks.**
- Timely inspection and preventive maintenance of these storage tanks assume high importance. Accordingly, the inspection schedules of storage tanks should be prepared and implemented.**
- This paragraph 13.6.4.2 covers the minimum inspection requirements for atmospheric and low-pressure storage tanks constructed as per standards IS-803, API620, API-650, IS 10987 or equivalent standards. The various types of storage tank inspections along with types of repairs and areas of inspections have been covered in this paragraph 13.6.4.2.**

13.6.4.3 Pipes, Valves and Fittings:

Inspection and maintenance of piping systems should be followed as given below, namely: -

- Safety in petroleum installations flows through continuous efforts at all stages and as such it can be ensured by observing that plant and equipment are designed,**

constructed, tested and maintained as per Engineering Standards and subsequent modifications and repairs are conforming to the same standard.

- (b) This standard covers minimum inspection requirements for plant piping as per Standard ANSI B-31.3 or equivalent standards. Areas to be inspected, facilities needed for inspection, frequency of inspection, likely causes of deterioration of pipelines in service and inspection of pipe fittings and repairs have to be specified which also included briefly are the inspection and testing requirements for the pipelines post commissioning.
- (c) It is necessary to draw up and adhere to an inspection programme to avoid failures and inconveniences in operation. The authorized persons should carry out the On Stream and Comprehensive Inspections. The experience and qualification of the authorized persons shall be in line with the applicable inspection standards and procedures.
- (d) **Type of Inspection:** The post-commissioning inspections of pipelines shall be as under, namely:–
 - (i) External inspection.
 - (ii) Comprehensive inspection.

13.6.4.4 *Inspection Intervals: Pipelines in plant mainly comes under Class-III category And Inspection Interval are as under, namely:-*

Class	Service	Maximum Inspection Interval in Years	
		External on stream	Comprehensive
Class-III	Class –B, Lubes, Furnace, asphalt.	4	10.
Class-III	Air process, cooling water and fire water	4	10.

Note:

- (i) Any other service which is not covered in the above tables shall be included under appropriate class, as the case may be.
- (ii) In case, high corrosion rates are observed and half the remaining life is less than the above-mentioned scheduled intervals, then the comprehensive inspection interval shall be suitably reduced to ensure that maximum inspection interval shall not be more than half the remaining life.

13.6.4.5 **Boiler:**

Inspection, testing and maintenance shall be as per manufacturer's guidelines and requirement in line with IBR norms. All applicable statutory norms as per requirement of inspector of boiler shall be followed.

13.6.4.6 **Pressure Vessels:**

Inspection, testing and maintenance shall be carried out as per statutory requirement.

13.6.4.7 **Weigh Bridge:**

Inspection and maintenance shall be as per manufacturer's guidelines. All statutory norms as per requirement of Inspector of legal metrology shall be followed.

13.6.4.8 **Hoist, EOT And Joist:**

Inspection and maintenance shall be as per manufacturer's guidelines. All statutory norms as per requirement of Inspector of Factory shall be followed.

13.6.4.9 **Fork Lift:**

- (a) **Inspection and maintenance shall be as per manufacturer's guidelines. All statutory norms as per requirement of Inspector of Factory shall be followed.**
- (b) **Periodical eye testing shall be carried out in line with requirement of Inspector of Factories and record shall be maintained in this regard.**
- (c) **Inspection, testing and maintenance of thermic fluid heater and cooling tower. shall be done as per manufacturers guidelines and record shall be maintained in this regard.**

13.6.4.10 **Ladder Safety (Portable Or Fixed):**

- (a) **The foot ladder should be properly supported on the firm surface and the top end should be securely fixed to prevent its slippage. At a time, only one person should use the ladder. The ladder should be checked periodically for its fitness for use.**
- (b) **The ladder should extend at least one meter above the platform for landing place. The ladder should be placed at suitable safe angle to minimize the risk of slippage (ideally 75 deg angle to the horizontal). The heavier objects should not be carried up the ladder.**

13.6.4.11 **Strainers and Filters:**

Strainers and filters shall be inspected and cleaned as per following frequency, unless sluggish operation warrants earlier inspection, namely:-

- (a) **Frequency of inspection and cleaning (Upstream of Pump Suction): Quarterly Upstream of PD meter quarterly.**
- (b) **Water spray strainer quarterly.**

13.6.4.12 **Safety Relief Valves:**

Safety Relief valves shall be tested once in a year. Further, an on-stream visual inspection should be carried out at least once in every 6 months to check the following, namely:-

- (a) **Blinds do not exist;**
- (b) **Upstream and downstream isolation valves, if any, are opened and sealed;**

- (c) **Seals protecting the spring setting have not been broken;**
- (d) **Relief device is not leaking. This should be checked visually or by thermography or contact thermometers or by hand touch at outlet nozzle wherever practicable;**
- (e) **The continuous operation of heat tracing provision, if any, provided for low temperature application on valve and discharge piping;**
- (f) **Condition of insulation and cladding on the heat traced piping and valves; and**
- (g) **Provisions of relevant standards on Inspection of Pressure Relieving Devices shall be followed.**
- (h)

13.6.4.13 Rotary Equipment:

- (a) **Compressors: Periodic maintenance checks, as detailed in Annexure-2 to be followed.**
- (b) **Pumps: Periodic checks as detailed in Annexure-2 to this part to be followed.**
- (c) **Diesel Engines: For maintenance of Diesel Engines Original Equipment manufacturer guidelines shall be followed.**
- (d) **Pressure gauges: Pressure gauges shall be checked daily for its proper functioning and shall be calibrated once in 6 months.**
- (e) **Flow measuring devices: All flow measuring devices shall be checked daily for proper functioning. Calibration of the flow measuring devices shall be carried out in line with requirement of Department of Legal Metrology of concern State.**

13.6.4.14 Firefighting Equipment (Portable And Trolley Mounted):

- (a) **Portable fire extinguishers are not expected to deal with large fires. Nevertheless, these are very valuable in the early stages of fire. The most important features of these extinguishers are their immediate availability and can be used by one or two persons. A fully charged fire extinguisher should not be more than 17 kgs. The extinguishing medium is discharged and directed into fire by storage pressure or release of pressurized charged stored in a cartridge.**
- (b) **Extinguishers shall be classified by the types of extinguishing medium which they contain. At present, the main types of extinguishers are –(a) water and or foam-based, (b) powder, (c) carbon dioxide and (d) clean agents.**
- (c) **Relevant IS code for fire extinguishers and schedule for hydraulic pressure testing of fire extinguisher are specified as below, namely:-**

S.No.	Type of extinguisher	IS Code	Test interval (Year)	Test pressure (kg/sq.cm)	Duration (minutes)
1	Mechanical foam type (gas cartridge)	IS:15683or IS:13386 or IS:14951	3	35	2.5.
2	Mechanical foam type (stored pressure)	IS:15683	3	35	2.5.
3	Dry powder (stored pressure)	IS:15683	3	35	2.5.
4	Dry powder (gas cartridge)	IS:15683 or IS:10658 or IS:11833	3	35	2.5.
5	Carbon dioxide	IS:15683	5	250	2.5.
6	Clean agent	IS:15683	3	35	2.5.

Note: Extinguisher should be hydraulically tested with cap.

- (d) **Each extinguishing media should comply respective IS code (given in following matrix), namely:-**

S. No	Extinguishing media	Respective IS code
1	Foam concentrate	IS 4989 or ISO 7203.
2	Powders (Class –BC)	IS 4308.
3	Powders (Class –ABC)	IS 14609.
4	Carbon dioxide	IS 15222.
5	Clean agents	IS 15493 or NFPA 2001 latest edition.

Note 1:

- (i) Propellants: The propellants for stored pressure and cartridge operated extinguishers shall be air, carbon dioxide, nitrogen or mixtures of these gases having a max dew point of (-) 55 deg centigrade.
- (ii) lives of fire extinguishers: (IS 2190:2010) are specified as below, namely:-

S. No	Type of extinguisher	Lifetime (year)
1	Foam type	10.
2	Powder type	10.
3	Carbon dioxide	15.
4	Clean agent	10.

Note2:

- (i) Lives of extinguishers shall be considered from date of manufacture of extinguishers. In case failure in hydraulic pressure testing, extinguisher should be rejected immediately before the lifetime given above.
- (ii) Carrying handle: An extinguisher having a total mass of 1.5 kg or more and having a cylinder diameter of 75 mm or more shall have a carrying handle.
- (iii) Mounting: Each extinguisher intended for wall mounting should be provided with a means of mounting.

13.6.4.15 Electrical Equipment:

- (a) **Proper functioning of electrical equipment can only be ensured by means of periodic preventive and predictive maintenance of the equipment. This enhances equipment life and also ensures safety of the equipment, installation and operating personnel.**
- (b) **Maintenance shall be daily, weekly, quarterly or annual depending upon the type of equipment. Adequate logs shall be maintained to ensure that maintenance is carried out as per approved checklists. Preventive maintenance shall be carried out as per relevant standards.**
- (c) **Special emphasis shall be laid on the maintenance of equipment installed in hazardous areas.**
- (d) **All electric apparatus and wiring in a hazardous area shall at all times be so maintained as to retain the characteristic on which their approval has been granted.**
- (e) **Precautions to be taken for repairs and testing of flameproof equipment shall be as below, namely:-**
 - (i) No Flame proof or intrinsically safe apparatus shall be opened and no work likely to impair the safety characteristics of such apparatus or electric wiring connected thereto shall be carried out until all voltage has been cut off from said apparatus or wiring. The voltage shall not be restored thereto until the work has been completed and the safety characteristics provided in connection with the apparatus and wiring has been fully restored.
 - (ii) Use of soldering apparatus or other means involving flame, fire or heat or use of industrial type of apparatus in a zone “1” area shall be permitted for the purposes of effecting repairs and testing and alterations, provided that the area

in which such apparatus or wiring has been installed, has first been made safe and certified by a competent person after testing with an approved gas – testing apparatus to be safe and free from inflammable vapours, gases or liquids and is maintained in such conditions, so long as the work is in progress

- (iii) No alteration that might invalidate the certificate or other document relating to the safety of the apparatus shall be made to any apparatus.
- (iv) Replacement fasteners, nuts, studs and bolts shall be of the type specified by the manufacturer for the particular apparatus. No attempt shall be made to replace or repair a glass in a flameproof enclosure that is to say, in a luminaire or other enclosures, except by replacement with the complete assembly or part obtainable from the manufacturer, complying with the approval certificate.
- (v) If replacement components such as cable glands, conduit or conduit accessories, are available only with thread forms which differ from those provided on the apparatus, suitable adaptors having necessary certification and approval shall be employed.
- (vi) Equipment enclosures and fittings shall be examined to see that all stopping plugs and bolts are in position and properly tightened. Locking and sealing devices shall be checked to ensure that they are secured in the appropriate manner.
- (vii) If at any time, there is a change in the area classification or in the characteristics of the flammable material handled in the area or if the equipment is relocated in the area, the area classification drawing should be correspondingly revised, and a check shall be made to ensure that the equipment selection corresponds to the revised area classification.
- (viii) A system shall be established to record the results of all inspections and the action taken to correct defects.

13.6.4.16 Ladders:

(a) Inspection and testing:

Wooden ladders shall be inspected at least once in a week for damage and deterioration. Metal ladders shall be inspected at least once in three months and all parts checked for wear, corrosion and structural failure.

(b) Storage and maintenance:

- (i) Ladders shall be stored in dry location and protected from weather. Ladders shall be supported during storage so as to avoid sagging and permanent set.
- (ii) Wooden ladders shall be periodically treated with a clear preservative such as varnish, shellac or linseed oil. Painting shall not be adopted as defects and cracks are likely to be covered up by the coating.
- (iii) Metal rungs shall be cleaned to prevent accumulation of materials which may destroy non-slip properties.

ANNEXURE- 1

Checklist for Bulk or Packed Lube Trucks at Loading or Unloading points:

S.No.	Item	Remarks
	Daily Checks	
1	Whether driver is having requisite or mandatory documents required for vehicle and driver?	
2	Whether the vehicle has at least one driver and one helper as its crew member?	
3	Whether the vehicle has two fire extinguishers?	
4	Whether vehicle's cabin is checked for presence of any flammable or explosivesubstance being carried by the crew?	
5	Whether there are any sources of ignition such as matches in the vehicle?	
6	Whether the engine exhaust is wholly in front of bulk truck and has ampleclearance from fuel oil system and combustibile material?	
7	Whether approved quality flame arrester provided on the engine exhaust andmuffler or silencer is properly bolted and without any sign of leaks?	
8	Whether each compartment of tank is fitted with independent vacuum and pre-operated vents (PV Valve)?	
	Additional Checks:	
9	Whether the vehicle has a cutoff switch for electrical system?	
10	Whether all electric wiring is properly insulated, and all junction boxes are sealed properly?	
11	Whether there is a quick shut off facility for the drain valves in case of emergency?	
12	Whether the vehicle has First Aid Box, Toolbox and Emergency search light?	
13	Whether the driver has a copy of standing instructions and TERM card?	
14	Whether electrical equipment like generator switches, fuses and circuit breakersare located inside the cabin or engine compartment?	
15	Whether battery is in easily accessible position with a heavy duty switch close by,to cut off the battery in emergency?	
16	Whether battery terminals have protective rubber covers?	

ANNEXURE- 2

Maintenance Schedule of Critical Equipments (Compressor):

S.No.	Equipment Parameters to check	Periodicity			
		Daily	Weekly	Monthly	Quarterly
1.	Check Lube Oil Level of plunger pump unit and top up, if necessary.				
2.	Check the oil level in the crank case and top up, if necessary.				
3.	Before start check flow of cylinder jacket cooling water.				
4.	Check oil flow from plunger pump to gland packing assembly and compressor cylinder.				
5.	Check for flow rate from plunger pump.				
6.	Drain water from receiver or liquid trap.				
7.	Check belt tension and adjust, if necessary.				
8.	Ensure tightness of foundation bolts.				
9.	Flush out lube oil system: (a)Crank case, (b)Pump chamber and fill fresh oil.				
10.	Flush jacket water cooling system.				
11.	Check alignment of compressor and motor pullies.				
12.	Change lube oil filter and clean Suction filter.				
13.	Clean oil strainer.				
14.	Clean Breather.				
15.	Open and inspect suction and discharge valves.				
16.	Check instrumentation calibrate, if necessary.				
17.	Check safety release valve.				
18.	Suction and discharge valves of compressor cylinder				
19.	Interlock with High level alarm.				
20.	All Trips.				
21.	Pressure and Temperature Gauges.				
22.	Control Panel.				
23.	Complete over-haul.				

MAINTENANCE SCHEDULE: (CENTRIFUGAL PUMP)

S.No.	Equipment Parameters to check	Periodicity			
		Daily	Weekly	Monthly	Quarterly
1.	Check lube oil and top up level, if necessary, Check cooling water flow (where provided).				
2.	Check mechanical seal or gland leakage.				
3.	Check the "AMPS" are within limits.				
4.	Change lubes oil every 800 running hours.				
5.	Check coupling and coupling bolts and replace worn out parts.				
6.	Check tightness of foundation bolts.				
7.	Clean suction strainer of: (a) Product pumps. (b) Other pumps.				
8.	Check alignment of pump and motor.				
9.	Overhauling.				

10.	Greasing of Bearings.				
11.	High Level Alarm.				
12.	Relief Valve				

DIESEL ENGINES(MAINTENANCE STEPS):

- (1) Keep the dirt out of the engine.
- (2) Maintain a lubricating film on all bearing surfaces.
- (3) Regulate the engine's fuel.
- (4) Control operating temperatures.
- (5) Guard against corrosion.
- (6) Let the engine breathe.
- (7) Prevent over speeding.
- (8) Know your engine's condition.
- (9) Correct troubles while they are simple.
- (10) Schedule and control your maintenance.

Diesel Engines: "A"

Daily Checklist

S.No.	Maintenance Steps	Remarks
1.	Check previous day's engine log book	Correct as required.
2.	Drain water and sediment from fuel tank and fuel filter through drain cock	Before starting engine.
3.	Check engine oil level and top up, if necessary	Must be slightly less than or equal to "h" mark on dip stick when engine is stopped and has stood for 20 minutes or more (must be measured after all oil is drained back into oil pan).
4.	Check for Fuel, oil, water	Correct if leaking.
5.	Fill radiator or surge tank with treated water (Chromate concentration 3500 ppm)	Radiator cap must be firmly tightened back into the radiator or surge tank neck , and engine must not be operated without the radiator cap since this will cause aeration and overheating of the coolant.
6.	Check air cleaner oil level and change oil, if required (if oil bath type) clean dust pan and pre-cleaner of day type air cleaner	Use clean engine oil
7.	Check air line connections for leaks	Correct as required
8.	Remove and clean air compressor breather, if equipped	Fill with clean oil, up-to mark.
9.	Drain air receiver tank at the beginning of each shift and, then ,close the drain cock	
10.	Clean crankcase breather	Discard paper type element, if clogged.
11.	Check oil level in hydraulic governor, if provided	Check for leaks, use specified engine oil for topping up.
12.	Start the engine and note the oil pressure both at idling and maximum	If there is a change in oil pressure from that recorded in the log book on earlier occasion, then ,stop engine and check through

S.No.	Maintenance Steps	Remarks
	speed	trouble shooting technique the cause for oil pressure changes and correct, if necessary (for Assistance in diagnosing the change in oil pressure and call your service representative, if necessary).
13.	Record oil pressure	Refer OEM Manual for Lube. Oil pressure limits.
14.	Fill fuel tank at the end of the shift	Use clean fuel and a strainer. Also clean the cap and surrounding area before opening the filler cap.

Note: In addition, Diesel Engines “B”, “C”, “D” and “E” checks shall be carried out as per manufacturers guide lines.

VANDANA SHARMA, Secy.
[ADVT.-III/4/Exty./369/2020-21]

Annexure 1 – List of Applicable Standards and References

Standard Number	Title of Standard
API STD 650	Welded Tanks for Oil Storage.
API STD 620	Design and Construction of Large, Welded, Low-pressure Storage Tanks.
API STD 2000	Venting Atmospheric and Low-Pressure Storage Tanks.
API 5L	Specification for Line Pipe.
API 15LR	Low Pressure Fiberglass Line Pipe.
API 15HR	High-pressure Fiberglass Line Pipe.
NFPA 2001	Standard on Clean Agent Fire Extinguishing Systems.
NFPA 11	Standard for Low-, Medium-, and High-Expansion Foam.
ASME B 31.3	Process Piping Guide.
ASME B 31.4	Pipeline Transportation Systems for Liquid Hydrocarbons and Other Liquids.
ASME B 16.5	Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric or Inch Standard.
ASME B 16.11	Forged Fittings, Socket – Welding and Threaded.
IS 12709	Installation of Glass Fibre Reinforced Plastic (GRP) Piping System Code of Practice.
IS 5572	Classification of Hazardous Areas (Other Than Mines) Having Flammable Gases and Vapours for Electrical Installation.
IS 11006	Flash Back Arrestor (Flame Arrestor).
IS 5571	Guide for Selection and installation of Electrical Equipment for Hazardous Areas (other than mines).
IS 10810	Methods of Test for Cables.
IS 3043	Code of practice for earthing.
IS 2309	Code of practice for the protection of buildings and allied structures against lightning.

IS 3844	Code of Practice for Installation and Maintenance of Internal Fire Hydrants and Hose Reels on Premises.
IS 636	Non-percolating flexible delivery hose for fire fighting.
IS 1978	Specification for Line Pipe.
IS 15683	Portable Fire Extinguishers-Performance and Construction–Specification.
IS 4991	Criteria for Blast Resistant Design of Structures for Explosions Above Ground.
IS 10658	Specification for Higher Capacity Dry Powder Fire Extinguisher.

Footnote: The Principal regulations were notified in the Official Gazette vide F. No. PNGRB/Tech/7-T4SPI (1)/2020, dated 11th November, 2020 and amended vide File No. PNGRB/Tech/7-T4SPI/(1)/ 2022 (P-4116) dated 29th March 2023.



OIL INDUSTRY SAFETY DIRECTORATE

तेल और गैस प्रतिष्ठानों का अभिन्यास
 ओ आई एस डी -मानक- 118

LAYOUTS FOR
 OIL AND GAS INSTALLATIONS

OISD-STANDARD-118

Inception	November 1988
Revised Edition	July 1995
Amended Edition	August 2000
Revised Edition	September 2004
Amended Edition	January 2006
Amended Edition	July 2008

FOR RESTRICTED CIRCULATION ONLY

OIL INDUSTRY SAFETY DIRECTORATE
 Government of India
 Ministry of Petroleum & Natural Gas
 8th Floor, OISD Bhavan, Plot No. 2, Sector – 73, Noida – 201301 (U.P.)
 Website: <https://www.oisd.gov.in> Tele: 0120-2593833

PREAMBLE

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

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

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

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

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

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

Jai Hind!!!

**Executive Director
Oil Industry Safety Directorate**

FOREWORD

The Oil Industry in India is over 100 years old. As such, various practices have been in vogue because of collaboration/ association with different foreign companies and governments. Standardization in design philosophies, operating and maintenance practices remained a grey area. This coupled with feedback from some serious accidents that occurred in the past in India and abroad, emphasized the need for the industry to review the existing state-of-the-art in designing, operating and maintaining of Oil and Gas installations.

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

The original document on "Layouts for Oil and Gas Installations" was published in November 1988 and its first revision released in July 1995. In August 2000 it was amended inline with the recommendations of the High Power Committee. The document on "Layouts for Oil and Gas Installation" was revised in September 2004 for the second time and in January 2006, separation distances of electrical substation were added in Table-I as addendum.

Attempts have been made to incorporate the latest technological changes, experience gained after the implementation of standards and relevant updation in the various national and international codes and practices.

The figures and photographs used in the document, if any, are representative in nature.

We, at OISD, are confident that the provisions of this standard, when implemented in totality, would go a long way in ensuring safe operation of the target group of locations.

Needless to mention, this standard, as always would be reviewed based on field level experience, incident analysis and environment scanning. Suggestions from all stake holders may be forwarded to OISD.

NOTE

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Though every effort has been made to assure the accuracy and reliability of the data contained in these documents, OISD hereby expressly disclaims any liability or responsibility for loss or damage resulting from their use.

These documents are intended only to supplement and not to replace the prevailing statutory requirements of PESO, DGMS, Factory Inspectorate or any other Government body which must be followed as applicable.

Wherever Acts/ Rules/ Regulation and National/ International Standards are mentioned in the standard, the same relates to in-vogue version of such documents.

Central Pollution Control Board

COMMITTEES ON LAYOUTS FOR OIL AND GAS INSTALLATIONS

First Edition – November 1988

Leader

Shri R P Bhatia Engineers India Limited, New Delhi

Members

[illegible]

Shri S K Mukherjee Hindustan Petroleum Corporation Ltd.,(R) Bombay

Shri V K Raina Bharat Petroleum Corporation Ltd., (M), Bombay.

Shri K Ravi Kumar Madras Refineries Limited, Madras.

Member Coordinator

Shri B K Trehan Oil Industry Safety Directorate.

First Revision – July 1995

Leader

Shri R P Bhatia / Engineers India Limited, New Delhi

Shri M M Kapur

(Feb 95 – July 95)

Members

Shri S K Mukherjee Hindustan Petroleum Corporation Ltd.,(R) Bombay

Shri K K Arora Oil and Natural Gas Corporation Ltd., Bombay.

Shri V K Raina Bharat Petroleum Corporation Ltd., (M), Bombay.

Shri S Pandarinathan Madras Refineries Limited, Madras.

Member Coordinator

Shri B Sadhukhan / Oil Industry Safety Directorate.

Shri S N Mathur (April 95 – July 95)

Amended Edition – August 2000

Amendments were carried out to this standard based on the recommendation of High Power Committee set up in 1997 by the Ministry of Petroleum and Natural gas to review the standard with respect to land requirement inline with national and international standards.

COMMITTEES ON LAYOUTS FOR OIL AND GAS INSTALLATIONS

Second Revision – Month /Year

LEADER

Shri Vinay Kumar GAIL (India) Limited, New Delhi

MEMBERS

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Shri S.S.Maji,	IOCL Refineries HQ, New Delhi
Shri Sunil Dewan,	BPCL, NOIDA
Shri A.Buragohain,	Oil India Limited, Duliajan

MEMBER-CO-ORDINATOR

S K Aggarwal Oil Industry Safety Directorate, New Delhi

Addendum in January 2006:

Separation distance of electrical substation was added in table 1 in January 2006 based on decision in 40th steering Committee Meeting in Dec'05.

In addition to the above, several other experts from the industry contributed in the preparation, review and finalization of this document.

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LAYOUTS FOR OIL AND GAS INSTALLATIONS

1.0 INTRODUCTION

Hydrocarbon processing and handling plants are inherently hazardous. Today's trend of large and complex plants present substantial risk potential. At times plants are modified to operate at higher capacities or efficiencies necessitating larger storage requirements than contemplated earlier. For these reasons, initial site analysis for the proposed new construction or addition should be done carefully while considering the space allocation to the various facilities.

The hydrocarbon industry over the years learnt lessons from fires and explosions throughout the world and has been up-dating plant safety norms including inter-distances between facilities and their relative locations. The minimum distances recommended many years ago need review in the context of today's environment in the industry.

It is not intended that requirement of this standard should be applied rigidly to existing premises where, for a variety of reasons, it may not be practicable to comply with.

2.0 SCOPE

This document lays down minimum requirements of layouts within the plant boundary for petroleum refineries, Oil / Gas production and processing plants, LPG facilities, Pipeline installations / terminals, Lube oil installations and other Petroleum storage installations such as Crude oil gathering stations, Marketing depots and terminals, Aviation storage & fuelling stations, Tank farm for storage of crude / products.

The requirement of green belt / buffer zone beyond the plant boundary is outside the scope of this standard. Such provisions should be considered based on local environmental / security requirements.

3.0 DEFINITIONS

a) Block

Facilities operated / used in integrated way and surrounded by roads. For example process unit, boiler house, group of tanks located in a dyke, group of pressurized storage tanks, loading gantries, flare etc.

b) C4 and Lighter ends

Hydrocarbons or a mixture of Hydrocarbons containing four or less than four carbon atoms. Examples are Butane, Propane, Propylene etc. LPG, a mixture of propane and butane also fall under the same category.

c) Crude Oil Gathering Station:

Crude oil gathering station / Group gathering station is a production installation used for gathering, treating or storing crude oil and includes central tank farm, oil collecting station, gas compressor station and well head installation.

d) Facility

This refers to any building, structure, installation, equipment, pipeline, or other physical feature used in petroleum refining, storage, transportation and distribution.

e) Fire station

A building housing facilities of parking fire tenders and keeping other ready to use fire-fighting equipment for meeting plant emergencies, fire control room with required communication facilities/mimic panel.

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f) Fire Water pump house

A building housing fire water pumps, jockey pumps, communication and alarm system, instrumentation and the required operating & supporting personnel.

g) Flash Point

"Flash point" of any petroleum liquid is the lowest temperature at which the liquid yields vapour in sufficient concentration to form an ignitable mixture with air and gives a momentary flash on application of a small pilot flame under specified conditions of test as per IS: 1448 (Part-I).

h) Gas Processing Plant

Gas processing plant is a facility where natural gas is received and processed to separate gas, LPG, condensate etc.

i) General Classification Of Petroleum Products

Petroleum products are classified according to their closed cup FLASH POINTS as given below:

- **Class-A Petroleum:** Liquids which have flash point below 23°C.
- **Class-B Petroleum:** Liquids which have flash point of 23 °C and above but below 65 °C.
- **Class-C Petroleum:** Liquids which have flash point of 65 °C and above but below 93 °C.
- **Excluded Petroleum:** Liquids which have flash point of 93 °C and above.

Liquefied gases including LPG do not fall under this classification but form separate category.

Note: In the following cases, above classification does not apply and special precautions should be taken as required:

- (i) Where ambient temperatures or the handling temperatures are higher than the flash point of the product.
- (ii) Where product handled is artificially heated to a temperature above its flash point.

j) Hazardous Area

An area will be deemed to be hazardous where;

- (i) Petroleum having flash point below 65 deg.C or any flammable gas or vapor in a concentration capable of ignition is likely to be present.
- (ii) Petroleum or any flammable liquid having flash point above 65 deg.C is likely to be refined, blended or stored at above its flash point.

For classification and extent of hazardous area, refer "The Petroleum Rules - 2002".

k) Petroleum Depots & Terminals

A portion of the property, where combustible/flammable liquids are received by tanker, pipelines, tank wagons, tank trucks and are stored or blended in bulk for the purpose of distribution by tankers, pipelines, tank wagons, tank trucks, portable drums.

l) LPG Facilities

LPG facility is one where liquefied petroleum gas (LPG) is stored, received / despatched by rail / road / pipeline and / or filled in cylinders.

m) Lube Oil Installations

The facilities for receipt, storage and blending of base oils & additives into finished Lube products. It includes lube-blending plants, grease manufacturing plants.

n) May

Indicates provisions that are optional.

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o) Oil / Gas Production Plant

Oil / Gas production plant is a plant where oil and/or gas is collected, stabilized and despatched for further processing. Drilling activities and facilities upstream of the Christmas Tree of a well are not covered under this definition.

p) Pipeline Installations

Pipeline Installations are the facilities on cross-country pipelines and include sectionalizing valve station, pig launching / receiving station, intermediate pumping station / compressor station, tap-off station, dispatch and receiving facilities with or without storage.

q) Petroleum Refinery

Petroleum Refinery is a plant where crude oil is received and processed into intermediates and finished products.

r) Process Unit

A unit having integrated sequence of operation, physical and chemical, and may involve preparation, separation, purification, or change in state, energy content or composition.

s) Protection for exposure

This refers to fire protection for structures on property adjacent to liquid storage.

t) Service building

A building housing facilities for inspection / maintenance / other supporting services which are directly required for operation of the plant e.g. warehouse, workshop etc.

u) Shall

Indicates provisions that are mandatory.

v) Should

Indicates provisions that are recommended but not mandatory. Implementation of these provisions shall be made based upon consideration of the followings, as appropriate: (a) risk / benefit analysis, (b) company standards, (c) company experience, and (d) company philosophy.

w) Stabling Line

It is an additional railway line / spur reserved for additional rake / stabling.

x) Storage / filling shed

Facility for storage and filling of packed (non-bulk) petroleum product.

y) Tank height

Tank height is the height from tank bottom to top kerb angle for cone roof tanks. For floating roof tanks, it is the height from tank bottom to top of tank shell.

z) Tank vehicle loading / unloading

Facility for loading / unloading of petroleum product to / from tank wagon or tank truck.

4.0 PLANT LAYOUT PHILOSOPHY

Following philosophy should be adopted in layout of an installation;

- a) Block layout should be adopted as far as possible. Plant layout arrangement should follow the general route of raw material to process unit(s) with tankages interposed as required followed by storage & despatch facilities. The entire area should be sub-divided into blocks.
- b) All process units and dyked enclosures of storage tanks shall be planned in separate blocks with roads all around for access and safety.
- c) Primary traffic roads in the installation should be outside hazardous areas. Roads separating the blocks shall act as firebreaks.

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- d) Pedestrian pathways should be provided / marked alongside the primary traffic roads.
- e) Alternative access shall be provided for each facility so that it can be approached for fire fighting in the event of blockage on one route.
- f) Road widths, gradient and turning radii at road junctions shall be designed to facilitate movement of the largest fire-fighting vehicle in the event of emergency.
- g) Rail spur shall be located close to the periphery of the plant to minimise road/pipe crossings and blockage of roads during shunting.
- h) Layout of the facilities shall be made to minimise truck traffic ingress in the plant.
- i) Two road approaches from the highway / major road should be provided, one for employees and other for product / material movement. Both these approaches should be available for receipt of assistance in emergency.
- j) Presence of ignition source shall always be contemplated beyond the boundary wall of the installation.
- k) Orientation of flares, furnaces & heaters, dusty operations (e.g. sulphur handling etc) and cooling towers should be decided based on prevailing wind direction to avoid travel of hydrocarbon vapour over sources of ignition.
- l) Erection methods shall be studied for all types of equipment / structures. Towers, reactors, fired equipment etc should be located in such an area so to facilitate erection.
- m) Maintenance requirements for each type of equipment shall be identified and considered.
- n) For construction activities, area should be earmarked.
- o) Future expansion should be assessed and space provision be made accordingly.

5.0. LAYOUT OF BLOCKS / FACILITIES

To prepare a layout, information should be collected on the following aspects, as applicable;

- Process units, utility requirements, storage tanks, LPG storage vessels and other pressurized storage vessels
- Product receipt / despatch and mode of transport (rail, road and pipeline)
- Warehouses, storage areas for solid products such as petroleum coke, petroleum wax, sulfur, bitumen / asphalt etc and other open storage areas like scrap yards and dumping ground
- Chemical / Toxic chemicals storage, hazardous waste storage / disposal.
- Flares
- Service buildings, fire station and fire training ground
- Site topography including elevation, slope, and drainage
- Meteorological data,
- Bathymetric data (high tide level, surge wave height etc.) for installations in coastal areas.
- Seismic data
- Highest flood level in the area, water table, natural streams/ canals
- Approach roads to main plant areas
- Aviation considerations
- Risk to and from adjacent facilities
- Environmental considerations
- Statutory obligations

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5.1 General consideration for the layout of blocks / facilities

While locating the various facilities / blocks, the following should be considered:

- (a) Layout of Blocks / facilities should be in sequential order of process flow.
- (b) Process unit(s), tank farm, loading gantry, solid storage, utilities, Effluent Treatment Plant (ETP) and approach roads should be located on high ground to avoid flooding.
- (c) In case process units are operated in an integrated way and shutdowns are taken simultaneously, then it may be considered as a single block.
- (d) Control room should be located in a non-hazardous area upwind of process plants / hydrocarbon storage and handling facilities. It shall not be located on a lower level than surrounding plants and tank farms. There shall be no structure that would fall on the control room in case of a blast. For details, refer OISD-STD-163.
- (e) Utility block(s) should preferably be located adjacent to unit blocks.
- (f) Power generation facilities which also supply steam for process requirement should be located near the process unit block. When external power grid is interconnected with plant power generation facilities, either the power plant should be located at the side of the boundary wall or the external power transmission lines should be taken underground upto interconnection grid.
- (g) Overhead power transmission lines shall not pass over the installation including the parking areas. Horizontal clearance shall be in line with the Indian Electricity Rules.
- (h) High Tension (HT) sub-station(s) should be located close to major load centers.
- (i) Low Tension (LT) sub-station should be located at load centers in such a way that the distance between distribution transformer and farthest motor is minimum.
- (j) Cooling Towers should be located downwind of process equipment and substation so that fog developed will not cause corrosion or obstruct vision or short-circuiting.
- (k) Storage tanks should be grouped according to product classification. In undulating areas, storage tanks should be located at lower elevations.
- (l) Truck loading / unloading facilities should be located close to product movement gate and should be oriented to provide one-way traffic pattern for entrance and exit.
Rail loading facilities should be located along the periphery of the installation.
- (m) Sulphur recovery unit and sulphur loading area should be located close to product movement gate and away from process units, hazardous and populated areas.
Equipment drawing air (e.g. air compressors, air blower, FD fan etc) should be located away from Sulfur recovery unit / Sulfur handling facility.
Minimum separation distance of 50 meters is recommended between sulfur storage / handling and any facility or boundary wall.
- (n) Petroleum coke storage and handling facilities should be located as far as possible away from process units, air separation plants, populated and hazardous areas.
- (o) Separate collection system should be provided for different types of waste generated in the process plant such as oily water, caustic, acid effluents, fecal etc. Effluent Treatment Plant should be located minimum one block away from process unit area, down wind of process units and important areas considering odour & emission of volatile organic compound. This should be closer to disposal point by the side of the boundary and at lower grade to facilitate gravity flow of effluent.
- (p) Flare should be located upwind of process units and the area around flare should be paved. For more details OISD-STD-106 on "Process Design and Operating Philosophies on Relief and Disposal systems" shall be referred.
- (q) Main pipe racks / pipe track shall not be routed through process units. Provide overhead clearance for vehicles over roadways and railroads.

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- (r) Roads should be provided in a symmetric manner to serve all process areas requiring access for the operation, maintenance and fire fighting. These roads should encircle the process blocks/ process units.
- (s) Smoking booths should not be provided in the hydrocarbon industry. However if required, these shall be located at minimum distance of 60 meters from any hydrocarbon source.
- (t) Fire station, firewater storage & firewater pump house shall be located at a safe place away from hazardous areas. Fire station should be upwind of process units and hydrocarbon storage area with straight approach to process units / other critical areas.
- (u) Location of firewater pumps & tanks shall be inline with OISD-STD-116, OISD-STD-117 & OISD-STD-144 as the case may be.

5.2 Separation distances;

Minimum separation distances between various blocks / facilities described above shall be as per Table-1. The table shall be read in conjunction with the notes specified with the table.

6.0 LAYOUT OF PROCESS UNITS

Equipment in process unit can be arranged in many ways. Safety, economy, operability, and ease of maintenance should be considered in locating each item within the unit. Adequate spacing between equipment will help in minimizing the spread of fire. Consideration should be given to access for fire fighting.

6.1 General Considerations for the layout of Process Equipment

- (a) Process flow sequence and operating procedures should be thoroughly understood so that equipment arrangement in the plot plan is functional. Equipment should be arranged in logistic process sequence for optimum piping runs and operational and maintenance ease. Spacing between equipment shall be adequate for undertaking maintenance jobs.
- (b) The unit pipe rack should be kept in the centre, thereby splitting the unit into two or more areas of equipment. Pumps may be arranged in two rows close to and on either side of the pipe rack. Heat Exchangers and vessels should be grouped together forming outer rows on both sides of the rack.
- (c) Heat exchangers should be located perpendicular to the pipe rack on the outer row to facilitate pulling of tube bundles with mobile crane or by other means. Shell and tube heat exchanger should have a longitudinal clearance of at least one-meter plus the length of removable bundles.
- (d) Air fin coolers should be installed above the pipe rack / technological structures / independent structure. Pumps handling hydrocarbons above the temperature of 230 °C or C4 and Lighters should not be installed underneath the air fin coolers.
- (e) Vessels having large liquid hold-up should be installed at lower heights and preferably at grade. Adequate drainage should be provided around such vessels. Where process requirement dictates their installation above grade, these should be located in open area.
- (f) Towers / columns should be located along the pipe rack towards open areas for unobstructed erection as well as maintenance of internals at grade. Tall towers requiring frequent operating attention at upper levels may be located at one place so that common connecting platform can be provided.
- (g) Thermo-siphon reboilers should preferably be placed close to their associated towers.
- (h) Vessels, column, Reactors with internals and / or containing catalysts, chemicals etc should have a drop-out area for removing / installing the internals and / or for loading / unloading of catalysts and chemicals.
- (i) Heaters should be located up wind at one corner of the unit. Space should be provided for removal and cleaning of heater tubes besides approach for crane. Areas around the heaters shall be graded

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for guiding spills away from process equipment. Forced Draft fans shall be located away from process equipment from where they are likely to suck hydrocarbon vapors.

- (j) No trenches or pits which might hold flammables should extend under the furnace and connections with underground drain system should be sealed over an area 15 meters from the furnace walls.
- (k) The local control panel for soot blower control and flue gas analyzer only should be located on and near the process heater. The rest of controls should be taken to control room.
- (l) Gas compressors should be located down wind from heaters so that leaked gases will not drift towards the heater. Gas compressors should have roofing and open from sides to avoid accumulation of heavier vapours/gases on the floor of compressor house. Compressor house should be located near the battery limits to facilitate ease in maintenance and operation. Drop out area should be provided for maintenance.
- (m) No other tankage except day tanks / process chemicals shall be provided within battery limits of any process unit.
- (n) Process chemicals storage tanks should be provided with kerb wall of minimum 300-mm height. Hydrocarbons day tanks shall be provided with dyke in line section 7.0 of this standard.
- (o) Cold boxes should be located on grade or on separate elevated structures. Adequate space should be provided around cold boxes for ease of operation and maintenance.
- (p) Flare knock out drum for the process units should be located at battery limit of the unit.
- (q) Blow down facilities / buried drum should be located at one corner of the plant farthest from furnace or any fired equipment and on the lee-ward side of the unit.
Vent from Blow down facility shall be minimum 6m above the highest equipment falling within radius of 15 m from the vent stack.
- (r) Operators cabin may be provided in the process unit. The cabin should be located upwind side of the unit in non-hazardous area and away from draining / sampling facilities. The cabin should be for minimum occupancy of the shift operators of the respective facilities only.
- (s) Stairways should be provided for the main access.
- (t) Minimum headroom under vessels, pipes, cable racks, etc should be 2.1 meters.
- (u) Equipment should be spaced to permit use of mobile equipment and power tools or servicing and maintaining equipment during turn around periods.

6.2 Equipment spacing with in process units;

Minimum separation distances between various equipment within process units are given in Table-2. The distances recommended should be followed to the extent feasible. Equipment spacing within the process unit may be varied to meet the requirements specified by Licensors or of the Engineering Consultants. However, the distances specified in notes to Table-2 shall be met.

7.0 LAYOUT OF STORAGE TANKS

7.1 General considerations

7.1.1 Dyked Enclosures;

- (a) Petroleum storage tanks shall be located in dyked enclosures with roads all around the enclosure. Aggregate capacity of tanks located in one dyked enclosure shall not exceed following values:
 - 60,000 cum. for a group of fixed roof tanks.
 - 120,000 cum. for a group of floating roof tanks

Fixed cum floating roof tanks shall be treated as fixed roof tanks. However in case these tanks are provided with windows opening on the shell and these windows will not get blocked in any case, then these may be considered as floating roof tanks.

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If a group of tanks contains both fixed and floating roof tanks, then it shall be treated as a group of fixed roof tanks for the purpose of above limits.

- (b) Dyked enclosure shall be able to contain the complete contents of the largest tank in the dyke in case of any emergency. Enclosure capacity shall be calculated after deducting the volume of tanks (other than the largest tank) and the tank pads within the dyke upto the height of the enclosure. A free board of 200 mm above the calculated liquid level shall be considered for fixing the height of the dyke.
- (c) The height of tank enclosure dyke (including free board) shall be at least 1.0 m and shall not be more than 2.0 m above average inside grade level. The dyke wall made up of earth, concrete or solid masonry shall be designed to withstand the hydrostatic load. Earthen dyke wall shall have not less than 0.6-meter wide flat section on top for stability of the dyke wall.
- (d) For excluded petroleum, the capacity of the dyked enclosure should be based on spill containment and not for containment on tank rupture. The minimum height of dyke wall in case of excluded petroleum shall be 600 mm.
- (e) Separation distances between the nearest tanks located in separate dykes shall not be less than the diameter of the larger of the two tanks or 30 meters, whichever is more.
- (f) Process equipment should not be located inside the dyke. Pump stations and piping manifold should be located outside dyke areas by the side of roads.
- (g) Tanks located overhead shall meet safety distances and shall also have dyked enclosure of RCC construction and provided with efficient drainage system for the dyke enclosure.

7.1.2 Grouping;

- (a) Grouping of petroleum products for storage shall be based on the product classification. Class-A and / or Class-B petroleum may be stored in the same-dyked enclosure. Class-C petroleum should preferably be stored in separate enclosure. However, where Class-C petroleum is stored in a common dyke along with Class-A and/or Class-B petroleum, all safety stipulations applicable for Class-A and/ or Class-B respectively shall apply.
- (b) Excluded petroleum shall be stored in a separate dyked enclosure and shall not be stored along with Class-A, Class-B or Class-C petroleum.
- (c) Tanks shall be arranged in maximum two rows so that each tank is approachable from the road surrounding the enclosure. This stipulation need not be applied to tanks storing excluded petroleum class.

Tanks having 50,000 cum capacity and above shall be laid in single row.

7.1.3 Fire walls;

- (a) In a dyked enclosure where more than one tank is located, firewalls of minimum height 600mm shall be provided to prevent spills from one tank endangering any other tank in the same enclosure.
- (b) A group of small tanks each not exceeding 9 meters in diameter and in all not exceeding 5,000 cum in capacity shall be treated as one tank for the provision of firewall.
- (c) For excluded petroleum product storage, firewall of height not less than 300 mm shall be provided by limiting the number of tanks to 10 or the capacity of group of tanks to 5,000 cum whichever is lower.

7.1.4 General;

- (a) The tank height shall not exceed one and half times the diameter of the tank or 20 m whichever is less. For the installations covered under Oil Mines Regulation, the maximum height of the tank, dyke requirements etc. shall be as per Oil Mines Regulations
- (b) Piping from / to any tank located in a dyked enclosure should not pass through any other dyked enclosure. Piping connected to tanks should run directly to outside of dyke to the extent possible to minimise piping within the enclosures.

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- (c) The minimum distance between a tank shell and the inside toe of the dyke wall shall not be less than half the height of the tank.
- (d) There shall be access on all four sides of each dyke area and roads should be linked to minimize the effect if one road is cut off during the fire.

7.2 Separation Distances between tanks / offsites facilities;

The following stipulations shall apply for the separation distances for above ground tanks storing petroleum:

- (a) For larger installation, minimum separation distances shall be as specified in Table- 3 and Table-4. The tables are applicable where total storage capacity for Class-A and Class-B petroleum products is more than 5000 cum or the diameter of Class-A or Class-B product tank is more than 9 meters.
- (b) For smaller installation, minimum separation distances shall be as specified in Table-5. This table is applicable where total storage capacity of Class-A & Class-B is less than 5000 cum and diameter of any tank storing Class-A and Class-B petroleum product does not exceed 9 meters. Table-5 shall also be applicable for the installation storing only Class-C petroleum.
- (c) Excluded petroleum should be treated as Class-C petroleum for the purpose of separation distances and Table – 5 shall be applicable for their separation distances.

8.0 LAYOUT OF LPG FACILITIES

8.1 General Considerations:

8.1.1 LPG Storage;

The requirements given below are applicable to above ground LPG storage facilities. For mounded LPG storage, refer OISD-STD-150.

- (a) Vessels shall be arranged into groups each having a maximum of six vessels. Capacity of each group shall be limited to 15000 cum. Each group shall be provided with a curb wall.
- (b) Any vessel in one group shall be separated from a vessel in another group by a minimum distance of 30 meters.
- (c) Spheres and bullets shall be treated as separate groups with 30 meters separation distance between two groups.
- (d) Longitudinal axes of horizontal vessels (Bullets) should not point towards other vessels, vital process equipments and control room.
- (e) Storage vessels should be located down wind of process units, important buildings and facilities.
- (f) LPG storage vessels shall not be located within the same dykes where other liquid hydrocarbons are stored.
- (g) Storage vessels shall be laid out in single row both in case of the spheres and bullets. Storage vessels shall not be stacked one above the other.
- (h) Spillage collection shallow sump shall be located at a distance where the flames from sump fire will not impinge on the vessel. This distance shall not be less than the diameter of the nearest vessel or 15 meters whichever is higher. The capacity of the collection sump shall be as per OISD-STD-144.
- (i) Curb wall around the storage tank shall have a minimum height of 30cm. However it shall not exceed 60cm at shallow sump position, as otherwise evaporation of spilled LPG may get affected.

8.1.2 LPG bottling facility;

- (a) LPG bottling facilities should be located at a safe distance from other facilities with minimum ingress to trucking traffic and downwind to storage.
- (b) There shall not be any deep ditches in the surrounding area to avoid LPG settling.

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- (c) Stacking areas for empty and filled cylinders should be located separately. Cylinders shall be stacked vertically. Filling machines and testing facilities shall be organized in sequential manner distinctly in a separate area.
- (d) Filled LPG cylinders shall not be stored in the vicinity of cylinders containing other gases or hazardous substances.
- (e) Trucking traffic shall be smooth to avoid blocking/ obstruction for loading and unloading of cylinders.

8.1.3 Bulk handling facilities;

- (a) LPG truck loading/unloading gantry shall be located in a separate block and shall not be grouped with other petroleum products.

Maximum number of LPG tank truck bays shall be restricted to 8 in one group. The bay should be designed in such a way that the driver's cabin will be facing the exit direction and shall have no obstruction.

- (b) The loading facilities for LPG and other petroleum products shall be kept dedicated keeping in view the possibility of mis-charging and large scale operations at refineries.
- (c) The unloading facilities of LPG & other petroleum products of marketing locations may be combined after complying with conditions as given in Annexure-I.
- (d) Rail loading/unloading of LPG should be restricted to a maximum of half rake. Full rake loading / unloading is shall be done on two separate rail gantries having a minimum distance of 50m.

8.2 Separation distances for LPG facilities;

Minimum separation distances for above ground LPG facilities shall be as given in Table-6 & Table-7. For other details refer OISD-STD-144.

For mounded LPG storage, refer OISD-STD-150.

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9.0 REFERENCES:

1. The Petroleum Rules - 2002.
2. The Static and Mobile Pressure Vessels (Unfired) Rules, 1981
3. Oil Mines Safety Regulations - 1984
4. OISD-STD-106 on Process Design and Operating Philosophies on Relief and Disposal System.
5. OISD-STD-116 on Fire protection Facilities for Petroleum Refineries / Process Plants
6. OISD-STD –117 on Fire protection facilities for Petroleum depots and terminals
7. OISD-STD- 144 on LPG bottling plant and layouts.
8. API Standard 2610–Design, construction, operation, maintenance and inspection of Terminal and Tank facilities.
9. API Recommended Practices 2001– Fire protection in Refineries.
10. Loss Prevention in process Industries by Frank P Lees.
11. NFPA 30, flammable and Combustible Liquid Code.

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Annexure - I**a. Risk Assessment**

- Risk analysis & Hazop studies shall be carried out for the combined facilities at the planning stage itself and all recommendation thereof complied with.

b. Facilities related

- Dedicated unloading arms / hoses shall be used for LPG and POL products to avoid any chance of wrong connections or mixing of POL and LPG.
- The unloading of POL products shall be done from bottom with POL headers running on ground / trenches.
- The LPG unloading shall be done from the top.
- The gas detectors shall be in place and operative all the time including as and when LPG / POL products are being handled.
- Only approved non-sparking tools and gadgets shall be used in the gantry.
- The emergency escape routes shall be planned considering the available facilities i.e. both at overhead platform and at ground level.
- Liquid withdrawal line headers shall be provided with ROV on common exit line from gantry and near vessel to minimise LPG leakage in case of emergency.
- Fire fighting system shall be in Auto mode for POL gantry with provision of keeping it in manual mode. The fire fighting facilities shall be provided to meet the requirement of independent requirements of both the products as given in respective OISD standards. Further, water cooling system shall also cover the above ground product pipelines.
- LPG liquid Line shall also be provided with NRV from sphere/ bullet side.
- Each liquid line shall be provided with EFCV.
- The electrical fittings in the gantry shall comply with the hazardous area classification considering LPG being the product handled.
- Earthing & Bonding system shall be checked periodically and records maintained thereof.
- Railway traction & insulation joint shall be terminated in line with extant railway / OISD guidelines from the first unloading point in gantry and sufficient number of buffer wagons shall be provided
- A proper drainage & collection system to be provided in the gantry to take care of spillage of POL, if any.
- The gantry and nearby area to be properly graded to avoid any accumulation of LPG vapours.
- Only standards fittings to be used in the gantry.

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c. Operations Related

- There is no simultaneous unloading operation of LPG and other petroleum products.
- The operation shall be carried out only by skilled and trained personnel under close supervision of officer.
- All operating personnel shall be trained for both POL & LPG operation and emergency handling.
- The unloading shall be carried out by following best operating practices as given in OISD standards.
- In case of any leakage, the complete operation shall be stopped.
- All safety and emergency inter-locks shall be in place and checked before commencing unloading operation.
- Gantry shall be kept free of spillage. There shall be a check of spillage / leakage before the start of the operations and during the operation. Spillage, if any, shall be flushed.
- Passing of valves in LPG unloading lines shall be checked and rectified, if any.
- Railway track shall be isolated and checked before commencing the operation.
- The mock drills shall be practiced jointly periodically keeping in view the presence of both products in gantry i.e. LPG headers and POL product lines in trenches or at ground level.
- The pressure in LPG headers should be brought to minimum after completion of unloading.
- All unloading arms/ hoses to be secured properly after use and ends capped.

Before commencing any unloading operations, an inspection of facilities by joint team of LPG & POL officers shall be carried out ensuring compliance to all the above recommendations and to identify any hazardous situation and also ensure safe condition for unloading operation. A common checklist shall be developed for compliance to signed by POL & LPG officers.



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SEPARATION DISTANCES BETWEEN BLOCKS/FACILITIES

TABLE – 1

Sr no	From / To	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1	Process Units	Note-1	Note-3	30	30	30	60	90	45	45	60	45	30	60	60	30	90	15
2	Process Control Room (Note –2)	Note-3	x	Note-4	Note-5	30	60	90	45	45	30	Note-3	x	30	15	30	30	0
3	Storage Tanks Class-A	30	Note-4	Note-6	Note-6	Note-6	30	90	30	30	60	(90)	30	T3	60	30	50	60
4	Storage Tank Class-B	30	Note -5	Note-6	Note-6	Note-6	30	90	30	30	60	(90)	30	T3	30	30	50	30
5	Storage Tank Class-C	30	30	Note-6	Note-6	Note-6	30	90	30	30	60	(90)	30	T3	30	30	50	15
6	Pressurised Storage: LPG/ C4 & Lighter / H2	60	60	30	30	30	T7	90	30	T6	90	(90)	30	T7	45	30	60	45
7	Flare (Note-7)	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90	90
8	Bulk Loading POL (Rail /Road)	45	45	30	30	30	30	90	Note-8	Note-9	60	30	Note-10	T3	60	30	50	30
9	Bulk Loading LPG (Rail /Road)	45	45	30	30	30	T6	90	Note-9	T6	90	(90)	T6	T6	60	30	50	30
10	Fire Station / First Aid Center	60	30	60	60	60	90	90	60	90	x	30	30	12	12	30	90	0
11	Boiler house / Process Unit Heaters (Note-11)	45	Note-3	(90)	(90)	(90)	(90)	90	30	(90)	30	x	15	50	30	30	Note-	15
12	Rail Spur	30	x	30	30	30	30	90	Note-10	T6	30	15	x	30	6	15	50	6
13	Boundary wall around installation	60	30	T3	T3	T3	T7	90	T3	T6	12	50	30	x	6	30	50	15
14	Service buildings	60	15	60	30	30	45	90	60	60	12	30	6	6	x	30	50	12
15	Cooling tower,	30	30	30	30	30	30	90	30	30	30	30	15	30	30	x	15	6
16	API Separators / Oil sludge pit	90	30	50	50	50	60	90	50	50	90	Note-12	50	50	50	15	x	45
17	Electrical Sub Station (Note 13)	15	0	60	30	15	45	90	30	30	0	15	6	15	12	6	45	x

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General Notes to Table-1 :

- a) All distances are in meters. “T” indicates the table number to be referred. “x” means any distance suitable for constructional or operational convenience.
- b) All distances shall be measured between the nearest points on the perimeter of each facility except (i) In case of tank vehicle loading / unloading area where the distance shall be from the center of nearest bay. (ii) The distances given in the brackets () are from the shell of the Heater / Boiler / Furnace / Still.

Specific notes to Table-1:

- Note-1:** This shall be 36 meters considering the 6-meter wide road passing through the center. The edge of the road shall not be less than 15 meters away from the edge of the unit.
- Note-2:** Type of construction shall be as per OISD-STD-163.
- Note-3:** Process control room to Process units / boiler house / heaters the minimum separation distance shall be 30 m. For a control room attached to single process unit or a boiler or a heater, the minimum separation distance shall be 16 m. For Gas processing plants, it shall be minimum 30 meters irrespective of whether it is for one or more units.
- Note-4:** Shall be 60 m for non-blast construction and 30 m for blast resistant construction.
- Note-5:** Shall be 45 m for non-blast construction and 30 m for blast resistant construction.
- Note-6:** Separation distances between the nearest tanks located in two dykes shall be equivalent to the diameter of the larger tank or 30 m, whichever is more. For distances within a dyke, it shall be as per Table-3 and Table-4
- Note-7:** The distances specified are for the elevated flare. For ground flare, these distances shall be 150 m. For Exploration & Production installations, this shall be in line with Oil Mines Regulations
- Note-8:** Separation distance between Tank truck gantry and wagon gantry shall be 50m.
- Note-9:** The separation distance shall be 50 m. However for LPG tank truck bulk loading to POL tank truck bulk loading it shall be 30 m.
- Note-10:** Separation distance between tank truck gantry and rail spur shall be 50 m.
- Note-11:** Boiler house or heater of a process unit is to be treated as a separate identity only for the consideration of surrounding blocks / facilities. However, heater of a process unit remains an integral part of the process unit to which it is attached and in that case the inter equipment distances should be inline with Table –2.
- Note-12:** Centralized / common API separators, Corrugated Plate Interceptor (CPI), open oil separators shall be categorized under the same risk and shall be located at a distance of 90 meters from heaters / boilers. However, if these are covered from the top and provided with adequate venting to safe location, the minimum separation distance shall be 30 meter.
- Note 13:** Separation distance of electrical substation was added in table 1 in January 2006 based on decision in 40th steering Committee Meeting in De’05.

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**SEPARATION DISTANCES BETWEEN EQUIPMENT WITHIN PROCESS UNIT****TABLE-2**

Sr no	From / To	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Fired Heater / Any fired equipment	x	15	15	15	22	15	15	20	15	15	15	x	18	6	30	15
2	Reactors	15	2	2	6	8	7	15	7	7	4	3	15	5	3	15	3
3	Distillation column	15	2	3	4	7	5	15	5	5	2	3	15	3	3	15	3
4	Accumulators – Hydrocarbons	15	6	4	2	8	5	15	4	4	2	3	15	3	3	15	3
5	Compressors - Hydrocarbons	22	8	7	8	3	7	15	7	7	7	7	15	4	3	20	7
6	Hot oil pump	15	7	5	5	7	1	7	1	1	2	2	15	3	x	15	x
7	Fuel Oil / HCs day tank	15	15	15	15	15	7	T-5	15	15	15	15	15	15	x	15	15
8	Pumps for class- A & all above Auto-ignition temp	20	7	5	4	7	1	15	1	1	2	2	15	3	x	15	x
9	Pumps - for all other Hydrocarbons	15	7	5	4	7	1	15	1	1	2	2	15	3	x	15	x
10	Heat Exchangers	15	4	2	2	7	2	15	2	2	2	2	15	2	2	15	x
11	Air fin coolers for Hydrocarbons	15	3	3	3	7	2	15	2	2	2	x	15	2	x	15	2
12	Fired heater Local control panel	x	15	15	15	15	15	15	15	15	15	15	x	10	x	15	5
13	Pressure vessels / Drums of Hydrocarbons	18	5	3	3	4	3	15	3	3	2	2	10	2	3	15	2
14	Main Pipe rack	6	3	3	3	3	x	x	x	x	2	x	x	3	x	15	x
15	Blow down facility – Drum, pump, vent stack	30	15	15	15	20	15	15	15	15	15	15	15	15	15	x	15
16	Structural main – Technological platforms	15	3	3	3	7	x	15	x	x	x	2	5	2	x	15	x

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General notes to Table –2:

- a) All distances are face-to-face clear minimum distances in meters.
- b) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements.
- c) Distances specified in Table-2 are the minimum recommended distances that the industry should adhere. These could be suitably modified as required to suit space constraints and relevant engineering practices except the followings.
 - (i) Blow down facility (open pit type) / oil catcher shall be located at a distance not less than 30 m from fired heater / any fired equipment. If the blow down drum is located underground / oil catcher is cover with vent to safe location, the minimum separation distance shall be 15m.
 - (ii) Fuel Oil day tank shall be located at a distance of not less than 15m from equipment except those facilities such as heat exchanger, pump connected directly with the Fuel Oil system.
- d) Firewater hydrant / monitors shall be minimum 15 m away from the equipment that is to be protected.
- e) Water spray deluge valve shall be minimum 15 m from equipment handling hydrocarbon.
- f) Fuel gas knock out drum shall be located at a minimum separation distance of 15 m from the heater.
- g) Separation distances specified in other OISD standards or elsewhere in this standard (other than Table –2) shall be followed as recommended.

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SEPARATION DISTANCES BETWEEN TANK / OFFSITE FACILITIES - (For large installations)
TABLE - 3

	Tanks / Facility	1	2	3	4	5	6	7	8	9
1	Storage Tank for Petroleum Class A / Class B.	T4	T4	15	15	15	15	8	15	0.5 D Min 20 m
2	Storage Tank for Petroleum Class C	T4	x	15	x	8	x	x	x	0.5 D Min 20 m
3	Storage / Filling Shed for packed (non bulk) petroleum Class A or class B	15	15	x	8	15	15	8	15	15
4	Storage / Filling Shed for packed (non bulk) Petroleum Class C	15	x	8	x	8	x	x	x	10
5	Tank vehicle loading / Unloading for petroleum class A or class B	15	15	15	8	x	x	8	15	20
6	Tank Vehicle loading / unloading for Class C	15	x	15	x	x	x	x	x	10
7	Flame proof Electric pump Motor	8	x	8	x	8	x	x	8	x
8	Non flame proof electric pump Motor	15	x	15	x	15	x	8	x	x
9	Boundary wall	0.5 D Min 20 m	0.5 D Min 20 m	15	10	20	10	x	x	x

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SEPARATION DISTANCES BETWEEN STORAGE TANKS WITHIN A DYKE
TABLE– 4

	Item	Between floating Roof Tanks Class A & B	Between fixed Roof Tanks Class A & B	Between Class C Petroleum Storage tanks
1	All tanks with Diameter upto 50 meters	$(D+d) / 4$ Min 10 m	$(D+d) / 4$ Min 10 m	$(D+d) / 6$ Min 6 m
2	Tanks with Diameter exceeding 50 meters.	$(D+d) / 4$	$(D+d) / 3$	$(D+d) / 4$

General notes to Table – 3 & 4

- a) All distances are in meters.
- b) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements
- c) D & d stands for diameter of larger and smaller tanks.
- d) In Table–3 all distances shall be measured between the nearest points on the perimeter of each facility except in the case of tank vehicle loading/unloading area where the distance shall be measured from the center of each bay.
- e) In Table–4, Distances given are shell to shell in the same dyke.
- f) For different combination of storage tanks, the stringent of the applicable formulae shall be considered for minimum separation distance.
- g) The distance of storage tanks from boundary wall is applicable for;
 - (i) Floating roof tanks having protection for exposure
 - (ii) Tanks with weak roof-to-shell joint having approved foam or inerting system and the tank diameter not exceeding 50 meters
- h) Distances mentioned in Table -3 are for electric pump motor located outside dyke. However for side entry mixer attached to tank shell, the motor can be mounted on the tank shell.
- i) For the facilities not covered in Table- 3, refer Table-1.

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SEPARATION DISTANCES BETWEEN TANKS/OFFSITE FACILITIES - (For small installations)
TABLE – 5

		1	2	3	4	5	6	7	8	9	10	11	12	13
1	Storage Tank Class A	0.5D	0.5D	0.5D / 6.0	9	9	9	15	15	15	3	15	15	15
2	Storage Tank Class B	0.5D	0.5D	0.5D / 6.0	9	0.5D	0.5D	9	4.5	4.5	3	4.5	D Min 4.5	D Min 4.5
3	Storage Tank Class C	0.5D / 6.0	0.5D / 6.0	x	9	0.5D	x	9	4.5	x	x	x	0.5D Min 3.0	0.5D Min 3.0
4	Storage / Filling shed for petroleum Class -A	9	9	9	x	4.5	6	9	9	9	3	9	9	9
5	Storage / Filling shed for packed (non bulk) petroleum Class -B	9	0.5D	0.5D	4.5	x	1.5	9	4.5	4.5	1.5	4.5	4.5	4.5
6	Storage / Filling shed for Packed (non bulk) petroleum Class -C	9	0.5D	x	6	1.5	x	9	4.5	x	x	x	3	3
7	Tank vehicle Loading / unloading Class - A	15	9	9	9	9	9	x	9	9	3	9	9	9
8	Tank vehicle Loading / unloading Class - B	15	4.5	4.5	9	4.5	4.5	9	x	4.5	1.5	4.5	4.5	4.5
9	Tank vehicle Loading / unloading Class - C	15	4.5	x	9	4.5	x	9	4.5	x	x	x	3	3
10	Flame proof Electric pump motors	3	3	x	3	1.5	x	3	1.5	x	x	3	x	x
11	Non Flame proof Electric pump motors	15	4.5	x	9	4.5	x	9	4.5	x	3	x	x	x
12	Office building, stores, amenities	15	D Min 4.5	0.5 D Min 3.0	9	4.5	3	9	4.5	3	x	x	x	x
13	Boundary wall	15	D Min 4.5	0.5D Min 3.0	9	4.5	3	9	4.5	3	x	x	x	x

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General notes to Table –5:

- a) All distances are in meter and the table specifies the minimum requirement.
- b) “x” indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements
- c) “D” indicates the diameter of the larger tank.
- d) Distances given for the tanks are shell to shell in the same dyke.
- e) Where alternate distances are specified (like 0.5 D / 6.0), the minimum thereof shall be used.
- f) All distances shall be measured between the nearest points on the perimeter of each facility except in case of tank vehicle loading /unloading area where the distance shall be from the center of each bay.
- g) Pig launcher/receiver at liquid hydrocarbon handling pipeline installations should be located at least 5 m from boundary.
- h) Distances mentioned in Table -3 are for electric pump motor located outside dyke. However for side entry mixer attached to tank shell, the motor can be mounted on the tank shell.

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**SEPARATION DISTANCES FOR LPG FACILITIES****TABLE - 6**

Sr no.	FROM / TO	1	2	3	4	5	6	7	8
1	LPG Storage vessels	Note-1	T7	30	30	50	30	15	60
2	Boundary wall / group of buildings not associated with LPG plant	T7	x	30	30	50	30	30	x
3	Shed for filling and storage of LPG, Cold repair shed, Cylinder evacuation facilities	30	30	15	30	50	30	15	60
4	Tank Truck Loading / unloading gantry	30	30	30	30	50	50	30	60
5	Tank wagon gantry	50	50	50	50	50	50	30	60
6	Rail spur	30	30	30	50	50	50	30	60
7	Pump house / Compressor house (LPG)	15	30	15	30	30	30	x	60
8	Fire Water pump house	60	x	60	60	60	60	60	x

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TABLE– 7

SEPARATION DISTANCES BETWEEN LPG STORAGE VESSELS AND BOUNDARY WALL / GROUP OF BUILDINGS NOT ASSOCIATED WITH LPG FACILITIES

Capacity of Each vessel in Cum of water	10 - 20	21 - 40	41 - 350	351 - 450	451-750	751 - 3800
Distance in meters	15	20	30	40	60	90

General Notes to Table-6 & Table-7;

- a) Table-6 is applicable for total storage of above 100 Tonnes.
- b) All distances are in meters
- c) “x “indicates suitable distance as per good engineering practices to meet construction, operational and maintenance requirements
- d) T7 indicates Table –7;
- e) Distance of stabling line shall be as per Railway Standards.

Specific Notes to Table- 6;

Note–1: The distance shall be 2 meters or 1/4 of the sum of the diameters of the adjacent vessels or half the diameter of the larger of the two adjacent vessels in the same group whichever is greater.

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MINISTRY OF PETROLEUM & NATURAL GAS

Notification

New Delhi, the 13th march, 2002

G.S.R. 204 (E) :- WHEREAS a draft of the Petroleum Rules 2001 was published as required by sub-section (2) and (3) of section 29 of the Petroleum Act 1934 (30 of 1934), by the notification of the Government of India in the Ministry of Petroleum and Natural Gas No. GSR 357(E) dated the 15th May, 2001 in the Gazette of India Extraordinary Part II Section 3 sub-section (i) dated the 15th May, 2001 inviting objections or suggestions from all persons likely to be affected thereby before the expiry of 45 days from the date on which the Notification was made available to the public;

AND WHEREAS, the said notification was made available to the public on the 19th June, 2001;

AND WHEREAS, except certain suggestions, no objection to the draft rules were received by the Central Government;

AND WHEREAS the Central Government have duly considered all the suggestions received by it on the draft rules;

NOW, THEREFORE, in exercise of the powers conferred by sections 4, 5, 14, 21, and 22 and sub-section (1) of Section 29 of the Petroleum Act 1934 (30 of 1934), the Central Government hereby makes the following rules, namely :-

CHAPTER I

PRELIMINARY

PART I – short title and definitions

1. Short title and commencement-

(1) These rules may be called the Petroleum Rules, 2002.

(2) They shall come into force on the date of their publication in the Official Gazette.

2. Definitions –

(1) In these rules, unless the context otherwise requires: -

(i) "Act" means the Petroleum Act, 1934 (30 of 1934);

(ii) "Adequate" –

(a) in relation to ventilation, means where the concentration of the inflammable gas in a gas-air mixture does not reach the lower inflammable limit, or

(b) where applied to provision of facilities for fire-fighting, means the facilities so provided are in accordance with the prevalent recognized standards or codes of safety;

(iii) "Approved" -

(a) Where applied to a specification, means that the specification is authorised by the Chief Controller including the following Oil Industry Safety Directorates Standards: OISD -105, OISD-116, OISD- 117, OISD-118, OISD-141 and OISD –156;

(b) where applied to an appliance or fitting, means that the appliance or fitting bears a label of a designated testing organization certifying conformity with a specification approved by the Chief Controller or with a laboratory test report accepted by the Chief Controller; or

(c) where applied to any facility for petroleum, means that it conforms to these rules;

(iv) "Chief Controller" means the Chief Controller of Explosives

(v) "Controller" means Controller of Explosives and includes Joint Chief Controller of Explosives, Deputy Chief Controller of Explosives and Deputy Controller of Explosives;

(vi) "Competent person" means a person recognized by the Chief Controller to be a competent person, or a person who holds a certificate of competency for the job in respect of which competency is required from an institution recognized by the Chief Controller in this behalf;

(vii) "Conservator " includes any person acting under the authority of the officer or body of persons appointed to be Conservator of a port under section 7 of the Indian Ports Act, 1908 (15 of 1908);

(viii) "Container " means a receptacle for petroleum not exceeding 1,000 litres in capacity;

- (ix) "Defence Forces of the Union" includes General Reserve Engineering Forces under the Director-general Border Roads, Assam Rifles, Central Reserve Police Force, Border Security Force and National Security Guard under the Ministry of Home Affairs and Special Security Bureau under the Cabinet Secretariat;
- (x) "District Authority " means -----
 - (a) in towns having a Commissioner of Police, the Commissioner or a Deputy Commissioner of Police;
 - (b) in any other place, the District Magistrate;
- (xi) "District Magistrate" means and includes an Additional District Magistrate and in the States of Punjab and Haryana and in the Karaikal, Mahe and Yenam areas of the Union Territory of Pondicherry, also includes a Sub-divisional Magistrate;
- (xii) "Electric Apparatus" includes motors, starters, lamps, switches, junction boxes, fuses, cut-outs or any other appliance, equipment or fitting which operates on electricity;
- (xiii) "Form" means a form in the First Schedule;
- (xiv) "Hot work" means any work which involves welding, burning, soldering, brazing sand blasting, chipping by spark-producing tools, use of certain power driven tools, non-flame proof electrical equipment or equipment with internal combustion engines and including any other work which is likely to produce sufficient heat, capable of igniting inflammable gases;
- (xv) "Inspector" means an officer authorized by the Central government under subsection (1) of section 13 of the Act;
- (xvi) "Installation " means any premises wherein any place has been specially prepared for the storage of petroleum in bulk, but does not include a well-head tank or a service station;
- (xvii) "OISD" means "Oil Industry Safety Directorate" a technical body assisting the Safety Council constituted under the Ministry of Petroleum and Natural Gas;
- (xviii) "OISD Standard" means technical standards formulated by OISD and approved by Safety Council constituted under the Ministry of Petroleum and Natural Gas to ensure safety in Oil and Gas Industry (as amended from time to time).;
- (xix) "Petroleum in bulk" means petroleum contained in a tank irrespective of the quantity of petroleum contained therein;
- (xx) "Protected Area" means the area necessary for the maintenance of the distance required under the conditions of the licence to be kept clear between any installation, service station or storage shed and any protected works;
- (xxi) "Protected works" include-
 - (a) buildings in which persons dwell or assemble, docks, wharves, timber and coal yards, furnace, kiln or chimney and buildings or places used for storing petroleum or for any other purpose but does not include buildings or places forming part of an installation;
 - (b) any public road or a railway line which is used exclusively as an oil siding; and
 - (c) overhead high-tension power lines;
- (xxii) "Sampling Officer" means an officer authorized by the Central Government under subsection (1) of section 14 of the Act;
- (xxiii) "Schedule" means a schedule annexed to these rules;
- (xxiv) "Service Station" means any premises specially prepared for the fuelling of motor vehicles and includes such places within the premises which have been specially approved by the licensing authority for the servicing of motor vehicles and for other purposes;
- (xxv) "Storage Shed" means a building used for the storage of petroleum other wise than in bulk whether forming part of an installation or not, but does not include a building used for the storage of petroleum exempt from licence under sections 7,8 or 9 of the Act;
- (xxvi) "Tank" means a receptacle for petroleum exceeding 1,000 litres in capacity;
- (xxvii) "Tank cart" means a hand-drawn or animal-drawn vehicle equipped with a tank;
- (xxviii) "Tank semi-trailer" means a tank trailer constructed in such a manner that when it is drawn by a tractor by means of fifth wheel connection, some part of the load rests on the towing vehicle;
- (xxix) "Tank trailer" means a vehicle with a tank mounted thereon or built as integral part thereof and constructed in such a manner that it has at least two axles and all its load rests on its own wheels;
- (xxx) "Tank truck" means a single self-propelled vehicle with a tank mounted thereon;

(xxxi) "Tank Vehicle" means any vehicle, including a tank wagon with a tank of a capacity exceeding 1,000 litres mounted thereon and also includes refueller used for refuelling of air crafts or onsite fuelling of heavy vehicles/machineries/stationery equipments.

(xxxii) "Tank wagon" means a railway carriage with a tank mounted thereon.

(xxxiii) "Testing Officer" means an officer authorized by the Central Government to test petroleum under section 17 of the Act;

(xxxiv) "Vehicle" means all carriages, including animal-drawn carriages for the transportation of petroleum either in bulk or otherwise than in bulk;

(xxxv) "Well-head tank" means a tank into which crude petroleum flowing or being pumped from an oil well is first discharged;

(2) The words and expressions used in these rules but not defined in sub-rule (1), shall have the respective meanings assigned to them in the Act.

PART II GENERAL PROVISIONS

3. Restriction on delivery and dispatch of petroleum. –

(1) No person, shall deliver or dispatch any petroleum to anyone in India other than the holder of a storage licence issued under these rules or his authorized agent or a port authority or railway administration or a person who is authorized under the Act to store petroleum without a licence.

(2) The petroleum delivered or dispatched under sub-rule (1) shall be of the class, and shall not exceed the quantity, which the person to whom it is delivered or dispatched is authorized to store with or without a licence under the Act.

(3) Notwithstanding anything contained in sub-rule (2), petroleum Class B not exceeding 15,000 litres in quantity packed in sealed airtight approved containers may be dispatched to a person not holding a storage licence provided that the person dispatching the petroleum has satisfied himself that prior arrangements have been made by the person to whom the petroleum is dispatched for the immediate disposal in the original sealed packages or such quantity as in excess of 2,500 litres : Provided that a dry chemical powder fire extinguisher as a means of fighting fire in emergency shall be carried in the case of the containers with more than 2,500 litres.

(4) Nothing in sub-rules (1) and (2) shall apply to the delivery or dispatch of petroleum to the Defence Forces of the Union and to the delivery or dispatch of kerosene (petroleum Class B) to the person holding licence in form XVIII for decantation into containers from tank vehicle: Provided that the person dispatching the Kerosene has satisfied himself that prior arrangements have been made by the person to whom the kerosene is dispatched for the immediate disposal into containers in lots of 2,500 litres or less.

4. Approval of containers. –

(1) Containers exceeding one litre in capacity for petroleum Class A and five litres in capacity for petroleum Class B or petroleum class C, shall be of a type approved by the Chief Controller.

(2) Where the approval of the Chief Controller is sought to a type of container not previously approved, an application together with copies of drawings thereof to scale showing the design, materials to be used, the method of construction and capacity of the container together with two samples containers and a fee of **rupees one thousand** for scrutiny shall be submitted to the Chief Controller.

(3) Nothing in sub-rules (1) and (2) shall apply to containers in the possession of the Defence Forces of the Union.

5. Containers for petroleum Class A.-

(1) Containers for petroleum Class A shall be constructed of tinned, galvanized or externally rust proofed sheet iron or steel and be of a type approved by the Chief Controller: Provided that glass bottles of a capacity not exceeding 2.5 litres and of a type approved by Chief Controller can be used as a container for laboratory chemicals classified as petroleum Class "A".

(2) The containers shall be so constructed and secured as not to be liable except under circumstances of gross negligence or extraordinary accident to become defective, leaky or insecure in transit and they shall be kept in proper repair.

(3) The containers shall have well-made filling aperture which shall be fitted with well-fitting and secure airtight screw plugs or screw caps or other caps.

(4) Containers made of sheet iron or steel shall have the following thickness of metal, namely: -

Capacity of Container exclusive of the free space Minimum thickness in mm. Prescribed in sub-rule (6) of sheet iron or steel

Not exceeding 10 litres 0.443(27BG)

Exceeding 10 but not exceeding 25 litres 0.63 (24BG)

Exceeding 25 but not exceeding 50 litres 0.80 (22BG)

Exceeding 50 but not exceeding 200 litres 1.25 (18BG)

Exceeding 200 but not exceeding 300 litres 1.59 (16BG)

(5) The capacity of any container, other than those approved by the Chief Controller for specific purposes, shall not exceed 300 litres.

(6) An air space of not less than 5 percent of its capacity shall be kept in each container.

(7) The container shall bear a stamped, embossed or painted warning exhibiting in conspicuous characters the words "Petrol" or "Motor Spirit" or an equivalent warning of the highly inflammable nature of the petroleum.

(8) Nothing in sub-rules (1), (3), (4), (5), (6) and (7), shall apply to containers in the possession of the Defence Forces of the Union.

6. Containers for petroleum Class B and Class C

(1) Containers for petroleum class B or petroleum class C shall be constructed of steel or iron and be of a type approved by the Chief Controller.

(2) An air space of not less than 5 percent of its capacity shall be kept in each container for petroleum Class B and not less than 3 percent of its capacity in each container for petroleum Class C.

(3) Nothing in this rule shall apply to containers in the possession of the Defence Forces of the Union.

7. Empty receptacles. –

All empty tanks which had petroleum Class A or petroleum Class B and empty containers which had petroleum Class A shall, except when they are opened for the purpose of filling or cleaning and rendering them free from petroleum vapour, be kept securely closed until they have been thoroughly cleaned and freed from petroleum vapour.

8. Repairs to receptacles. –

(1) No person shall cause to be repaired or repair by the use of hot work any tank or container which had petroleum unless it has been thoroughly cleaned and freed from petroleum and petroleum vapour or otherwise prepared for safely carrying out such hot repair and certified, in writing, by a competent person to have been so repaired.

(2) The certificate required under sub-rule (1) shall be preserved by the repairer for a period of at least three months and produced to an inspector on demand.

9. Prevention of escape of petroleum. –

All due precautions shall be taken at all times to prevent escape of petroleum into any drain, sewer, and harbour, river or watercourse or over any public road or railway line.

10. Prohibition of employment of children and intoxicated persons. –

No child under the age of eighteen years and no person who is in a state of intoxication shall be employed on the loading, unloading or transport of petroleum or in any premises licensed under these rules.

11. Prohibition of smoking, fires, lights, etc..-

Unless expressly provided in these rules, no person shall smoke and no matches, fires, lights or articles or substances capable of causing ignition of petroleum shall be allowed, at any time in

proximity to a place where petroleum is refined, stored or handled or in a vehicle's carriage or vessel in which petroleum is transported.

12. Special precautions against accident. –

(1) No person shall commit or attempt to commit any act, which may tend to cause a fire or explosion in or about any place where petroleum is refined, stored or handled, or any vehicle's carriage or vessel in which petroleum is transported.

(2) Every person storing petroleum and every person in charge of or engaged in the storage, handling or transport of petroleum shall at all time. -

(a) comply with the provisions of these rules and conditions of any licence relating thereto;

(b) observe all precautions for prevention of accident by fire or explosion; and

(c) prevent any person from committing any act referred to in sub-rule (1)

13. Payment of fees. –

(1) All fees payable under these rules to the Chief Controller shall be paid by a crossed bank draft drawn in favour of the Chief Controller of Explosives, Nagpur. The bank draft shall be drawn on any nationalized bank, payable at Nagpur. Fees upto rupees one hundred in each case may be paid in cash at the office of the Chief Controller.

(2) Fees payable to a Controller shall be paid by a crossed bank draft drawn in favour of the Controller of Explosives to whom the payment is made. The bank draft shall be drawn on any nationalized bank payable at the station where the office of the Controller to whom payment is to be made is located. Fees upto rupees one hundred in each case may also be paid in cash at the office of the Controller concerned.

(3) Fees payable to District Authority or any other authority under these rules shall be paid in such a manner as may be specified by that authority.

(4) (i) If an application for the grant, renewal or amendment of the licence is rejected, the fees paid by the applicant shall be refunded to him;

(a) by the licensing authority, if the fee has been paid in cash or by bank draft; or

(b) if the fee has been paid into a treasury, by that treasury on the production of signed order from the licensing authority directing such refund.

(ii) The fees shall be refunded by the licensing authority preferably within six months of the realisation.

(5) Fees payable under these rules for purposes other than the grant, renewal, or amendment of licences shall not be refundable.

CHAPTER II IMPORTATION OF PETROLEUM

PART I General

14. Licence for import of petroleum. –

Petroleum, other than petroleum, which may be stored without a licence under sections 7, 8 and 9 of the Act, shall not be imported into India except under a licence granted under these rules: Provided that, such Petroleum products may also be imported by a person not having a licence if adequate advance arrangements are made by such person to receive and store the imported petroleum products in licensed premises.

15. Petroleum exempted. –

- (1) Nothing in this chapter applies to petroleum Class B or petroleum Class C comprising in a ship's stores and manifested as such;
- (2) Nothing in rules 14, 19 and 26 shall apply to petroleum imported by the Defence Forces of the Union.

PART II IMPORTATION BY SEA

16. Ports into which petroleum may be imported. –

- (1) Petroleum shall not be imported into India by sea except through the ports which are duly approved for this purpose by the Ministry of Shipping, Government of India, in consultation with the Chief Controller and declared as Custom's ports by the Commissioner of Customs.
- (2) Notwithstanding anything contained in sub-rule (1), the Commissioner of Customs may, on the recommendation of the Chief Controller, allow import of petroleum Class B or petroleum Class C, otherwise than in bulk, through any other port.
- (3) Adequate fire fighting facilities as per OISD Standard-156 shall be provided at the ports handling petroleum.
- (4) Person(s) desirous of seeking approval in respect of proposed facilities for unloading of petroleum for the purpose of import under sub-rule(1) or of making modifications in the existing facilities shall submit to the Chief Controller an application alongwith -
 - (a) specification and plans drawn to scale in quadruplicate, clearly indicating-
 - (i) surroundings and all protected works within 500 metres of the unloading facilities on all sides showing therein the location, available draft, navigation channel, turning circle, route of transfer pipeline(s),
 - (ii) mooring or berthing facilities, service platform/berth, mode of unloading , fire fighting facilities, illumination arrangements, navigational facilities, control room, spill collection/ containment arrangements etc., and
 - (iii) piping and instrumentation diagram of the petroleum pipeline(s) at the unloading area;
 - (b) comprehensive project report elaborating the scheme and methodology of import, safety and security features including those mentioned in (a) (i), (ii) and (iii) of this sub-rule;
 - (c) Environment Impact Assessment and Risk Analysis Report indicating qualitative and quantitative risks, probable failure scenarios, LFL distances and consequent hazards and damages with damage distances and remedies recommended;
 - (d) scrutiny fee of rupees two thousand, and
 - (e) copies of clearances obtained from the following authorities. -
 - (i) Ministry of Shipping or State Maritime Board as the case may be.
 - (ii) Ministry of Environment and Forests or State Pollution Control Board, as the case may be, and
 - (iii) Commissioner of Customs.

(5) Unloading of petroleum in bulk shall be either by mechanized arm or by armoured hose as approved by Chief Controller. All hoses, pipes and other appliances used in unloading of petroleum shall be electrically and mechanically continuous and duly tested as per codes/standards.

17. Declaration by the master of the ship carrying petroleum or by the ship's agent. –

(1) The master of every ship carrying petroleum shall deliver to the pilot before entering any port approved under sub-rule (1) of rule 16, a written declaration in Form I under his signature:

Provided that no such declaration is necessary if the agent of the ship deliver such a declaration signed by him to the Conservator before the arrival of such ship.

(2) The pilot shall make over the said declaration to the Conservator without delay and the Conservator shall forward the declaration to the Commissioner of Customs of the port with all convenient dispatch.

18. Anchorage of ships carrying petroleum. –

(1) Every ship having petroleum on board shall be anchored at such anchorage as the Conservator shall specify in this behalf and shall not leave such anchorage without the general or special order of the Conservator and subject to such conditions as may be specified in such order.

(2) The anchorage shall in no case be the same as that for vessel laden with explosives and shall be at such distance from the anchorage for vessels laden with explosives as to render it impossible for a fire originating at the former anchorage to affect vessels at the latter: Provided that nothing in this rule shall apply to ships having on board petroleum Class C.

19. Production of certificate and licence for import. –

(1) Every person desiring to import petroleum shall furnish personally or through his agent to the Commissioner of Customs. -

(a) certificate of storage accommodation in Form II signed by such person or his agent; and
(b) the licence or an authenticated copy of the licence for the import and storage of such petroleum: Provided that nothing in this rule shall apply to the importation, otherwise than in bulk of petroleum exempted under sections 7, 8, 9 and 10 of the Act: Provided further that the furnishing of a licence under clause (b) shall not be necessary for the importation of petroleum class C in bulk in quantity exempted under section 7 of the Act.

(2) Notwithstanding anything contained in sub-rule (1) a person may import petroleum Class A in bulk, even if -

(i) he is not holding a licence for storage at the port of importation; or
(ii) the storage accommodation in the premises licensed in his name is not sufficient to hold the quantity of petroleum intended to be imported: Provided in both cases adequate advance arrangements to the satisfaction of the Conservator are made by the importer to distribute the petroleum from the post of import to premises licensed to store such petroleum.

20. Permission of Commissioner of Customs to land petroleum. –

(1) No imported petroleum shall be landed except with the permission of the Commissioner of Customs.

(2) If the Commissioner of Customs after receiving-

(a) of the testing officer's report on the petroleum;
(b) the certificate of storage accommodation in Form II if required under rule 19; and
(c) the licence or an authenticated copy of the licence if required under rule 19, 18 and after making such further inquiries, as he deems necessary, is satisfied that the petroleum can be lawfully imported and that there is suitable accommodation for it, he shall permit it to be landed.

(3) If the Commissioner of Customs is satisfied that any petroleum imported otherwise than in bulk is not intended to be stored in India but is intended to be dispatched immediately after landing to any place outside India, he may waive the requirements of rules 14 and 19 and by written order permit subject to such conditions as he may specify such petroleum to be landed for the purpose of immediate dispatch to that place. The Commissioner of Customs shall ensure that

the goods are immediately moved to destination country. In the event of road breaches etc. occurring maximum time of 30 days may be allowed from the date of landing of the goods upto the date of dispatch to the destinations outside of India.

(4) Nothing in this rule shall affect the power of the Commissioner of Customs to detain the petroleum under any other law or rule for the time being in force.

21. Landing of petroleum Class B or petroleum Class C in anticipation of the testing officer's report. –

(1) Not with standing anything contained in Rule 20 where the consignee furnishes a guarantee to re-ship the petroleum if the testing officer's report proves unfavourable, the Commissioner of Customs may in anticipation of the testing officer's report permit any petroleum which he believes to be petroleum Class B or petroleum Class C to be discharged into boats or to be landed.

(2) The permission granted under sub-rule (1) shall be subject to the conditions that the boats into which the petroleum is discharged shall remain at such place as the Conservator may specify or that the petroleum shall be landed at a landing place duly specified for the purpose by him and stored in an installation licensed under these rules.

22. Unloading of petroleum in bulk. –

Subject to the provisions of Part II of Chapter III, petroleum imported in bulk shall be discharged into storage tanks on shore either 19 directly or by means of barges or lighters specially constructed for carrying petroleum in bulk and only at such places as the Conservator may by general or special order direct.

23. Unloading of petroleum otherwise than in bulk. –

(1) Subject to the provisions of Part II of Chapter III, petroleum imported otherwise than in bulk shall be landed either at jetties provided for the purpose, or in barges or lighters and only at any such places as the Conservator shall direct.

(2) No petroleum contained in containers shall be landed unless such containers are free from leakage and are of such strength or construction as not to be liable to be broken or to leak except in cases of gross negligence or extraordinary accident: Provided that petroleum contained in containers, which do not satisfy the requirements of this sub-rule, may subject to provisions of Part II of Chapter III and to such conditions as the Conservator may impose, be landed at separate landing place approved for the purpose.

24. Transshipment of petroleum. –

Petroleum may be transhipped from one ship to another for conveyance to any other port, whether within or beyond the territory of India subject to the provisions of Part II of Chapter III.

PART III IMPORTATION BY LAND

25. Petroleum to be imported by land only at authorized places. –

No petroleum shall be imported into India by land except at places specially authorized for the purpose by the Central Government.

26. Declaration and certificate to be furnished and licence to be produced before importing petroleum by land.-

Every person desiring to import petroleum by land shall furnish to the Commissioner of Customs²⁰

(a) a declaration in Form I signed by him or his agent;

(b) a certificate of storage accommodation in Form II signed by him or his agent; and

(c) the licence or an authenticated copy of the licence held for the importation and storage of such petroleum : Provided that nothing in this rule shall apply to the importation of petroleum exempted under sections 7,8 and 9 of the Act: Provided further that the furnishing of licence under clause

(c) shall not be necessary for the importation of petroleum class C, in bulk, in quantity exempted under section 7 of the Act.

27. Permission of the Commissioner of Customs to unload petroleum. –

(1) No petroleum shall be unloaded except with the permission of the Commissioner of Customs.

(2) If the Commissioner of customs, after receiving:-

(a) the testing officer's report on the Petroleum;

(b) the certificate in Form II, if required by rule 26; and

(c) the licence, if required by rule 26; and after making such further inquiries as he deems necessary, is satisfied that the petroleum can be lawfully imported and that there is suitable accommodation for it, he shall permit it to be unloaded.

(3) If the Commissioner of Customs is satisfied that any petroleum imported is not intended to be stored in India but is intended to be dispatched immediately after unloading to any place outside India, he may waive the requirements of rules 14 and 26 and by written order permit, subject to such conditions as he may specify, such petroleum to be unloaded for the purpose of immediate dispatch to that place.

(4) Nothing in this rule shall affect the power of the Commissioner of Customs to detain petroleum under any other law or rule for the time being in force.

CHAPTER III TRANSPORT OF PETROLEUM PART I

General

28. Restriction on leaky receptacles. –

No leaky tank or container containing petroleum shall be tendered for transport..

29. Loading of containers. –

Barrels, drums and other containers filled with petroleum shall be loaded with bung upwards.

30. Restriction on passengers, combustible and inflammable cargo. –

Save as provided in rules 38,39 and 52 and clause, (b) of rule 60, no ship, vessel or vehicle shall carry petroleum Class A or petroleum Class B and Class C in bulk if it is carrying passengers or any combustible cargo other than petroleum: Provided that nothing in this rule shall prohibit the use of dunnage for packing purposes in the case of coastwise transport of petroleum Class A otherwise than in bulk.

31. Prohibition of smoking, fires, lights. –

No person while engaged in loading or unloading or transporting shall smoke or carry matches, lighters or other appliances capable of producing ignition or explosion.

32. Restriction on loading and unloading by night. –

Petroleum shall not be loaded into, or unloaded from, any ship, vessel or vehicle between the hours of sunset and sunrise, unless.-

(a) adequate electric lighting is provided at the place of loading or unloading and the provisions of Chapter IV are complied with; and

(b) adequate fire-fighting facilities with personnel are kept ready at the place of loading for immediate use in the event of a fire.

(2) Nothing in this rule shall apply to the refueling of an aircraft by vessels or vehicles licensed under these rules in accordance with the provisions of the Indian Aircraft Rules, 1937, or to the refueling of an aircraft by the Defence Forces of the Union.

Explanation - For the purposes of this rule the Chief Controller shall determine the adequacy or otherwise of the electric lighting and fire-fighting facilities.

PART II TRANSPORT BY WATER

33. Conditions of carriage of petroleum in bulk by water. –

(1) Petroleum in bulk shall not be carried by water, except in a ship or other vessel licensed for the carriage of petroleum in bulk by an officer appointed by the Central Government in this behalf (hereinafter in this part referred to as the, licensing authority) and the petroleum shall be stored in such part of the ship or other vessel and in such manner as may be approved by general or special order by the licensing authority after consultation with the Chief Controller,:

Provided that -

(a) nothing in this rule shall apply to vessels registered in a country other than India importing petroleum

(b) petroleum in tank vehicles may, with the permission, in writing, of the Chief Controller and subject to such conditions as he may specify, be transported across a river by a ferry.

(2) The licence referred to in sub-rule (1) shall be granted in Form III, and shall remain in force for a period of one year from the date of its issue.

33. Requirement as to the construction of vessels. –

Every ship or other vessel carrying petroleum in bulk, other than a ferry permitted to transport tank vehicles under clause (b) of the proviso of sub-rule (1) of rule 33, shall be made of iron or steel well and substantially constructed with scantlings of ample dimensions in proportion to the size of the vessel: Provided that the licensing authority may, in special circumstances, allow use of such ships or other vessels constructed of materials other than iron or steel under such conditions as it may, in consultation with the Chief Controller, specify.

35. Tank fittings on ships or vessels. –

The following provisions shall apply for the transport of petroleum other than petroleum Class C in ship or other vessels, namely: -

- (a) All tanks shall be fitted with independent approved filling and suction pipes and valves, or with stand pipes with blank flanges, all pipes being carried down nearly to the bottom of the tanks, and no petroleum in bulk shall be taken on board or discharged except through such pipes and valves, unless otherwise permitted by the Chief Controller in writing;
- (b) All tanks shall be fitted with manholes having screw-down cover with petroleum-tight joints and, in the case of tanks intended for use with petroleum class A, with ventilators or relief valves of approved pattern properly protected with wire gauge of a mesh not less than 11 meshes to linear centimeter; and
- (c) Ventilators similarly protected shall be fitted to all spaces, around tanks.

36. Self propelled barges. –

The following conditions shall be observed in self propelled barges transporting petroleum other than petroleum class C, namely: -

- (a) The whole of the machinery shall be at the stern of the barge and shall be entirely separated from the cargo by a cofferdam consisting of two transverse petroleum-proof bulkheads separated by a space of at least 75 centimetres;
- (b) each exhaust outlet from the machinery shall be fitted with an approved type of spark arrester;
- (c) no petrol-driven engine shall be used either as main engine or for the purpose of driving any auxiliary machinery or pumps.
- (d) a quick-action closing valve which can be operated from outside the machinery space, shall be fitted to each fuel feed pipe at its junctions with the fuel service tank;
- (e) the barge shall be provided with a heavy wood belting; and
- (f) suitable ventilators shall be fitted to the cargo space.

37. Petroleum in bulk on barges and flats. –

Petroleum in bulk shall not be transported in a barge or flat unless the barge or flat is self-propelled or is in tow of, or otherwise, attended by, a steamer or tug and carries:

- (a) at least four fire extinguishers suitable for extinguishing oil fires and a covered sand box, on deck, containing at least 0.20 cubic metres of dry sand;
- (b) a suitable hammer of non-sparking metal; and
- (c) a red flag.

38. Restriction on cargo or passengers. –

- (1) No ship or other vessel shall carry petroleum in bulk if it is carrying passengers, or any inflammable cargo other than petroleum or coal.
- (2) This rule shall not apply to petroleum Class C used as fuel and carried in cellular double bottoms under engine and boiler compartments and under ordinary holds; such fuel oil tanks and installations connected therewith shall comply with the provisions of the Indian Merchant Shipping (Construction and Survey of Passenger Steamers) Rules, 1956.

39. Petroleum carried as cargo in unberthed passenger ships. –

Petroleum class A shall not be transported as cargo by an unberthed passenger ship as defined in the Merchant Shipping Act, 1958 (44 of 1958): Provided that the certifying officer referred to in section 243 of the Merchant Shipping Act, 1958 (44 of 1958), may in cases where he is satisfied

that no other means of transporting the petroleum are available, permit petroleum Class A in quantity not exceeding 1,250 litres to be transported otherwise than in bulk by an unberthed passenger ship subject to :

- (a) the condition that no more persons shall be carried in the ship than can with safety be accommodated in the ship's life-boats in case of an accident; and
- (b) such other conditions as the certifying officer may, after consultation with the Chief Controller, impose : Provided further that clause (a) of the first proviso shall not apply in the case of unberthed passenger ships engaged on voyages in the course of which they do not go beyond 32 kilometres from land.

40. Prohibition of transport of petroleum Class A by country craft. –

No country craft shall carry petroleum class A if it is carrying passengers.

41. Restrictions on steamers or tugs employed in towing or attending a petroleum vessel. –

- (1) No steamer or tug employed in towing or otherwise attending a barge, flat or lighter carrying petroleum, other than petroleum class C in bulk, shall at the same time tow or otherwise attend any other vessel carrying an inflammable cargo other than petroleum or coal.
- (2) No such steamer or tug shall carry any inflammable cargo other than petroleum or coal.
- (3) All such steamers or tugs shall be fitted with efficient spark arresters.

42. Ventilation and cleaning of holds and tanks. –

- (1) Before any petroleum is discharged from a ship or vessel, the holds of such vessels shall be thoroughly ventilated: Provided that nothing in this sub-rule shall apply to any vessel carrying petroleum Class A not exceeding 30 litres or petroleum Class B not exceeding 2,500 litres or petroleum Class C.
- (2) After all petroleum has been discharged from any such vessel, the holds, tanks and bilge's of the vessel shall be rendered free from inflammable vapour.
- (3) Sub-rule (2) shall not apply to the tanks of a ship importing petroleum which leaves the port without delay after unloading of cargo or remains only for the purpose of taking on board bunkers, stores or ballast or for such other purpose as may be approved by the Conservator, if the tanks of every such ship are securely fastened down immediately after the discharge of the cargo.
- (4) Sub-rule (2) shall not apply to barges or lighters continuously engaged in the transport of petroleum in bulk, if -
 - (a) an interval of not more than 72 hours is likely to elapse between an operation of unloading and the next loading operation; and
 - (b) the tanks are securely fastened down immediately after unloading.
- (5) Sub-rule (2) shall not apply to specially constructed steel tank motor vessel approved by the Chief Controller which are engaged in the transport of petroleum in bulk on such rivers and on such ports thereof as may be approved by him in areas outside port limits, or by the Conservator within port limits, if the tanks of such vessels are securely fastened down immediately after unloading and the vessels depart not later than 12 hours after completion of unloading for their next place of loading.
- (6) All ships or other vessels which by sub-rule (3) or sub-rule (4) or sub-rule (5) are exempted from the application of sub-rule (2), shall until their holds and tanks have been rendered free from inflammable vapour, comply with all the rules applicable to ships or other vessels when carrying petroleum in bulk.

43. Master of vessels specially responsible. –

The Master or other officer incharge of any vessel which had carried petroleum on board whether as a cargo or as a fuel, or any vessel licensed under rule 33 shall be responsible to see that -

- (a) all due precautions are taken for the prevention of accidents due to ignition of petroleum or petroleum vapour;
- (b) so long as there is petroleum or petroleum vapour in a tank, all openings from the tank to the atmosphere except the gas escape line are kept closed and locked or otherwise securely fastened; and when it is necessary to take dips or samples, the sludge plugs or sighting ports are

closed immediately after such dips or samples are taken: Provided that subject to the provisions of clause (c) the master or officer incharge may cause the necessary openings to be opened or unlocked for the purpose of taking on board or unloading petroleum Class B or petroleum Class C for cleaning the tanks or for other sufficient reason;

(c) no person enters a tank or an enclosed space which had, or is suspected to have contained petroleum without wearing a breathing apparatus of a type approved by the Chief Controller unless an officer appointed by the Central Government in this behalf has examined the tank or space with the aid of an approved petroleum vapour-testing instrument and has been certified by him in writing that the said tank or space is free from petroleum vapour.

(d) the vessel does not undergo repair by hot work to any of its tanks, part of fittings which are likely to contain petroleum vapour or petroleum unless each such tank, part of fittings, as the case may be, has been examined by an officer appointed under clause (c) with the aid of an approved petroleum vapour-test instrument and has been certified by him in writing that the tank, part or fittings is free from petroleum vapour or petroleum;

(e) the vessel used for the carriage of petroleum in bulk as a cargo is not taken among other ships or to a dry dock unless-

(i) the vessel is proceeding to an oil berth, or

(ii) a certificate from an officer appointed under clause (c); to the effect that he has examined all the tanks, cofferdams, pump rooms and such other parts as are deemed necessary with the aid of an approved petroleum vapour-testing instrument, and that such tanks, cofferdams, pump rooms and other parts are free from petroleum vapour; and declaration from the Master that to the best of his knowledge there is no petroleum vapour, present in other parts of the vessel not covered by the above certificate are produced.

(f) the officer granting certificate under clause (c) or clause (d) or clause (e) may specify such conditions and make such recommendations as are necessary to maintain gas-free conditions of tanks, space or parts certified;

(g) the certificate referred to in clause (c), (d) and (e) shall be granted only on receipt of fee fixed by the Central Government from time to time;

(h) the vessel or any steamer or tug towing or otherwise attending on such vessel exhibits conspicuously :-

(i) from sunrise to sunset a red flag not less than 90 centimetres square with a white circular centre 15 centimetres in diameter if petroleum class A is carried and a red flag not less than 90 centimetres square if petroleum Class B is carried; and

(ii) from sunset to sunrise such warning lights as may be required by the Conservator;

Note : The port authority concerned shall be the authority for the issue of final permission for the purpose of clauses (c), (d) and (e) even though Gas Free Certificates have been obtained from the officer concerned under clause (c) of this rule.

²[43-A. Agency undertaking ship breaking specially responsible.—The Agency, which owns vessels meant for breaking or beaching, before undertaking breaking of such vessels, called ship breaking, shall be responsible to see that—

(a) all due precautions are taken for the prevention of accidents due to ignition of petroleum or petroleum vapour;

(b) so long as there is petroleum vapour in a tank, all openings from the tank to the atmosphere except the gas escape line are kept closed and locked or otherwise securely fastened; and subject the provisions of clause (c), the

2. Inserted by G.S.R. 61(E), dated 2-2-2007 (w.e.f. 2-2-2007).

agency undertaking the ship breaking activities may cause the necessary openings to be opened or unlocked for cleaning the tanks or for making the tank free from petroleum vapour or for other sufficient reason;

(c) no person enters a tank or an enclosed space which had, or is suspected to have contained petroleum without wearing a breathing apparatus of a type approved by the Chief Controller unless an officer appointed by the Central Government in this behalf has examined the tank or space with the aid of an approved petroleum vapour-testing instrument and has been certified by him in writing that the said tank or space is free from petroleum vapour;

(d) the vessel does not undergo breaking by hot work to any of its tanks, part of fittings which are likely to contain petroleum vapour or petroleum unless each such tank, part of fittings, as the case may be, has been examined by an officer appointed under clause (c) with the aid of an approved petroleum vapour-test instrument and has been certified by him in writing that the tank, part of fittings are free from petroleum vapour or petroleum;

(e) the vessel is not taken to ship breaking yard unless a certificate from an officer appointed under clause (c) to the effect that he has examined all the tanks, cofferdams, pump rooms and such other parts as are deemed necessary with the aid of an approved petroleum vapour-testing instrument, and that such tanks, cofferdams, pump room and other parts are free from petroleum vapour; and declaration from the agency undertaking the ship breaking activities that to the best of its knowledge there is no petroleum vapour, present in other parts of the vessel not covered by the above certificate are produced;

(f) the officer granting certificate under clause (c) or clause (d) or clause (e) may specify such conditions and make such recommendations as are necessary to maintain gas free conditions of tanks, space or parts certified;

(g) the certificate referred to in clauses (c), (d) and (e) shall be granted only on receipt of fee fixed by Central Government from time to time.

Note.—The port authority concerned shall be the authority for the issue of final permission for the purpose of clauses (c), (d) and (e) even though Gas Free Certificates have been obtained from the officer concerned under clause (c) of this rule.

44. Loading and unloading of bulk petroleum. –

- (1) Petroleum in bulk shall not be loaded or unloaded into or from any ship/ barge at any place unless-
 - (a) the location is notified or permitted by the Central Government and the facilities are approved by Chief Controller under rule 16, in case of import, or
 - (b) the location and facilities for loading or unloading are approved by the Chief Controller, in cases other than import
- (2) Persons(s) seeking approval under sub-rule 1 (b) of this rule shall submit to Chief Controller-
 - (a) Specification and plans drawn to scale in quadruplicate, indicating³²
 - (i) surroundings and all protected works within 500 metres of the loading or unloading facilities on all sides showing therein the location, size of the ship, available draft, navigation channel, turning circle, route of transfer pipeline(s),
 - (ii) mooring or berthing facilities, service platform/berth, mode of loading or unloading, fire fighting facilities, illumination arrangements, control room, spill collection/containment arrangements etc., and
 - (iii) piping and instrumentation diagram of the petroleum pipeline(s) at the loading or unloading area:

- (b) Comprehensive project report elaborating the scheme and methodology of loading or unloading of petroleum, safety and security features including those mentioned in (a) (i), (ii) and (iii) of this sub-rule;
- (c) Risk Analysis Report indicating qualitative and quantitative risks, probable failure scenarios and consequent hazards and damages with damage distances etc, and remedies recommended;
- (d) Scrutiny fee of rupees two thousand, and
- (e) Copies of clearances obtained from the following authorities
 - (i) Ministry of Shipping or State Maritime Board as the case may be.
 - (ii) Ministry of Environment and Forests or State Pollution Control Board as the case may be.
- (3) Loading or unloading of petroleum in bulk shall be either by merchandised arm, or armoured hose metal pipe as approved by Chief Controller.
- (4) All hoses, pipes and other appliances used in loading or unloading of petroleum shall be electrically and mechanically continuous and duly tested as per codes/standards.
- (5) The hose and metal pipes used for loading and unloading of petroleum in bulk shall be subjected to periodic testing.

45. Precautions on suspension of loading or unloading. –

When the loading or unloading of petroleum has commenced, such loading or unloading shall proceed with due diligence and, if it is discontinued, the tanks, and holds of the ships or other vessels concerned and all loading or unloading valves shall be closed immediately.

46. Prohibition of naked lights, fire and smoking on board a vessel. –

No fire, naked light, fuses, matches or other appliances for producing ignition or explosion and no smoking shall be allowed on board any barge, flat or lighter carrying petroleum in bulk or on board any vessel used for the transport of petroleum class A otherwise than in bulk or for the transshipment of petroleum to or from any vessel within the limits of any port: Provided that nothing in this rule shall prevent the use on a self propelled barge of the machinery or propulsion.

47. Prohibition of smoking, fire and lights, during loading or unloading. –

At all times during loading or unloading of a ship or other vessel and until such time as all petroleum shall have been loaded into or unloaded from the holds or tanks and the holds or tanks shall have been securely closed down and, in the case of unloading rendered free from inflammable vapour, there shall be no fire or artificial light or smoking on board such ship or other vessel or within 30 metres of the place where the petroleum is being loaded or unloaded:

Provided that nothing in this rule shall apply: -

- (i) to the use of lamps, cookers or similar apparatus, electric or otherwise so designed, constructed and maintained as to be incapable of igniting inflammable vapour or in the case of petroleum Class C the use of gally fires.
- (ii) to the unloading or loading of a ship under conditions approved by the conservator by means of steam from her own boilers or power generated by electric motors or internal combustion engines placed in a position away from cargo holds and pump rooms or by means of electric motors, so designed, constructed and maintained as to be incapable of igniting inflammable vapour and maintained in accordance with the requirements specified by Lloyds or other ship surveyors approved by Central Government.

48. Fire-extinguishing appliances to be ready for use. –

Vessels unloading or loading petroleum shall have adequate fire-extinguishing appliances so disposed that they can be put into immediate use.

49. Restriction on the simultaneous conveyance of different classes of petroleum. –

- (1) Petroleum Class A shall not be conveyed to the shore from, or loaded into the same vessel simultaneously with petroleum Class B or petroleum Class C.
- (2) The Chief Controller may, by written order exempt specially any particular operation from the provisions of sub-rule(1) if separate and distinct pipelines and pumps are provided for loading or unloading of petroleum Class A simultaneously with petroleum Class B or petroleum Class C.

50. Transport by sea of petroleum which has not been tested. –

Petroleum which has been imported into any port approved under sub-rules (1) and (2) of rule 16 and which has not been tested at such port in accordance with the rules contained in Chapter X, shall not be transported to any port other than a port at which importation is permitted under sub-rule (1) of rule 16 and in accordance with the provisions of all the rules in Chapter II.

PART III**Coastwise Transport of Petroleum Class A otherwise than in Bulk****51. Application. –**

(1) The rules in this Part apply only to the transport coastwise of petroleum class A otherwise than in bulk.

(2) Unless otherwise expressly provided in this part, nothing contained in Part II of this Chapter shall apply to any petroleum transported in accordance with this Part.

52. Conditions of transport by unberthed passenger ships. –

Petroleum Class A may be transported otherwise than in bulk by an unberthed passenger ship as defined in the Merchant Shipping Act, 1958 (44 of 1958), in accordance with the provisions of rules 29, 30, 39 and 54 to 60 (both inclusive).

53. Maximum quantity allowed to be carried. –

Petroleum Class A may be transported otherwise in bulk by a country craft or steam or motor vessel other than unberthed passenger ship as defined in the Merchant Shipping Act, 1958 (44 of 1958), subject to the provisions of rules 29, 30, 39 and 54 to 60 (both inclusive), if the quantity of petroleum does not exceed –

- (a) in the case of country craft, the licensed carrying capacity of the vessel after taking into account the weight of barrels or tins in which the petroleum is carried; or
- (b) in the case of steam or motor vessels, 15 tonnes.

54. Carriage below decks. –

(1) Petroleum Class A shall not be carried below deck in decked vessels unless there are efficient ventilators in the hold.

(2) Half of the ventilators referred to in sub-rule (1) shall be carried down nearly to the bottom of the holds and the other half of such ventilators terminated only a short distance below the deck; the short ventilators shall be labelled "Outlet or to Leeward" and the long ventilators shall be labelled "Inlet or to Windward", such ventilators shall have large cowl heads, the openings being covered with double copper or noncorroding metal gauze not less than 11 meshes per linear centimeter.

55. Provisions of bulkhead. –

In all vessels other than country craft, a solid gas-tight bulkhead without openings, and in country craft a solid bulkhead without openings, shall be between the hold and the afterdeck where the crew are accommodated, and in vessels fitted with a poop the bulkhead shall be placed immediately in front of the poop. In decked vessels the bulkhead shall reach upto the deck; in all other vessels it shall reach to within 15 centimetres of the gunwale.

56. Prohibition of fire, lights and smoking. –

(1) No fire, naked light of any description and smoking shall be allowed on any part of the vessel transporting petroleum Class A except abaft the solid bulkhead.

(2) The navigational lights on any such vessel shall be carried abaft the bulkhead.

57. Provisions of fire extinguishers. –

Fire extinguishers suitable for fighting oil fires shall be placed at convenient points on any vessel transporting petroleum Class A. Not less than two such fire-extinguishers shall be placed on the afterdeck.

58. Construction of steam or motor-vessels. –

Steam or motor-vessels not specially constructed for the carriage of petroleum shall not carry petroleum unless they are constructed of iron or steel or any other material approved by the Chief Controller.

59. Transport in steam or motor-vessels. –

On steam or motor vessels not specially constructed for the carriage of petroleum-

(a) any petroleum shall either be carried in separate compartments which shall be gas-tight and shall be effectively sealed, or in a hold in which there are efficient ventilators in accordance with sub-rule (2) of rule 54 or on deck in accordance with rule 60;

(b) Petroleum Class A shall be packed in containers complying with the provisions of rules 4 and 5.

(c) Special precautions shall be taken against smoking and the use of lights or fire of any kind while cargo is being loaded or unloaded or while the hatches are off, or any deck openings are uncovered; before any lights are used in compartment which contains petroleum, precautions shall also be taken to ensure that the space is clear of vapour and all empty containers which have contained petroleum class A are kept securely closed.

60. Transport of deck. –

Petroleum may be carried in deck in steamer or motorvessels not specially built for the carriage of petroleum, subject to the following conditions, namely:

(a) in cargo ships petroleum Class A shall not occupy more than 50 per cent of the open deck area and shall be so stowed as not to interfere with the navigation of the ship or make it unseaworthy.

(b) in passenger ships a limited quantity of petroleum Class A may be carried provided that proper precautions are taken regarding stowage and keeping the packages away from passengers, promenade or deck space;

(c) the petroleum shall be protected from the direct rays of the sun by the use of canvas awnings or otherwise; and

(d) Conspicuous notices shall be posted up, drawing attention to the danger arising from smoking or striking matches near the deck cargo.

61. Conditions of transport by country craft. –

No petroleum Class A shall be transported in a country craft unless the following conditions are satisfied, namely:

(a) the petroleum shall be carried –

(i) in 200 litres capacity steel barrels, the screw bungs of such barrels being well fitting and sealed; or

(ii) in 200 litres capacity sealed steel drums, not more than three tiers of which may be carried on any single vessel; or

(iii) in 10 litres capacity sealed tins, not more than six tiers of which may be carried on any single vessel; or

(b) all barrels or tins shall be carefully examined and no leaky barrel or tin shall be taken on board the craft.

(c) no barrels, drums or tins shall be placed within 1.2 metres of afterdeck where the crew are accommodated in the case of an undecked vessel or on deck in the case of a decked vessel; and

(d) no passengers shall be carried on board the craft.

PART – IV

TRANSPORT ON LAND BY VEHICLES

62. Application. –

The provisions of this part shall apply to the transport of petroleum on land by vehicles except transport of –

- (a) Petroleum Class A in quantity not exceeding 100 litres and petroleum of any other class, otherwise than in bulk, subject to the provisions of rule 67.
- (b) Petroleum of any class transported by the Defence Forces of the Union.

63. Tank Vehicles. –

(1) every tank vehicle used for the transport of petroleum, in bulk on land shall be built, tested and maintained in accordance with the requirements laid down in the Third Schedule and be of a type approved in writing by the Chief Controller : Provided that the Chief Controller may under exceptional circumstances to be recorded in writing, waive any of the requirements of the Third Schedule. This will, inter alia, include approvals for trials of better quality vehicles that will contribute to enhancement of safety of petroleum transportation by road under Indian conditions.

(2) The tank shall be fabricated and mounted on the vehicle chassis by a manufacturer approved by the Chief Controller. Such a manufacturer shall apply to the Chief Controller for approval with particulars of facilities and competent persons available with him and a scrutiny fee of **rupees five hundred**. The tank fabrication and mounting drawings in quadruplicate for each type of tank vehicle, along with scrutiny fee of rupees one hundred shall be submitted to the Chief Controller for approval. Such approval shall be valid for three years from the date of issue of approval and renewable for further period of 3 years on payment of fee of **rupees five hundred**.

(3) If the Chief Controller, after receipt of the drawing under sub-rule (2) and after making such further inquiries as he may deem necessary, is satisfied that the tank vehicle or the special safety fittings, as the case may be, meet with the requirements laid down in the Third Schedule, he shall approve the drawing and return to the applicant one copy thereof duly endorsed.

(4) Nothing in this rule shall apply to tank wagons for the carriage of petroleum by rail.

64. Tank Capacity. –

(1) In this part, “the tank forming part of a tank vehicle” shall be deemed to include any number of tanks on the same chassis and any limitation herein specified on the capacity of a tank shall be construed so as to permit of the tank containing the quantity specified under varying degrees of temperature.

(2) The net carrying capacity of a tank shall be 97 percent of its gross carrying capacity in the case of petroleum Class A and petroleum Class B and 98 percent, in the case of petroleum Class C.

(3) The net carrying capacity of a tank truck or a tank semi-trailer shall not exceed 25 kilolitres of petroleum except in case of air-craft refueller in which case it should not exceed 50 kilolitres and the net carrying capacity of any tank trailer should not exceed 5 kilolitres of petroleum.

(4) The maximum safe carrying capacity in weight of petroleum that can be carried in a tank vehicle shall not exceed the difference between the unladen weight of the vehicle and the maximum gross weight permitted for the class of vehicle under the appropriate transport regulations.

65. Restriction on other use. –

Tank vehicle meant for the carriage of petroleum in bulk shall not be used for any other purpose except when so authorised by the Chief Controller in writing.

66. Trailers. –

(1) A tank trailer not exclusively used for transporting petroleum shall not be attached to any vehicle for transporting petroleum.

(2) A tank trailer transporting petroleum shall not be attached to any vehicle other than a vehicle used exclusively for transporting petroleum and not more than one trailer

shall be so attached.

(3) A tank trailer shall not be attached to a tank semi-trailer or a trailer.

(4) A tank trailer or tank semi-trailer shall have reliable brakes and all wheels which shall be capable of efficient operation from driver's seat of the vehicle towing the trailer.

(5) The width of the tank trailer or a tank semi-trailer shall be less than the overall width of the towing vehicle

(6) A tank trailer shall be so connected to the towing vehicle as to cause the trailer to follow substantially the path of the towing vehicle and to prevent the tank trailer from whipping or swerving side to side dangerously.

(7) If a tank trailer carrying petroleum Class A is attached to a vehicle carrying petroleum Class B or petroleum Class C, the towing vehicle shall comply with all the provisions of these rules relating to a vehicle for the transportation of petroleum Class A.

(8) A trailer other than a tank trailer shall not be attached to any tank truck.

(9) Where a tank trailer is attached to a tank truck, the total quantity of petroleum transported in the tank trailer and the tank truck shall not exceed 15 kilolitres.

(10) No tank trailer shall be attached to a tank truck having a net carrying capacity exceeding 12 kilolitres of petroleum.

(11) No tank trailer attached to a tank truck shall be operated within a thickly populated area without the written permission of the district authority.

67. Vehicle for transport otherwise than in bulk. –

(1) Every vehicle on which petroleum otherwise than in bulk is transported shall be strongly constructed and with sides and back of adequate height, and shall be maintained in good condition.

(2) In the case of animal-drawn vehicles, push carts and pedal carts, the requirements of sub-rule (1) regarding the sides and back of the vehicle shall not apply if the load is securely fastened to the vehicle.

(3) All containers shall be so packed as not to project beyond the sides or back of the vehicle.

(4) Petroleum Class A otherwise than in bulk shall not be transported in a trailer, attached to any vehicle.

68. Composite vehicles. –

Petroleum in cans or in other containers shall not be transported by road on any tank vehicle used for transport of petroleum unless the vehicle is so constructed as to comply with the rules applicable to the transport of petroleum otherwise than in bulk as well as with the rules applicable to the transport of petroleum in bulk.

69. Carriage of other articles prohibited. –

No vehicle shall carry any other article while it is carrying petroleum except when specifically authorised in writing by the Chief Controller.

70. Engines of mechanically propelled vehicles. –

(1) In every mechanically propelled vehicle used for the transport by road of petroleum other than petroleum Class B otherwise than in bulk or petroleum Class C.

(i) the engine shall be diesel engine or an internal combustion engine.

(ii) the exhaust shall be wholly in front of the tank or the load, as the case may be and shall have ample clearance from fuel-system and combustible materials and shall not be exposed to leakage or spillage of the fuel or product or accumulations of grease or oil;

(iii) the exhaust pipe shall be fitted with an approved spark arrestor;

(iv) the muffler or silencer shall not be cut off from the exhaust system;

(v) the engine air intake shall be fitted with an effective flame-arrester, or an air cleaner having effective flame-arrester, characteristics, substantially installed and capable of preventing emission of flame from the side of the engine in the event of back firing;

(vi) the cab of the vehicle shall be of all-metal construction and its rear window, if provided, shall be fully covered with wired glass; alternatively, the cab and the engine shall be separated from the tank or the load, as the case may be, by a fire-resisting shield which shall fully cover the tank

or load.

(2) The fuel tanks of every such vehicle, if installed behind the cab of vehicle, shall be-

(a) so designed, constructed and installed as to present no unusual hazard, and shall be so arranged as to permit drainage without removal from their mountings; and

(b) protected against blows by stout steel guards and provided with a lock in the filling caps.

(3) In every engine running on petroleum Class A, quick action cut-off valve shall be fitted to the fuel feed pipe in an easily accessible position which shall be clearly marked.

(4) Notwithstanding any thing contained in this rule, provisions of sub-rules (1) to (3) except Clauses (i) and (iii) of sub-rule (1) shall not apply for transportation of petroleum Class A otherwise than in bulk exclusively used by helicopters and aeroplanes for aerial crops-spraying purpose only.

71. Electrical installation. –

If electric light or instrument or any other electrically operated equipment is employed on any vehicle including a trailer used in the transportation by road of petroleum other than petroleum Class C-

(i) the pressure of the electric circuit shall not exceed 24 volts.

(ii) electrical wiring shall-

(a) be heavily insulated and be adequate for maximum loads to be carried.

(b) be provided with suitable over-current protection in the form of fuses or automatic circuit breakers and installed so as to be protected from physical damage and contact with possible product spill either by location or by being encased in metal conduit or other oil resistant protective covering, and

(c) have all junction boxes sealed;

(iii) the generator, battery, switches, fuses and circuit brackets shall be carried in the cab of the vehicle or in the engine compartment and the battery shall be in an easily accessible position with a heavy-duty switch close by to cutoff the battery;

(iv) generators and motors and switches thereof which are not installed within the engine compartment shall be of the approved flame-proof type: Provided that where such generators or motors or switches thereof are installed in an enclosed space, adequate provision shall be made for air circulation to prevent overheating and possible accumulation of inflammable vapours: Provided further that the provisions of this rule except clause (i) and subclause (a) of clause (ii) shall not apply for transportation of petroleum Class A otherwise than in bulk exclusively used by helicopters and aeroplanes for aerial crop spraying purposes only.

72. Means of extinguishing fire to be carried. –

A portable fire extinguisher (10 kg, dry chemical powder or equivalent) suitable for extinguishing petroleum fire shall be carried in an easily accessible and detachable position and away from the discharge faucets on every vehicle transporting petroleum by road. Additionally, one dry chemical powder type fire extinguisher of 1Kg. capacity shall be carried in the driver's cabin of the vehicle.

73. Vehicles to be constantly attended. –

(1) Every vehicle which is engaged in the transport of petroleum by road shall be constantly attended to by at least one person who shall be familiar with the rules in this Part Provided that such a vehicle, if its tanks or compartments are empty, but not free from Petroleum vapour, may be left unattended in places previously approved for the purpose in writing by the Chief Controller.

(2) Every vehicle in which more than 5 kilolitres of petroleum, other than petroleum Class C, is being transported by road, or which, while transporting petroleum, other than petroleum Class C, by road is being trailed by another vehicle, shall, so long as it is in motion, be attended to, by the driver and at least one more person both of whom shall be familiar with the rules in this Part.

74. Prohibition as to parking. –

No vehicle carrying petroleum by road shall be parked on a public road or in any congested area or at a place within 9 metres of any source of fire.

75. Licence necessary for the transport in bulk of Petroleum Classes A and B.-

- (1) No person shall transport petroleum Class A or petroleum Class B in bulk, by road except under and in accordance with the condition of a licence granted under these rules.
- (2) Nothing in this rule shall apply to the transport by railway administration of petroleum which is in its possession in its capacity as a carrier or to the transport of petroleum in the refueller, licensed under these rules between places within the same aerodrome.

76. Restriction against loading and unloading of tank vehicles. –

- (1) No person shall load or unload a tank vehicle with any class of petroleum except at a place which is situated within premises licensed under these rules and is approved in writing, for loading or unloading of such class of petroleum, by the Chief Controller: Provided that petroleum Class C may be loaded or unloaded at a place where such Petroleum is allowed to be stored without licence under sections 7 and 10 of the Act: Provided further that-
- (a) a tank wagon may be loaded or unloaded at railway sidings earmarked for the purpose; and
- (b) a tank vehicle may be unloaded at any other place with all due precautions against fire and under adequate supervision if such unloading is necessitated by an accident or breakdown.
- (2) Every tank vehicle, while it is being loaded or unloaded and until its valves have been shut and filling pipe and discharge faucets closed, shall be attended to by a person who is familiar with the rules in this part.
- (3) No person shall under any circumstances allow filling or replenishment of the fuel tank of any motor vehicle or internal combustion engine directly from a tank vehicle: Provided that nothing in this sub-rule shall restrict filling or replenishment of the fuel tank of an aircraft in accordance with the rule framed under Aircraft Act, 1934 (22 of 1934).

77. Prohibition of loading of leaky or defective tank vehicles or unlicensed tank vehicles. –

No person shall load -

- (i) any class of petroleum in tank vehicle if any tank, compartment, valve, pipes or any safety fitting thereof becomes leaky or defective and until such leaks are repaired and defects rectified and, in the case of any leak in a tank or a compartment until all the tanks or compartment are re-tested in the manner laid down in para 5 of the third Schedule and pass the test;
- (ii) Petroleum Class A or petroleum Class B in any tank vehicle other than a tank wagon which is not licensed under these rules.

78. Precautions against static charges. –

- (1) All petroleum pipelines entering any tank vehicle loading or unloading area shall be electrically continuous and be efficiently earthed.
- (2) An earth boss with a flexible cable having robust clamping device shall be provided adjacent to the loading point.
- (3) Sound and electrically continuous hoses or metal pipes shall only be used for loading or unloading of a tank vehicle. Where stand pipes or metallic loading arms are provided, swivel joints shall be electrically continuous.
- (4) The tank, filling pipe and the chassis of the tank vehicle shall, during loading of a tank vehicle, be efficiently bonded and connected with the earth boss referred to in sub-rule (2) by means of a flexible metal wire or tape.
- (5) The bonding and earthing connections shall not be broken until loading of the tank vehicle has been completed and the filling and dip pipes thereof have been securely closed.
- (6) Dip rod, if used, shall be lowered into the tank or compartment before loading of petroleum starts; such a rod shall not be completely raised above the liquid level during or within one minute of the completion of such loading.
- (7) No tank vehicle shall be loaded at a rate exceeding one metre per second at the delivery end of the filling pipe until the filling pipe is completely submerged in petroleum and thereafter the loading rate may be gradually increased but it shall at no time exceed six metres per second at the delivery end of the filling pipe: Provided that the Chief Controller may specify a faster loading rate in respect of crude petroleum and petroleum products which have a relative higher conductivity rate.
- (8) No tank or compartment of any tank vehicle which has last carried petroleum Class A, shall be

filled with petroleum of any other class if the interior thereof has any floating non-conducting loose object or water. No tank vehicle shall be subjected to splash loading.

79. Precautions against electrical hazards and hazard of a running engine. –

No mechanically propelled vehicle for the petroleum shall be loaded or unloaded until its engine has been stopped and battery is isolated from the electrical circuit. The engine shall not be restarted and the battery shall not be connected to the electrical circuit until tanks and valves have been securely closed: Provided that this rule shall not apply in the case of unloading of a tank vehicle into the fuel tank of aircraft in accordance with the rules framed under the Aircraft Act, 1934 (22 of 1934) or in any other case as may be authorized, in writing, by the Chief Controller subject to such conditions as he may specify in that behalf.

80. Precautions against movements of vehicles during loading or unloading. -

Petroleum shall not be loaded into or unloaded from a vehicle until its wheels have been secured by efficient brakes or by scotching and in the case of animal-drawn vehicle until the animals have been unhitched and removed.

81. Precaution against product contamination. –

(1) No person shall load or unload any tank vehicle unless he has selected the correct filling hose and otherwise satisfied himself that such loading or unloading will not result in any dangerous contamination of one class of petroleum with another class of petroleum.

(2) A tank or compartment which carried petroleum Class A shall not be filled with any other class of Petroleum until such tank or compartment has been completely drained of residual oil and its discharge faucet and emergency control valve have been closed firmly.

82. Filling discharge faucet and dip pipes to be kept close. -

Except during the operation of loading or emptying a tank vehicle, the filling pipe, discharge faucet and dip pipe shall be kept securely closed. Where the filling pipes are not provided with a liquid seal, the covers shall be locked or sealed except during the operation of loading a tank vehicle and the keys shall not be carried on the vehicle or the trailer.

83. Restrictions on loading and unloading of Petroleum at night. –

Except where approved electric lights as specified in Chapter IV are exclusively used, the loading or unloading of tank vehicles carrying petroleum shall be performed between the hours of sunrise and sunset.

84. Prohibition of fires and smoking. –

(1) No fire or other artificial light capable of igniting inflammable vapour shall be allowed on any vehicle containing petroleum Class A otherwise or petroleum Class B and class C in bulk.

(2) No person shall smoke while on or attending such a vehicle.

(3) No article or substance capable of causing fire or explosion shall be carried on such a vehicle.

85. Repair of tank. –

(1) No tank which has carried petroleum shall be repaired by welding, brazing, soldering or hot-riveting unless it has been examined by a competent responsible person and certified in writing by such person to be free from inflammable vapour or oil.

(2) The certificate issued by the competent and responsible person under sub-rule (1) shall be preserved by the repairer for a period of at least three months and shall be produced for examination on demand by an inspector.

(3) All repairs to tanks which have contained petroleum shall be carried out by qualified and experienced persons.

(4) All the compartments of the tank shall be tested after each repair in the manner laid down in para 5 of the Third Schedule.

86. Special provisions for motor conveyances. –

(1) No motor conveyance carrying passengers on hire shall carry petroleum other than -

(a) Petroleum in the tank incorporated in the conveyance, and

(b) Petroleum not exceeding 100 litres in quantity intended to be used to generate motive power for the conveyance of that vehicle kept in the manner provided in sub-section (2) of section 8 of the Act.

(2) During the filling or replenishment of the fuel tank of a motor conveyance licensed for the carriage of more than six passengers on hire the driver or other person in charge of such conveyance shall not allow any passenger to remain therein.

(3) All petroleum containers carried in a motor conveyance carrying passengers on hire shall be free from leaks and be securely closed and shall be placed in a specially prepared receptacle which is not accessible to passengers in such conveyance and is not on the roof.

PART – V TRANSPORT BY PIPELINES

87. Application. –

The rules in this part apply only to the transport of petroleum by means of pipelines other than those in any area in which operation for the winning of natural petroleum or natural gas or both are carried on or within the limits of refineries and installations.

88. Right of way to be acquired. –

No pipeline and installation connected with a pipeline, shall be constructed without acquiring the necessary land, leaseholds and right for the construction thereof and for the unhindered access thereto for inspection, maintenance, repairs, replacements and patrolling.

89. Approval of the design and route of the pipeline. –

(1) No pipeline shall be laid without the prior written approval of the Chief Controller of the route of the pipeline, and of the design, construction and working thereof.

(2) Where the approval of the Chief Controller is sought for the laying of a pipeline, the person desirous of laying the pipeline shall submit to the Chief Controller:-

(a) a comprehensive project report, accompanied by all necessary drawings, calculations giving references to recognized code or codes followed, giving full details of the design, construction and testing of the pipeline and its components; the route along which the pipeline will be laid and the manner of laying, the class or classes of petroleum proposed to be transported in the pipeline and provisions proposed to be made for the maintenance and patrolling of the pipeline.

(b) a scrutiny fee of rupees five hundred.

90. Design of pipeline and attachments. –

(1) The pipeline shall be constructed of suitable steel which is safe for the conditions under which it is to be used.

(2) The pipeline and its components shall be designed and constructed in accordance with a code recognized by the Chief Controller or OISD Standard 141 regarding design and construction requirements for cross country hydrocarbon pipelines and shall be capable of withstanding a pressure which shall not be less than the maximum working pressure thereof plus an allowance for surge pressure, as anticipated.

(3) Provision shall be made for thermal expansion or contraction of the pipeline and for the prevention of excessive stresses on the pipeline or its anchorages, guides and connections.

(4) The pipeline shall be protected by a casing of steel pipe or by increasing the thickness of its wall or in any other manner approved by the Chief Controller and any other authority having jurisdiction to prevent damage to the pipeline from usual external conditions which may be encountered in railway crossings, road crossings, river or water course crossings, bridges, long self supported spans, unstable ground, vibrations, weight of special attachments or thermal forces.

(5) By-pass relief valves, pressure limiting stations or automatic shut down equipment of approved design shall be provided in the pipe line to prevent rising at any time of the pressure, in the pipeline to a pressure which exceeds the designed internal pressure by more than ten

percent.

(6) Isolation valves shall be installed at each of the following locations.-

- (a) On the suction end and the discharge end of the pump station in a manner that permits isolation of the pump station equipment in the event of an emergency.
- (b) On each line entering or leaving the installation in a manner that permits isolation of the installation from other facilities.
- (c) On each main line at locations along the pipeline system that will minimize damage from accidental product discharge, as appropriate for the terrain in open country or for the location near cities or other populated areas.
- (d) On each lateral take off from a trunk line in a manner that permits shutting off the lateral without interrupting the flow in the trunk line.
- (e) On each side of a water crossing that is more than 30m wide from highwater mark to high-water mark.
- (f) On each side of a reservoir holding water for human consumption.

91. Laying of Pipe line. –

- (1) Pipeline shall be laid in the most favorable route, avoiding as far as possible, known obstructions and areas in which unusual external conditions prevail.
- (2) Pipeline shall be laid below the ground level except where laying thereof above the ground level is desirable for topographical economic or other special reasons.
- (3) Where an underground Pipeline has to cross any existing underground water or gas line, cable, drain or other services, the pipeline shall be laid at least thirty centimetres below such services in a manner that will not obstruct access to such services for inspection repair, or maintenance.
- (4) The number of bends in the pipeline shall be kept to the minimum by proper grading of trenches or supports at crossing and other obstacles.
- (5) The route of underground sections of a pipeline shall be indicated by markers and not less than two such markers shall be visible from any point along the route.

92. Protection against corrosion. –

The pipeline shall be protected against corrosion by suitable coating strapping and where necessary by cathodic protection.

93. Hydrostatic testing of pipeline. –

- (1) Before transporting petroleum for the first time, each pipeline or completed sections thereof shall be filled with water and the pressure in the line or section, as the case may be, raised to 1.1 times the design internal pressure and maintained for a period of at least 24 hours or as per procedure laid down in the relevant pipelines design code recognized by Chief Controller. A pipeline or a section thereof showing any significant drop of pressure during the period of testing shall not be used for transporting petroleum until necessary repairs have been carried out and satisfactory retest done.
- (2) The test specified in sub-rule (1) shall be carried out atleast once every 12 months in each completed pipeline section which crosses an area where there is danger of water pollution by any leakage : Provided that the Chief Controller may subject to such conditions as may be specified by him in this behalf allow retesting of such sections of the pipelines as are protected by sleeves or otherwise -
 - (i) to contain or prevent leakage at longer intervals, and
 - (ii) by filling them with petroleum in place of water for the purposes of test.
- (3) The provisions of sub-rule (2) shall not apply to cross-country pipelines, for which new technologies are available.

94. Shut down of pipelines. –

Except when shut down for maintenance work, a pipeline when not in operation shall be shut down under pressure and a careful record made of the pressure during the shut down period. Any significant drop in pressure shall be deemed to render the pipeline unfit for transport of petroleum

until it is repaired and tested in accordance with rule 98 and no significant drop in shut-down pressure is observed and it passes the test specified in rule 93.

95. Patrolling of pipeline. –

(1) The whole of every pipeline shall be efficiently patrolled by the company owning the pipeline.
 (2) Telegraph or telephone or radio communication facilities shall be provided at frequent intervals along the pipeline: Provided that one such communication channel shall suffice for a series of parallel pipelines laid close to each other: Provided further that nothing in this sub-rule shall apply to a pipeline if the length thereof does not exceed two kilometres.

96. Checking of gauges. –

Tank gauges or gauges at intermediate or booster pump stations shall be checked atleast once a year.

97. Additions and alterations in the pipeline. –

(1) No addition or alteration to a pipeline shall be carried out without the previous approval of the Chief Controller in writing.
 (2) Every person desirous of carrying out any additions or alterations in any pipeline shall submit to the Chief Controller an application alongwith –
 (a) three copies of a drawing to scale and a full descriptive note of the proposed additions and alterations and the purpose thereof, and
 (b) a scrutiny fee of rupees five hundred.
 (3) On receipt of the drawings and fee under sub-rule (2) and after eliciting such additional information as may be required, the Chief Controller shall, if he is satisfied, approve the proposed additions or alterations subject to such conditions as he may deem fit.

98. Repair and maintenance of pipeline. –

No maintenance or repair involving cutting or rewelding of any pipeline shall be carried out except under following conditions, namely: -

- (i) an experienced engineer shall inspect the section requiring maintenance or repair before the work is undertaken and issue a written permit specifying therein the precautions to be observed and the procedure to be followed for carrying out the work. The permit so issued shall be preserved by the owner of the pipeline for a period of six months;
- (ii) all work involving cutting or welding shall be carried out by an experienced person in accordance with the permit referred to in clause (i);
- (iii) the section of the pipeline shall be isolated and drained before starting repairs or maintenance.
- (iv) only mechanical cutters shall be used for cutting the pipeline or any connection thereof unless the section of the pipeline and its connections have been purged with an inert gas.
- (v) no hot work shall be carried out on any pipeline until the section thereof requiring repair has been isolated drained and purged with inert gas or steam or kept filled with water or until such section has been prepared in a manner approved in writing by the experienced engineer.
- (vi) the section of the pipeline in which repairs or maintenance work has been carried out shall not be used for transporting petroleum until such sections are replaced with hydro statically pretested sections and the repaired weld joints pass the radiography test;
- (vii) no section of any pipeline and no valve fitted to it shall be separated until an efficient electrical bond has been established between the parts to be so separated which shall not be broken until the separated parts have been rejoined.

99. Relaying or repairs to a pipeline in public interest. –

Where the Chief Controller is of the opinion that it is in the interest of public safety to do so, he may, by a notice in writing given to the owner of the pipeline, require such owner, to relay, renew or repair such pipeline in accordance with such requirements as may be specified in such notices.

100. Power of inspection and examination. –

The Chief Controller or Controller may at any time inspect and examine any pipeline, and the owner thereof or persons operating or using the pipeline and the person on whose land such pipeline is situated or his representative shall facilitate such inspection and examination and answer all inquiries put by the Chief Controller or Controller in regard to such pipeline.

101. Reports of fire or major leakage. –

The occurrence of any fire or major leakage in a pipeline and connected facilities thereof shall be reported immediately by the person for the time being incharge of the pipeline to the nearest Magistrate or officer-incharge of the nearest police station and to the Chief Controller by telephone/fax and also by telegram at his telegraphic address, namely "Explosives Nagpur".

CHAPTER IV ELECTRIC INSTALLATION

102. Restriction on electric installation and apparatus. –

Save as provided in this chapter, no electric wiring shall be installed and no electric apparatus shall be used in any refinery, installation, storage shed, service station or in any other place where petroleum is refined, blended, stored, loaded or unloaded.

103. Hazardous area. –

For the purpose of this chapter, an area shall be deemed to be a hazardous area, where –

- (i) petroleum having flash point below 650 C or any inflammable gas or vapour in a concentration capable of ignition is likely to be present.
- (ii) Petroleum or any inflammable liquid having flash point above 650 C is likely to be refined, blended, handled, stored at above its flash point.

104. Classification of hazardous area. –

(1) A hazardous area shall be deemed to be. –

- (i) a zone “0” area, if inflammable gas or vapours are expected to be continuously present in the area; or
 - (ii) a zone “1” area, if inflammable gases or vapours are likely to be present in the area under normal operating conditions; or
 - (iii) a zone “2” area, if inflammable gases or vapours are likely to be present in the area only under abnormal operating conditions or failure or rupture of an equipment.
- (2) If any question arises as to whether hazardous area is a zone “0” area or a zone “1” or a zone “2” area, the decision thereon of the chief controller shall be final.

105. Extent of hazardous area. –

The extent of hazardous area shall be as laid down in the fourth Schedule. –

Provided that the Chief Controller may, increase or reduce the extent of hazardous area where there are special circumstances which, in his opinion, warrant such increase or reduction, and the persons affected shall be informed of his decision .

106. Fixed electric apparatus. –

(1) No electric apparatus shall be allowed in a zone “0” area: Provided that this sub-rule shall not prohibit the use in a zone “0” area of an intrinsically safe apparatus of a type approved in writing by the Chief Controller and in connection with an intrinsically safe circuit, where use of such apparatus cannot be completely excluded.

(2) All electric apparatus installed or used in a zone “1” area shall be either. –

- (i) a flame proof or intrinsically safe apparatus of a type or types approved in writing by the Chief Controller or
- (ii) an industrial-type apparatus housed in an enclosure or a room which has been made safe by pressurizing or purging with a plenum of atmosphere free from significant concentration of any inflammable gas or vapour and so arranged and inter blocked that in case of failure of the pressurizing or purging agent, the electricity supply is automatically cut off or a warning is automatically given to a person in attendance who shall take suitable measures to prevent a hazard.

(3) All electric apparatus installed or used in a zone “2” area shall, be either

- (i) a non-sparking apparatus of a type approved by the Chief Controller; or
- (ii) an apparatus of any of the types permitted under sub-rule (2).

(4) Where the approval of the Chief Controller is sought for any type of electric apparatus for use in hazardous area, the person desirous of manufacturing the apparatus shall submit to the Chief Controller;

- (i) a comprehensive report accompanied by all necessary drawings, calculations giving references to recognized code or codes followed, full details of design and construction and

necessary test certificates from the recognized bodies in respect of the apparatus and its components.

(ii) a scrutiny fee of rupees five hundred.

107. Fixed electric wiring. –

(1) All conductors of an intrinsically safe circuit in connection with an intrinsically safe apparatus installed in any hazardous area shall be so laid as to prevent invasion of such circuit by current arising from contact or electrostatic or electromagnetic induction from any other circuit.

Conductors of intrinsically safe circuits shall be effectively protected against mechanical damage.

(2) All electric wiring in a hazardous area, other than the conductors of an intrinsically safe circuit, shall be effectively sealed at all joints, mechanically protected and adequately supported throughout its length and shall consist of –

(i) approved armoured cable with correctly designed terminations, complete with armour clamps, the armouring being carried and electrical clamps to provide mechanical support to the cable and electrical continuity; or

(ii) approved metal sheathed cable with correctly designed and installed terminations; or

(iii) single or multicored insulated cables accommodated in solid drawn heavy gauge screwed galvanized conduits used in conjunction with approved flameproof fittings, the conduit being sealed at both ends and installed in such a manner as to permit internal condensation to drain to a point or points from which it may be removed; where a conduit runs from a zone “1” area to a zone “2” area or an area which is not a hazardous area, an adequate seal shall be provided outside the boundary of zone “1” area;

(iv) single or multicored mineral insulated cable of approved type in conjunction with approved flame-proof type glands at all joints and terminations;

(v) bare conductors contained in an approved flameproof or forming part of an intrinsically safe circuit.

(3) Insulated cables without metallic sheathing or armouring but accommodated in a conduit shall not be buried in the open ground in any hazardous area;

(4) The electric supply circuits of each electric pump in a hazardous area shall be –

(i) separately protected by a fuse or circuit breaker set to operate when the current in the circuit so exceeds the rated current for such a period of time as to involve danger; and

(ii) provided with an individual isolating switch at the main supply point for each electric pump including its integral lighting system, if any.

(5) If the Chief Controller is satisfied that the requirements of sub-rules (1) and (2) may be modified or relaxed in any class of electric wiring, he may authorize such modification or relaxation for such period and subject to such conditions as he may think fit.

108. Earthing and bonding. –

(1) All electrical systems and equipments and all structures, plants and other non-current-carrying metallic parts of major electric apparatus or any major metallic object in any place where petroleum is refined, blended, stored, loaded or unloaded shall be efficiently earthed; the resistance value of and earthing system to the general mass of the earth, shall not be more than–

(a) 4 ohms in the case of electrical systems and equipment or a valve that ensures the operation of the protective device in the electrical circuit, whichever is lower, and

(b) 10 ohms in the case of all non-current carrying metallic parts of major electric apparatus or any major metallic object.–

(2) All joints in pipelines, valves, plants, storage tanks and associated facilities and equipments for petroleum shall be made electrically continuous by bonding or otherwise; the resistance value between each joint shall not exceed 1ohm.

(3) A piping which is not in electrical contact with the associated tank or vessel shall be efficiently connected to such tank or vessel by a flexible conductor and earthed.

109. Cathodic protection. –

(1) Cathodic protection system where employed shall be designed and installed in accordance with the current recognized practice and so maintained as –

(a) not to affect adversely metallic bodies in the zone of protection; and

(b) to eliminate the danger of sparking in a hazardous area.

(2) The metallic structures, pipelines, valves, plants and associated equipment under cathodic protection shall not be broken for repair or maintenance unless a heavy gauge conducting cable is clamped to each side of the intended break for establishing between them an electrical bond and the cable shall remain clamped until repair or maintenance work is completed and the break rejoined.

110. Protection against stray current. –

(1) Where high values of stray currents are likely to exist, both the rails of spur lines shall be insulated from a railway siding which is used for the loading or unloading of tank wagons.

(2) On electrified railway systems, live-contact rails and overhead electric lines shall be terminated outside the area where tank wagons are loaded or unloaded, such rails or overhead lines shall not be allowed within a refinery or an installation.

(3) No joint in a pipeline or associated equipments shall be broken save as provided in sub-rule (2) of rule 109.

111. Portable electric apparatus.-

(1) No person shall install or use in a hazardous area any portable electric lamp or apparatus other than a portable lamp or apparatus of a type approved by the Chief Controller after such examination and test and for such application as he may specify.

(2) No mains operated portable lamp shall be operated at a voltage exceeding 25 volts above the earth : Provided that the Chief Controller may, at his discretion, allow higher operating voltage not exceeding 55 volts above earth.

(3) All portable lamps or apparatus other than a self-contained lamp or apparatus shall be connected to the mains in such a manner and used under such conditions as the Chief Controller may specify.

112. Maintenance of approved electric apparatus and wiring. –

All electric apparatus and wiring in a hazardous area shall at all times be so maintained as to retain the characteristic on which their approval has been granted.

113. Repair and test work. –

(1) No flame-proof or intrinsically safe apparatus shall be opened and no work likely to impair the safety characteristics of such apparatus or electric wiring connected thereto shall be carried out until all electrical supply has been cut off from the said apparatus or wiring. The power supply shall not be restored thereto until the work has been completed and the safety characteristics provided in connection with the apparatus and wiring have been fully restored.

(2) Notwithstanding anything contained in this rule, use of soldering apparatus or other means involving flame, fire or heat or use of industrial type apparatus in a zone “1” area shall be permitted for the purposes of effecting repairs and testing and alternations, provided that the area in which such apparatus or wiring has been installed, has first been made safe and certified by a competent person after testing with an approved gas-testing apparatus to be safe and free from inflammable vapours, gases or liquids and is maintained in such conditions, so long as the work is in progress.

114. Certificate of electric installation. –

(1) Before engineering any electric circuit and any electric apparatus in hazardous area for the first time and after each repair maintenance or alteration work carried out in such circuit or apparatus, a competent person shall issue a certificate under his signature to the effect that the circuit and the apparatus have the safety characteristics upon which their use in such area has been approved.

(2) The certificate referred to in sub-rule (1) shall be preserved by the occupier of the premises and shall be produced to the Inspector on demand : Provided that the certificate issued for each repair and maintenance work need not be preserved for a period exceeding six months.

115. Precautions against corrosion. –

- (1) Where necessary, all electric apparatus and equipments and conduits carrying electric wiring in a hazardous area shall be regularly treated with a suitable protective paint.
- (2) The certification label indicating the flame-proof or intrinsically safe nature of the apparatus or equipment shall not be painted over or treated in any manner to impair the legibility of the particulars written stamped or embossed on such label.

CHAPTER V

STORAGE OF PETROLEUM REQUIRING LICENCE

116. Licence for storage. –

Save as provided in sections 7, 8 and 9 of the Act, no person shall store petroleum except under and in accordance with a licence granted under these rules : Provided that no licence shall be necessary.-

- (i) for the storage of petroleum in well-head tanks; or
- (ii) for the storage of petroleum as transit cargo within the limits of a port subject to such conditions as may be specified by the Conservator.

117. Precautions against fire. –

- (1) No person shall smoke in any installation, storage shed or service station save in places specifically authorized by the licensing authority for the purpose.
- (2) No person shall carry matches, fuses or other appliances capable of producing ignition or explosion in any installation or storage shed, which is used for the storage of petroleum.
- (3) No fire, furnace or other source of heat or light capable of igniting inflammable vapour shall be allowed in any installation, storage shed or service station save in places specially authorized by the licensing authority for the purpose.
- (4) (i) An adequate number of portable dry chemical powder or any other fire extinguisher capable of extinguishing oil fires shall always be kept in every storage shed and small class B or C installations at strategic point and all persons employed at such locations shall be conversant with the use of such fire extinguishers.
- (ii) Scale of fire fighting provided in other areas of installation should be as per the requirement given in OISD Standard -117 for all installations approved by the Chief Controller after publication of the original standard OISD-117. For Installations existing prior to the publication of this standard the fire fighting facilities shall be improved to the extent feasible (keeping this standard in mind) and approved by the Chief Controller.

118. Supervision of operations within an installation, service station or storage shed. –

All operations within an installation, service station or storage shed shall be conducted under supervision of an experienced responsible agent or supervisor who is conversant with the terms and conditions of the licence held for the installation, service station or storage shed as the case may be and those persons should have proper safety training.

119. Cleanliness of installation, service station or storage shed. –

The ground in the interior of an installation or service station and the protected areas surrounding any installation, service station or storage shed shall be kept clean and free from all vegetation, waste material and rubbish.

120. Drainage. –

- (1) All enclosures surrounding above ground tanks in an installation shall be provided with proper drainage facilities in such a way that no water is allowed to accumulate in the enclosures.
- (2) No part of the enclosure referred to in sub-rule (1) shall be below the level of the surrounding ground within the protected area.
- (3) Where drainage is effected by means of a pipe, the pipe shall be fitted with a valve which is capable of being operated from the outside of the enclosure or with any other arrangements approved in writing by the Chief Controller.
- (4) All valves and other opening for draining off water shall be kept closed except when water is being drained off.
- (5) The nature of the drainage arrangements and the position of all openings and valves therein shall be shown in the plan submitted with the application for a licence.

121. Exclusion of unauthorized persons. –

- (1) The protected area surrounding every installation and storage shed shall be surrounded by a wall or fence of at least 1.8 metres in height.
- (2) In case of service station 1.2 metre high boundary wall or fence on sides other than the drive way shall be provided.
- (3) Precautions shall be taken to prevent unauthorized persons from having access to any storage shed or installation.

122. Petroleum only to be stored. –

No installation, service station or storage shed shall, without permission in writing from the Chief Controller be used for any purpose other than the storage and distribution of petroleum and for purpose directly connected therewith.

123. Marking of Capacity of Tanks. –

The capacity in litres or kilolitres of every above ground tank in an installation shall be conspicuously marked on the tank

124. Construction of tanks. –

- (1) Every tank or receptacle for the storage of petroleum in bulk other than a well-head tank shall be constructed of iron or steel in accordance with the codes or specification approved by the Indian Standards Institution or any other code or specifications approved in writing by the Chief Controller. Provided that if the properties of petroleum to be stored so required or for any other reason it is necessary to do so, tanks or other receptacles may be built of materials other than iron or steel.
- (2) The tanks or other receptacles shall be erected on firm foundations or supports of non-combustible material in accordance with sound engineering practice.
- (3) The height of a storage tank shall not exceed one and a half times its diameter or twenty metres, whichever is less.

Explanation :- For the purpose of this sub-rule, the height of a tank shall be the height from its bottom to top curb angles .

- (4) An air space of not less than five percent of the total capacity of the tank or the space prescribed in the code or specification referred to in sub-rule (1), whichever is less, shall be kept in each tank.

125. Protection against corrosion. –

All tanks or other receptacles for the storage of petroleum in bulk, other than well-head tanks installed on the ground or below the ground, shall be protected against corrosion by the use of protective coatings or cathodic protection or by any other means approved by the licensing authority.

126. Testing of tanks. –

- (1) Storage tanks or other receptacles for the storage of petroleum-in bulk, other than well-head tanks, after being installed and secured in the final position or after undergoing re-installation or any major repair, shall, before being put into use, be tested by water pressure by a competent person.
- (2) The water used for testing shall be free from petroleum and shall not be passed through any pipe or pump ordinarily used for the conveyance of petroleum: Provided that where the licensing authority is satisfied that it is not reasonably possible to convey water by pipes or pumps other than those ordinarily used for conveyance of petroleum, he may permit use of a petroleum pipe or pump for the conveyance of water subject to such conditions as he may impose.
- (3) The competent person carrying out the test as required under sub-rules (1) shall issue a certificate in the proforma given below; the certificate so issued shall be submitted to the licensing authority along with the application for the grant or amendment of a licence, or, in the case of any major repair, after each repair.

Proforma of Certificate of Tank Testing
[See Rule 126]

In respect of of size..... (number of tanks)
 (diameter and height or length of each tank)..... and capacity
 respectively, installed with in the installation service station of
 (delete words not applicable) (full name of occupier of
 installation/service station as the case may be) at.....
 (Name of place, police station, District State) covered by licence No.
 (To be filled in the case of amendment of licence or repair of tank)
 Certified that I have in accordance with rule 126 of the Petroleum Rules, 2002, tested the tanks
 described above by water pressure after they had been installed and secured in the final
 position/repared and found them free from leak and suitable for the storage of Petroleum(delete
 words not applicable) Date of test Full signature of the competent person issuing the certificate
 His recognized qualification..... His full name and postal
 address

127. Earthing of tank. –

(1) Every tank or other receptacle for the storage of Petroleum in bulk, other than a well head tank or tanks of less than 50,000 litres capacity containing petroleum Class C shall be electrically connected with the earth in an efficient manner by not less than two separate and distinct connections placed at the opposite extremities of such tank or receptacle. The roof and all metal connections of such tank or receptacle shall be in efficient electrical contact with the body of such tank or receptacle.

(2) The connections and contacts required under sub-rule (1) shall have a few joints as possible. All joints shall be riveted, welded or bolted and also soldered to ensure both mechanical and electrical soundness.

(3) The resistance to earth shall not exceed 7 ohms and the resistance to any part of the fitting to the earth plate or to any other part of fitting shall not exceed 2 ohms.

128. Testing of earth connections. –

(1) The connections and contacts of the tank or receptacle required under rule 127 shall be inspected and tested by a competent person at least once in every twelve months by means of a direct reading instrument, such as a Megar.

(2) The testing instrument referred to in sub-rule (1), if capable of producing a spark, shall be so shielded as to be incapable of igniting petroleum vapour.

(3) A record of such inspections and tests shall be maintained by the licensee in the licensed premises and shall be produced on demand by any inspector.

129. Night working. –

No installation storage shed shall be open and no work in any installation or storage shed shall be permitted between sunset and sunrise except where approved electric lights conforming to the provisions of Chapter IV are exclusively used.

130. Certificate of safety. –

(1) A certificate of safety in the proforma given below this rule and signed by a competent person shall be furnished to the licensing authority before any petroleum is stored in an installation or a service station for the first time or whenever any additions or alterations to the enclosure walls and embankments are carried out or when any tank is installed or its position shifted.

Proforma of Certificate of Safety
[See Rule 130]

I, hereby certify that I have inspected the petroleum service station/installation described below on ... (date) and it has been constructed as per plan

approved by Chief Controller/Controller, vide letter No. dated and the service station/installation, in my opinion is safe for storage of petroleum.

1. Name & Address of occupier
2. Location of the service station/installation (Plot No. , Village/Town, District, State)
3. Description of facilities of the service station/installation.

(A) Tanks :-

(i) Aboveground tanks :-

- (a) identification No., size, capacity, product, class of petroleum
- (b) whether enclosure walls provided –if so, nature of enclosure walls its capacity, provision of drain pipe and valve
- (c) nature and description of fittings provided.

(ii) Underground tanks :-

- (a) identification No., size, capacity, product, class of petroleum
- (b) nature of pit, soil cover, fastening arrangement
- (c) nature of top cover (whether soil/RCC)
- (d) nature and description of fittings provided.

(B) Filling /storage shed :-

Whether provided as per approved plan

(C) Tank lorry and/or Tank wagon loading/unloading:-

- (i) Number of bays and points provided
- (ii) Type of loading & unloading facilities:-

(D) Pipelines :-

- (i) Size and specification of pipeline(s)
- (ii) Test pressure of pipeline kg/cm²
(Tested by on)

(E) Electrical fittings/equipment's:-

- (i) Pumps (specification, make and CCE approval reference for each)
- (ii) Starters
- (iii) Junction Box
- (iv) Switches
- (v) Light fittings
- (vi) Others

(F) Earthing, bonding and electrical continuity:-

- (i) Earthing of tanks, pumps, bulk loading/unloading facilities
- (ii) Bonding of pipeline joints
- (iii) Earthing resistance at each point

(G) Nature of Fencing/boundary wall:-

(H) Description of fire fighting facilities provided:-

4. Remarks :

Place :

Date : Signature of the competent person

Particulars of recognition by Chief Controller (2)

- (i) Anybody intending to be recognized as competent person shall possess the qualification and experience prescribed in para (A) of Form- XX and shall submit to the Chief Controller an application in the form prescribed in para (B) of the same form. Every application shall be accompanied by a scrutiny fee of rupees five hundred. The Chief Controller shall register such application and within a period of sixty days of the date of receipt of the application, and after having satisfied himself with regard to competence and professional ethics either recognize the applicant as a competent person or reject the application specifying the reason therefor.

- (ii) The Chief Controller may after giving an opportunity to such person to be heard revoke the recognition-

(a) if he has reason to believe that such person has violated any condition stipulated in the letter of recognition or has not carried out a test, examination and inspection or has acted, in a manner inconsistent with the intent for the purpose of these rules: or

(b) for any other reason to be recovered in writing.

131. Prior approval of specifications and plans of premises proposed to be licensed . –

(1) Every person desiring to obtain a licence to import and store petroleum in Form XIV, Form XV, Form XVI or in Special Form, as the case may be, shall submit to the licensing authority an application along with:-

(a) specification and plans drawn to scale, in duplicate, clearly indicating:-

(i) the manner in which the provisions prescribed in these rules will be complied with;

(ii) the premises proposed to be licensed, the area of which shall be distinctly coloured or otherwise marked.

(iii) The surroundings and all protected works lying within 100 metres of the edge of all facilities which are proposed to be licensed;

(iv) The position, capacity, materials of construction and ground and elevation view of all storage tanks, enclosures around tanks, all valves, filling and discharge points, vent pipes, dip pipes, storage and filling sheds, pumps, fire-fighting and all other building and facilities forming part of the premises proposed to be licensed;

(v) The areas reserved for different class of petroleum including petroleum exempted under section 11 of the Act; and

(b) a scrutiny fee of rupees four hundred paid in the manner specified in rule 13.

(2) If the Chief Controller, after scrutiny of the specification and plans and after making such enquiries as he deems fit, is satisfied that petroleum may be stored in the premises proposed to be licensed, he shall return to the applicant one copy each of the specifications and plans signed by him conveying his sanction subject to such conditions as he may specify.

132. Pumping. –

No internal combustion engine or electric motor in an installation shall be used for driving pumps for pumping petroleum save in a pump house or pumping area specially constructed for the purpose and approved by the Chief Controller.

133. Identification mark on licensed premises. –

Every installation, storage shed or service station under these rules shall have prominently marked thereon the number of the licence held for it.

134. Posting up of rules and conditions .

-An extract of rules 3 to 12, 102 to 115, 116 to 134 and rules 146 to 148 and 152 to 160 and of the conditions of the licence shall be exhibited in a conspicuous place in every licensed installation, service station or storage shed.

135. Petroleum in the possession of Defence Forces of the Union. –

Nothing in rules 116, 121, 122, 125, 126, 127, 128, 130, 131, 133 and 134 shall apply to petroleum in the possession of the Defence Forces of the Union.

CHAPTER VI

STORAGE OF PETROLEUM CLASS “C” NOT REQUIRING A LICENCE

136. Application. –

(1) The provisions of this chapter shall apply to petroleum Class C stored otherwise than under a licence as provided in section 7 of the Act but shall not apply to petroleum Class C in the possession of the Defence Forces of the Union.

(2) The provisions of Chapter V shall not apply to petroleum Class C permitted to be stored without a licence under section 7 of the Act.

137. Restriction of Storage. –

Petroleum Class C shall not be stored together with any other class of petroleum except under and in accordance with a licence granted under these rules.

138. Storage of exempted Petroleum Class C in bulk. –

(1) Petroleum Class C in bulk shall be stored in a tank constructed of iron or steel or any other material approved in writing by the Chief Controller.

(2) The tank referred to in sub-rule (1) shall be properly designed and erected and the tank with all its fittings shall be so constructed and maintained as to prevent any leakage of petroleum.

(3) All tanks of capacity exceeding 5,000 litres for the storage of petroleum Class C shall be surrounded by an enclosure wall or placed inside a pit, so constructed and maintained as to be able to contain without leakage the maximum quantity of petroleum capable of being contained in largest tank within such enclosure or pit.

(4) A drainage pipe with a valve capable of being actuated from outside the enclosure wall shall be provided in the enclosure or pit referred to in sub-rule (3) and the valve shall be kept closed.

(5) A distance of not less than 1.5 metres shall be kept clear between protected works and the edge of such enclosure wall or pit.

139. Storage of Petroleum Class C in non-bulk. –

Petroleum Class C which is not in bulk shall, if the quantity at any one time exceeds 2,500 litres be stored in a storage shed of which either. -

- (a) the doorways and openings shall be built up to a height of 30 centimetres above the floor, or
- (b) the floor shall be sunk to a depth of 30 centimetres.

140. Prior report of storage of Petroleum Class C. –

Every person intending to store petroleum Class C in quantity exceeding 5000 litres otherwise than under a licence shall submit the following to the Chief Controller before commencing storage-

- (i) plans drawn to scale of the storage facilities showing compliance of rule 138 and site plan of the storage premises and surroundings upto 100 metres identifying the locations of premises; and
- (ii) a scrutiny fee of rupees five hundred.

CHAPTER VII LICENCES

141. Grant of licence. –

Licences under these rules may be granted by the licensing authorities set forth in the First Schedule in the forms specified for the purpose and on payment of a fee specified therein.

142. Period for which licences may be granted or renewed. –

(1) A Licence in Form III or Form XVII may be granted for such period as the licensing authority may deem necessary subject to a maximum of one year.

(2) Every other licence granted or renewed under these rules will remain in force until the 31st day of December of the year up to which the licence is granted or renewed subject to a maximum of three years.

(3) Notwithstanding anything contained in sub rule (1) or sub-rule (2), the licensing authority where it is satisfied that a licence is required for a specific work or festival which is not likely to last up to the 31st day of December of the year up to which the licence is granted or renewed, may grant or renew a licence for such period as is actually necessary.

143. Application for licence. –

(1) A person wishing to obtain or renew a licence under these rules shall submit an application in writing to the authority empowered to grant such a licence.

(2) An application for the grant of a licence to transport petroleum in bulk by road in mechanically propelled vehicles shall be in Form VII and to transport petroleum class A/B in bulk on land for onsite fuelling of aircraft's, heavy vehicles/machineries and stationary equipment by a mechanically propelled vehicle viz. Refueller shall be in Form VIII. An application for licence to import and store petroleum shall be in Form IX and to decant kerosene (petroleum class B) from mechanically propelled vehicles containers shall be in Form X.

144. No-objection certificate. –

(1) Where the licensing authority is the Chief Controller or the Controller, as the case may be, an applicant for a new licence other than a licence in Forms III, XI, XVII, XVIII, or XIX shall apply to the District Authority with two copies of the site-plan showing the location of the premises proposed to be licensed for a certificate to the effect that there is no objection, to the applicant receiving a licence for the site proposed and the District Authority shall, if he sees no objection, grant such certificate to the applicant who shall forward it to the licensing authority with his application Form IX.

(2) Every certificate issued by the District Authority under sub-rule (1) shall be accompanied by a copy of the plan of the proposed site duly endorsed by him under his official seal.

(3) The Chief Controller or the Controller as the case may be, may refer an application not accompanied by certificate granted under sub-rule (1) to the District Authority for his observations.

(4) If the District Authority, either on a reference being made to him or otherwise, intimates to the Chief Controller or the Controller as the case may be, that any licence which has been applied for should not, in his opinion, be granted, such licence shall not be issued without the sanction of the Central Government.

(5) The District Authority shall complete his inquiry for issuing NO OBJECTION CERTIFICATE (NOC) under sub-rule (1) and shall complete the action for issue or refusal of the NOC, as the case may be, as expeditiously as possible but not later than three months from the date of receipt of application by him.

145. Particulars of licence. –

(1) Every licence granted under these rules shall be held subject to the conditions specified therein and shall contain all the particulars which are contained in the Form specified under these rules.

(2) One copy of the plan or plans for the licensed premises signed in token of approval by the licensing authority shall be attached to the licence which shall form part 81 of such licence, and an identical copy shall be filed for record in the office of the licensing authority, except in the case of licence in Form XVIII.

146. Prior approval necessary for alterations in the licensed premises. –

- (1) No alteration shall be carried out in the licensed premises until a drawing or drawings showing such alteration has been approved in writing by the licensing authority.
- (2) A person wishing to carry out any alteration in the licensed premises shall submit to the licensing authority-
 - (i) three copies of a properly drawn plan of the licensed premises showing in distinct colour or colours the proposed alteration and the reasons and therefore.
 - (ii) a fee of rupees four hundred for scrutiny of the proposed alteration.
- (3) If the licensing authority, after scrutiny of the plan showing the proposed alteration and after making such enquiries as he deems fit, is satisfied that the proposed alteration may be carried out, he shall return to the licensee one copy of the plan signed by him and conveying his sanction subject to such condition or conditions as he may specify.
- (4) The holder of the licence, shall apply to the licensing authority for the amendment of the licence as soon as the sanctioned alteration has been carried out.

147. Amendment of licence. –

- (1) Any licence granted under these rules may be amended by the authority empowered to grant such a licence.
- (2) The fee for amendment of a licence shall be rupees five hundred plus the amount, if any, by which the fee that would have been payable if the licence had originally been issued in the amended form exceeds the fee originally paid for the licence.
- (3) A licensee who desires to have his licence amended shall submit to the licensing authority-
 - (i) an application duly filled in and signed in Form VII if the licence has been granted for transport of petroleum in bulk by road, in Form VIII, if the licence has been granted for refueller in Form XIX, in Form IX if the licence is granted to import and store petroleum and in Form X, if the licence is granted to decant kerosene (Petroleum Class B) from mechanically propelled vehicles in containers.
 - (ii) the licence sought to be amended together with the approved plans attached to it;
 - (iii) where any alteration in the licensed premises has been carried out three copies of the properly drawn plan shown in the alteration sanctioned under rule 146 by the licensing authority;
 - (iv) fee for the amendment of a licence as specified in sub rule (2);
 - (v) a certificate of testing of the tank or tanks, if required under rule 126;
 - (vi) a certificate of safety, if required under rule 130.

148. Renewal of licence. –

- (1) A licence may be renewed by the authority empowered to grant such a licence. Provided that a licence which has been granted by the Chief Controller may be renewed without alteration by a Controller duly authorized by the Chief Controller.
- (2) Every licence granted under these rules, other than a licence in Form III or Form XVII may be renewable for three calendar years where there has been no contravention of the Act or of the rules framed thereunder or of any conditions of the licence so renewed.
- (3) Where a licence which has been renewed for more than one year is surrendered before its expiry, the renewal fee paid for unexpired portion of the licence shall be refunded to the licensee provided that no refund of renewal fee shall be made for any calendar year during which-
 - (a) the licensing authority receives the renewed licence for surrender, or
 - (b) any petroleum is received or stored on the authority of the licence.
- (4) Every application under sub-rule (2) shall be made in Form VII, form VIII, Form IX or Form X as the case may be and shall be accompanied by the licence which is to be renewed together with approved plans attached to the licence, wherever applicable and the renewal fee paid in the manner specified in rule 13.

(5) Every application for the renewal of licence shall be made so as to reach the licensing authority at least thirty days before the date on which it expires, and if the application is so made, the licence shall be deemed to be in force until such date as the licensing authority renews the licence or until an intimation that the renewal of the licence is refused, has been communicated to the applicant.

(6) Where the renewal of a licence is refused, the fee paid for the renewal shall be refunded to the licensee after deducting therefrom the proportionate fee for the period beginning from the date from which the licence was to be renewed up to the date on which renewal thereof is refused.

(7) The same fee shall be charged for the renewal of licence for each calendar year as for the grant thereof: Provided that -

(i) if the application with accompaniments required under sub-rule (4) is not received within the time specified in sub-rule (5), the licence shall be renewed only on payment of a fee amounting to twice the fee ordinarily payable;

(ii) if such an application with accompaniments is received by the licensing authority after the date of expiry but not later than 30 days from the date of expiry, the licence may, without prejudice to any other action that may be taken in this behalf, be renewed on payment of twice the fee ordinarily payable. Provided further that in case of an application for the renewal of a licence for a period of more than one calendar year at a time, the fee prescribed under clause (i) or (ii) of the first proviso, if payable, shall be paid only for the first calendar year of renewal.

(8) No licence shall be renewed if the application for renewal is received by the licensing authority after thirty days of the date of its expiry.

149. Refusal of no-objection certificate. –

A district authority refusing to grant a no-objection certificate under rule 144 shall record, in writing, the reasons for such refusal and shall furnish to the applicant a copy of such order: Provided that before refusing to grant a no-objection certificate, the applicant shall be given a reasonable opportunity of being heard.

150. Cancellation of no-objection certificate. –

(1) A no-objection certificate granted under rule 144 shall be liable to be cancelled by the District Authority or the state Government, if the District Authority or the state Government is satisfied, that the licensee has ceased to have any right to use the site for storing petroleum : Provided that before cancelling a no-objection certificate, the licensee shall be given a reasonable opportunity of being heard.

(2) A District Authority or a State Government canceling a no-objection certificate shall record, in writing, the reasons for such cancellation and shall immediately furnish to the licensee and to the licensing authority concerned, copy of the order cancelling the no-objection certificate.

151. Refusal of licence. –

A licensing authority refusing to grant, amend, renew or transfer a licence, shall record his reason for such refusal in writing.

152. Suspension and cancellation of licence. –

(1) Every licence granted under these rules shall.-

(i) stand cancelled, if the licensee ceases to have any right to the site for storing petroleum;

(ii) stand cancelled, if the no-objection certificate is cancelled by the District Authority or the State Government in accordance with sub-rule (1) of rule 150;

(iii) be liable to be suspended or cancelled by an order of the licensing authority for any contravention of the Act or of any rule thereunder or of any condition contained in such licence, or by order of the Central Government, if it is satisfied that there are sufficient ground for doing so: Provided that -

(a) before suspending or cancelling a licence under this rule, the holder of the licence shall be given an opportunity of being heard;

(b) the maximum period of suspension shall not exceed three months; and

(c) the suspension of a licence shall not debar the holder of the licence from applying for its renewal in accordance with the provisions of rule 148.

(2) Notwithstanding anything contained in sub-rule (1), an opportunity of being heard may not be given to the holder of a licence before his licence is suspended or cancelled in cases -

(a) where the licence is suspended by a licensing authority as an interim measure for violation of any of the provisions of the Act or these rules, or of any conditions contained in such licence and in his opinion such violation is likely to cause imminent danger to the public: Provided that where a licence is so suspended, the licensing authority shall give the holder of the licence an opportunity of being heard before the order of suspension is confirmed; or

(b) Where the licence is suspended or cancelled by the Central Government, if that Government considers that in the public interest or in the interest of the security of the State, such opportunity should not be given.

(3) A licensing authority or the Central Government suspending or cancelling a licence under sub-rule (1), shall record its reason for so doing in writing.

153. Procedure on expiration, suspension or cancellation of licence. –

(1) A person licensed to store petroleum shall, on the expiration, suspension or cancellation of his licence, forthwith give notice to the District Authority of the class and quantity of petroleum in his possession and shall comply with any directions which the District Authority may, on the recommendation of the Chief Controller, give in regard to its disposal.

(2) The District Authority may grant for a term not exceeding three months from the date of expiration, suspension or cancellation, as the case may be, a temporary licence for the storage of petroleum actually held at the time of the issue of the temporary licence: Provided that where the expired, suspended or cancelled licence was granted by an authority, other than the District Authority, no temporary licence shall be granted without the previous consent of such other authority.

(3) The fee chargeable on a licence granted under sub-rule (2) shall bear the same proportion to the fee charged on the expired or cancelled or suspended licence as the period covered by the temporary licence bears to a full year.

154. Appeals -

(1) An appeal shall lie against any order refusing to grant, amend or renew a licence or cancelling or suspending a licence to-

(i) the Central Government, where the order is passed by the Chief Controller;

(ii) the Chief Controller, where the order is passed by a Controller;

(iii) the immediate official superior to the District Authority, where the order is passed by the District Authority;

(iv) the immediate official superior to officer appointed under rule 33 in the case of vessels licensed for the carriage of petroleum in bulk.

(2) An appeal against any order of the District Authority refusing to grant or cancelling a no-objection certificate shall lie to the authority which is immediately superior to the said District Authority.

(3) Every appeal shall be in writing and shall be accompanied by a copy of the order appealed against and shall be presented within sixty days of the order passed.

155. Supply of rules. –

With every licence granted for the storage of petroleum, an extract of rules 3 to 12, rules 102 to 134, rules 146 to 148 and rules 151 to 159 shall be given free of charge to the licensee.

156. Transfer of licence for storage. –

(1) The holder of a licence, for the storage of petroleum may, at any time before the expiry of the licence, apply to the licensing authority to transfer the licence to another person.

(2) Every application for the transfer of a licence shall be accompanied by-

(i) a letter signed by the holder of the licence indicating the full name and address of the person to whom he wishes to transfer the licence and give complete possession of the licensed premises;

(ii) the licence sought to be transferred together with the approved plan or plans attached to it.

- (iii) an application in Form IX duly filled in and signed by the person to whom the licence is sought to be transferred;
- (iv) a fee of rupees five hundred paid in the manner specified in rule-13.
- (3) The licensing authority on receipt of the documents and fee required under subrule (2) shall, if he approves the transfer, enter upon the licence, under his signature, an endorsement to the effect that the licence has been transferred to the person named.
- (4) The person to whom the licence is so transferred shall enjoy the same power and be subject to the same obligations under the licence as the original licensee.

157. Procedure on death or disability of licensee. –

- (1) If a licensee dies or becomes insolvent or mentally incapable or is otherwise disabled, the person carrying on the business of such licensee shall not be liable to any penalty or confiscation under the Act or these rules of exercising the powers granted to the licensee during such time as may reasonably be required to allow him to make an application for a new licence in his own name for the unexpired portion of the original licence in respect of the year in which the licensee dies or becomes insolvent or mentally incapable or is otherwise disabled: Provided that nothing in this sub-rule shall be deemed to authorize the exercise of any power under this sub-rule by any person after the expiry of the period of the licence.
- (2) An application for a new licence for the unexpired portion of the original licence shall be accompanied by a no-objection certificate issued by the District Authority in favour to the person applying for such licence.
- (3) A fee of rupees two hundred shall be charged for a new licence for the unexpired portion of the original licence granted to any person applying for it under this rule.

158. Loss of licence. –

Where a licence granted under these rules is lost or accidentally destroyed, a duplicate may be granted on submission of a copy of plan or plans identical with those attached to the licence and on payment of a fee of rupees two hundred.

159. Production of licence on demand. –

- (1) Every person holding or acting under a licence granted under these rules shall produce it, or an authenticated copy of it, at the place to which the licence applies, when called upon to do so by any Inspector.
- (2) Copies of any licence may, for the purpose of this rule, be authenticated by the authority which granted the licence -
 - (a) on payment of a fee of rupees fifty for each authenticated copy, and
 - (b) on the submission of a copy or copies of the plans identical with the approved plan or plans attached to the licence.

160. Procedure on reports of infringement. –

The District Authority shall inform the Chief Controller of the action taken by him on any report of infringements of the Act or of these rules which the Chief Controller may make to him.

161. Executive control over authorities. –

Every authority other than the Central Government, acting under this Chapter shall perform its duties subject to the control of the Central Government : Provided that nothing in this rule shall be deemed to affect the powers of executive control of the Chief Controller over the officer subordinate to him.

CHAPTER VIII REFINING OF PETROLEUM

162. Approval of refinery. –

(1) No person shall refine, crack, reform or blend petroleum unless the project report with specifications and plans showing the general arrangements of tanks, stills, furnaces, electrical installations, pump houses, arrangement for drainage treatment and disposal of effluents, arrangement for fighting fire, fencing gates and all plants and buildings at the place where it is proposed to refine, crack, reform or blend petroleum (hereinafter in this chapter referred to as the refinery) has been approved by the Chief Controller.

(2) The design and layout of the various blocks/facilities/process units in new crude oil refineries shall be as per design philosophy given in OISD standard-118. This will apply to new crude oil refineries/gas processing installations approved by the Chief Controller after publication of this rule.

(3) Any person desiring to refine, crack, reform or blend petroleum shall submit to the Chief Controller an application along with -

(i) a copy of the project report and specifications and plans referred to in subrule (1) in triplicate; and

(ii) a scrutiny fee of rupees five thousand paid in the manner specified in rule 13.

(4) The Chief Controller on receiving the project report with specifications and plans may require submission of such further particulars as he may specify after satisfying himself that petroleum can be so refined, cracked reformed or blended, shall return to the applicant one set of the specifications and plans signed by him and conveying his sanction subject to such conditions as he may specify.

163. Retention of plans and specifications. –

A copy each of the approved plans and specifications and containing any alterations sanctioned under rule 164 from time to time shall be kept at the refinery.

164. Alterations. –

(1) No alterations in refinery involving the general arrangements or the design of tanks, stills, furnaces, plants, pump-houses, electric installation or firefighting facilities shall be carried out without the previous sanction in writing of the Chief Controller.

(2) The occupier of a refinery wishing to carry out any of the alterations referred to in sub-rule (1) shall submit to the Chief Controller an application along with -

(i) specifications and plans, in triplicate, showing proposed alterations together with reason therefor, and

(ii) a scrutiny fee of rupees one thousand paid in the manner prescribed in rule 13.

(3) The Chief Controller on receiving the specifications and plans for the alterations and reasons therefor, may require submission of such further particulars as he may specify and after satisfying himself that the proposed alterations can be carried out, return to the applicant one copy of the specifications and plans signed by him and conveying his approval subject to such conditions as he may prescribe.

165. Use of fire-proof materials. –

All buildings and facilities in which petroleum is handled shall be built of fire-proof materials.

166. Situations of storage tanks. –

No storage tanks for petroleum shall be situated nearer than 90 metres to any still, boiler or furnace : Provided that this rule shall not apply to a storage tank containing petroleum Class C for use as a fuel for a boiler and such a storage tank shall not be larger than is necessary to conserve 24 hours fuel for the fire which it services.

167. Situation of storage tanks and facilities for liquefied petroleum gases. –

No storage tank or filling facility for liquefied petroleum gases shall be nearer than 90 metres to any still, boiler or furnace or nearer than 30 metres to any storage tank, pump-house or any facility for the blending or filling of petroleum or to any protected work.

168. Situation of flare. –

No flare shall be situated nearer than 90 metres to any tank, still, pump-house or any facility for the refining, cracking, reforming, blending, storage or handling of petroleum or liquefied petroleum gas, other than knockout drum and condensate recovery pump attached to such flare.

169. Drainage. –

- (1) Adequate arrangement shall be made to ensure that effluents and drainage passing from the refinery does not cause pollution of rivers, irrigation channels water reservoirs or foreshore and does not harmfully affect animal or vegetable life in any way.
- (2) Effluent drainage from pump-houses and all other points where oil be entrained shall be passed through an efficient oil interceptor system of adequate size.
- (3) All chemical waste shall be rendered harmless before they leave the refinery area.
- (4) The whole of the sewerage shall be independent of other drainage systems.
- (5) All drains shall have adequate capacity to prevent any flooding or backing-up and be of such construction as to prevent leakage from them to the surrounding grounds.
- (6) Drains for carrying waste chemicals shall be of a type which is not affected by the chemicals in question.
- (7) Trash racks shall be fitted to the drains where there is a possibility of rubbish being carried forward and forming a plug.
- (8) Manholes shall be provided in closed drains where there is an abrupt change of directions and also at reasonable intervals in straight sections to permit rodding.
- (9) When vents are provided to release gases separated from contaminated effluents in closed drains, they shall be sited where they are unlikely to cause danger or annoyance.
- (10) All drains shall be fitted with fire traps/water seals at suitable points to prevent the passage of flame.
- (11) Where gas traps are provided in the drains they shall be constructed on the upstream side of the oil interceptors and such gas traps shall be fitted with vents to liberate the gas at such a height that danger or annoyance is not caused.

170. Fire and Smoking. –

- (1) No fire furnace, source of heat or light capable of igniting inflammable vapours shall be allowed except in the firing space of stills and boilers.
- (2) No smoking shall be allowed except in spaces or buildings specially approved for the purpose by the Chief Controller.

171. Permits to carry out maintenance and repair work. –

- (1) No maintenance or repair work and no entry into confined spaces including a closed drain or manhole shall be permitted except under and in accordance with the conditions of a written permit as per OISD standard 105 issued by a competent person authorized by the occupier of the refinery.
- (2) The competent person referred to in sub-rule (1) shall, before issuing the permit, satisfy himself by inspection and testing, whenever necessary, that the conditions of the vessel, site or equipment are entirely safe for the work which is to be undertaken and shall specify on the permit the conditions under which the work can be carried out safely.
- (3) Permits for carrying out maintenance or repair work shall be issued for limited and stated period during which known conditions will remain safe and such permits shall not be renewed without re-inspection and re-testing of the vessel, site or equipment.
- (4) All gas tests for the purpose of issuing a permit shall be carried out by suitably trained persons by an instrument which is calibrated and checked at such intervals as are recommended in this behalf by the manufacturers of such instruments in the manual of instructions pertaining thereto.

(5) In the case of vessels which had contained products blended with leaded fluid, the regulations laid down by the suppliers of the fluid shall be fully observed.

172 Fire Control. –

(1) Every crude oil refinery shall be fully protected against fire by a well organized and trained fire fighting service with necessary materials and fixed, mobile and portable equipments for fighting fires in line with the OISD Standard –116. This will apply to new crude oil refineries/gas processing installation approved by the Chief Controller after publication of this rule.

(2) An adequate supply of water shall be available at all strategic points in the refinery by means of an independent ring main or grid provided with isolating valves. The main shall be kept constantly pressurized by two or more boosting pumps of adequate capacity preferably working automatically as any significant loss of pressure in the main occurs. At least one of the boosting pumps shall be independent of the normal power supply.

(3) All mains shall be fitted with hydrants at convenient places not more than thirty metres apart in hazardous areas and not more than 45 metres apart in non hazardous area. Such hydrants shall be of design suitable for operating conditions and for connecting mobile pumps.

(4) Static water supply of adequate capacity shall be provided where mains water supply may be subject to interference.

(5) All refinery personnel shall be practiced in the use of first-aid, fire-fighting appliances and selected refinery personnel shall be trained in all aspects of fire-fighting.

(6) The Chief Controller may relax any of the provisions of sub-rule (1) to (5) or require additional fire-fighting provisions to be made if he deems such relaxation or additional fire-fighting provisions necessary in respect of any class of refinery.

173. Removal of Petroleum. –

All petroleum as it leaves the stills with the exception of such quantities as may be pumped direct to service tanks for fuel, shall at once be pumped out into the refinery storage tanks and shall not be stored in the immediate neighbourhood of stills and boilers: Provided that the Chief Controller may permit petroleum to be disposed of otherwise.

174. Prevention of danger from static electricity. –

Adequate provision shall be made to prevent accumulation of dangerous static charges of electricity.

175. Warning notices. –

(1) Warning notices regarding prevention of unauthorized persons, naked lights, smoking and other hazards shall be displayed prominently at strategic locations in the refinery.

(2) No fire works of any kind shall be carried out within a radius of one Kilometre from the refinery except with the prior permission of District Magistrate

176. Marking of pipelines and cables. –

(1) All above-ground pipelines and cables shall be identified by taping, stenciling, colouring distinctively or by any other suitable methods.

(2) All overhead pipelines and cables crossing roads shall be adequately protected against accidental damage.

(3) Pipelines and valves at loading and discharging berths shall be prominently marked to identify the product.

(4) The route of all underground cables shall be marked by prominent markers. At least two such markers shall be visible from any point on the route of the cable.

(5) The route of all underground pipelines shall be marked by prominent markers or by any other effective means to prevent accidental damage to the pipelines.

177. Inspections. –

All plants, instruments and equipment including fire-fighting equipment shall be inspected and tested at intervals, the frequency depending on practical or other relevant factors, and records of all such inspections shall be maintained.

178. Safe operations. –

(1) All operators employed in a refinery shall be adequately trained in the safe operation of plants and equipments.

(2) Written procedures shall be established for operators to start up, shut down and gas-free plants or sections of plants safely and to take safe action under emergency conditions.

(3) Checks shall be made at all stages of the operations by supervisors to ensure that vessels and equipments are properly isolated or connected up, as required, and to ensure that safety facilities are commissioned as the operation proceeds.

179. Report of Fire. –

The occurrence of any fire in the refinery shall be reported immediately by the person in-charge of the refinery for the time being to the Chief Controller and to the nearest police station.

180. Closing of refinery. –

If refinery is closed down, the area within the fence surrounding it shall be cleared of all petroleum having flash point below 93 degree C as soon as possible.

CHAPTER IX TETRA ETHYL LEAD MIXTURES

181. Additions of Tetra Ethyl Lead Mixtures. –

Tetra Ethyl Lead shall not be blended with petroleum except in an equipment approved in writing by the Chief Controller and in such proportions and under such conditions as may from time to time be determined by him.

182. Additions of Tetra Ethyl Lead Mixture. –

Tetra Ethyl Lead shall not be blended except in an equipment approved in writing by the Chief Controller and in quantities not exceeding the limits specified in the relevant Indian Standards specifications.

183. Prescription of special conditions. –

The Chief Controller may from time to time by a written order prescribe special conditions which shall be observed during mixing of petroleum with ethyl fluid, handling of leaded petroleum or cleaning or repair of storage tanks which have contained leaded petroleum.

184. Colouration of leaded petroleum. –

Every mixture of petroleum and tetra ethyl lead shall be distinctively coloured before being supplied to the public.

185. Marking of receptacles. –

All receptacles other than tank containing a mixture of petroleum and tetra ethyl lead shall, except when they are in possession of the Defence Forces of the Union, bear a warning in the following terms, namely :

WARNING:

THIS SPIRIT CONTAINS LEAD AND SHALL BE USED AS A MOTOR FUEL ONLY

CHAPTER X TESTING OF PETROLEUM

186. Drawing of Sample. –

(1) In all cases, the sampling officer shall personally superintend the drawing of the sample and the sample shall be drawn in the presence of at least one witness. Where the sample is drawn from an original unopened receptacle containing petroleum otherwise than in bulk the opening shall be sufficient to admit of the sample being rapidly transferred from the receptacle.

(2) Two bottles, each of a capacity of 1 litre shall be filled to nine-tenths of their capacity with the sample and corked. The corks shall be driven home and cut-off level with the neck; and melted sealing wax shall be worked into the corks and the bottles shall be efficiently sealed.

(3) In the case of petroleum imported into India the bottles containing the samples shall, after being sealed, be labelled with the name of the consignee, particulars of the ship or vehicle by which it is imported and such other distinguishing marks as may be necessary.

187. Forwarding and retention of samples. –

One of the bottles referred to in subrule (2) or rule 186 shall be preserved for reference in case of need and the other shall be forwarded to the testing officer.

188. Procedure of delivery of samples. –

(1) When the master of, or the agent for, a ship or the agent of the importer has made the declaration required under rule 17 or rule 26, the sampling officer shall obtain samples of all the petroleum which is intended to land at the port or place of import, If the importer so desires, the sampling officer shall also take samples of all the petroleum which is intended to land at any other port or place of import in India : Provided that no sample need be taken of petroleum if it is declared to be the petroleum Class A.

(2) The master of ship or the person for the time being in-charge of the vehicle by which petroleum is imported shall deliver to the sampling officer, without charge, samples of every variety of petroleum comprised in the petroleum of which samples are to be taken under sub-rule (1). Such samples shall, if the sampling officer so requires, be taken from the particular receptacles indicated by him : Provided that when the petroleum is in cases, samples shall be taken as the landing proceeds.

189. Selection of samples from imported cargo. –

The minimum number of samples to be selected from each brand or quality contained in the cargo to be imported shall be as follows :-

- (i) in cases-one sample for every 10,000 cases or part thereof;
- (ii) in casks or drums, declared to be uniform quality - one sample for every 600 kilolitres or part thereof;
- (iii) in bulk or in tanks - one sample from each tank or tank compartment.

190. Standard test apparatus. –

The Standard test apparatus shall -

- (a) agree in every respect with the Indian Standard Specification No. IS-1448 (Part I): (P 20) or (P 21) as applicable and for the time being in force; and 101
- (b) have been tested and certified by an officer appointed by the Central Government under sub-section (1) of section 15 of the Act.

191. Certification of apparatus. –

(1) When any apparatus for determining the flash point of petroleum is submitted to the officer appointed under sub-section (1) of section 15 of the Act for comparison with the standard test apparatus, the officer shall examine the apparatus including the thermometres and the barometres or aneroid.

(2) No certificate shall be granted under section 16 of the Act if the apparatus, any thermometres or barometer is in any respect outside the tolerances laid down or variations permitted under the

Indian Standard Specification No. IS-1448 (Part I): (P20) or (P21) as applicable and for the unit being in force.

(3) A certificate in Form IV shall be granted in respect of any apparatus which has been found to agree with the standard test apparatus within the limits specified in IS 1448 (Part I) (P.20) (P.21) was applicable and for the time being in force.

(4) A certificate granted under this rule shall be valid for a period of three years.

192. Register of Certificates . –

A register of all certificates granted under rule 191 shall be maintained in form V by the officer appointed under sub-section (1) of section 15 of the Act.

193. Method of test . –

(1) The testing officer shall test the samples in the manner laid down in the Indian Standard Specification No. IS-1448 (Part I): (P 20) or (P 21) as applicable and for the time being in force.

(2) In all cases at least three samples shall be separately tested, the average of the three readings being corrected for the thermometer correction, if any, and for the barometric correction in case of dispute.

(3) If the average flash point is not lower than 230C, the whole of the petroleum represented by the samples shall be deemed to be petroleum Class B or petroleum Class C according to the average flash point determined by the test.

(4) If the petroleum to be tested is viscous or solid or contains sediments or thickening ingredients, such petroleum shall be tested in accordance with the methods specified in the Fifth Schedule.

194. Procedure when tests show want of uniformity. –

(1) If the testing officer after testing samples taken from an imported cargo, considers further testing necessary to satisfy himself that none of the petroleum is petroleum class A, he shall report to the Commissioner of Customs accordingly.

(2) On receipt of a report under sub-rule (1) -

(a) when the consignment is imported in cases or casks or drums, the Commissioner of Customs shall cause the petroleum in question to be landed and stacked in lots of not more than 1500 cases or casks or drums each, or to be discharged into boats each containing not more than 1500 cases, casks or drums, and the sampling officer shall select and deliver to the testing officer one sample from each lot.

(b) when the consignment is imported in bulk, the sampling officer shall forward a second sample and Commissioner of Customs may, until the receipt of the testing Officer's further report, prevent the landing of any portion of the contents of the tank in question or may permit it to be landed as provided under rule 21.

(c) if the petroleum has already been landed and stored under rule 21:

(i) if it is otherwise in bulk, it shall be divided into lots, and samples of each lot shall be selected as provided in clause (a);

(ii) if it is in bulk, samples shall be drawn from each separate storage tank containing the petroleum.

195. Certificate of tests . –

(1) The testing officer shall, as soon as practicable, and ordinarily within twenty-four hours after receipt of samples make out a certificate in Form VI and shall forward it in the case of samples, of petroleum taken on board a ship or a vehicle by which petroleum is imported to the Commissioner of Customs and in the case of other samples to the officer submitting the sample.

(2) The testing officer shall, at the request of any person concerned, furnish him with a certified copy of the certificate in form VI on payment of a fee of rupees two hundred.

196. Fee for inspection and comparison. –

(1) The fee for each inspection of the standard test apparatus shall be rupees one hundred.

(2) The fee for comparing a privately owned test apparatus with the standard test apparatus shall be as follows:-

(in Rupees) Test apparatus 500 Barometer 200 Thermometer 100

197. Fee for testing . –

(1) The fee for testing each sample of petroleum shall be rupees five hundred: Provided that the aggregate fees chargeable under this sub-rule shall not, in the case of any single consignment of petroleum in any one ship, other vessel, train or place, exceed rupees one thousand.

(2) The fee for re-testing each sample under section 20 of the Act shall be rupees one thousand. It shall be refunded if the original test is proved to be erroneous.

198. Power to enter, inspect, search and seize . –

(1) Any, officer, specified in column (1) of the table below, may within the jurisdiction specified in the corresponding entry in column 2 of the said table:

(a) enter, inspect and search any place where he has reason to believe that any petroleum is being imported, transported, stored, produced, refined or blended or is under transport and inspect all receptacles, plants and appliances used in connection therewith in order to ascertain if they are in accordance with provisions of the Act and of these rules:

(b) search for petroleum therein;

(c) take samples for testing of any petroleum found therein and make payments by cash for value of samples taken; and

(d) seize, detain and remove any petroleum or any material suspected to be petroleum or any equipment or appliances used therein together with connected documents thereof in respect of which he has reasons to believe that any of the provisions of the act or of these rules have been contravened.

TABLE

Designation of the Officer Limit of Jurisdiction

(1) (2)

Chief Controller and Controller Whole of India All District Magistrates Their respective Districts All Magistrates sub-ordinate to Their respective Jurisdiction District Magistrate Police Officer not below the The area over which their Rank of an Inspector authority extends (2) Whenever any officer other than the Chief Controller, seizes, detains or removes any petroleum or any material connected therewith or any connected documents thereof under this rule, he shall forthwith report the fact by telegram to the Chief Controller and Controller having jurisdiction over the place where seizure etc. has taken place and whenever any officer not being the District Authority seizes, detains or removes any petroleum or any material connected therewith or any connected documents thereof under this rule, he shall intimate the facts of the case to the Chief Controller or the Controller having jurisdiction.

(3) Whenever any samples are taken in accordance with this rule, they shall be tested in accordance with the relevant provisions of Chapter X of these rules.

(4) Whenever any petroleum is seized under this rule, it shall be stored, under adequate guard until examination by Chief Controller or Controller and receipt of instructions from him as to its disposal.

(5) Whenever searches are made under this rule the same shall be carried out in accordance with the provisions of the Code of Criminal Procedure, 1973 (2 of 1974). All officers of the police and district authorities shall assist the Chief Controller in the execution under the Act and rules.

(6) Whenever any person by himself or by any person in his employment voluntarily obstructs or offers any resistance to or otherwise interferes with or refuses or fails to give or willfully gives false or misleading information to the officer duly appointed under this rule who is acting in accordance with his duty thereunder such person shall be deemed to have committed an offence under the Act.

199. Destruction of petroleum . –

The Chief Controller or Controller may destroy any petroleum or any material or equipment connected in respect of which the Chief Controller or Controller has reason to believe that any of the provisions of the Act or of these rules have been contravened or which in his opinion is not

longer fit for storage, transport or use. The petroleum shall be destroyed at the expenses of the licensee or the occupier of the premises, as the case may be.

CHAPTER XI NOTICE OF ACCIDENT

200. Notice of Accident. –

(1) The notice of an accident required to be given under section 27 of the Act shall be given forthwith-

(a) to the Chief Controller by telephone/fax and also by telegram [telegraphic address- 'Explosive Nagpur'] followed within 24 hours by a letter giving particulars of the occurrence; and

(b) to the officer-in-charge of the nearest police station by the quickest means of communication.

(2) Pending the visit of the Chief Controller or his representative, or until instruction is received from the Chief Controller that he does not wish any further investigation or inquiry to be made, all wreckage and debris shall be left untouched except in so far as its removal may be necessary for the rescue of persons injured and recovery of the bodies of any persons killed by the accident or in the case of Railways for the restoration through communication.

CHAPTER XII EXEMPTION

201. Power to exempt . - The Central Government may, on the recommendation of the Chief Controller, in exceptional cases, by order exempt any class or classes of petroleum from all or any of the provisions of these rules, on such conditions, if any, as may be specified in the order.

202. Repeal and savings . -

(1) The Petroleum Rules, 1976, are hereby repealed.

(2) Notwithstanding such repeal -

(i) all licences or duplicates granted or renewed under the said rules and all fees imposed or levied shall be deemed to have been granted, renewed or imposed or levied, as the case may be under the corresponding provisions of these rules, and

(ii) all approvals given and all powers conferred by or under any notification or rule shall, so far as they are consistent with the Act and these rules be deemed to have been given or conferred by or under these rules.109

FIRST SCHEDULE

1. Article

2. Form of Licence

3. Purpose for which Granted

4. Authority empowered to grant licence

5. Fee

1. III To carry petroleum in bulk by water An Officer appointed by the Central Govt.

For ships or other Rs. 5000 for Vessels not exceeding 100 tonnes year or part thereof from the date of issue.

For every Rs. 1000 Additional 50 Tonnes gross tonnage or fraction thereof.

2. XI To carry petroleum by land on mechanically propelled vehicles Controller Rs. 500 for every Calendar year or part thereof

3. XII To import and store petroleum Class A in quantity not exceeding 300 litres District Authority Rs. 200 for every Calendar year or part thereof.

4. XIII To import and store petroleum Class B otherwise than in bulk in quantity not exceeding 25000 litres District Authority Rs. 20 for every 1000 litres or part thereof for a calendar year.

5. XIV To store petroleum in tank or tanks, in connection with pump outfit for fueling motor conveyances. Controller For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

6. XV To import and store petroleum in an installation Chief Controller or a Controller authorised in this behalf by the Chief Controller For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

7. XVI To import and store other wise than in bulk

(a) Petroleum Class A in quantities exceeding 300 litres

(b) Petroleum Class B in quantities exceeding 25000 litres

(c) Petroleum Class C in quantities exceeding 45000 litres or

(d) partly one class and partly two classes of petroleum Controller For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

8. XVII To store petroleum Class A temporarily in quantities not exceeding 50000 litres for fuelling of aircrafts in connection with crop spraying work only. Controller For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

9. Special Form To import and store petroleum class not provided for in Articles 3,4,5,6 and 7 Controller For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

10. XVIII To decant kerosene (petroleum class B) from mechanically propelled vehicle in containers) Controller Rs. 200 for every Calendar year or part thereof.

11. XIX To transport petroleum Class A/B in bulk on land for on site refuelling of aircrafts, heavy vehicles/machinery and stationery equipments by a mechanically propelled vehicle Viz, Refueller Controller Rs. 500 for every Calendar year or part thereof.

SECOND SCHEDULE FORM I

(See rules 17 and 26)

Declaration to be made by the Master or agent of ship carrying petroleum by sea before entering port or by the importer or his agent before importing petroleum by land

Name of ship

.....

Particulars of the carriage

Name of Petroleum	Total quantity in the ship or carriage	Quantity of petroleum to be landed in India. Name of port or Place of import	Remarks

Petroleum Class A which can be used in an internal combustion engine

Other Petroleum Class A

Petroleum Class B

Petroleum Class C

Signature of Master or agent of the ship

FORM II (See rules 19 and 26)

Certificate of Storage Accommodation

I here by declare that I propose to store the following consignment of petroleum arriving per(name of ship or particulars of carriage) in(name of port or place of Import) on or about.....(date, month, year) at the storage tanks or shed, particulars of which are given in item (i) and (ii) of col. (1) of the statement below and I certify that the capacity as shown as available and shown as available in item (iii) of the said column are duly licensed for the storage of petroleum in question.

Signature of importer or his agent

Dated the.....

STATEMENT

Description of Import and storage capacity (1)	Petroleum Class A (2)	Petroleum Class B (3)	Petroleum Class C (4)
A			
(i) Total licensed capacity of storage tanks.			
(ii) Total capacity available in storage tanks.			
(iii) Capacity to be utilized by present consignment.			
B			
(i) Total licensed capacity of storage sheds.			
(ii) Total capacity available in storage sheds.			
(iii) Capacity to be utilized by present consignment.			

FORM III
(See rule 33 and Art. I of the First Schedule)

Licence for the carriage of Petroleum in bulk by water.

Licence No. Fee Rs.

The vessel described below is hereby licensed for the carriage of Petroleum in bulk by water under rule 33 of Petroleum rules 2002 in the vessel described below subject to the provisions of Petroleum Act, 1934 and the rule made thereunder and to the further conditions of this licence.

The licence shall remain in force till the day of two thousand*

Licensing Authority

Description of the licensed vessel

Name of vessel

Official number

Gross tonnage

Name and address of owners

The licence is liable to be cancelled if the licensed vessel when inspected is not found to be conforming to the descriptions and conditions attached hereto and contravention of any rules and conditions under which this licence is granted is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every such subsequent offence with simple imprisonment which may extend to three months, or with fine which may extend to five thousand rupees, or with both.

Conditions

The Petroleum shall be Stored only in -

(i) the following** part of the vessel
.....
.....
.....
.....

(ii) the following manner** that is to say
.....
.....
.....
.....

* One year from the date of issue

** The parts of the vessel and the manner of storage to be specified in details by the licensing authority in consultation with the Chief Controller of Explosives.

FORM IV
(See rule 191)
Certificate of Apparatus

..... Apparatus

Marked No

Maker's Name.....

SlideNo.....

Thermometer No. Oil Cup No.....

Water Bath Cup No.

The above apparatus including the thermometres been submitted for verification with the Standard Test Apparatus was compared by me on and found to agree with it within the prescribed limits.

The following corrections are necessary to the thermometer and barometer or aneroid readings:

Thermometer No.

Barometer or Aneroid No.

This certificate is valid for a period of three years from the

Date.....

Reference.....

Signature and designation of the Officer
appointed under Section 15 (1)
Of the Petroleum Act, 1934

FORM V (See rule 192)

Register of Certificate of Apparatus

Serial No	Designation of officer by whom the apparatus has been tested	Place at which the apparatus is indented to be used	Number and date engraved on the apparatus	Contents of certificate	Date on which certificate will cease to be valid

FORM VI (See rule 195)

Certificate of Tests of Petroleum

Owner

Marks.....

Test (1).....

(2)

(3)

Average Thermometer

Correction No.

The sample is

Petroleum and (in the case of petroleum Class B) has a flash point of

.....

Place:

Testing Officer

Date.....

FORM VII [See rule 143, 147 and 148]

Application for the grant/amendment/renewal/transfer of licence to transport Petroleum Class A and Class B in bulk on land by mechanically propelled vehicles. Documents listed below must be submitted with this application

PART A. To be filled in and signed by the applicant

1. Applicant's name and full postal address
2. Particulars of the vehicle in which.....Petroleum is proposed to be transported
 - (i) Make and Model
 - (ii) Engine Number
 - (iii) Chassis Number
 - (iv) Registered Number.....
 - (v) ULW and RLW
 - (vi) Date up to which the vehicle is registered
 - (vii) Name and full postal address of the registered owner.....
 - (viii) Number of compartments and certified capacity in kilolitres of each compartment
 Compartment 1 2 3 4 5 6 7 Total Capacity in Kilolitres No.
 Capacity in kilolitres
 - viii) Class or Classes of petroleum proposed to be transported in the vehicle described above
 - ix) Number and date of approval of the design drawing of the vehicle by the Chief Controller

3. Does the tank vehicle described above fully conform to the requirements laid down in third Schedule to the Petroleum Rules 2002 and are the design drawings approved by the Chief Controller?

4. Full Postal Address of the Place where the vehicle will be normally stationed.

I/We declare that the particulars given above have been checked up by me/us and are correct. I/We undertake to transport petroleum in the tank vehicle/trailer, particulars of which are given above, in accordance with the provisions of the petroleum Act, 1934, and the rules framed thereunder and any other law or rules for the time being in force. I/We understand that any contravention of the said Act and the Rules framed thereunder is punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees or with both and for every subsequent offence with simple imprisonment which may extend to three months or with fine which may extend to five thousand rupees or with both.

Date

Place..... Signature of the applicant.

Part-B To be filled in and signed by the recognized engineer.

I certify that the tank vehicle/trailer, the particulars of which are given in Part A of this form has been examined and tested by me and found to be fully conforming to particulars shown in approved drawing No..... date
complying with the requirements laid down in the Third Schedule to the Petroleum Rules, 2001.

Date Name

Place..... Recognized Qualification

Full Postal Address

Signature

Documents required to be submitted with this Application

1. Two copies of drawing approved under sub-rule (3) of rule 63.
2. Expired licence if the vehicle was previously licensed.
3. Required amount of fee paid in the manner specified in rule 13.

FORM VIII

(See rules 143, 147 and 148)

Application for a grant/amendment/renewal of a licence to transport petroleum Class A/B in bulk on land for fueling of aircraft, heavy vehicles/ machineries and stationery equipment by a mechanically propelled vehicle viz. Refueller

Documents listed below must be submitted with this application.

PART-A To be filled in and signed by the applicant

1. Applicant's Name and full postal address.....
2. Particulars of the vehicle in which..... petroleum is proposed to be transported for on-site fuelling of aircraft, heavy vehicles/machineries and stationery equipment.
 - (i) Make and Model
 - (ii) Engine Number
 - (iii) Chassis Number
 - (iv) Registered Number.....
 - (v) ULW and RLW.....
 - (vi) Date up to which the vehicle is registered
 - (vii) Name and full postal address of the registered owner
 - (viii) Number of compartments and certified capacity in kilolitres of each compartment

Compartment 1	2	3	4	5	6	7	Total Capacity in Kilolitres
Capacity in Kilolitres							

- (ix) Class or Classes of petroleum proposed to be transported in the vehicle described above.
- (x) Number and date of approval of the design drawing of the vehicle by the Chief Controller.
- (3) Does the tank vehicle described above fully conform to the requirements laid down in third Schedule to the Petroleum Rules 2002 and the design drawings approved by the Chief Controller.
- (4) Full Postal Address of the place where the vehicle will be normally stationed.
- (5) Full Postal Address and license number of the installation where the vehicle shall be loaded. In case of service station, number and date of the letter under which the specifically prepared loading area attached to the service station has been approved.
- (6) Name and full postal address of users and of the place where the vehicle normally will be transporting petroleum Class A/B for the purpose of the site refueling of aircraft's, heavy vehicles/machineries, stationery/equipment. Particulars of heavy vehicles which are proposed to be refueled by the vehicle.

I/We declare that the particulars given above have been checked up by me/us and are correct. I/We undertake to transport petroleum by the vehicle, particulars of which are given above, in accordance with the provisions of the petroleum Act, 1934 and the rules framed thereunder and any other law or rules for the time being in force. I/We understand that any contravention of the said Act and the Rules framed thereunder is punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees or with both and for every subsequent offence with simple imprisonment which may extend to three months or with fine which may extend to five thousand rupees or with both.

Date :

Place :

Signature of the applicant

Part II

To be filled in duly signed by the recognized engineer

I certify that the vehicle, the particulars of which are given in Part A of this form, has been examined and tested by me and found to be fully conforming to the particulars shown in approved drawing no.....dated complying with the requirements laid down in the Third Schedule to the Petroleum Rules. 2002.

Name.....
 Recognized Qualification
 Full Postal address.....

Signature

Place

Date

Documents required to be submitted with this application

1. Four copies of drawing approved under sub-rule 3 of rule 63.
 2. Required amount of licence fee to be paid in the manner specified in rule 13.
 3. Original licence (only in case of renewal/amendment).
 4. Four copies of site plan showing area of operations (only in case vehicle is used for on-site fuelling of the heavy vehicle/machineries and stationery equipment).
 5. List of heavy vehicles/machineries and stationery equipment's whose tanks require filling/replacement.
 6. Four copies of the plans of the premises approved for loading the vehicles under rule 76(1).
- Authorised carrying capacity Compartment No. 1 2 3 4 Total Capacity in Kilolitres Capacity in Kilolitres

SPACE FOR ENDORSEMENT OF RENEWALS

(The licence shall be renewable without any concession in fee for the maximum period upto three years)

Date of renewal Date of Expiry Signature and office stamp of Licence authority This licence is liable to be cancelled if the licensed vehicle is not found conforming to the specifications given in the Third Schedule or for the contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months or with fine which may extend to five thousand rupees, or with both.

FORM IX

(See rules 143, 147, 148 and 156)

Application for a grant/amendment/renewal/transfer of a licence to import and store petroleum

Documents listed below must be enclosed with this application, if it is for the grant of a licence in Forms XIV, XV, XVI or in Special Form

The replies to be given in this Column

1. Applicant's Name

Applicant's calling

Applicant's full

Postal Address

2. Situation of the premises where

Petroleum is to be stored

State

District

Town and village

Police Station

Nearest railway station

3. Quantity (in litres) of petroleum proposed to be imported and stored :

(i) Petroleum Class A

(a) In bulk

(b) Not in bulk

(c) Total

(ii) Petroleum Class B

(a) In bulk

(b) Not in bulk

(c) Total

(iii) Petroleum Class C

(a) In bulk

- (b) Not in bulk
 (c) Total

Total of all classes of Petroleum

4. Quantity in litres of petroleum already stored in the premises:

- (i) Petroleum Class A
 (a) In bulk
 (b) Not in bulk
 (c) Total
 (ii) Petroleum Class B
 (a) In bulk
 (b) Not in bulk
 (c) Total
 (iii) Petroleum Class C
 (a) In bulk
 (b) Not in bulk
 (c) Total

Total of all classes of Petroleum

5. Number of licence held for the premises and the Full name of the holder of the licence

I hereby declare that the statements made above have been checked up by me and are true and I undertake to abide by the terms and conditions of the licence which will be granted to me.

Date of application Signature and designation of the applicant.

Notes.

1. Where the application is made on behalf of a company, the name and address of the company and the name of the manager or agent should be given and the application should be signed by him. Every change in the name of the manager or agent shall be forthwith intimated to, and his specimen signature filed with, the licensing authority.
2. "In bulk" means in tanks or receptacles exceeding 1,000 litres in capacity "Not in bulk" means in approved containers not exceeding 1,000 litres in capacity.

Documents required to be submitted with this application for a Licence in Forms XIV, XV, XVI or in special Forms.

- (i) Four copies of specifications and plans approved under sub-rule (5) of rule 131 or sub-rule (3) of rule 147, as the case may be. (Not required for renewal and transfer or a licence without amendment)
- (ii) Licence together with approved plan and specifications attached there to. (Not required for the first grant of licence)
- (iii) "No Objection Certificate" from the District Authority. (Not required for renewal, transfer and amendment of a licence without any change in the site of the licensed premises).
- (iv) Requisite amount of fees for the grant, amendment, or transfer of a licence paid in the manner specific in Rule 13.
- (v) A certificate of tank testing if required under Rule 126.
- (vi) A certificate of safety if required under Rule 130.

FORM X

[See rules 143, 147, and 148]

Application for a grant/amendment/renewal of a licence to decant kerosene (petroleum Class B) from mechanically-propelled vehicles in containers Replies to be given in this Column

1. Applicant's Name
 Applicant's calling
 Applicant's full
 Postal Address
2. Particulars of the vehicle in which kerosene (petroleum Class B) is to be transported.
 1. Registration No.
 2. Licence No. under the Petroleum Rules, 2002.....
 3. Validity of the Licence

4. Name and address of licensee:.....
3. Area of operation for which licence is required:
 State (1)
 State (2)
 District/City/Town/Village/Street/Road/Police Station

4. Location of premises where kerosene container is to be stored: Municipal Corporation/Panchayat
 No.
 Name and address of the occupant:
5. Has the applicant been appointed agent dealer of oil company.

 If, yes, please give name of the Oil company and reference no. and date of appointment.
 I hereby declare that the particulars have been checked up by me and are true and I undertake to abide by the terms and conditions of the licence which will be granted to me.
 Date of application Signature of the applicant.

Notes:-

1. When the application is made on behalf of the company, the name of the manager or agent should be given and the application should be signed by him. Every change in the name of the manager or agent shall be forth with intimated to, and his specimen signature filed with, the licensing authority.
2. Application shall be made in respect of not more than two areas of operation and decantation of kerosene will be done in due area at a time.

FORM XI

(See Art. 2 of the First Schedule)

Licence to transport petroleum Class A or petroleum Class B in bulk on land by mechanically propelled vehicles.
 Licence No. Fee Rs.
 Licence is hereby granted to to transport
 Petroleum in bulk on land by the vehicle as described below subject to the provisions of Petroleum Act, 1934 and the rules made thereunder and to the further conditions of this licence.
 The Licence shall remain valid up to the * day of 20.....
 Date of issue.....
 Controller

DESCRIPTION OF THE VEHICLE

Make and Model Engine Number
 Chassis Number Registration Number.....
 Name of the Registered Owner.....
 Class (es) of petroleum authorized to be carried in vehicle
 Authorised carrying capacity of the tank and compartments.
 Compartment 1 2 3 4 5 6 7 Total Capacity in Kilolitres
 No.
 Capacity in kilolitres
 * One year from the date of issue.

SPACE FOR ENDORSEMENT OF RENEWALS

(The licence shall be renewable without any concession in fee for three years in the absence of contravention of the provisions of the Petroleum Act, 1934, or the rules formed thereunder or of the conditions of this licence)

Date of renewal Date of Expiry Signature and office stamp of Licensing authority
 This licence is liable to be cancelled if the licensed vehicle is not found conforming to the specificationS given in the Third Schedule or for the contravention of any of the rules and

conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

- 1) The licence or its authenticated copy shall at all times be kept in the licensed vehicle and produced on demand by an inspector.
- 2) Only responsible persons who are conversant with the conditions of this licence shall be employed for driving the licensed vehicle or attending to it.
- 3) The licensed vehicle shall be constantly attended to by a responsible person and by at least two persons while it is transporting petroleum exceeding 5 kilolitres or towing another vehicle: Provided that the licensed vehicle may, if its tanks and compartments are empty, be left unattended in a place approved for the purpose in writing, by the Chief Controller.
- 4) The licensed vehicle shall at all times carry
 - a) a portable fire extinguisher of capacity not less than 9 litres and suitable for extinguishing oil fires. The extinguisher shall be kept unlocked at an easily accessible position which shall be away from the discharge faucets of the vehicle.
 - b) A separate oil tight and electrically continuous hose for each class of petroleum it is carrying, the hoses shall have at each end oil-tight coupling to match the discharge faucet of the licensed vehicle and the inlet pipe into which the petroleum carried in the vehicles is to be unloaded.
 - c) a strong and flexible cable for electrical bonding; the cable shall be at least 5 metres long and shall have at each end a suitable clamp or clip.
- 5) The licensed vehicle shall not be loaded or unloaded except in a place approved for the purpose, in writing, by the Chief Controller: Provided that the licensed vehicle may not be unloaded at any other place with all due precautions and under adequate supervision if such unloading is necessitated by an accident or breakdown.
- 6) Petroleum carried in the licensed vehicle shall not be directly transferred in to any container or into the fuel tank of any motor conveyance or an internal combustion engine.
- 7) The licensed vehicle shall not be loaded if any tank or compartment, pipe valve, emergency discharge control or any safety fitting becomes leaky, defective or otherwise insecure until necessary repairs have been carried out satisfactorily, and in the event of any leak in the tanks or compartments, until the leak is thoroughly repaired and all the tanks or compartments pass the test specified in clause 5 of the Third Schedule to the petroleum Rules.
- 8) Before petroleum is loaded into or unloaded from the licensed vehicle:
 - a) its engine shall be stopped and the battery shall be isolated by a proper switch or otherwise;
 - b) its wheels shall be secured by brakes or by scotching and in the case of animal drawn vehicles, animals shall be unhitched and removed;
 - c) its chassis shall be electrically bonded by a cable with the pipe into or from which it is to be unloaded or loaded;
 - d) the correct filling or discharge hose shall be selected and connected by oil-tight coupling at both ends;
 - e) a responsible person shall be in attendance and remain so until loading or unloading is over and the tanks and compartments have been sealed.
- 9) Except when called upon by the traffic signals or required by an Inspector or a Sampling Officer, the licensed vehicle shall not stop on any road, congested area or a place which is not a place approved in writing, under these rules for loading, unloading or stabling of such vehicles.
- 10) No smoking and no fire or artificial light or any article capable of igniting inflammable vapour shall be allowed on the licensed vehicle.
- 11) The licensed vehicle shall not be used for carrying passenger or any article other than petroleum.
- 12) The licensed vehicle shall not be allowed to be repaired by welding, soldering, brazing, or hot riveting until its tanks, compartments, pipes and valves have been thoroughly cleaned and examined by a competent person and certified by him in writing to be free from inflammable vapour or oil.

13) No alteration in the licensed vehicle or its safety fittings shall be carried out without the previous sanction in writing of the licensing authority. Such alterations so sanctioned shall be endorsed on this licence by an amendment.

14) Every facility shall be given at all reasonable time to any inspector or sampling officer for ascertaining that the rules and the conditions of this licence are dully observed or for drawing samples.

15) Any accident, fire or explosion occurring in the licensed vehicle, which is attended with loss of human life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station having jurisdiction and by telephone/fax and also by telegram to the Chief Controller or Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

Additional conditions for the carriage of Petroleum Class A along with any other class of petroleum in the same vehicle covered by this licence.

a) Two capital letters "ML" each not less than 10 cm. square shall be printed in a conspicuous colour on each side and the rear of the licensed vehicle.

b) The filling pipe, discharge faucet and the vent pipe of the one compartment shall not be interconnected by manifolding or otherwise with the filling pipe, discharge faucet or vent pipe of any other compartment.

c) A metal band not less than 2.5 cm wide, coloured red and bearing embossed or printed words "MOTOR SPIRIT" shall be securely attached to fill the pipe and discharge faucet of each compartment carrying petroleum Class A. A similar metal band coloured blue and grey and bearing embossed or printed words describing the class of petroleum shall be securely attached to fill the pipe and discharge faucet of each compartment carrying such other class of petroleum.

d) Separate hoses for each calls of petroleum shall at all times be carried in the licensed vehicle. Hoses for each calls or petroleum shall have securely attached to it distinctively coloured and marked identification bands as prescribed under additional conditions No. (c) for filling pipe and discharge faucet.

e) Petroleum carried in the licensed vehicle shall not be unloaded except into the underground tanks of a service station.

Space For Endorsement of Alterations

(See condition 13)

**Serial Description of Date of sanctioning Signature of Number alteration alteration
licensing authority**

FORM XII

(See Art. 3 of the First Schedule)

Licence to import and store Petroleum Class A in quantity not exceeding 300 litres in a storage shed or approved bin

Licence No. Fee Rs.

Licence is hereby granted to

.....valid only for the importation and storage of

.....litres of Petroleum in the premises described below

subject to the provisions of Petroleum Act, 1934 and the ruleS made thereunder and to the further conditionS of this licence.

The Licence shall remain in force up to the 31st day of December20.....

The 20..... District Authority.

Description and location of the licensed premises:

The licensed premises consist of Storage Shed

An approved bin of type approved by the Chief Controller.

and is situated at

**House Number/Name of Street/Village or Town/Police Station/District Space for
Endorsement of Renewals**

This licence shall be renewable without
any concession in fee for three years
in the absence of contravention of the
provisions of the Petroleum Act, 1934
or of the rules framed thereunder

or of the conditions of this licence.

Date of renewal Date of expiry of
licence

Signature and
Office stamp of the
licensing authority.

This licence is liable to be cancelled if the licensed premises are not found conforming to the description and conditions attached hereto and contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

1) Petroleum Class A shall be stored only:-

(i) in a storage shed constructed of suitable non-combustible materials on private ground, the doors and windows may be of wood; or

(ii) in a property ventilated iron bin of a design approved by the Chief Controller and placed on private ground in the open air.

2) The storage shed shall be adequately ventilated near the ground level and also near the roof. The ventilators shall be provided with two layers of noncorroding metal wire gauze having not less than 11 meshes per linear centimeter.

3) The storage shed shall not from part, or be attached to, any building in which any person resides or works or where persons assemble for any purpose unless it is separated therefrom by a substantial roof and partition – wall of masonry construction having no openings therein.

4) The storage shed if in any building, shall not be situated under any staircase or under any other means of exit likely to be required to be used for escape in case of fire.

5) Any two storage shed or bins or other storage premises not more than six metres apart shall be deemed to one storage shed.

6) No alterations shall be carried out in the storage shed or bin without the previous sanction in writing of the licensing authority.

7) If the licensing authority calls upon the holder of a licence, by a notice in writing to execute any repairs to the storage shed, which are, in the opinion of such authority necessary for the safety of the shed, the holder of the licence shall execute the repairs within such period as may be fixed by the notice.

8) All empty receptacles which have contained petroleum Class A shall except when they are opened for the purpose of cleaning them and rendering them free from petroleum vapour be kept securely closed unless they have been thoroughly cleaned and freed from petroleum vapour.

9) No receptacles shall be repaired on the premises and no person shall repair or cause to be repaired any receptacle in which to his knowledge, any petroleum Class A is or has been kept until he has taken all reasonable precautions to ensure that the receptacle has been rendered free from such petroleum and any inflammable vapour.

10. Adequate precautions shall be taken at all times for the prevention of accident by fire or explosion.

11. Every care shall be taken to prevent any petroleum Class A escaping into any drain, sewer harbour, river or watercourse or a public road.

12. Adequate precautions shall be taken to prevent unauthorized persons having access to a petroleum Class A kept and to the vessel which contains or has contained such petroleum.

13. The licensee shall keep daily records and accounts of all receipts and issues of petroleum in such form as the licensing authority may from time to time prescribe and shall exhibit his stock and records to an inspector or sampling officer on demand.

14. Any accident, fire or explosion occurring in the licensed premises, which is attended with loss of human life or serious injury to person or property shall

be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and to the Chief Controller of Explosives Nagpur, immediately by telephone/fax and also by telegram or telephone where such means of communication are available. [Telegraphic address: 'EXPLOSIVES, NAGPUR']

15. Free access to the licensed premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this licence are duly observed.

FORM XIII

(See Art. 4 of the First Schedule)

Licence to import and store Petroleum Class B otherwise than in bulk in quantity not exceeding 25,000litres.

Licence No.

Fee Rs.

Licence is hereby granted to

.....valid only for the importation and storage of

.....litres of Petroleum in the premises described below subject to the provisions of Petroleum Act, 1934 and the rules made thereunder and to the further condition of this licence.

The Licence shall remain force up to the 31st day of

The 20.....

District Authority

Description and location of the licensed premises:

The licensed premises, consist of storage shed and is situated at

(House No. or Plot No.) (Name of Street) (Town or village) (Police Station)

(District)

Space for Endorsement of Renewals

This licence shall be

renewable without

any concession in

fee for three years

in the absence of

contravention of the

provisions of the

Petroleum Act, 1934

or of the rules

framed thereunder

or any of the

conditions of this

licence.

Date of renewal Date of expiry of

licence

Signature and

Office stamp of the

licensing authority.

This licence is liable to be cancelled if the licensed premises are not found conforming to the description and conditions attached hereto and contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

1) Petroleum shall be stored in the licensed storage shed which shall be constructed of suitable non-combustible material but the beams, rafters, columns, doors and windows may be of wood. The floor of the storage shed shall be suitably finished to form a sump or enclosure not more than thirty centimetres deep and capable of receiving and retaining, in case of any accident or emergency, a volume not less than one half of the quantity allowed under the licence.

- 2) The storage shed shall not form part of, or be attached to any building in which any person resides or works or where persons assemble for any purpose unless it is separated therefrom by a substantial floor or partition – which is constructed of unflammable material and has no opening in it.
- 3) The storage shed if in any building, shall not be situated under any staircase or under any other means of exit likely to be required to be used for escape in case of fire.
- 4) No alteration shall be carried out in the storage shed or bin without the previous sanction in writing of the licensing authority.
- 5) If the licensing authority calls upon the holder of a licence, by a notice in writing to execute any repairs to the storage shed, which are, in the opinion of such authority necessary for the safety of the shed, the holder of the licence shall execute the repairs within such period not being less than one month from the date of receipt of the notice, as may be fixed by the notice.
- 6) Any two storage sheds not more than three metres apart shall be deemed to one storage shed.
- 7) Petroleum Class B shall be packed in air-tight tins or drums of approved type or in other receptacles not easily broken.
- 8) The drum or other receptacles containing petroleum shall only be opened in the licensed premises and for the time necessary for drawing off the petroleum and during such drawing off every reasonable precaution shall be adopted for preventing the escape of petroleum or the vapour therefrom.
- 9) Adequate precautions shall be taken to prevent unauthorized persons having access to a petroleum kept and to any receptacles which contains or has contained such petroleum.
- 10) Adequate precautions shall be taken at all times for the prevention of accident by fire or explosion.
- 11) Every care shall be taken to prevent any petroleum escaping into any drain, sewer harbour, river or watercourse or a public road.
- 12) The licensee shall keep daily records and accounts of all receipts and issues of petroleum in such form as the licensing authority may from time to time prescribe and shall exhibit his stock and records to an inspector or sampling officer on demand.
- 13) Any accident, fire or explosion occurring in the licensed premises, which is attended with loss of human life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and by telephone/fax and also by telegram to the Chief Controller of Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").
- 14) Free access to the licensed premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this licence are duly observed.

FORM XIV

(See Art. 5 of the First Schedule)

Licence to store Petroleum in tank or tanks in connection with Pump outfit for fuelling Motor Conveyances

Licence No. Fee Rs.

Licence is hereby granted to
 valid only for the storage of
 Kilolitres of Petroleum Class A and Kilolitres of Petroleum Class B/C in
 tank(s) in the premises described below and shown on the plan No. dated
 hereto attached subject to the provisions of Petroleum Act, 1934 and the rule made thereunder
 and to the further conditions of this licence.

The licence shall remain in force up to the 31st day of December 20.....
 The 20.....

Controller

Description and location of the licensed premises:

This licensed premises, the boundaries of which are shown in the attached plan, are situated at
 and consist of

a) number(s)
 underground gas tanks of capacity kilolitres
 respectively of petroleum Class A connected with
 number(s)

- electrically/manually operated dispensing pump(s).
 b) number(s)
 underground gas tight tanks of
 capacity.....kilolitres each respectively of
 petroleum Class B/C connected with
number(s)
 electrically/manually operated dispensing pumps(s).
 c) A sales room/kiosk.
 d) Servicing facilities consisting of

Space for Endorsement of Renewals

This licence shall be
 renewable without any
 concession in fee for
 three years in the
 absence of contravention
 of the provisions of the
 Petroleum Act, 1934 or
 of the rules framed
 thereunder or of the
 conditions of this licence.
 Date of renewal Date of expiry of
 licence
 Signature and
 Office stamp of the
 licensing authority.

This licence is liable to be cancelled if the licensed premises are not found conforming to the description given or the approved plan attached hereto or to the conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

- 1) The Petroleum shall be stored only in one or more underground gastight tanks of capacity and in the position shown in the approved plan attached hereto.
- 2) Every tank shall be outside any building and placed in a masonry or concrete pit and packed around with sand, earth or clay so that no air space is left between the tank and the masonry or concrete pit and the tank is not visible, such a masonry or concrete pit shall not be obligatory if the tank is a welded one and tested up to pressure of 0.25 kg per square centimeter and is buried and is on a private, leased or rented land and no part of the tank is less than 1.5 metres from any point of the marked boundary of the premises in the approved plan attached hereto.
- 3) The space over the buried tank(s) shall not be used for any purpose other than _____.
- 4) There shall be no openings in any tank other than those necessary for the introduction or removal of the petroleum or for ventilating or dipping the tank. The filling and dipping pipes shall be carried down nearly to the bottom of the tank.
- 5) Every tank shall be fitted with an independent vent pipe leading into the open air. The vent pipe shall be securely supported and shall not be less than 4 metres in height and four metres from any adjoining land or property or from the nearest opening of the sales room/kiosk or any other facility in which sources of fire are likely to be present. Vent pipe of any tank shall not be interconnected with the vent pipe of another tank. The open end of every vent pipe shall be covered with two layers of non-corrodible metal wire gauze having not less than 11 meshes per liner centimeter and shall be further protected from rain by hood or by suitably bending it downward.

- 6) No alteration of the position of a pump or tank and replacement of a tank shall be effected except with the previous sanction in writing of the licensing authority. All alterations sanctioned under this condition shall be shown on an amended plan to be attached to this licence.
- 7) If the licensing authority calls upon the holder of a licence, by a notice in writing to execute any repairs to the storage shed, which are, in the opinion of such authority necessary for the safety of the premises, the holder of the licence shall execute the repairs within such period not being less than one month from the date of receipt of the notice, as may be fixed by the notice.
- 8) Every tank before being repaired or exhumed, shall be cleared of all petroleum and of all flammable vapours, when a tank in position is opened for cleaning or repairs, no electric or other lamps, electric cable or electric fans and no articles, appliances or equipment capable of igniting flammable vapour shall be brought near the manhole of the tank until the tank has been certified in writing to be 'gas-free' by a competent person. Where the tank has been so certified as "gas-free" the certificate shall be preserved by the licensee for a period of not less than three months.
- 9) The petroleum shall enter a tank through close coupled electrically continuous and sound hose.
- 10) The underground tank or tanks shall not be filled between the hours of sunset and sunrise except in a manner and under conditions specially endorsed on this licence by the licensing authority.
- 11) No artificial light capable of igniting flammable vapour shall at any time be present in the immediate vicinity of the tank lorry/wagon during the transfer of the petroleum to the tank and no person engaged in such transfer shall smoke. When the underground tank is filled with petroleum from barrels, no such light and no smoking shall be allowed within a distance of 9 metres from barrels.
- 12) No petroleum shall be removed from a tank except by means of the pump or pumps at the positions marked on the plan hereto attached. Every pump shall together with its connections and fittings be so constructed and maintained as to be gas and petroleum tight. The pipe connection between the tank and a pump shall be placed underground.
- 13) For the purpose of charging the tanks of motor vehicles the petroleum shall only be supplied by being:-
- a) pumped through strong metal piping by means of approved pumps into above ground measuring tanks of a capacity not exceeding 150 litres, fixed in approved positions, and run thence through sound hose fitted with a secure self-closing cock and nozzle, into the tanks of motor vehicles, or
 - b) pumped through strong metal piping by means of approved pumps into an above ground service tank of approved capacity, fixed in an approved position, and run thence through strong metal piping into measuring tanks of a capacity not exceeding 150 litres, fixed in approved positions, and run hence through sound hose fitted with a secure self-closing cock and nozzle, into the tanks of motor vehicles, or
 - c) pumped by means of approved measuring pumps, fixed in approved positions, through sound hose fitted with a secure tap and nozzle, into the tanks of motor vehicles.
- 14) Petroleum may be supplied to a motor vehicle between the hours of sunset and sunrise from the pump provided that-
- (i) the pump and the vehicle are adequately illuminated by electric light or failing this by some other form of lighting, and
 - (ii) no light capable of igniting flammable vapour is situated or brought within the extent of hazardous area as specified in part B of Fourth Schedule to the Petroleum Rules, 2002.
- 15) a) Petroleum shall not be placed in any motor vehicle while the engine is running and, where the vehicle is licensed for the conveyance of more than six passengers on hire, while any passenger remains in the vehicle;
- b) person in and engaged in connection with any motor vehicle shall not be permitted to smoke while it is being refueled.
- 16) Petroleum shall not be filled from the tank or the pump into a container or receptacle other than those securely clamped or fitted to a motor vehicle. The restriction imposed by this condition shall not apply.-
- (i) when it is absolutely necessary for the purpose of condition of this licence to clear a tank, or
 - (ii) for testing the accuracy of the pump's discharge by means of a standard capacity measure, or

(iii) to the filling of an approved container of capacity not exceeding 25 litres when such filling is absolutely necessary for replenishing the fuel tank of a motor vehicle which has run dry and the motor vehicle cannot be brought into the pump.

(iv) to the filling of Petroleum class B in an approved containers of capacity not exceeding 200 litres and no vehicle with its engine running shall be allowed within 4.5 metres of the container and the dispensing pump.

17) (a) This licence shall be held to cover the use of portable kerb side pump outfit for a period of not more than one month in the place of the licensed permanent outfit in the event of the latter being out of orders, provided notice in writing is given to the licensing authority before the portable pump is taken into use and the conditions of this licence which apply to a portable pump are observed. No petroleum shall be allowed above ground (except that actually in the pump) in any case where the underground tanks can be used in connection with the portable pump by making a temporary connection from the portable pump to the underground tank.

(b) In case where portable pumps are used not more than 400 litres of petroleum in reserve shall be kept within 6 metres of the pump. The petroleum so kept shall be in approved containers and none of it shall be kept outside the licensed premises.

18) Every person managing or employed on or in connection with the licensed premises shall abstain from any act whatsoever which tends to cause fire or explosion and which is not reasonably necessary and to the best of his ability shall prevent any other person from doing such act.

19) Every care shall be taken to prevent any petroleum escaping into any drain, sewer or public road.

20) The licensee shall provide for each pump, whether kerb side or portable, a minimum of two tins or drums of dry sand and two portable foam type or dry chemical type fire-extinguishers which shall be kept ready at convenient location for immediate use in the event of any fire.

21) In premises where auto LPG or CNG dispensing facilities are installed, the requirements of Static and Mobile Pressure Vessels(Unfired) Rules 1981, or Gas Cylinder Rules 1981, as the case may be, and condition of the respective licences granted under those Rules for the above facilities shall also be complied with.

22) Any accident, fire or explosion occurring in the licensed premises, which is attended with loss of life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and by telephone/fax and also by telegram to the Chief Controller or Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

23) Free access to the licenced premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this licence are duly observed.

FORM XV

(See Art. 6 of the First Schedule)

Licence to Import and Store Petroleum in an Installation

Licence No. Fee Rs.

Licence is hereby granted to valid only for the importation and storage of petroleum of the class and in quantities as herein specified and storage thereof in the place described below and shown on the approved plan No. dated.....

Attached hereto subject to the provisions of Petroleum Act, 1934 and the rules made thereunder and to the further conditions of this licence. The licence shall remain force up to the 31st day of December 20..... Description of petroleum Quantity

Licensed in Kilolitres

Petroleum Class A, in bulk

Petroleum Class A, otherwise than in bulk

Petroleum Class B, in bulk

Petroleum Class B, otherwise than in bulk

Petroleum Class C, in bulk

Petroleum Class C, otherwise than in bulk

Total

The 20
Chief Controller

Description and location of the licensed premises:

This licensed premises, the lay-out boundaries and other particulars of which are shown in the attached approved plan are situated at

.....
.....
And consists of
.....
.....

Space for Endorsement of Renewals

This licence shall be renewable without
any concession in
fee for three years
in the absence of
contravention of the
provisions of the
Petroleum Act, 1934
or of the rules
framed thereunder
or any of the
conditions of this
licence.

Date of renewal Date of expiry of
licence

Signature and
Office stamp of the
licensing authority.

This licence is liable to be cancelled if the licensed premises are not found conforming to the description and conditions attached hereto and contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

1) The licensed premises shall not without permission in writing from the Chief Controller, be used for any purpose other than the storage and distribution of petroleum and purposes directly connected therewith.

2) The Petroleum shall be kept only in the storage tanks and storage filling sheds or other approved places within the installation specified for the purpose on the plan attached hereto.

3) (i) The tank or tanks shall be supported on well-designed foundations and shall be either buried underground or installed in the open and surrounded by wall or embankment not more than 2 metres high and made of earth, steel, concrete or solid masonry capable of withstanding fully hydrostatic load. Earth wall of over 1m. high shall have not less than 0.6m wide flat section on top: Provided that a wall or embankment higher than 2m may be allowed by the licensing authority where there are special circumstances which, in his opinion warrant such increase.

(ii) The ground within the enclosure shall not be lower than the level of the ground outside the enclosure and shall be finished to form a slope of not less than half a percent from the tank towards the drain or sump. Provided that nothing in this clause shall apply in the case of an enclosure which is connected to an efficient oil interceptor of sample capacity through an underground drainage system having proper slope.

(iii) The drainage from the enclosure shall be controlled by a valve which shall be accessible under fire conditions and be capable of being operated from outside the enclosure. All surface water drainage from the enclosure shall be passed through an efficient oil interceptor.

(iv) Where two or more tanks are installed in one enclosure the total capacity of the tanks in the enclosure shall not exceed 60,000 kilolitres in the case of conventional fixed -roof and 1,20,000 kilolitres in the case of floating roof tank or those of special design (where there is a combinations of fixed and floating roof tanks in the same enclosure then the total capacity of fixed-roof tanks and floating roof tanks shall not exceed 60,000 kilolitres). Such an enclosure shall be sub-divided by masonry channels of ample dimensions or by intermediate wall of not less than 0.6 m in height to prevent spills from one tank endangering any other tank in the same enclosure. Explanation : for the purpose of this clause, a group of small tanks each not exceeding 9m in diameter and in all not exceeding 5,000 kilolitres in capacity shall be treated as one tank.

(v) (a) Where petroleum Class A or petroleum Class B is stored in the enclosure or petroleum Class C is stored along with petroleum Class A or Class B, the capacity of the enclosure shall be hundred percent of capacity of the largest tank in the enclosure after deducting the volume up to the height of the enclosure wall, of all other tanks in the same enclosure.

(b) Where petroleum Class C is only stored in the enclosure the height of the enclosure wall shall be not less than one metre.

(vi) Except for necessary pipes and valves and approved electric lights, the space within and enclosure and not occupied by tank or tanks shall be kept entirely clear and unoccupied.

4) All tanks shall be fitted with vent pipes leading into the open air, the open end being covered with two layers of fine copper or other non corrodible metal wire gauze of not less than 11 meshes per linear centimeter and fitted with a hood or the tank shall be fitted with an approved relief valve or other approved means of preventing dangerous internal or external pressures. The vent pipe and the relief valve of one tank shall not be interconnected with those of any other tank.

5) Cast-iron valves are not permitted on any tank and all valves in an installation must be permanently marked in a manner clearly indicating the direction of opening and shutting the valve.

6) Pumps shall be of a type and placed only in the position shown on the plan attached thereto and they shall together with all connections and fittings be so constructed and maintained as to prevent leakage of petroleum.

7) Storage or filling sheds for containers shall be constructed of suitable unflammable material. The shed shall rest foundation walls and shall be surrounded by a wall or embankment of substantial construction so as to form a sump or enclosure not less than 0.25m and not more than 1m deep. The sump or enclosure thus formed shall be of sufficient capacity to contain without leakage not less than one-fourth of the maximum quantity of petroleum likely to be present in the shed at any one time. The sumps and enclosures must be kept clean and free from any accumulation of inflammable liquids.

8) Every enclosed shed for the storage or filling of petroleum Class A and Class B otherwise than in bulk shall be adequately ventilated near the ground level immediately above the walls constructed to prevent leakage of petroleum and also near or in the roof.

9) (i) Tank vehicles shall be filled, discharged or stabled only in the positions approved for the purpose and shown on the plan attached hereto. An extract of rules 62 to 86 printed in bold etters in the local language and in Hindi and English shall be prominently displayed at each such position.

(ii) A tank vehicle which does not fully comply with the requirement laid down in Part IV of chapter III of these rules shall not be loaded, unloaded or stabled within the licensed premises.

10) Every facility for the storage, loading, unloading or pumping of petroleum shall at all times maintain from any other facility, building, boundary fencing or protected works the distances specified in the Tables 1, 2 and 3

(a) Table 1 and Table 2 in the case of installation where the total quantity of petroleum Class A and petroleum Class B stored above ground in bulk exceeds 5,000 kilolitres or where the iameter of any tank for the storage of such petroleum exceeds 9 metres or

(b) Table 3 in the case of installation where only petroleum Class C is stored or where the total quantity of petroleum Class A and petroleum Class B stored above ground in the bulk does not exceed 5,000 kilolitres and the diameter of any tank for storing petroleum Class A or petroleum Class B does not exceed 9 metres. The layouts of all new grass root refineries/installations approved subsequent to the publication of this rule, shall conform to the oil Industry Safety Director's Standard 118, as amended from time to time. This shall not apply to refineries/installations existing and/or under construction before the publication of the original OISD standard-118. Not withstanding anything herein to the contrary when petroleum is stored in

an installation at or near wells, pumping stations, petro-chemical plants or refineries, the concessional distances given in the attached Table 2 shall not apply and no storage tank, the capacity of which exceeds 250 kilolitres and no petroleum storage of filling sheds/area shall be placed nearer than 90 metres to any boiler, furnace of fire. In such an installation all tanks shall be situated in a compact area (a) under a single control, (b) enclosed or capable of being enclosed by one continuous fence and (c) on which there shall be no protected works.

TABLE 1
[See condition 10 (a) of Licence Form XV]

Distance to be observed around facilities in an installation where total quantity of petroleum Class A and petroleum Class B stored above ground in bulk exceeds 5000 kilolitres, or where the diameter of any such tank for the storage of petroleum exceeds 9 metres:

1. In this table :-

"D" means diameter of large tank.

"d" means diameter of small tank.

"x" means any distance suitable for constructional or operational convenience.

2. Where alternative distances are specified, minimum there of may be observed.

3. All distances shall be measured between the points in the perimeter of each facility except in the case of tank vehicle loading/unloading area where the distance shall be measured from the centre of each bay for such loading/unloading.

To from	Storage tank for petroleum class A	Storage tank for petroleum class B	Storage tank for petroleum class C	Storage shed for petroleum class A or class B	Storage shed for petroleum class C	Tank vehicle loading / unloading area for petroleum class A or class B	Tank vehicle loading / unloading area for petroleum class A or class B	Flame proof electric pump	Non flame - proof electric pumps	Office building worksh ops, stores amenities, fire station, etc. within installation	Boundary fencing around installation
	1	2	3	4	5	6	7	8	9	10	11
1. Storage tank for Petroleum Class A 15m	0.5D or d or 15m	0.5D or d or 15m	6m	15m	15m	15m	15m	15m	15m	15m	20m
2. Storage tank for Petroleum Class B 15m	0.5D or d or 15m	0.5D or d or 15m	6m	15m	15m	15m	15m	8m	15m	15m	15m

3. Storage tank for Petroleum Class C	6m	6m	x	15m	x	8m	x	x	x	8m	4.5m
4. Storage /filling shed for Petroleum Class A or class B	15m	15m	15m	x	8m	15m	15m	8m	15m	15m	15m
5. Storage /filling shed for Petroleum Class C	15m	15m	x	8m	x	8m	x	x	x	8m	4.5m
6. Tank vehicle loading/unloading area for Petroleum Class A or class B	15m	15m	8m	15m	8m	x	x	8m	15m	15m	15m
7. Tank vehicle loading/unloading area for Petroleum	15m	15m	x	15m	x	x	x	x	x	8m	3m

eum Class A or Class C											
8. Flame Proof Electri c pump	8m	8m	x	8m	x	8m	x	x	8m	8m	3m
9. Non Flame proof electri c pump	15m	15m	x	15m	x	15m	x	8m	x	3m	x
11. Bound ary fencin g aroun d install ation.	20m	15m	4.5m	15m	4.5m	15m	3m	3m	x	x	x

TABLE 2

(See condition 10(b) of licence Form XV)

Inter distance Between Storage Tanks

Item	Floating Roof	Fixed Roof Tanks	Class C
	(Class A and B Petroleum)		
All tanks with diametres Upto 50 metres	(D + d)/4	D + d)/4	((D + d)/6
All tanks with diametres Upto 50 metres	(D + d)/4	(D + d)/3	(D + d)/4

Notes :-

1. This table is applicable for installations where aggregate storage capacity of class A and class B petroleum stored above grade exceeds 5000 kilolitres or where the diameter of any such tank for the storage of petroleum exceeds 9 m. 2. Distance given are shell to shell in the same dyke.
3. Notation :
D - diameter of larger tank in metres
d - diameter of smaller tank in metres
4. If the inter distance (for class A and B) calculated as above are less than 15m, then minimum of 15 m or 0.5 D or d shall be followed.

5. Interdistance between class A/B storage tanks and class C storage tanks shall not be less than 6 metres.

TABLE 3
[See condition 10 (b) of Licence Form XV]

Distances to be observed around facilities in an installation where:-

- (i) Only petroleum Class C is stored ;
- (ii) Total quantity of petroleum Class A and petroleum Class B stored above ground in bulk does not exceeds 5,000 kilolitres;
- (iii) The diameter of any tank for storing petroleum Class A or Class B does not exceed 9 metres.

1. In this table “D” means diameter of larger tank and “x” means any distance suitable for constructional or operational convenience.

2. Where alternatives distances are specified, minimum there of may be observed. All alternative distances shall be measured between the nearest points in the perimeter of each facility except in the case of tank vehicle loading/unloading area where the distance shall be measured from the centre of each **bay** for such loading/unloading.

To From	Storage tank for petroleum Class A	Storage tank for petroleum Class B	Storage tank for petroleum Class C	Storage /filling shed for petroleum Class A	Storage /filling shed for petroleum Class B	Storage /filling shed for petroleum Class C	Tank vehicle loading/unloading area for petroleum Class A	Tank vehicle loading/unloading area for petroleum Class B	Tank vehicle loading/unloading area for petroleum Class C	Flame proof electric pump	Non flame proof electric pump	Office building stores amenities Station etc. within installation	Boundary fencing around installation
	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Storage tank for Petroleum Class A	0.5D or 6m	0.5D	0.5D	9m		9m	9m	15m	15m	15m	3m	15m	15m
2. Storage tank for Petroleum Class B	0.5D or 6m	0.5D	0.5D	9m	0.5D	0.5D	9m	4.5m	4.5m	3m	4.5m	D min 4.5m	D Min 4.5m
3. Storage tank for Petroleum Class C	0.5D or 6m	0.5D or 6m	x	9m	0.5D	x	9m	4.5m	x	x	x	D min 3m	D min 3m
4. Storage /filling shed for	9m	9m	9m	x	4.5m	6m	9m	9m	9m	9m	9m	9m	9m

Petroleum Class A													
5. Storage /filling shed for Petroleum Class B	9m	0.5D	0.5D	4.5m	x	1.5m	9m	4.5m	4.5m	1.5m	4.5m	4.5m	4.5m
6. Storage /filling shed for Petroleum Class C	9m	0.5m	x	6m	1.5m	x	9m	4.5m	x	x	x	3m	3m
7. Tank vehicle loading/unloading area for Petroleum Class A	15m	9m	9m	9m	9m	9m	x	9m	9m	3m	9m	9m	9m
8. Tank vehicle loading/unloading area for Petroleum Class B	15m	4.5m	4.5m	9m	4.5m	4.5m	9m	x	4.5m	.5m	4.5m	4.5m	4.5m
9. Tank vehicle loading/unloading area for Petroleum Class C	15m	4.5m	x	9m	4.5m	x	9m	4.5m	x	x	x	3m	3m
10. Flame Proof Electric pump	3m	3m	x	3m	1.5m	x	3m	1.5m	x	x	3m	x	x
11. Non Flame proof electric pump	15m	4.5m	x	9m	4.5m	x	9m	4.5m	x	x	x	3m	3m
12. Office building workshop, stores amenities, fire fire	15m D min 4.5m	0.5D min 3m	9m	4.5m	3m	9m	4.5m	3m	x	x	x	x	

station, etc													
13. Boundary fencing around installatio n	15m min 4.5m	D min 3m	0.5D	9m	4.5m	3m	9m	4.5m	3m	x	x	x	x

11) The distances specified in condition 10 may be reduced by the licensing authority in cases where special precautions are taken and where there are special circumstances which, in his opinion, warrant such reduction.

12) No alteration shall be carried out in the installation without the previous sanction in writing of the licensing authority. Such alterations so sanctioned shall be shown on an amended plan to be attached to this licence.

13) If the licensing authority calls upon the holder of a licence, by a notice in writing to execute any repairs to the storage shed, which are, in the opinion of such authority necessary for the safety of the premises, the holder of the licence shall execute the repairs within such period not being less than one month from the date of receipt of the notice, as may be fixed by the notice.

14) The responsible agent or supervisor referred to in rule 118 shall not allow any person to enter a tank, which has contained petroleum unless-

(a) such person wear an approved breathing apparatus of a description approved by the Chief Controller, or

(b) (i) the responsible agent or supervisor has certified in writing in prescribed proforma given in OISD standard 105, as the result of an examination of the tank by him self or by some other competent person that the atmosphere in the tank is fit for the person to enter, and

(ii) atleast one person wear an approved breathing apparatus of a pattern approved by the Chief Controller shall have been kept ready for instant use at the manhole of the tank which is being cleaned or repaired. The certificate referred to in sub-clause (i) of clause (b) of this condition shall be preserved in the licensed premises for a period of three months.

15) No work involving the use of fire, welding or hot reveting, shall be performed in or on any tank or within the safety distance required to be observed from such tanks by building and boundary until the tank has been certified in prescribed proforma given in OISD Standard 105 in the manner laid down in clause (b) of condition 14 to be free from petroleum vapour. When any water is pumped into or withdrawn from the tank no further work of above description shall be done until the tank has been retested and a fresh certificate issued. When a tank is opened for cleaning and repairs, no lamp of any description either ordinary or electric, electric torches, electric cables or fans other than of a flameproof or intrinsically safe type approved by the Chief Controller shall be brought near tank.

16) No person shall repair or cause to be repaired any receptacle or pipe in which to his knowledge, any petroleum is or has been kept until he has taken all reasonable precautions to ensure that the receptacles or pipe has been rendered free from petroleum and any inflammable vapour: Provided that this condition shall not be deemed to prohibit the usual soldering operations connected with the filling and dispatching of receptacles containing petroleum Class B or petroleum Class C.

17) All empty receptacles which have contained petroleum Class A shall except when they are opened for the purpose of cleaning them and rendering them free from petroleum vapour, be kept securely closed unless they have been thoroughly cleaned and freed from petroleum and inflammable vapours.

18) a) Adequate precautions shall be taken at all times for the prevention of accident by fire or explosion.

b) Wherever so specified by the Chief Controller, storage tanks shall be fitted with approved fire foam and/or water sprinkler attachments which shall be maintained in proper order at all times.

19) Every care shall be taken to prevent any petroleum escaping into any drain, sewer, harbor, river or watercourse or a public road and enclosures or sumps must not be permanently connected with any drain or sewer.

20) The licensee shall keep daily records and accounts of all receipts and issues of petroleum in such form as the licensing authority may from time to time prescribe and shall exhibit his stock and records to an inspector or sampling officer on demand.

21) Any accident fire or explosion occurring in the licensed premises, which is attended with loss of human life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and by telephone/fax and also by telegram to the Chief Controller of Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

22) Free access to the licensed premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this licence are duly observed.

FORM XVI

(See Art. 7 of the First Schedule)

Licence to import and store otherwise than in bulk petroleum Class A in quantities exceeding 300 litres or petroleum Class B, in quantities exceeding 25,000 litres or petroleum Class C in quantities exceeding 45,000 litres or petroleum Class A, together with any other class of petroleum in quantities exceeding 300 litres in all.

Licence No. Fee Rs.
 Licence is hereby granted to for the
 importation of petroleum of the classes and the quantities as herein specified and storage thereof
 in the place described below and shown in the approved plan No.
 dated..... attached hereto subject to the provisions of Petroleum Act, 1934
 and the rules made thereunder and to the
 further condition of this licence.

The Licence shall remain force up to the 31st day of December 20.....

Description of petroleum

Petroleum Class A Litres

Petroleum Class B Litres

Petroleum Class C Litres

The 20

Controller

Circle

Description and location of the licensed premises:

This licensed premises, the lay-out boundaries and other particulars of which are shown in the attached approved plan are situated at

.....

Space for Endorsement of renewals

This licence shall be
 renewable without
 any concession in
 fee for three years
 in the absence of
 contravention of the
 provisions of the
 Petroleum Act, 1934
 or of the rules
 framed thereunder
 or any of the
 conditions of this

licence.

Date of renewal Date of expiry of
licence

Signature and
Office stamp of the
licensing authority.

This licence is liable to be cancelled if the licensed premises are not found conforming to the description and conditions attached hereto and contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

- 1) The licensed premises shall not, without permission in writing from the chief Controller, be used for any purposes other than storage and distribution of petroleum & purposes directly connected therewith.
- 2) The petroleum shall be stored only in the storage shed which shall be constructed of suitable non-combustible materials, provided that when no petroleum Class A is stored, the beams, rafters, columns, windows and doors may be of wood. one or more underground gaslight tanks of capacity and in the position shown in the approved plan attached hereto.
- 3) The storage shed shall rest on foundation walls and shall be surrounded by a wall or embankment of substantial construction or the walls and floor shall be suitably finished to form a sump not more than 30 cm deep. A combination of these methods is permissible. The enclosure or sump thus formed shall be of sufficient capacity to contain not less than one half of the total quantity of petroleum for which the licence is granted and be so constructed and maintained as to prevent escape therefrom of any petroleum in the form of liquid whether under the action of fire or otherwise. The sump and enclosure must be kept clean and free from any accumulation of inflammable liquids.
- 4) The storage shed if used for the storage of petroleum Class A shall be adequately ventilated near the ground level immediately above any walls constructed to form the sumps specified in condition 3 and also near the roof. The ventilators shall be covered with two layers of fine copper or other noncorrodible metal wire gauge of mesh not less than 11 meshes per linear cm.
- 5) If the licensing authority calls upon the holder of a licence, by a notice in writing to execute any repairs to the storage shed, which are, in the opinion of such authority necessary for the safety of the premises, the holder of the licence shall execute the repairs within such period not being less than one month from the date of receipt of the notice, as may be fixed by the notice.
- 6) No alteration shall be carried out in the licensed premises without the previous sanction in writing of the licensing authority. All alterations shall be shown on an amended plan to be attached to this licence.
- 7) The following distances shall be kept clear at all times from any storage shed to protected works:

Licensed capacity of storage			
shed of all classes of			
petroleum stored in the shed			
Total Distances to be observed from storage shed			
for			
Petroleum Petroleum Petroleum			
Class A Class B Class C			
not exceeding 2,500 litres	6m	Not	Not
Applicable	Applicable		
exceeding 2,500 litres but 7.5m	-do-	Not applicable	
not exceeding 25,000 litres			
exceeding 25,000 litres but 9m	3m	-donot	
exceeding 50,000 litres			
exceeding 50,000 litres but 12m	4.5m	3m	

not exceeding 1,00,000 litres

exceeding 1,00,000 litres 15m 6m 3m

Where more than one class of petroleum is stored together, the entire quantity of petroleum shall for the purpose of this condition deemed to be of the most flammable class thereof.

8) The distances specified in condition 7 may be reduced by the licensing authority where screen walls are provided or other special precautions taken or where there are special circumstances, in his opinion, warrant the reduction.

9) Drums of other receptacles containing petroleum shall only be opened in the licensed premises and for the time necessary for drawing off the petroleum and during such drawing off every reasonable precautions shall be adopted for preventing the escape of petroleum or the vapour therefrom.

10) All empty receptacles which have contained petroleum Class A shall except when they are opened for the purpose of cleaning them and rendering them free from petroleum vapour be kept securely closed unless they have been thoroughly cleaned and freed from petroleum vapour.

11) No person shall repair or cause to be repaired any receptacle in which to his knowledge, any petroleum is or has been kept until he has taken all reasonable precautions to ensure that the receptacle has been rendered free from such petroleum and any inflammable vapour Provided that this condition shall not be deemed to prohibit the usual soldering operations connected with the filling and dispatching of petroleum receptacles when such operations are conducted in and approved place outside the storage shed.

12) Adequate precautions shall be taken at all times for the prevention of accident by fire or explosion. An adequate supply of dry sand together with necessary implement for the convenient application or an adequate member of portable fire-extinguishers suitable for fighting oil fires shall always be kept in easily accessible places immediately outside the storage shed.

13) Every care shall be taken to prevent any petroleum escaping into any drain, sewer, harbour, river or watercourse or a public road.

14) Adequate precautions shall be taken to prevent unauthorized persons having access to a petroleum kept and to any receptacles which contains or has contained such petroleum.

15) The licensee shall keep daily records and accounts of all receipts and issues of petroleum in such form as the licensing authority may from time to time prescribe and shall exhibit his stock and records to an inspector or sampling officer on demand.

16) Any accident, fire or explosion occurring in the licensed premises, which is attended with loss of human life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and by telephone/fax and also by telegram to the Chief Controller of Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

17) Free access to the licensed premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this license are duly observed.

FORM XVII

(See Art. 8 of the First Schedule)

Licence to store petroleum Class A and Class B temporarily in quantities not exceeding 50,000 litres for refueling of aircraft's in connection with crop spraying and fighting forest fire only.

Licence No.

Fee Rs.

Licence is hereby granted to valid

only for the storage of Kls petroleum Class A

at..... subject to the provisions of Petroleum Act, 1934 and the rules made thereunder and to the further condition of this licence.

The licence shall remain valid till

Dated

Controller.

Circle

CONDITIONS

- 1) The licensed premises shall not be used any purpose other than storage and distribution of petroleum & purposes directly connected therewith. 2) The Petroleum shall be stored only in open bounded enclosures observing the required safety distance vide condition (3).
- 3) The following distances shall be kept clear at all times from any storage shed to protected works. In case of storage for fighting forest fire the storage premises shall be sufficiently away from the forest area so that petroleum products, stored in the premises, under no circumstances, can be affected by the forest fire. Licensed capacity Distance to be kept clear (litres of petroleum) at all times (metres) not exceeding 2,500 litres 12metres Exceeding 2,500 litres 15metres but not exceeding 25,000 litres Exceeding 25,000 litres 15metres but not exceeding 50,000 litres
- 4) The capacity of the bounded enclosure should be 5 percent more than the maximum quantity of petroleum likely to be stored in the enclosure.
- 5) The petroleum shall be stored in barrels of a type approved by the Chief Controller.
- 6) The safety zone required vide condition 3 shall be surrounded by a rope or other suitable fencing.
- 7) No smoking sign in English and local language shall be prominently displayed on all the four sides of the fenced area.
- 8) The storage area shall be constantly guarded by providing guard in adequate strength. Guard's shelter, if required, shall be provided just outside the fenced area.
- 9) The containers containing petroleum shall be covered by a tarpaulin.
- 10) Any petroleum remaining surplus after the completion of crop spraying operation shall be returned to the depot or stored in premises duly licensed under the Petroleum Rules 2002.
- 11) Drums or receptacles containing petroleum shall be opened only for the time necessary for drawing off petroleum and during such drawing off every reasonable precautions shall be adopted for preventing the escape of petroleum or the vapour there from.
- 12) All empty receptacles which have contained petroleum except when they are opened for the purpose of cleaning them and rendering them free from petroleum vapour be kept securely closed unless they have been thoroughly cleaned and freed from petroleum inflammable vapours.
- 13) No person shall repair or cause to be repaired any container in which to his knowledge, any petroleum is or has been kept until he has taken all reasonable precautions to ensure that the container has been rendered free from such petroleum and any inflammable vapour.
- 14) Adequate precautions shall be taken at all times for the prevention of accident by fire or explosion. An adequate supply of dry sand together with necessary implements for its convenient application or an adequate number of portable fire-extinguishers suitable for fighting petroleum fires shall always be kept in easily accessible places immediately outside the bounded enclosure.
- 15) Every care shall be taken to prevent any petroleum escaping into any drain, sewer harbor, river or watercourse or a public road.
- 16) Adequate precautions shall be taken to prevent unauthorized persons having access to a petroleum and to any container which contains or has contained petroleum.
- 17) The licensee shall keep daily records and accounts of all receipts and issues of petroleum and present the same to Inspector or sampling officer on demand.
- 18) Any accident, fire or explosion occurring in the licensed premises, shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and to the licensing authority.
- 19) Free access to the licensed premises shall be given at all reasonable times to any inspector or sampling officer and every facility shall be afforded to such officer for ascertaining that rules and the conditions of this licence are duly observed

[FORM XVIII]

(See Art. 10 of the First Schedule)

Licence to Decant Kerosene (Petroleum Class B) From Mechanically-Propelled vehicle in Containers.

Licence No.

Fee Rs.

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Licence is hereby granted to Agent/Dealer of.....

.....to deliver kerosene (Petroleum Class B) from the tank vehicle into containers subject to the provisions of Petroleum Act, 1934 and the rule made thereunder and to the further conditions of

this licence. The licence shall remain force up to the 31st day of December 20.....The area of operation of the tank vehicle is:

1..... 2.
The 20.....
Controller of explosives

Space for Endorsement/Renewals

This licence shall be
renewable without
any concession in
fee for three years
in the absence of
contravention of the
provisions of the
Petroleum Act, 1934
or of the rules
framed thereunder
or any of the
Date of renewal Date of expiry of
licence
Signature and
Office stamp of the
licensing authority.
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conditions of this
licence.

This licence is liable to be cancelled if the premises are not found conforming to the conditions attached thereto and for contravention of any of the rules and conditions under which this licence is granted and the holder of this licence is also punishable for the first offence with simple imprisonment which may extend to one month or with fine which may extend to one thousand rupees, or with both and for every subsequent offence with simple imprisonment which may extend to three months; or with fine which may extend to five thousand rupees, or with both.

CONDITIONS

- 1) The licence or its authenticated copy shall at all times be kept available on tank vehicle and produced on demand by an Inspector.
- 2) The tank vehicle decanting kerosene shall have a valid licence in Form XI under Petroleum Rules, 2002 and the licence or its authenticated copy shall be kept in the licensed vehicle and produced on demand by an Inspector.
- 3) Not more than two tank vehicle load of kerosene per day will be taken by the licensee for the purpose of decanting into barrels, delivery of kerosene to a retail dealer will be given only once during a day and record to this effect will be maintained by the licensee.
- 4) Not more than 2,500 litres of kerosene shall be decanted into containers at any one place. Not more than 2,500 kilolitres of kerosene will be delivered to retail dealer at any one time and none of it will be delivered in a receptacle exceeding one thousand litres capacity.
- 5) The licensee or his authorised representative shall personally supervise decanting kerosene into containers and take all adequate precautions against fire and explosion.
- 6) 'No Smoking' boards in vernacular and English shall be displayed near the premises where kerosene is being decanted.
- 7) The decanting hose should be sound, and electrically continuous and shall be provided with suitable reducer for filling containers. Such reducer shall have suitable valve so as to enable the licensee or his representative to stop unloading in case of emergency.
- 8) The licensee or his authorised representative shall ensure before decanting kerosene from the tank vehicle that the containers are non-leaky.
- 9) The licensee shall ensure that the containers are not splash filled and the reducer has its open end used for delivery extended right up to the bottom of the container.

- 10) All precautions to ensure that static electric charge does not accumulate during decanting operation shall be taken.
- 11) No decanting shall be carried out from the hours of sunset to sunrise.
- 12) The licensee should ensure that no person shall smoke and there is no matches, fires, light or articles or substances capable of causing ignition of petroleum in the vicinity of the place of decantation.
- 13) The licensee shall ensure that no unauthorized person is permitted in the vicinity of the place of decantation.
- 14) The licensee shall not decant kerosene at a time when abnormal conditions prevail in that area.
- 15) No sale of kerosene by the shop-keeper will be permitted during decantation of kerosene.
- 16) The licensee or his representative should be fully conversant with rules 72 to 80,82 and 84 of the Petroleum Rules, 2002 and an extract of the above mentioned rules should be prominently displayed at conspicuous place where the decanting into barrels will be done.
- 17) At least two buckets of dry sand and two dry chemicals or foam type fireextinguishers should be kept available during decanting operation.
- 18) The tank vehicles shall not decant kerosene into containers to any licence holder under the rules unless approval is obtained from the licensing authority.
- 19) Any accident, fire or explosion occurring in the licensed premises, which is attended with loss of life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-in-charge of the nearest police station and by telephone/fax and also by telegram to the Chief Controller or Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

LICENCE FROM XIX

(See Article 11 of the First Schedule of the Petroleum Rules, 2001)

LICENCE TO TRANSPORT PETROLEUM CLASS A/B IN BULK ON LAND BY MECHANICALLY PROPELLED VEHICLES VIZ., REFUELLER

(a) PETROLEUM CLASS A OR B FOR REFUELLER OF AIRCRAFTS
OR

(b) PETROLEUM CLASS A OR B FOR ON SITE REFUELLING OF
VEHICLES/MACHINERIES/STATIONERY EQUIPMENTS.

Licence No. Fee Rs.

Licence is hereby granted to to transport petroleum Class A/B in bulk on land for on site fuelling of the Aircrafts/ heavy vehicles/Machineries/Stationery Equipments by the refueller as described below subject to the provisions of Petroleum Act, 1934 and the rules made thereunder and to the further condition of this licence.

The licence shall remain valid up to the 31st day of December 200.....

Date of issue Controller

Circle

DESCRIPTION

- 1) The vehicle is loaded in the specially prepared area described in approved plan No. dated attached hereto or in the storage premises licensed in form XV or special form.
- 2) The area of operation and the equipments to be filled.....
- 3) The refueller conforms to the approved drawing no. dated.....attached hereto and to the further particulars given below: Make and Model Engine Number Chassis Number Registered Number.....
Name of the Registered Owner.....

CONDITIONS

- 1) The licence or its authenticated copy shall at all times be kept in the licensed vehicle and produced on demand by an Inspector.
- 2) Only responsible persons who are conversant with the conditions of this licence shall be employed for driving the licensed vehicle or attending to it.

- 3) The licensed vehicle shall be attended to by a responsible person during its filling, transport and onsite refueling of the tank of Aircraft, heavy vehicles/machineries and stationery equipment: Provided that the licensed vehicle may, if its tanks and compartments are empty, be left unattended to in a place approved for the purpose in writing, by the Chief Controller.
- 4) The licensed vehicle shall conform to the design and construction requirements laid down in Third Schedule.
- 5) The licensed vehicle shall at all times carry:
 - a) A portable fire extinguisher of capacity not less than 9 litres and suitable for extinguishing oil fires. The extinguishers shall be kept unlocked at an easily accessible position which shall be away from the discharge faucets of the vehicles.
 - b) An electrically continuous hose having oil-tight coupling to match the discharge faucet of the licensed vehicle;
 - c) A strong and flexible cable for electrical bonding. The cable shall be at least 5 metres long and shall have at each end a suitable clamp or clip.
- 6) The licensed vehicle shall be loaded at a storage premises licensed in special form or form XV having tank lorry loading facilities. The vehicle if licensed for petroleum B can be loaded at a specially prepared area attached to a service station licensed in form XIV. This area shall have rigid pipeline drawn from the underground tank in service station, delivery pump and vehicle parking space and shall be segregated by a fencing of least 1.8m high. The parking space and filling a point shall observe at least 4.5m clearance all round within the fencing.
- 7) The licensed vehicle shall not be loaded if any tank or compartment, pipe valve, emergency discharge control or any safety insecure until necessary repairs have been carried out satisfactory, and in the event of any leak in the tanks or compartments, until the leak is thoroughly repaired and all the tanks and compartments pass the test specified in clause 5 of the Third Schedule to the petroleum Rules.
- 8) Before petroleum is loaded into the licensed vehicle into the specially prepared area mentioned in conditions;-
 - (a) its engine shall be stopped and the battery shall be isolated by a proper switch or otherwise;
 - (b) its wheels shall be secured by brakes or by scotching and in the case of animal drawn vehicles, animals shall be unhitched and removed; its chassis shall be electrically bonded by a cable with the pipe into or from which it is to be unloaded or loaded;
 - (c) the correct filling or discharge hose shall be selected and connected by oil-tight coupling at both ends;
 - (d) a responsible person shall be in attendance and remain so until loading or unloading is over and the tanks and compartments have been sealed.
- 9) Except when called upon the traffic signals or required by an Inspector or a Sampling Officer, the licensed vehicle shall not stop on any road, congested area or a place which is not a place approved in writing, under these rules for loading, unloading or stabling of such vehicles.
- 10) No smoking and no fire or artificial light or any article capable of igniting inflammable vapour shall be allowed on the licensed vehicle.
- 11) The licensed vehicle shall not be used for carrying passengers or for any other purpose except transport of petroleum Class A/B and refueling the Aircrafts/Heavy vehicles/Machineries/Stationery Equipments. Particulars of the area of the operation shall be intimated.
- 12) Vehicle shall observe minimum 9 metres clearance from any protected works all-round during refueling the tanks of Aircraft, heavy vehicles/ machineries and stationery equipments as the case may be. Unauthorized person shall not be permitted within this safety zone during refueling. No smoking board in vernacular and English shall be displayed prominently near the premises of refueling the tanks of Aircraft, heavy vehicles/ machineries and stationery equipments. No person shall smoke or carry matches, fire, lights, articles or substance capable of causing ignition of petroleum in the vicinity of refueling.
- 13) Before petroleum is unloaded from the licensed vehicle:
 - a) its wheels shall be secured by brakes or by scotching.
 - b) its chassis shall be electrically bonded by a cable with the Aircraft, heavy vehicles/ machineries and stationery equipments, as the case may be.
- 14) Petroleum shall be unloaded only through the pump, viz. Motoring devices mounted on the vehicle.

15) The refueling operation shall be undertaken in the presence of authorised responsible persons of licensee and he will ensure that the tank being refueled is not leaky and is in sound condition.

16) No refueling shall be undertaken during the period of sunset and sunrise without specific approval in writing from the licensing authorities and also when abnormal atmosphere condition prevails in the area.

17) At least two buckets of dry sand and two dry chemicals or foam type fireextinguishers should be kept available during refueling operations.

18) The licensed vehicle shall not be allowed to be repaired by welding, soldering, brazing, or hot riveting until its tanks, compartments, pipes and valves have been thoroughly cleaned and examined by a competent person and certified by him in writing to be free from inflammable vapour or oil.

19) No alteration in the licensed vehicle or its safety fittings shall be carried out without the previous sanction in writing of the licensing authority. Such alternations so sanctioned shall be endorsed on this licence by an amendment.

20) Every facility shall be given at all reasonable time to any Inspector or sampling officer for ascertaining that the rules and the conditions of this licence are dully observed or for drawing samples.

21) Any accident, fire or explosion occurring in the licensed vehicle, which is attended with loss of human life or serious injury to person or property shall be immediately reported to the nearest Magistrate or to the officer-incharge of the nearest police station having jurisdiction and by telephone/fax and also by telegram to the Chief Controller or Explosives (Telegraphic address "EXPLOSIVES, NAGPUR").

+++Space for Endorsement/Renewals

(See condition 19)

Sl. No. Description of

Alteration

Date of

sanctioning

Signature of the

licensing authority

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FORM XX

[See rules 2(v) and 130]

A. Qualification and Experience of Competent Person:

Sl. No. Rule under which Qualification and other Experience for the Competency is requirements purpose Recognized

1. Rules 126 and 130 1. Degree in any Minimum experience of branch of Engineering 10 years in testing from a recognized fabrication or university or installation of petroleum equivalent tanks and operation professional and maintenance of qualifications petroleum storage installations.

2. Physically fit and mentally sound for carrying out tests and examinations.

2. Part B of Forms VII -Do- Minimum experience of and VIII 10 years in testing and fabrication or mounting of petroleum transport

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tanks and operation and maintenance of petroleum tank vehicles.

B. Application for recognition as competent person under rules 126, 130 or part of Forms VII and VIII

1. Name

2. Date of birth

3. If employed or member in any organization, the name of the organization of the applicant

4. Educational qualification (copies of testimonials to be attached)

5. Particulars of professional experience in chronological order.

Name of the Period of Designation Area of

Organization service responsibilities

6. Membership, if any, of professional bodies

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7. Purpose for which competency certificate is sought (specify the rules)

8. Whether the applicant has been declared as competent person under any statute (if so details)

9. Any other relevant information

10. Declaration by the applicant

I hereby declare that the information furnished above is true. I undertake that in the event of my leaving the aforesaid organization, I will promptly inform the Chief Controller.

b) to fulfil and abide by all the conditions stipulated in the certificate of competency and instructions issued by the Chief Controller from time to time.

Place : Signature of applicant

Date :

I _____ certify that Shri _____ Whose particulars are furnished above, is in our employment and nominate him on behalf of the organization for the purpose of being declared as a competent person under the rules. I also undertake that I will notify the Chief Controller in case the competent person leaves our employment.

201

Place :

Date :

Signature of _____

Name and Designation _____

Telephone No. _____

Fax No. _____

Official Seal

202

THIRD SCHEDULE

(See rules 63 and 77)

Design and construction of Tank Vehicles for Transporting Petroleum in Bulk

1. Basic design of tank vehicle:

1) Tank vehicles for the transportation of petroleum in bulk shall be designed and constructed according to sound engineering practice to ensure correct structural relationship between the tank the propulsion equipment and supporting members, ruggedness, safe-road performance and breaking power.

2) In the case of an articulated vehicle, the weight at the ground of the carrying axles of the tank shall not exceed 60 percent of the designed gross laden weight.

3) The maximum width of any tank shall be less than the overall width of the vehicle on which it is mounted or by which it is being towed.

2. Material construction of tank:

1) The tank shall be constructed of iron or steel having the following physical requirements and thickness of metal or of any other material approved by the

Chief Controller.

a) Physical requirements:

Yield Point, minimum 1700 kg/cm²

Ultimate strength minimum 3100 kg/cm²

203

Minimum elongation on standard 20 percent 5 cm gauge length.

B. Thickness of metal

(a) Minimum thickness of tank ends, partitions, baffles and stiffeners shall not be less than 2mm for having volume capacity up to 21 litres per centimetre 2.7mm for tanks having volume capacity exceeding 21 litres per centimetre: Provided that the thickness of tank ends shall in no case be less than the thickness of the tank as specified in clause (b)

(b) The thickness of the tank shell shall be related to the volume capacity of the tank expressed in litres per centimeter and the distance between partitions, baffles or other stiffeners as well as to the radius of shell curvature as specified in the below table:

204

Distance between attachment of
Partition, baffle and stiffeners

Upto Above Above

90 cm 90 cm 135 cm

upto 135 cm

1 2 3

I. Minimum thickness for tanks having shell radius up to 175 cm and volume capacity-

(i) upto 21 litres per centimetre 2.0mm 2.0mm 2.0mm

(ii) above 21 up to 27 litres per cm 2.0mm 2.5mm 2.5mm

(iii) above 27 litres per cm 2.5mm 2.5mm 2.5mm

II. Minimum thickness for tanks having

shell radius exceeding 175 cm but not exceeding 225 cm and volume capacity-

(i) upto 21 litres per centimetres 2.0mm 2.0mm 2.5mm

(ii) above 21 up to 27 litres per cm 2.5mm 2.5mm 2.5mm

(iii) above 27 litres per cm 2.5mm 2.5mm 3.5mm

205

III. Minimum thickness for tanks having

shell radius exceeding 225 cm and volume capacity-

(i) upto 21 litres per centimetre 2.5mm 2.5mm 2.5mm

(ii) above 21 up to 27 litres per cm 2.5mm 2.5mm 3.5mm

(iii) above 27 litres per cm 2.5mm 2.5mm 3.5mm

IV. Minimum thickness for tanks having

shell radius exceeding 310 cm and volume capacity-

(i) upto 21 litres per centimetres 2.5mm 3.5mm 3.5mm

(ii) above 21 up to 27 litres per cm 3.5mm 3.5mm 3.5mm

(iii) above 27 litres per cm 3.5mm 3.5mm 3.5mm

Note: If the tank has other than circular cross-section, the radius for the purpose of this table shall be the maximum for that portion of the cross-section under consideration.

3. Joints

206

All joints to tank, its shell, heads, partitions, baffles and stiffeners shall be welded in accordance with recognized good practice and the efficiency of any joint shall not be less than 85 percent of the adjacent metal so joined.

4. Division of tank into compartment:

1) Unless expressly permitted in writing by the Chief Controller, a tank having a net capacity exceeding 5 kilolitres shall be divided into compartments by oiltight partitions and no compartment shall have net capacity exceeding 5 kilolitres.

2) Every partition shall be either dished, corrugated, reinforced or rolled. Flat partition without reinforcement shall not be allowed.

5. Testing of tank:

- 1) Every compartment of a tank shall be tested by a responsible competent person by hydrostatic pressure of not less than 0.316 kg/cm², The pressure shall be maintained for a period of not less than one hour and shall be gauged at the top of the compartment. The compartment under test shall not show any leakage or drop of pressure during the test.
- 2) Two adjoining compartments of a tank shall not be tested or filled with water simultaneously.

6. Anchoring of tank:

- 1) The tank shall be securely anchored to the vehicle in a manner that will not-
 - (i) introduce undue concentration of stresses;
 - (ii) impair the stability and performance of the vehicle; and
 - (iii) allow any movement between the tank and the vehicle due to starting, stopping and turning.
- (2) All stops and anchors used to anchor a tank to the vehicle shall be so installed as to be readily accessible for inspection and maintenance.

7. Discharge faucet;

Each compartment of a tank shall be fitted with a discharge faucet which shall be substantially made and so attached. The discharge end of the faucet shall be threaded or so designed as to permit the hose being tightly coupled to it.

8. Emergency discharge control;

- (1) The outlet of each compartment of the tank shall have an efficient and reliable shut-off valve located inside the shell or in a sump forming an integral part of the shell.
- (2) The operating mechanism for the shut-off valve shall be provided with a secondary control in an easily accessible position but remote from all fill openings and discharge faucets.
- (3) The secondary control required by sub-paragraph (2) shall be provided with a fusible section which will permit the shut-off valve to close automatically in the event of a fire.
- (4) A shear section which will break under strain shall be provided between the internal shut-off valve and the discharge faucet. The shear section shall be located as close as possible to the internal shut-off valve.

9. Normal –venting

208

- (1) Every compartment shall be fitted with an independent vacuum and pressure operated vent with a minimum effective opening being covered with two layers of non corroding metal wire gauge having not less than 11 meshes per centimetre.
- (2) The vent shall be so arranged as to limit the pressure within the compartment to 0.21 kg/cm² and the vacuum to 5 centimetres water gauge.

10. Emergency venting for fire exposure:

- (1) In addition to normal venting required by para 9, every compartment of a tank shall be fitted with an emergency venting facility which shall be of the fusible type so as to provide a minimum fire-venting opening having a net area in square centimetres equal to 8 plus 4.3 times the gross capacity of the compartment in kilolitres.
- (2) The emergency vent shall be so designed as to prevent loss of liquid through the vent in the case of vehicle upset except in the case of pressure rise when in the upset position.
- (3) Fusible vents shall be actuated by elements which will operate at a temperature not exceeding 930C.

11. Top-filling Pipe:

- (1) The inner end of the filling pipe shall be fitted with a proper type of splash deflector and the outer end threaded or so designed as to ensure leak proof connection with the filling hose.
- (2) Top filling pipe, if provided, shall be carried down early to the bottom of the tank.

209

(3) The outer end of the filling pipe shall be fitted with an oil-tight locker cap.

12. Tank-gauging arrangements:

(1) Each compartment shall be fitted with a dip pipe or any approved tank gauging device.

(2) The dip pipe, if provided, shall be carried up to the bottom of the tank and all opening in the dip pipe, except the capped top opening shall be covered with two layers of wire gauges having not less than 11 meshes per cm.

(3) The dip pipe shall be fitted with an oil tight locker cap.

13. Tank overturn protection:

(1) All tank top fittings shall be protected from damage in the event of overturning of the vehicle chassis on which it is mounted.

(2) Where protection to tank top fitting are provided by enclosing them within the contour of the shell or with in a rigid coming welded to the tank shell, the area enclosed by such protection shall be adequately drained and provided with plug or cut outs to enable the section to be gas freed completely before repair.

14. Marking:

Every tank vehicle used for the transportation of petroleum shall, whether loaded or empty be conspicuously marked on each side and rear thereof in letters at least 7cm high on a background of sharply contrasting colours with the words "FLAMMABLE " and the common name of the flammable liquid being transported e.g. "MOTOR SPIRIT", "KEROSENE", etc.

210

FOURTH SCHEDULE

[See Rule 105]

A extent of hazardous area in Refineries /Processing/Plants/major installations conforming to condition 10 (a) of licence **FORM XIII**

Sl. Description of Location of Products Handled Characteristics Extent of Classification

No. the facility the facility stored in the of the facility Areas of Area Facility (Division)

1 2 3 4 5 6 7

1.Plant, Equipment, Open Air Inflammable liquid Releases inflammable (i) Pits, sumps, trenches

1

Process Vessels above its flash-point products under below the floor or ground or inflammable ABNORMAL level within hazardous vapour or conditions area (**any zone**). gas heavier than air

or requires to

be opened

up for maintenance due

to ABNORMAL

conditions

(ii) Area above the ground 2

level extending vertically

8m above the

source of

hazards and horizontally

16m in all directions from

such source. Beyond 8m

from the source of hazard

in the horizontal plane, the

212

1 2 3 4 5 6 7

vertical extent of the

hazardous area may be

reduced to 8m above

the ground level.

(iii) Where large release of volatile products may occur, the area in the horizontal plane beyond 16m upto 32m from the source of hazard, extending vertically up to 60cm above the ground level in all directions.

1.1 Plant, Equipment Open Air Inflammable liquid Releases inflammable (i) Pits, sumps, trenches

1 process Vessels above its flash-point products under below the floor or ground or **inflammable NORMAL** level within hazardous **vapour or** gas heavier conditions or Normally area (**any zone**). than air requires **frequent** opening up for maintenance.

(ii) Area above the ground level extending vertically 8m above the source of

213

1 2 3 4 5 6 7 hazards and horizontally 16m in all directions from such source. Beyond 8m from the source of hazard in the horizontal plane, the vertical extent of the hazardous area may be reduced to 8m above the ground level.

(iii) Where large release of volatile products may occur, the area in the horizontal plane up to 16m beyond the hazardous area **zone 1**, extending vertically upto 60cm above the ground level in all directions.

1.2 Plant, Equipment Well- **inflammable liquid** Releases inflammable(i) Pits, sumps, trenches Process Vessels ventilated **above its flash point** products under below the floor or ground sheds. **or inflammable vapour** ABNORMAL level within hazardous **our or gas heavier** conditions or requires area (**any zone**). **than air** to be

opened up for maintenance due

214

1 2 3 4 5 6 7 **for maintenance** **under** ABNORMAL conditions

(ii) Area above the ground **1** level extending vertically 8m above the source of hazards and

horizontally 16m in all directions from such source. Beyond 8m from the source of hazard in the horizontal plane, the vertical extent of the hazardous area may be reduced to 8m above the ground level.

(iii) Where large release of volatile products may occur, the area in the horizontal plane beyond 16m up to 32m from the source of hazard, extending vertically upto 60cm above the ground level in all directions.

215

1 2 3 4 5 6 7

1.3 Releases inflammable (i) Pits, sumps, trenches products under below the floor or ground NORMAL conditions level within hazardous or normally requires area (zone)

Frequent opening for maintenance

(ii) Area above the ground level extending vertically 8m above the source of hazards and horizontally 16m in all directions from such source. Beyond 8m from the source of hazard in the horizontal plane, the vertical extent of the hazardous area may be reduced to 8m above the ground level.

(iii) Where large release of volatile products may occur, the area in the horizontal plane up to

216

16m beyond the hazardous area zone1,

1 2 3 4 5 6 7

extending vertically upto 60cm above the ground level in all directions.

1.4 Plant, Equipment Well- Lighter than air, Releases inflammable (a) With in the shed.- 2 Process Vessels ventilated inflammable gases. products under (i) Entire shed above the sheds. ABNORMAL level of the lowest opening conditions or requires in the

side wall. to be opened
up for maintenance

ABNORMAL

conditions

(ii) Area above the ground 2

level or a level 4.5m

below the source of hazards, whichever

is higher, extending vertically up to

the level of the lowest

opening in the side wall

of the shed and

horizontally 4.5m from such

source in all directions.

(b) Outside the shed :- 2

Area above the roof of

the shed extending

217

vertically 8m above each

1 2 3 4 5 6 7

opening in the roof

and horizontally

4.5m from such

source in all

directions.

1.5 Plant, Equipment Inadequately Lighter than air, Releases inflammable (a) With in the shed.- 2

Process Vessels ventilated inflammable gases. products under (i) Entire shed above the

sheds. ABNORMAL level of the lowest opening

conditions or requires in the

side wall. to be opened up

for maintenance (ii) Area above ground ABNORMAL

level or a level conditions.

4.5m. below the source of

hazards, whichever is higher, extending

vertically up to the level of the

lowest opening in the side

wall of the shed and

horizontally 4.5m from such

source in all directions.

(b) Outside the shed :-

2 Area above the lowest

in the side walls of

shed extending vertically

218

4.5m above the roof and

1 2 3 4 5 6 7

horizontally 3mtrs.

from the side wall

1.6 Plant, Equipment Inadequately inflammable liquids, Releases inflammable (a) With in the

shed.- 1

Process Vessels ventilated above its flash-point products under (i) Entire area with in shed

sheds. or inflammable ABNORMAL including pits, sumps and

vapour or gas conditions or requires

trenches. heavier than

air to be opened up

for maintenance

ABNORMAL conditions.

(b) Outside the shed :-

2 Area extending vertically

3m above roof and horizontally

3m beyond shed or 16 meters from the source of hazard whichever is farthest.

Beyond 3meters from the shed or 8 meters from the source of hazard, whichever is farthest, in the horizontal plane, 219

the vertical extent of the hazardous area may be reduced to 8m above the ground level.

1 2 3 4 5 6 7

Pits, sumps, trenches 1 below the ground level within **zone** 2 area (**zone**).

Where large release - of inflammable products occur-

Area with in **2**

16cm of the **zone** area **additional** extending vertically up to 60 cm above the ground level.

Releases inflammable i Entire shed 1 **vapours** under

NORMAL conditions ii. Taking the **top** most 1 or Normally requires opening in the shed as a opening frequently the source of hazard, the for maintenance. area extending vertically 8m above such source & horizontally 16m in all directions from the 220

source. Beyond 8m from the source of hazard 1 2 3 4 5 6 7

in the horizontal plane, the vertical extent of the hazardous area may be reduced to 8m above the ground level.

iii. Pits sumps, trenches, 1 within hazardous area.

(iv) Where large release 1 of volatile products may (Additional) occur, the area within 16meters of the **zone**1 area extending vertically upto 60cm above the ground level.

1.7 Enclosed premises Within No flammable In case of failure of Entire enclosed premises Safe

with purging system. a hazardous products handled in the purging system,
 Air intake of fresh of area (any the enclosed electric supply is
 the air purging zone) premises. automatically cut off
 system not less or a warning is
 than 1.5 meters automatically given to
 above the hazardous a person in attendance.

area (any zone),

221

1 2 3 4 5 6 7

1.8 Enclosed premises a. Entire shed.

without purging -ditto- -ditto- -ditto- system,
 electric

b. Outside the shed. As specified
 in the case of for inadequate
 quately

ventilated shed ventilated

sheds

1.9 Pipeline with well Well-venti- Any inflammable Releases inflammable (i) Pits below or within 3
 1

maintained valves, lated situ- liquid above its flash products under metre of the facility.

metres, fittings. ations or in point or any ABNORMAL ii) Area within 3m of 2

a pit outside inflammable vapour conditions or requires pipeline fittings, valves,
 hazardous or gas. to be opened metres, in all directions.

area (any up for maintenance

zone) due to ABNORMAL

conditions.

1.10 Tanks, above Open air Any inflammable liquid -ditto- i) Above the floating 1
 ground (floating above its flash points roof, within the shell.

Roof) ii) Within 3m of the shell 2

iii) Space within the tank

222

enclosure up to top level

of the enclosure wall.

1 2 3 4 5 6 7

1.11 Tanks, above Open air Any inflammable Releases inflammable i) Within 1.5m of the vent 1
 ground (cone liquid above its flash products under openings

Roof) point. ABNORMAL ii) Within 3m of the 2

conditions or requires tank

shell, ends or roof to be opened up for of the

tank maintenance

due iii) Space within tank 2 to

ABNORMAL enclosure up to top level conditions.

of the enclosure wall.

1.12 Pumps, withdrawals i. In an open Inflammable liquid -ditto- Entire Enclosure 1
 fittings. enclosure or gases

ii. In a plat- -ditto- -ditto- Within 1.5m of the edge 2

form in the of the platform in all

open or in a directions extending

shed without Vertically from the ground

walls. level up to 1.5metres above

the top of pumps/withdrawal

fittings.

iii. Within a well -ditto- -ditto- (i) Pits, sumps, trenches 1

ventilated pump below the floor or ground

223

house. level within hazardous

area (any zone).

(ii) Area above the ground

level extending vertically
8m. above the source of
hazards and horizontally
1 2 3 4 5 6 7

16m in all directions from
such source. Beyond 8m.
from the source of hazard
in the horizontal plane, the
vertical extent of the
hazardous area

may be reduced to 8m
above the ground level.

(iii) Where large release
1 of volatile products may
Additional occur, the area in the
horizontal plane beyond
16m up to 32m from
the source of hazard,
extending vertically upto
90m above the ground
level.

224

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FOURTH SCHEDULE CONTINUED

(See rule 105)

B. Extent of hazardous area in installation conforming to condition 10(a) of Licence in Form XV and storage sheds.

Location Classification Extent of Classified area of the area

1 2 3 4

1. Tanks above ground: 2 Within 3 metres form shell.

(a) shell, ends or roof ends or roof of tank Area
and enclosed area inside the enclosure up to top
level of enclosure wall.

(b) Vent 1 Within 1.5 metres of open end of
vent extending in all directions.

(c) Floating roof 1 Above the roof and within the
shell.

2. Tanks underground Fill Pipe 1 Any pit, box or space below
grade level, any part of which is

227

within zone 1 or zone 2 area.

2 Up to 45 cms. above grades level
within a horizontal radius of 3 metres
from a loose fill connection and within
a horizontal radius of 1.5 metres from
a tight fill connection.

Vent discharging upward 1 Within 90 cms. or of open end of vent
extending in all directions.

2 Area between 90 cms. and 1.5 metres
or of open end of vertical directions.

3. Pits sumps (below grade level)

a) Without mechanical 1 Entire area within pit/sump if
ventilation any part is within zone 1 or 2 area

b) With mechanical 2 Entire area within pit/sump if ventilation any part is within zone 1 or 2 area.

c) Containing valves, 2 Entire pit/sumps filling piping and not within zone 1 or 2 area.

4. Pumps, bleeders withdrawal fitting, metres and similar devices:
228

a) indoor 1 Pits sumps or trenches below floor level within zone 2 area.

2 Within 1.5 metres of any edge of such devices extending in all directions. Also 90 cms. above grade level or floor level exceeding up to 7.5 metres horizontally from any edge of such devices.

b) Outdoor 1 Pits sumps or trenches below platform or ground level within zone 2 area.

2 Within 90 cms of any edge of such devices extending in all directions. Also 45 cms. above grade level within 3 metres horizontally from any edge of such devices.

5. Tank Vehicle 1 Pits sumps or trenches below within zone 2 area.

a) Bottom loading or 2 Within 90 cms of point of unloading connection extending in all directions. Also up to 45 cms. above grade level within a horizontal radius of 3 metres from any point of connection.

229

b) Loading from top 1 Within 90 cms of open end with atmospheric of vent extending in all venting directions.

2. Area between 90 cms. and 1.5 metres from open end of vent extending in all directions. Area within 90 cms. of the edge of connection extending in all directions.

c) Loading from top 2 Within 90 cms of point of with vapour recovery connection of fill pipe and vapour recovery pipe, extending in all directions.

6. Container filling: 1 Pits sumps or trenches below within zone 1 or 2 area.

a) Outer in a shed 1 Within 90 cms of and fill opening without wall of the container extending in all directions.

2 Area between 90 cms. and 1.5 metres from fill/vent opening of the container extending in all directions. Also up to 45 cms. above floor/or grade level within a horizontal radius of 3 metres from vent/fill opening or

within the filling enclosure,
whichever is higher.

230

b) Indoor in a storage/ 1 Whole of the interior of the
filling shed well shed.

ventilated near 1 Pits sumps or trenches below
roof and floor level and within zone 1 or 2 area.
situated in open area

2 Area within the cone formed by
Joining the top vent level of the
shed to a point 2.5 metres outside
the shed in all directions.

7. Storage and repair garages 1 All sumps or spaces below floor
for tank vehicles level.

2 Area above 45 cms. Above floor or
grade level of entire storage/repair
garages.

8. Drainage, ditches, 1 Area up to 45 cms above ditch
separators, separators or basin.
compounding basis in

2 Also up to 45 cms above grade level
within 4.5 metres horizontally from
any edge.

9. Container Storage 3 As in 6(b)

10. Garages for ordinary If there is any opening to
vehicles, ordinary these rooms within the
231

office, Rest Room extent of an indoor or outdoor
classified area, the facility shall
be classified as if the wall, curb
or partition separating the
classified area did not exist.

C. Extent of hazardous area in service station.

Location of hazard Classification Extent of hazardous area
of the area

1 2 3 4

1. Underground tank

a) Filling point 1 Any pit, sump, box or space grade
level, any part of which is within zone
1 or zone 2 hazardous area. Upto 45
cms. above grade level within
horizontal radius of 3 metres from the
filling point.

b) Vent 1 Within 90 cms. of open end of vent
extending in all directions.

2. Area between 90 cms. And 1.5 mtrs
of open end of vent extending in all
directions

2. Dispensing pump or unit

232

a) Pits/Sumps 1 Any pit, sump or box below grade level
any part of which is within zone 1 or
zone 2 hazardous area.

b) Pump cabinet or 1 The area 1.2 metres vertically above
dispenser enclosure the base within the cabinet enclosure
and 45 cms. horizontally in all
directions.

c) Outdoor 2 The area between 45cm and 6 metres

of the cabinet/enclosure extending 45 cms. vertically above the grade level.

d) Indoor with 2 -dittomechanical ventilation

e) Indoor with normal 2 The area 45 metres and 7.5 (gravity)ventilation metres of the cabinet/enclosure extending 45 cms. vertically above the grade level.

3. Remote pumps (Outdoor) 1 Any pit, box or space below grade level of any part within a horizontal distance of 3 metres from the edge of the pump.

2 Within 90 cms. of any edge of pumps, extending in all direction. Also up to 45 metres above floor or grade 233

level within 7.5 metres horizontally from any edge of pump.

4. Remote pumps (Indoor) 1 Entire area within any pit.

2 Within 1.5 metres of any edge of pump, extending in all directions. Also up to 90 metres above floor or ground level within 7.5 metres horizontally from any edge of pump.

5. Lubrication/service room 1 Entire area within a pit.

2 Area up to 45 cms above floor or grade level within entire lubrication/ service room.

6. Storage bin or enclosure for 1 Entire bin or enclosure Class A or Class B Petroleum

7. Sales, Storage and Rest room ordinary If there is any opening to these rooms within the extent of a zone 1 or zone 2 area the entire room shall be classified as zone 1.

234

FIFTH SCHEDULE

(See rule 193)

Methods of testing viscous or solid Forms of petroleum

If the sample of petroleum to be tested is viscous or solid or contains sediments or thickening ingredients, such petroleum shall be tested in the ABEL apparatus in the following manner :-

The solid mixture must be cut into cylinders 38.1mm in diameter by means of a cork borer or other similar cutter having the correct internal diameter. These cylinders are to be placed in the petroleum cup of the testing apparatus in a vertical position in such number as will completely fill the cup. The cylinders must be in contact with one another but must not be so tightly packed and so be deformed in shape.

Five or six of the cylinders in the centre of the cup must be shortened to 127 mm to allow space for the thermometer bulb.

The petroleum which is viscous or contains sediments or thickening ingredient shall be filled in the petroleum cup of the testing apparatus in a vertical position so that it completely fills the cup.

The air bath of the testing apparatus must be filled to a depth of 38.1mm with water.

The water bath must then be raised to, and maintained at temperature of about 800F.

The cup must then be placed in the air bath, and temperature of the sample must be allowed to rise until the thermometer in the oil –cup show 750F then test flame must be applied.

If no flash is obtained, this temperature must be maintained constant in the oil-cup

for one hour at the expiration of which time the test flame must again be applied.

235

If a flash is obtained, the solid mixture will be subject to the provisions of the Petroleum Act, 1934.

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FIRST SCHEDULE

Article

1.

Form of

Licence

2.

Purpose for which

Granted

3.

Authority empowered

to grant licence

4.

Fee

5.

1. III To carry petroleum in bulk by water

An Officer

appointed by the

Central Govt.

For Ship or other Rs. 5000 for

Vessels not exceeding 100 tonnes year or part thereof

Gross tonnage reof from the

date of issue.

For every Rs. 1000

Additional 50

Tonnes gross

tonnage or

fraction thereof.

2. XI To carry petroleum by

land on mechanically

propelled vehicles

Controller Rs. 500 for every Calendar year or

part thereof

3. XII To import and store

petroleum Class A in

quantity not exceeding

300 litres

District Authority Rs. 200 for every Calendar year or

part thereof.

4. XIII To import and store

petroleum Class B otherwise

than in bulk in

quantity not exceeding

25000 litres

District Authority Rs. 20 for every 1000 litres or part

thereof for calendar year.

5. XIV To store petroleum in tank

or tanks

Controller For each class of petroleum Rs. 1000

for the first 50 KL plus Rs. 15 for

every additional KL or part thereof,

for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

6. XV To import and store petroleum in an installation

Chief Controller or a Controller authorised in this behalf by the Chief Controller

For each class of petroleum Rs. 1000 for the first 50 KL plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

7. XVI To import and store other wise than in bulk (a)

Petroleum Class A in quantities exceeding 300 litres (b) Petroleum Class B in quantities exceeding 25000 litres (c) Petroleum Class C in quantities exceeding 45000 litres or (d) partly one class and partly two classes of petroleum

Controller For each class of petroleum Rs. 1000 for the first 50 KI plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

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8. XVII To store petroleum Class

A temporarily in quantities not exceeding 50000 litres for fuelling of aircrafts in connection with crop spraying work only.

Controller For each class of petroleum Rs. 1000 for the first 50 KI plus Rs. 15 for every additional KL or part thereof, for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

9. Special Form

To import and store petroleum class not provided for in Articles 3,4,5,6 and 7

Controller For each class of petroleum Rs. 1000 for the first 50 KI plus Rs. 15 for every additional KL or part thereof,

for every calendar year subject to a maximum of Rs. 15,000 per calendar year or part thereof.

10. XVIII To decant kerosene (petroleum class B) from mechanically propelled vehicle in containers)

Controller Rs. 200 for every Calendar year or part thereof.

11. XIX To transport petroleum

Class A/B in bulk on land

for on site refuelling of

aircrafts, heavy

vehicles/machinery &

Stationery equipments by

a mechanically propelled

vehicle Viz, Refueller

Controller Rs. 500 for every Calendar year or part thereof.

**THE MANUFACTURE,
STORAGE AND IMPORT
OF HAZARDOUS
CHEMICAL RULES, 1989**

(as amended to date)

MINISTRY OF ENVIRONMENT & FORESTS
(Department of Environment, Forests and Wildlife)

NOTIFICATION

New Delhi, the 27th November 1989

¹S.O.966(E). – In exercise of the powers conferred by sections 6, 8 and 25 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government hereby makes the following rules, namely:

1. Short title and commencement. –

- (1) These rules may be called The Manufacture, Storage and Import of Hazardous Chemicals Rules, 1989.
- (2) They shall come into force on the date of their publication in the Official Gazette.

(3) Definitions. –In these rules, unless the context otherwise requires, –

- (a) "Act" means the Environment (Protection) Act, 1986 (29 of 1986);
- (b) "Authority" means an authority mentioned in column 2 of Schedule 5;
- (c) "export" with its grammatical variations and cognate expression, means taking out of India to a place outside India;
- (d) "exporter" means any person under the jurisdiction of the exporting country and includes the exporting country, who exports hazardous chemicals;
- (e) "hazardous chemical" means, -
 - (i) any chemical which satisfies any of the criteria laid down in Part I of ²[Schedule 1 or] listed in column 2 of Part II of this Schedule;
 - (ii) any chemical listed in column 2 of Schedule 2;
 - (iii) any chemical listed in column 2 of Schedule 3;
- (f) "import", with its grammatical variations and cognate expression, means bringing into India from a place outside India;
- (g) "importer" means an occupier or any person who imports hazardous chemicals;
- (h) "industrial activity" means, -
 - (i) an operation or process carried out in an industrial installation referred to in Schedule 4 involving or likely to involve one or more hazardous chemicals and includes on-site storage or on-site transport which is associated with that operation or process, as the case may be; or
 - (ii) isolated storage; or
 - (iii) pipeline;

¹ The principal rules were published in the Gazette of India vide number S.O. 966(E), dated 27.11.1989 and subsequently amended vide: S.O.115 (E), dated 05.02.1990; GSR 584, dated 09.09.1990; S.O.2882, dated 03.10.1994; and S.O. 57(E), dated 19th January, 2000.

² Substituted by Rule 2 (i) of the Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000 notified vide S.O. 57(E), dated 19th January, 2000.

- (i) "isolated storage" means storage of a hazardous chemical, other than storage associated with an installation on the same site specified in Schedule 4 where that storage involves at least the quantities of that chemical set out in Schedule 2;
- ¹[(j) "major accident" means an incident involving loss of life inside or outside the installation, or ten or more injuries inside and/or one or more injuries outside or release of toxic chemicals or explosion or fire or spillage of hazardous chemicals resulting in on-site or off-site emergencies or damage to equipment leading to stoppage of process or adverse effects to the environment;
- (ja) "major accident hazards (MAH) installations" means isolated storage and industrial activity at a site handling (including transport through carrier or pipeline) of hazardous chemicals equal to or in excess of the threshold quantities specified in, column 3 of schedules 2 and 3 respectively;]
- (k) "pipeline" means a pipe (together with any apparatus and works associated therewith) or system of pipes (together with any apparatus and works associated therewith) for the conveyance of a hazardous chemical other than a flammable gas as set out in Column 2 of Part II of Schedule 3 at a pressure of less than eight bars absolute; the pipeline also includes interstate pipelines;
- (l) "Schedule" means Schedule appended to these rules;
- (m) "site" means any location where hazardous chemicals are manufactured or processed, stored, handled, used, disposed of and includes the whole of an area under the control of an occupier and includes pier, jetty or similar structure whether floating or not;
- (n) "Threshold quantity" means, -
 - (i) in the case of a hazardous chemical specified in column 2 of Schedule 2, the quantity of that chemical specified in the corresponding entry in columns 3 and 4;
 - (ii) in the case of a hazardous chemical specified in column 2 of Part I of Schedule 3, the quantity of that chemical specified in the corresponding entry in columns 3 and 4 of that part;
 - (iii) in the case of substances of a class specified in column 2 of Part II of Schedule 3, the total quantity of all substances of that class specified in the corresponding entry in columns 3 and 4 of that part.

²**[3. Duties of authorities.** -The concerned authority shall, -

- (a) inspect the industrial activity at least once in a calendar year;
- (b) except where such authority is the Ministry of Environment and Forests, annually report on the compliance of the rules by the occupiers to the Ministry of Environment and Forests through appropriate channel;
- (c) subject to the other provisions of these rules, perform the duties specified in column 3 of Schedule 5.]

¹ Substituted by Rule 2 (ii) of the Manufacture, Storage and Import of Hazardous Chemical (Amendment) Rules, 2000 notified vide S.O.57 (E), dated 19th January, 2000.

² Substituted by Rule 2 of the MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

4. General responsibility of the occupier during industrial activity. -(1) These rules shall apply to, -

- (a) an industrial activity in which a hazardous chemical, which satisfies any of the criteria laid down in Part I of Schedule I ¹[or listed] in column 2 of Part II of this Schedule is or may be involved; and
- ²[(b) isolated storage of a hazardous chemical listed in Schedule 2 in a quantity equal to or more than the threshold quantity specified in column 3, thereof.]
- (2) An occupier who has control of an industrial activity in terms of sub-rule (1) shall provide evidence to show that he has, -
 - (a) identified the major accident hazards; and
 - (b) taken adequate steps to-
 - (i) prevent such major accidents and to limit their consequences to persons and the environment;
 - (ii) provide to the persons working on the site with the information, training and equipment including antidotes necessary to ensure their safety.

5. Notification of Major accident .- (1) Where a major accident occurs on a site, the occupier shall ³[within 48 hours notify] the concerned authority as identified in Schedule 5 of that accident, and furnish thereafter to the concerned authority a report relating to the accidents in instalments, if necessary, in Schedule 6.

(2) The concerned authority shall, on receipt of the report in accordance with sub-rule (1) of this rule, undertake a full analysis of the major accident and send the ⁴[requisite information within 90 days to the Ministry] of Environment and Forests through appropriate channel.

⁵[(3) An occupier shall notify to the concerned authority, steps taken to avoid any repetition of such occurrence on a site.]

⁶[(4) The concerned authority shall compile information regarding major accidents and make available a copy of the same to the Ministry of Environment and Forests through appropriate channel.

(5) The concerned authority shall in writing inform the occupier, of any lacunae which in its opinion needs to be rectified to avoid major accidents.]

6. Industrial activity to which rules 7 to 15 apply. - (1) Rules 7 to 15 shall apply to, -

- (a) an industrial activity in which there is involved a quantity of a hazardous chemical listed in column 2 of Schedule 3 which is equal to or more than the quantity specified in the entry for that chemical in columns 3 and 4 (rules 10-12 only for column 4), and
- (b) isolated storage in which there is involved a quantity of a hazardous chemical listed in column 2 of Schedule 2 which is equal to or more than the quantity specified in the entry for that chemical in ⁷[columns 3 and 4 (rules 10-12 only for column 4)].

¹ Substituted by Rule 3 (i) of the MSIHC (Amendment) Rules, 1994 notified vide S.O. 2882 dated 3rd October, 1994

² Substituted by Rule 3 (ii) *ibid*.

³ Substituted by Rule 3 (a) of the MSIHC (Amendment) Rules, 1994 notified vide S.O. 2882, dated 3rd October, 1994

⁴ Substituted by Rule 3(b); of The MSIHC (Amendment) Rules, 1994 notified vide S.O. No. 2882, dated 3rd October, 1994

⁵ Substituted by Rule 3(c); of The MSIHC (Amendment) Rules, 1994 notified vide S.O. No. 2882, dated 3rd October, 1994

⁶ Inserted by Rule 3(c); of The MSIHC (Amendment) Rules, 1994 notified vide S.O. No. 2882, dated 3rd October, 1994

⁷ Substituted by S.O. 57 (E), dated 19th January, 2000 (w.e.f.20-01-2000)

(2) For the purposes of rules 7 to 15, -

- (a) "new industrial activity" means an industrial activity which--
 - (i) commences after the date of coming into operation of these rules; or
 - (ii) if commenced before that date, is an industrial activity in which a modification has been made which is likely to cover major accident hazards, and that activity shall be deemed to have commenced on the date on which the modification was made;
- (b) an "existing industrial activity" means an industrial activity which is not a new industrial activity.

7. [Approval and Notification of sites].- (1) An occupier shall not undertake any industrial activity¹ [unless he has been granted an approval for undertaking such an activity and has submitted] a written report to the concerned authority containing the particulars specified in Schedule 7 at least 3 months before commencing that activity or before such shorter time as the concerned authority may agree and for the purposes of this paragraph, an activity in which subsequently there is or is liable to be a threshold quantity or more of an additional hazardous chemical shall be deemed to be a different activity and shall be notified accordingly.

²[(2) The concerned authority within 60 days from the date of receipt of the report, shall approve the report submitted and on consideration of the report if it is of the opinion that contravention of the provisions of the Act or the rules made thereunder has taken place, it shall issue notice under rule 19.]

8. Updating of the site notification following changes in the threshold quantity .- Where an activity has been reported in accordance with rule 7(1) and the occupier makes a change in it (including an increase or decrease in the maximum threshold quantity of a hazardous chemical to which this rule applies which is or is liable to be at the site or in the pipeline or at the cessation of the activity) which affects the particulars specified in that report or any subsequent report made under this rule, the occupier shall forthwith furnish a further report to the concerned authority.

9. Transitional provisions. - Where, -

- (a) at the date of coming into operation of these rules, an occupier is in control of an existing industrial activity which is required to be reported under rule 7(1); or
- (b) within six months after that date an occupier commences any such new industrial activity; it shall be a sufficient compliance with that rule if he reports to the concerned authority as per the particulars in Schedule 7 within 3 months after the date of coming into operation of these rules or within such longer time as the concerned authority may agree in writing.

10. ³[Safety reports and safety audit reports]. - (1) Subject to the following paragraphs of this rule, an occupier shall not undertake any industrial activity to which this rule applies, unless he has prepared a safety report on that industrial activity containing the information specified in Schedule 8 and has sent a copy of that report to the concerned authority at least ninety days before commencing that activity.

(2) In the case of a new industrial activity which an occupier commences, or by virtue of sub-rule (2)(a)(ii) of rule 6 is deemed to commence, within 6 months after coming into operation of these rules, it shall be a sufficient compliance with sub-rule (1) of this rule if the occupier sends to the concerned authority a copy of the report required in accordance with that sub-rule within ninety days after the date of coming into operation of these rules.

¹ Substituted by Rule 4 (a) of MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

² Substituted by Rule 4(b), of MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

³ Substituted by Rule 6 of the MSIHC (Amendment) Rules, 2000 notified vide S.O. 57(E), dated 19th January, 2000

¹[(3) In case of an existing industrial activity, the occupier shall prepare a safety report in consultation with the concerned authority and submit the same within one year from the date of the commencement of the Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 1994, to the concerned authority.]

²[(4) After the commencement of the Manufacture, Storage and Import of Hazardous Chemicals (Amendment) Rules, 1994, the occupiers of both the new and the existing industrial activities shall carry out an independent safety audit of the respective industrial activities with the help of an expert, not associated with such industrial activities.

(5) The occupier shall forward a copy of the auditor's report alongwith his comments, to the concerned authority within 30 days after the completion of such Audit.

³[(6) The occupier shall update the safety audit report once a year by conducting a fresh safety audit and forward a copy of it with his comments thereon within 30 days to the concerned authority.

(7) The concerned authority may if it deems fit, issue improvement notice under rule 19 within 45 days of the submission of the said report.]

11. Updating of reports under Rule 10. - (1) Where an occupier has made a safety report in accordance with sub-rule (1) of rule 10, he shall not make any modification to the industrial activity to which that safety report relates which could materially affect the particulars in that report, unless he has made a further report to take account of those modifications and has sent a copy of that report to the concerned authority at least 90 days before making those modifications.

(2) Where an occupier has made a report in accordance with rule 10 and sub-rule (1) of this rule and that industrial activity is continuing, the occupier shall within three years of the date of the last such report, make a further report which shall have regard in particular to new technical knowledge which has affected the particulars in the previous report relating to safety and hazard assessment, and shall within 30 days ⁴[* *], send a copy of the report to the concerned authority.

⁵[**12. Requirement for further information to be sent to the authority.** - Where in accordance with rule 10 an occupier has sent a safety report and the safety audit report relating to an industrial activity to the concerned authority, the concerned authority may, by a notice served on the occupier, require him to provide such additional information as may be specified in the notice and the occupier shall send that information to the concerned authority within 90 days.]

13. Preparation of on-site emergency plan by the occupier. - (1) An occupier shall prepare and keep up-to-date ⁶[an on-site emergency plan containing details specified in Schedule 11 and detailing] how major accidents will be dealt with on the site on which the industrial activity is carried on and that plan shall include the name of the person who is responsible for safety on the site and the names of those who are authorised to take action in accordance with the plan in case of an emergency.

(2) The occupier shall ensure that the emergency plan prepared in accordance with sub-rule (1), takes into account any modification made in the industrial activity and that every person on the site who is affected by the plan is informed of its relevant provisions.

(3) The occupier shall prepare the emergency plan required under sub-rule (1), -

(a) in the case of a new industrial activity, before that activity is commenced;

¹ Substituted by Rule 5 (a) of the MSIHC (Amendment) Rules, 1994 notified vide S.O. 2882, dated 3rd October, 1994

² Inserted by Rule 5(b), of MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

³ Inserted by Rule 5(b), *ibid*.

⁴ Omitted by Rule 6, of the MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

⁵ Ins. by MSIHC (Amendment) Rules, 1994 (w.e.f. 22-10-1994).

⁶ Ins. by MSIHC (Amendment) Rules, 1994 (w.e.f. 22-10-1994)

- (b) in the case of an existing industrial activity, within 90 days of coming into operation of these rules.

¹[(4) The occupier shall ensure that a mock drill of the on-site emergency plan is conducted every six months;

(5) A detailed report of the mock drill conducted under sub-rule (4) shall be made immediately available to the concerned authority.]

14. Preparation of off-site emergency plans by the authority .- (1) It shall be the duty of the concerned authority as identified in column 2 of Schedule 5 to prepare and keep up-to-date ²[an adequate off-site emergency plan containing particulars specified in Schedule 12 and detailing] how emergencies relating to a possible major accident on that site will be dealt with and in preparing that plan the concerned authority shall consult the occupier, and such other persons as it may deem necessary.

(2) For the purpose of enabling the concerned authority to prepare the emergency plan required under sub-rule (1), the occupier shall provide the concerned authority with such information relating to the industrial activity under his control as the concerned authority may require, including the nature, extent and likely effects off-site of possible major accidents and the authority shall provide the occupier with any information from the off-site emergency plan which relates to his duties under rule 13.

(3) The concerned authority shall prepare its emergency plan required under sub-rule (1), -

- (a) in the case of a new industrial activity, before that activity is commenced;
- (b) in the case of an existing industrial activity, within six months of coming into operation of these rules.

³[(4) The concerned authority shall ensure that a rehearsal of the off-site emergency plan is conducted at least once in a calendar year.]

15. Information to be given to persons liable to be affected by a major accident. - (1) The occupier shall take appropriate steps to inform persons outside the site either directly or through District Emergency Authority who are likely to be in an area which may be affected by a major accident about-

- (a) the nature of the major accident hazard; and
- (b) the safety measures and the "Do's" and "Don'ts" which should be adopted in the event of a major accident.

(2) The occupier shall take the steps required under sub-rule (1) to inform persons about an industrial activity, before that activity is commenced, except in the case of an existing industrial activity in which case the occupier shall comply with the requirements of sub-rule (1) within 90 days of coming into operation of these rules.

16. Disclosures of information. –

Where for the purpose of evaluating information notified under rule 5 or 7 to 15, the concerned authority discloses that information to some other person, that other person shall not use that information for any purpose except for the purpose of the concerned authority disclosing it, and before disclosing the information the concerned authority shall inform that other person of his obligations under this paragraph.

¹ Ins. by MSIHC (Amendment) Rules, 1994 (w.e.f. 22-10-1994).

² Ins. by MSIHC (Amendment) Rules, 1994 (w.e.f. 22-10-1994).

³ Inserted by Rule 9(b) *ibid*.

17. Collection, Development and Dissemination of Information. – (1) This rule shall apply to an industrial activity in which a hazardous chemical which satisfies any of the criteria laid down in Part I of Schedule 1 ¹[or listed] in column 2 of Part II of this Schedule is or may be involved.

(2) An occupier, who has control of an industrial activity in terms of sub-rule (1) of this rule, shall arrange to obtain or develop information in the form of safety data sheet as specified in Schedule 9. The information shall be accessible upon request for reference.

(3) The occupier while obtaining or developing a safety data sheet as specified in Schedule 9 in respect of a hazardous chemical handled by him shall ensure that the information is recorded accurately and reflects the scientific evidence used in making the hazard determination. In case, any significant information regarding hazard of a chemical is available, it shall be added to the material safety data sheet as specified in Schedule 9 as soon as practicable.

(4) Every container of a hazardous chemical shall be clearly labelled or marked to identify, -

- (a) the contents of the container;
- (b) the name and address of the manufacturer or importer of the hazardous chemical;
- (c) the physical, chemical and toxicological data as per the criteria given at Part I of Schedule 1.

(5) In terms of sub-rule (4) of this rule, where it is impracticable to label a chemical in view of the size of the container or the nature of the package, provision should be made for other effective means like tagging or accompanying documents.

18. Import of hazardous chemicals. - (1) This rule shall apply to a chemical which satisfies any of the criteria laid down in Part I of Schedule 1 ²[or listed] in column 2 of Part II of this Schedule.

(2) Any person responsible for importing hazardous chemicals in India shall provide ³[before 30 days or as reasonably possible but not later than] the date of import to the concerned authorities as identified in column 2 of Schedule 5 the information pertaining to-

- (i) the name and address of the person receiving the consignment in India;
- (ii) the port of entry in India;
- (iii) mode of transport from the exporting country to India;
- (iv) the quantity of chemical(s) being imported; and
- (v) complete product safety information.

⁴[(3) If the concerned authority of the State is satisfied that the chemical being imported is likely to cause major accidents, it may direct the importer to take such safety measures as the concerned authority of the State may deem appropriate.]

⁵[(3A) In case the concerned authority of the State is of the opinion that the chemical should not be imported on safety or on environmental considerations, such authority may direct stoppage of such import.]

¹ Substituted by Rule 7 of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

² Substituted by Rule 8(a), of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

³ Substituted by Rule 10(a) of the MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

⁴ Subs. by MSIHC (Amendment) Rules, 1994 (w.e.f. 22-10-1994)

⁵ Inserted by Rule 10(c), *ibid*.

(4) The concerned authority at the State shall simultaneously inform the concerned port authority to take appropriate steps regarding safe handling and storage of hazardous chemicals while off-loading the consignment within the port premises.

(5) Any person importing hazardous chemicals shall maintain the records of the hazardous chemicals imported as specified in Schedule 10 and the records so maintained shall be open for inspection by the concerned authority at the State or the Ministry of Environment and Forests or any officer appointed by them in this behalf.

(6) The importer of the hazardous chemical or a person working on his behalf shall ensure that transport of hazardous chemicals from port of entry to the ultimate destination is in accordance with the Central Motor Vehicles Rules, 1989 framed under the provisions of the Motor Vehicles Act, 1988.

19. Improvement notices. - (1) If the concerned authority is of the opinion that a person has contravened the provisions of these rules, the concerned authority shall serve on him a notice (in this para referred to as "an improvement notice") requiring that person to remedy the contravention or, as the case may be, ¹[the matters occasioning it within 45 days.]

(2) A notice served under sub-rule (1) shall clearly specify the measures to be taken by the occupier in remedying the said contraventions.

20. Power of the Central Government to modify the Schedules. - The Central Government may, at any time, by notification in the Official Gazette, make suitable changes in the Schedules.

²[SCHEDULE 1

[See rules 2c (i), 4(1)(a), 4(2), 17 and 18]

PART I

(a) **Toxic Chemicals:** - Chemicals having the following values of acute toxicity and which owing to their physical and chemical properties, are capable of producing major accident hazards:

Sr.No.	Toxicity	Oral toxicity LD50(mg/kg)	Dermal toxicity LD50/(mg/kg)	Inhalation toxicity LC50/(mg/l)
1.	Extremely toxic	>5	<40	<0.5
2.	Highly toxic	>5 - 50	>40 - 200	<0.5 - 2.0
3.	Toxic	>50 - 200	>200 - 1000	>2 - 10

(b) **Flammable Chemicals:**

(i) Flammable gases: Gases which at 20°C and at standard pressure of 101.3KPa are: -

- (a) ignitable when in a mixture of 13 percent or less by volume with air, or;
- (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limits.

Note. - The flammability shall be determined by tests or by calculation in accordance with methods adopted by International Standards Organization ISO Number 10156 of 1990 or by Bureau of Indian Standard ISI Number 1446 of 1985.

¹ Substituted by Rule 11 of MSIHC Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

² Substituted by Rule 9 of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

- (ii) Extremely flammable liquids. - chemicals which have flash point lower than or equal to 23°C and boiling point less than 35°C.
- (iii) Very highly flammable liquids. chemicals which have a flash point lower than or equal to 23°C and initial boiling point higher than 35°C.
- (iv) Highly flammable liquids. - chemicals which have a flash point lower than or equal to 60°C but higher than 23°C.
- (v) Flammable liquids. - chemicals which have a flash point higher than 60°C but lower than 90°C.

(c) **Explosives:** explosives means a solid or liquid or pyrotechnic substance (or a mixture of substances) or an article.

- (a) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings;
- (b) which is designed to produce an effect by heat, light, sound, gas or smoke or a combination of these as the result of non-detonative self sustaining exothermic chemical reaction.

PART II

S. No.	LIST OF HAZARDOUS CHEMICALS
1.	Acetaldehyde
2.	Acetic acid
3.	Acetic anhydride
4.	Acetone
5.	Acetone cyanohydrin
6.	Acetone thiosemicarbazide
7.	Acetonitrile
8.	Acetylene
9.	Acetylene tetra chloride
10.	Acrolein
11.	Acrylamide
12.	Acrylonitrile
13.	Adiponitrile
14.	Aldicarb
15.	Aldrin
16.	Allyl alcohol
17.	Allyl amine
18.	Allyl chloride
19.	Aluminium (powder)
20.	Aluminium azide
21.	Aluminium borohydride
22.	Aluminium chloride
23.	Aluminium fluoride
24.	Aluminium phosphide
25.	Amino diphenyl
26.	Amino pyridine
27.	Aminophenol-2
28.	Aminopterin
29.	Amiton
30.	Amiton dialate

31.	Ammonia
32.	Ammonium chloro platinate
33.	Ammonium nitrate
34.	Ammonium nitrite
35.	Ammonium picrate
36.	Anabasine
37.	Aniline
38.	Aniline 2,4, 6-Trimethyl
39.	Anthraquinone
40.	Antimony pentafluoride
41.	Antimycin A
42.	ANTU
43.	Arsenic pentoxide
44.	Arsenic trioxide
45.	Arsenous trichloride
46.	Arsine
47.	Asphalt
48.	Azinpho-ethyl
49.	Azinphos methyl
50.	Bacitracin
51.	Barium azide
52.	Barium nitrate
53.	Barium nitride
54.	Benzal chloride
55.	Benzenamine, 3-Trifluoromethyl
56.	Benzene
57.	Benzene sulfonyl chloride
58.	Benzene. 1- (chloromethyl)-4 Nitro
59.	Benzene arsenic acid
60.	Benzidine
61.	Benzidine salts
62.	Benzimidazole. 4, 5-Dichloro-2 (Trifluoromethyl)
63.	Benzoquinone-P
64.	Benzotrichloride
65.	Benzoyl chloride
66.	Benzoyl peroxide
67.	Benzyl chloride
68.	Beryllium (Powder)
69.	Bicyclo (2, 2, 1) Heptane -2- carbonitrile
70.	Biphenyl
71.	Bis (2-Chloroethyl) sulphide
72.	Bis (Chloromethyl) Ketone
73.	Bis (Tert-butyl peroxy) cyclohexane
74.	Bis (Terbutylperoxy) butane
75.	Bis(2,4, 6-Trinitrophenylamine)
76.	Bis (Chloromethyl) Ether

77.	Bismuth and compounds
78.	Bisphenol-A
79.	Bitoscanate
80.	Boron Powder
81.	Boron trichloride
82.	Boron trifluoride
83.	Boron trifluoride comp. With methylether, 1:1
84.	Bromine
85.	Bromine pentafluoride
86.	Bromo chloro methane
87.	Bromodialone
88.	Butadiene
89.	Butane
90.	Butanone-2
91.	Butyl amine tert
92.	Butyl glycidal ether
93.	Butyl isovalerate
94.	Butyl peroxy maleate tert
95.	Butyl vinyl ether
96.	Butyl-n-mercaptan
97.	C.I. Basic green
98.	Cadmium oxide
99.	Cadmium stearate
100.	Calcium arsenate
101.	Calcium carbide
102.	Calcium cyanide
103.	Camphenchlor (Toxaphene)
104.	Cantharidin
105.	Captan
106.	Carbachol chloride
107.	Carbaryl
108.	Carbofuran (Furadan)
109.	Carbon tetrachloride
110.	Carbon disulphide
111.	Carbon monoxide
112.	Carbonphenothion
113.	Carvone
114.	Cellulose nitrate
115.	Chloroacetic acid
116.	Chlordane
117.	Chlorofenvinphos
118.	Chlorinated benzene
119.	Chlorine
120.	Chlorine oxide
121.	Chlorine trifluoride
122.	Chlormephos

123.	Chlormequat chloride
124.	Chloroacetal chloride
125.	Chloroacetaldehyde
126.	Chloroaniline -2
127.	Chloroaniline -4
128.	Chlorobenzene
129.	Chloroethyl chloroformate
130.	Chloroform
131.	Chloroformyl morpholine
132.	Chloromethane
133.	Chloromethyl methyl ether
134.	Chloronitrobenzene
135.	Chlorophacinone
136.	Chlorosulphonic acid
137.	Chlorothiophos
138.	Chloroxuron
139.	Chromic acid
140.	Chromic chloride
141.	Chromium powder
142.	Cobalt carbonyl
143.	Cobalt Nitrilmethylidyne compound
144.	Cobalt (Powder)
145.	Colchicine
146.	Copper and Compounds
147.	Copperoxychloride
148.	Coumafuryl
149.	Coumaphos
150.	Coumatetralyl
151.	Crimidine
152.	Crotenaldehyde
153.	Crotonaldehyde
154.	Cumene
155.	Cyanogen bromide
156.	Cyanongen iodide
157.	Cyanophos
158.	Cyanothoate
159.	Cyanuric fluoride
160.	Cyclo hexylamine
161.	Cyclohexane
162.	Cyclohexanone
163.	Cycloheximide
164.	Cyclopentadiene
165.	Cyclopentane
166.	Cyclotetramethyl enetetranitramine
167.	Cyclotrimethylen etrintrinitranine
168.	Cypermethrin

169.	DDT
170.	Decaborane (1 :4)
171.	Demeton
172.	Demeton S-Methyl
173.	Di-n-propyl peroxydicarbonate (Conc = 80%)
174.	Dialifos
175.	Diazodinitrophenol
176.	Dibenzyl peroxydicarbonate (Conc>= 90%)
177.	Diborane
178.	Dichloroacetylene
179.	Dichlorobenzalkonium chloride
180.	Dichloroethyl ether
181.	Dichloromethyl phenylsilane
182.	Dichlorophenol – 2, 6
183.	Dichlorophenol – 2, 4
184.	Dichlorophenoxy acetic acid
185.	Dichloropropane – 2, 2
186.	Dichlorosalicylic acid-3, 5
187.	Dichlorvos (DDVP)
188.	Dicrotophos
189.	Dieldrin
190.	Diepoxy butane
191.	Diethyl carbamazine citrate
192.	Diethyl chlorophosphate
193.	Diethyl ethtanolamine
194.	Diethyl peroxydicarbonate (Conc=30%)
195.	Diethyl phenylene diamine
196.	Diethylamine
197.	Diethylene glycol
198.	Diethylene glycol dinitrate
199.	Diethylene triamine
200.	Diethleneglycol butyl ether
201.	Diglycidyl ether
202.	Digitoxin
203.	Dihydroperoxypropane (Conc>=30%)
204.	Diisobutyl peroxide
205.	Dimefox
206.	Dimethoate
207.	Dimethyl dichlorosilane
208.	Dimethyl hydrazine
209.	Dimethyl nitrosoamine
210.	Dimethyl P phenylene diamine
211.	Dimethyl phosphoramidi cyanidic acid (TABUM)
212.	Dimethyl phosphorochloridothioate
213.	Dimethyl sulfolane (DMS)
214.	Dimethyl sulphide

215.	Dimethylamine
216.	Dimethylaniline
217.	Dimethylcarbonyl chloride
218.	Dimetilan
219.	Dinitro O-cresol
220.	Dinitrophenol
221.	Dinitrotoluene
222.	Dinoseb
223.	Diniterb
224.	Dioxane-p
225.	Dioxathion
226.	Dioxine N
227.	Diphacinone
228.	Diphosphoramid octamethyl
229.	Diphenyl methane di-isocynate (MDI)
230.	Dipropylene Glycol Butyl ether
231.	Dipropylene glycolmethyl ether
232.	Disec-butyl peroxydicarbonate (Conc>80%)
233.	Disufoton
234.	Dithiazamine iodide
235.	Dithiobiurate
236.	Endosulfan
237.	Endothion
238.	Endrin
239.	Epichlorohydrine
240.	EPN
241.	Ergocalciferol
242.	Ergotamine tartarate
243.	Ethanesulfenyl chloride, 2 chloro
244.	Ethanol 1-2 dichloracetate
245.	Ethion
246.	Ethoprophos
247.	Ethyl acetate
248.	Ethyl alcohol
249.	Ethyl benzene
250.	Ethyl bis amine
251.	Ethyl bromide
252.	Ethyl carbamate
253.	Ethyl ether
254.	Ethyl hexanol -2
255.	Ethyl mercaptan
256.	Ethyl mercuric phosphate
257.	Ethyl methacrylate
258.	Ethyl nitrate
259.	Ethyl thiocyanate
260.	Ethylamine

261.	Ethylene
262.	Ethylene chlorohydrine
263.	Ethylene dibromide
264.	Ethylene diamine
265.	Ethylene diamine hydrochloride
266.	Ethylene flourohydrine
267.	Ethylene glycol
268.	Ethylene glycol dinitrate
269.	Ethylene oxide
270.	Ethylenimine
271.	Ethylene di chloride
272.	Femamiphos
273.	Femitrothion
274.	Fensulphothion
275.	Fluemetil
276.	Fluorine
277.	Fluoro2-hyrdoxy butyric acid amid salt ester
278.	Fluoroacetamide
279.	Fluoroacetic acid amide salts and esters
280.	Fluoroacetylchloride
281.	Fluorobutyric acid amide salt esters
282.	Fluorocrotonic acid amides salts esters
283.	Fluorouracil
284.	Fonofos
285.	Formaldehyde
286.	Formetanate hydrochloride
287.	Formic acid
288.	Formoparanate
289.	Formothion
290.	Fosthiotan
291.	Fuberidazole
292.	Furan
293.	Gallium Trichloride
294.	Glyconitrile (Hydroxyacetonitrile)
295.	Guanyl-4-nitrosaminoguynyl-1-tetrazene
296.	Heptachlor
297.	Hexamethyl terta-oxyacyclononate (Conc 75%)
298.	Hexachlorobenzene
299.	Hexachlorocyclohexan (Lindane)
300.	Hexachlorocyclopentadiene
301.	Hexachlorodibenzo-p-dioxin
302.	Hexachloronaphthalene
303.	Hexafluoropropanone sesquihydrate
304.	Hexamethyl phosphoromide
305.	Hexamethylene diamine N N dibutyl
306.	Hexane

307.	Hexanitrostilbene 2, 2, 4, 4, 6, 6
308.	Hexene
309.	Hydrogen selenide
310.	Hydrogen sulphide
311.	Hydrazine
312.	Hydrazine nitrate
313.	Hydrochloric acid (Gas)
314.	Hydrogen
315.	Hydrogen bromide
316.	Hydrogen cyanide
317.	Hydrogen fluoride
318.	Hydrogen peroxide
319.	Hydroquinone
320.	Indene
321.	Indium powder
322.	Indomethacin
323.	Iodine
324.	Iridium tetrachloride
325.	Ironpentacarbonyl
326.	Iso benzan
327.	Isoamyl alcohol
328.	Isobutyl alcohol
329.	Isobutyro nitrile
330.	Isocyanic acid 3, 4-dichlorophenyl ester
331.	Isodrin
332.	Isofluorophosphate
333.	Isophorone diisocyanate
334.	Isopropyl alcohol
335.	Isopropyl chlorocarbonate
336.	Isopropyl formate
337.	Isopropyl methyl pyrazolyl dimethyl carbamate
338.	Juglone (5-Hydroxy Naphthalene-1,4 dione)
339.	Ketene
340.	Lactonitrile
341.	Lead arsenite
342.	Lead at high temp (molten)
343.	Lead azide
344.	Lead styphanate
345.	Leptophos
346.	Lenisite
347.	Liquified petroleum gas
348.	Lithium hydride
349.	N-Dinitrobenzene
350.	Magnesium powder or ribbon
351.	Malathion
352.	Maleic anhydride

353.	Malononitrile
354.	Manganese Tricarbonyl cyclopentadiene
355.	Mechlor ethamine
356.	Mephospholan
357.	Mercuric chloride
358.	Mercuric oxide
359.	Mercury acetate
360.	Mercury fulminate
361.	Mercury methyl chloride
362.	Mesitylene
363.	Methaacrolein diacetate
364.	Methacrylic anhydride
365.	Methacrylonitrile
366.	Methacryloyl oxyethyl isocyanate
367.	Methanidophos
368.	Methane
369.	Methanesulphonyl fluoride
370.	Methidathion
371.	Methiocarb
372.	Methonyl
373.	Methoxy ethanol (2-methyl cellosolve)
374.	Methoxyethyl mercuric acetate
375.	Methyacrylol chloride
376.	Methyl 2-chloroacrylate
377.	Methyl alcohol
378.	Methyl amine
379.	Methyl bromide (Bromomethane)
380.	Methyl chloride
381.	Methyl chloroform
382.	Methyl chloroformate
383.	Methyl cyclohexene
384.	Methyl disulphide
385.	Methyl ethyl ketone peroxide (Conc.60%)
386.	Methyl formate
387.	Methyl hydrazine
388.	Methyl isobutyl ketone
389.	Methyl isocyanate
390.	Methyl isothiocyanate
391.	Methyl mercuric dicyanamide
392.	Methyl Mercaptan
393.	Methyl Methacrylate
394.	Methyl phencapton
395.	Methyl phosphonic dichloride
396.	Methyl thiocyanate
397.	Methyl trichlorosilane
398.	Methyl vinyl ketone

399.	Methylene bis (2-chloroaniline)
400.	Methylene chloride
401.	Methylenebis-4,4(2-chloroaniline)
402.	Metolcarb
403.	Mevinphos
404.	Mezacarbate
405.	Mitomycin C
406.	Molybdenum powder
407.	Monocrotophos
408.	Morpholine
409.	Muscinol
410.	Mustard gas
411.	N-Butyl acetate
412.	N.-Butyl alcohol
413.	N-Hexane
414.	N- Methyl-N, 2, 4, 6-Tetranitroaniline
415.	Naphtha
416.	Nephtha solvent
417.	Naphthalene
418.	Naphthyl amine
419.	Nickel carbonyl/nickel tetracarbonyl
420.	Nickel powder
421.	Nicotine
422.	Nicotine sulphate
423.	Nitric acid
424.	Nitric oxide
425.	Nitrobenzene
426.	Nitrocellulose (dry)
427.	Nitrochlorobenzene
428.	Nitrocyclohexane
429.	Nitrogen
430.	Nitrogen dioxide
431.	Nitrogen oxide
432.	Nitrogen trifluouide
433.	Nitroglycerine
434.	Nitropropane-1
435.	Nitropropane-2
436.	Nitroso dimethyl amine
437.	Nonane
438.	Norbormide
439.	O-Cresol
440.	O-Nitro Toluene
441.	O-Toludine
442.	O-Xylene
443.	O/P Nitroaniline
444.	Oleum

445.	OO Diethyl S ethyl suph. methyl phos
446.	OO Diethyl S propythio methyl phosdithioate
447.	OO Diethyl s ethylsulphinyl methylphosphorothioate
448.	OO Diethyl s ethylsulphonyl methylphosphorothioate
449.	OO Diethyls ethylthiomethylphospho-rothioate
450.	Organo rhodium complex
451.	Orotic acid
452.	Osmium tetroxide
453.	Oxabain
454.	Oxamyl
455.	Oxetane, 3, 3-bis(chloromethyl)
456.	Oxidiphenoxarsine
457.	Oxy disulfoton
458.	Oxygen (liquid)
459.	Oxygen difluoride
460.	Ozone
461.	P-nitrophenol
462.	Paraffin
463.	Paraoxon (Diethyl 4 Nitrophenyl phosphate)
464.	Paraquat
465.	Paraquat methosulphate
466.	Parathion
467.	Parathion methyl
468.	Paris green
469.	Penta borane
470.	Penta chloro ethane
471.	Penta chlorophenol
472.	Pentabromophenol
473.	Pentachloro naphthalene
474.	Pentadecyl-amine
475.	Pentaerythritol tetranitrate
476.	Pentane
477.	Pentanone
478.	Perchloric acid
479.	Perchloroethylene
480.	Peroxyacetic acid
481.	Phenol
482.	Phenol, 2, 2-thiobis (4, 6-Dichloro)
483.	Phenol, 2, 2-thiobis (4 chloro 6-methyl phenol)
484.	Phenol, 3-(1-methyl ethyl) methylcarbamate
485.	Phenyl hydrazine hydrochloride
486.	Phenyl mercury acetate
487.	Phenyl silatrane
488.	Phenyl thiourea
489.	Phenylene P-diamine
490.	Phorate

491.	Phosazetin
492.	Phosfolan
493.	Phosgene
494.	Phosmet
495.	Phosphamidon
496.	Phosphine
497.	Phosphoric acid
498.	Phosphoric acid dimethyl (4-methyl thio)phenyl
499.	Phosphorothioic acid dimethyl S(2-Bis) Ester
500.	Phosphorothioic acid methyl (ester)
501.	Phosphorothioic acid, OO Dimethyl S-(2-methyl)
502.	Phosphorothioic, methyl-ethyl ester
503.	Phosphorous
504.	Phosphorous oxychloride
505.	Phosphorous pentaoxide
506.	Phosphorous trichloride
507.	Phosphorous penta chloride
508.	Phthalic anhydride
509.	Phylloquinone
510.	Physostigmine
511.	Physostigmine salicylate (1:1)
512.	Picric acid (2, 4, 6- trinitrophenol)
513.	Picrotoxin
514.	Piperdine
515.	Piprotal
516.	Pirinifos-ethyl
517.	Platinous chloride
518.	Platinum tetrachloride
519.	Potassium arsenite
520.	Potassium chlorate
521.	Potassium cyanide
522.	Potassium hydroxide
523.	Potassium nitride
524.	Potassium nitrite
525.	Potassium peroxide
526.	Potassium silver cyanide
527.	Powdered metals and mixtures
528.	Promecarb
529.	Promurit
530.	Propanesultone
531.	Propargyl alcohol
532.	Propargyl bromide
533.	Propen-2-chloro-1,3-diou diacetate
534.	Propiolactone beta
535.	Propionitrile
536.	Propionitrile, 3-chloro

537.	Propiophenone, 4-amino
538.	Propyl chloroformate
539.	Propylene dichloride
540.	Propylene glycol, allylether
541.	Propylene imine
542.	Propylene oxide
543.	Prothoate
544.	Pseudosumene
545.	Pyrazoxon
546.	Pyrene
547.	Pyridine
548.	Pyridine, 2-methyl-3-vinyl
549.	Pyridine, 4-nitro-1-oxide
550.	Pyridine, 4-nitro-1-oxide
551.	Pyriminil
552.	Quinaliphos
553.	Quinone
554.	Rhodium trichloride
555.	Salcomine
556.	Sarin
557.	Selenious acid
558.	Selenium Hexafluoride
559.	Selenium oxychloride
560.	Semicarbazide hydrochloride
561.	Silane (4-amino butyl) diethoxy-meth
562.	Sodium
563.	Sodium anthra-quinone-1-sulphonate
564.	Sodium arsenate
565.	Sodium arsenite
566.	Sodium azide
567.	Sodium cacodylate
568.	Sodium chlorate
569.	Sodium cyanide
570.	Sodium fluoro-acetate
571.	Sodium hydroxide
572.	Sodium pentachloro-phenate
573.	Sodium picramate
574.	Sodium selenate
575.	Sodium selenite
576.	Sodium sulphide
577.	Sodium tellorite
578.	Stannane acetoxo triphenyl
579.	Stibine (Antimony hydride)
580.	Strychnine
581.	Strychnine sulphate
582.	Styphinic acid (2, 4,6-trinitroresorcinol)

583.	Styrene
584.	Sulphotec
585.	Sulphoxide, 3-chloropropyl octyl
586.	Sulphur dichloride
587.	Sulphur dioxide
588.	Sulphur monochloride
589.	Sulphur tetrafluoride
590.	Sulphur trioxide
591.	Sulphuric acid
592.	Tellurim (powder)
593.	Tellurium hexafluoride
594.	TEPP (Tetraethyl pyrophosphate)
595.	Terbufos
596.	Tert-Butyl alcohol
597.	Tert-Butyl peroxy carbonate
598.	Tert-Butyl peroxy isopropyl
599.	Tert-Butyl peroxyacetate (Conc $\geq$ 70%)
600.	Tert-Butyl peroxy pivalate (Conc $\geq$ 77%)
601.	Tert-Butyl peroxyiso-butylate
602.	Tetra hydrofuran
603.	Tetra methyl lead
604.	Tetra nitromethane
605.	Tetra-chlorodibenzo-p-dioxin, 1, 2, 3, 7, 8(TCDD)
606.	Tetraethyl lead
607.	Tetrafluoroethylene
608.	Tetramethylene disulphotetramine
609.	Thallic oxide
610.	Thallium carbonate
611.	Thallium sulphate
612.	Thallos chloride
613.	Thallos malonate
614.	Thallos sulphate
615.	Thiocarbamide
616.	Thiocyanic acid, 2(Benzothiazolythio) methyl
617.	Thiofamox
618.	Thiometon
619.	Thionazin
620.	Thionyl chloride
621.	Thiophenol
622.	Thiosemicarbazide
623.	Thiourea (2 chloro-phenyl)
624.	Thiourea (2-methyl phenyl)
625.	Tirpate (2,4-dimethyl-1,3-di-thiolane)
626.	Titanium powder
627.	Titanium tetra-chloride
628.	Toluene

629.	Toluene -2,4-di-isocyanate
630.	Toluene 2,6-di-isocyanate
631.	Trans-1,4-di chloro-butene
632.	Tri nitro anisole
633.	Tri (Cyclohexyl) methylstannyl 1,2,4 triazole
634.	Tri (Cyclohexyl) stannyl-1H-1, 2, 3-triazole
635.	Triaminotrinitrobenzene
636.	Triamphos
637.	Triazophos
638.	Tribromophenol 2, 4, 6
639.	Trichloro napthalene
640.	Trichloro chloromethyl silane
641.	Trichloroacetyl chloride
642.	Trichlorodichlorophenylsilane
643.	Trichloroethyl silane
644.	Trichloroethylene
645.	Trichloromethane sulphenyl chloride
646.	Trichloronate
647.	Trichlorophenol 2, 3, 6
648.	Trichlorophenol 2, 4, 5
649.	Trichlorophenyl silane
650.	Trichlorophon
651.	Triethoxy silane
652.	Triethylamine
653.	Triethylene melamine
654.	Trimethyl chlorosilane
655.	Trimethyl propane phosphite
656.	Trimethyl tin chloride
657.	Trinitro aniline
658.	Trinitro benzene
659.	Trinitro benzoic acid
660.	Trinitro phenetole
661.	Trinitro-m-cresol
662.	Trinitrotoluene
663.	Tri-orthocreysyl phosphate
664.	Triphenyl tin chloride
665.	Tris(2-chloroethyl)amine
666.	Turpentine
667.	Uranium and its compounds
668.	Valino mycin
669.	Vanadium pentaoxide
670.	Vinyl acetate monomer
671.	Vinyl bromide
672.	Vinyl chloride
673.	Vinyl cyclohexane dioxide
674.	Vinyl fluoride

675.	Vinyl norbornene
676.	Vinyl toluene
677.	Vinylidene chloride
678.	Warfarin
679.	Warfarin Sodium
680.	Xylene dichloride
681.	Xylidine
682.	Zinc dichloropentanitrile
683.	Zinc phosphide
684.	Zirconium & compounds]

SCHEDULE 2

[See rule 2(e)(ii), 4(1)(b), 4(2) and 6 (1) (b)]

Isolated Storage at Installations other than those covered by Schedule 4.

- (a) The threshold quantities set out below relate to each installation or group of installation belonging to the same occupier where the distance between installations is not sufficient to avoid, in foreseeable circumstances, any aggravation of major accident hazards. These threshold quantities apply in any case to each group of installations belonging to the same occupier where the distance between the installations is less than 500 metres.
- (b) For the purpose of determining the threshold quantity of a hazardous chemical at an isolated storage, account shall also be taken of any hazardous chemical which is: -
- (i) in that part of any pipeline under the control of the occupier having control of the site, which is within 500 metres of that site and connected to it;
 - (ii) at any other site under the control of the same occupier any part of the boundary of which is within 500 meters of the said site; and
 - (iii) in any vehicle, vessel, aircraft or hovercraft, under the control of the same occupier which is used for storage purpose either at the site or within 500 metres of it;

but no account shall be taken of any hazardous chemical which is in a vehicle, vessel, aircraft or a hovercraft used for transporting it.

Sl.No.	Chemicals	Threshold Quantities (tonnes)	
		¹ [For application of rules 4,5,7 to 9 and 13 to 15]	² [For application of rule 10 to 12]
1	2	3	4
1.	Acrylonitrile	350	5,000
2.	Ammonia	60	600
3.	Ammonium nitrate (a)	350	2,500
4.	Ammonium nitrate fertilizers (b)	1,250	10,000
5.	Chlorine	10	25
6.	Flammable gases as defined in Schedule 1, paragraph (b) (i)	50	300
³ [7.]	Extremely flammable liquids as defined in Schedule 1, paragraph (b) (ii)	5000	50,000
8.	Liquid oxygen	200	2000
9.	Sodium chlorate	25	250
10.	Sulphur dioxide	20	500
11.	Sulphur trioxide	15	100
⁴ [12.]	Carbonyl chloride	0.750	0.750
13.	Hydrogen Sulphide	5	50
14.	Hydrogen Fluoride	5	50
15.	Hydrogen Cyanide	5	50

¹ Substituted by Rule 10(i) (a) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19th January, 2000

² Substituted by Rule 10(i) (b), *ibid*;

³ Substituted entry 7 by Rule 10(ii), *ibid*;

⁴ Inserted entries 12 to 27 by Rule 11 of the MSIHC (Amendment) Rules, 1994 notified vide S.O.2882, dated 3rd October, 1994

16.	Carbon disulphide	20	200
17.	Bromine	50	500
18.	Ethylene oxide	5	501
19.	Propylene oxide	5	50
20.	2-Propenal (Acrolein)	20	200
21.	Bromomethane (Methyl bromide)	20	200
22.	Methyl isocyanate	0.150	0.150
23.	Tetraethyl lead or tetramethyl lead	5	50
24.	1,2 Dibromoethane (Ethylene dibromide)	5	50
25.	Hydrogen chloride (liquefied gas)	25	250
26.	Diphenyl methane di-isocyanate (MDI)	20	200
27.	Toluene di-isocyanate (TDI)	10	100]
¹ [28.	Very highly flammable liquids as defined in Schedule 1, paragraph (b) (iii)	7,000	7,000
29.	Highly flammable liquids as defined in Schedule 1, paragraph (b) (iv)	10,000	10,000
30.	Flammable liquids as defined in Schedule - 1, paragraph (b) (v)	15,000	1,00,000]

- (a) This applies to ammonium nitrate and mixtures of ammonium nitrate where the nitrogen content derived from the ammonium nitrate is greater than 28 per cent by weight and to aqueous solutions of ammonium nitrate where the concentration of ammonium nitrate is greater than 90 per cent by weight.
- (b) This applies to straight ammonium nitrate fertilizers and to compound fertilizers where the nitrogen content derived from the ammonium nitrate is greater than 28 per cent by weight (a compound-fertilizer contains ammonium nitrate together with phosphate and/or potash).

SCHEDULE 3

[See Rule 2(e)(iii), 5 and 6(1)(a)]

List of Hazardous Chemicals for Application of Rules 5 and 7 to 15

- (a) The quantities set out below relate to each installation or group of installations belonging to the same occupier where the distance between the installations is not sufficient to avoid, in foreseeable circumstances, any aggravation of major accident hazards. These quantities apply in any case to each group of installations belonging to the same occupier where the distance between the installations is less than 500 metres.
- (b) For the purpose of determining the threshold quantity of a hazardous chemical in an industrial installation, account shall also be taken of any hazardous chemicals which is: -
- in that part of any pipeline under the control of the occupier having control of the site, which is within 500 metres off that site and connected to it;
 - at any other site under the control of the same occupier any part of the boundary of which is within 500 metres of the said site; and
 - in any vehicle, vessel, aircraft or hovercraft under the control of the same occupier which is used for storage purpose either at the site or within 500 metres of it;

but no account shall be taken of any hazardous chemical which is in a vehicle, vessel, aircraft or hovercraft used for transporting it.

¹ Inserted entries 28 to 30 by 10(iii) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19th January, 2000

PART I

Named Chemicals

S. No.	Chemicals	Threshold Quantity		CAS Number
		for application of Rules 5, 7-9 and 13-15	for application of Rules 10- 12	
(1)	(2)	(3)	(4)	(5)
GROUP 1-TOXIC SUBSTANCES				
1.	Aldicarb	100 kg		116-06-3
2.	4-Aminodiphenyl	1 kg		96-67-1
3.	Amiton	1 kg		78-53-5
4.	Anabasine	100 kg		494-52-0
5.	Arsenic pentoxide, Arsenic (V) acid & salts	500 kg		
6.	Arsenic trioxide, Arsenic (III) acid & salts	100 kg		
7.	Arsine (Arsenic hydride)	10 kg		7784-42-1
8.	Azinphos-ethyl	100 kg		2642-71-9
9.	Azinphos-methyl	100 kg		86-50-0
10.	Benzidine	1 kg		92-87-5
11.	Bezidine salts	1 kg		
12.	Beryllium (powders, compounds)	10 kg		
13.	Bis (2-chloroethyl) sulphide	1 kg		505-60-2
14.	Bis (chloromethyl) ether	1 kg		542-88-1
15.	Carbophuran	100 kg		1563-66-2
16.	Carbophenothion	100 kg		786-19-6
17.	Chlorethion	100 kg		470-90-6
18.	4-(Chloroformyl) morpholine	1 kg		15159-40-7
19.	Chloromethyl methyl ether	1 kg		107-30-2
20.	Cobalt (metal, oxide, carbonates, sulphides, as powders)	1 t		
21.	Crimidine	100 kg		535-89-7
22.	Cynthoate	100 kg		3734-95-0
23.	Cycloheximide	100 kg		66-81-9
24.	Demeton	100 kg		8065-48-3
25.	Dialifos	100 kg		10311-84-9
26.	OO-Diethyl S-ethylsulphinylmethyl phosphorothiate	100 kg		2588-05-8
27.	OO-Diethyl S-ethylsulphonylmethyl phosphorothiate	100 kg		2588-06-9
28.	OO-Diethyl S-ethylthiomethyl Phosphorothioate	100 kg		2600-69-3
29.	OO-Diethyl S-isopropylthiomethyl phosphorothiate	100 kg		78-52-4
30.	OO-Diethyl S-isopropylthiomethyl phosphorodithioate	100 kg		3309-68-0
31.	Dimefox	100 kg.		115-26-4
32.	Dimethylcarbamoyl chloride	1 kg		79-44-7

33.	Dimethylnitrosamine	1 kg		62-75-9
34.	Dimethyl phosphorimidocynicidic acid	1 t		63917-41-9
35.	Diphacinone	100 kg		82-66-6
36.	Disulfoton	100 kg		298-04-4
37.	EPN	100 kg		2104-64-5
38.	Ethion	100 kg		563-12-2
39.	Fensulfothion	100 kg		115-90-2
40.	Fluometil	100 kg		4301-50-2
41.	Fluoroacetic acid	1 kg		144-49-0
42.	Fluoroacetic acid, salts	1 kg		
43.	Fluoroacetic acid, esters	1 kg		
44.	Fluoroacetic acid, amides	1 kg		
45.	4-Fluorobutyric acid	1 kg		462-23-7
46.	4-Fluorobutyric acid, salts	1 kg		
47.	4-Fluorobutyric acid, esters	1 kg		
48.	4-Fluorobutyric acid, amides	1 kg		
49.	4-Fluorobutyric acid	1 kg		37759- -1
50.	4-Fluorocrotonic acid, salts	1 kg		
51.	4-Fluorocrotonic acid, esters	1 kg		
52.	4-Fluorocrotonic acid, amides	1 kg		
53.	4-Fluoro-2-hydroxybutyric acid, amides	1 kg		
54.	4-Fluoro-2-hydroxybutyric acid, salts	1 kg		
55.	4-Fluoro-2-hydroxybutyric acid, esters	1 kg		
56.	4-Fluoro-2-hydroxybutyric acid, amides	1 kg		
57.	Glycolonitrile (Hydroxyacetonitrile)	100 kg		107-16-4
58.	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	100 kg		194-8-74-3
59.	Hexamethylphosphoramide	1 kg		680-31-9
60.	Hydrogen selenide	10 kg		7783-07-5
61.	Isobenzan	100 kg		297-78-9
62.	Isodrin	100 kg.		465-73-6
63.	Juglone (5-Hydroxynaphthalene 1, 4 dione)	100 kg		481-39-0
64.	4,4-Methylenebis (2-chloroniline)	10 kg		101-14-4
65.	Methyl isocyanate	150 kg	150kg	624-83-9
66.	Mevinphos	100 kg		7786-34-7
67.	2-Naphthylamine	1 kg		91-59-8
68.	2-Nickel (metal, oxides, carbonates), sulphides, as powers)	1 t		
69.	Nickel tetracarbonyl	10 kg		13463-39-3
70.	Oxygendisulfoton	100 kg		2497-07-6
71.	Oxygen difluoride	10 kg		7783-41-7
72.	Paraxon (Diethyl 4-nitrophenyl phosphate)	100 kg		311-45-5
73.	Parathion	100 kg		56-38-2
74.	Parathion-methyl	100 kg		298-00-0
75.	Pentaborane	100 kg		19624-22-7
76.	Phorate	100 kg		298-02-2
77.	Phosacetim	100 kg		4104-14-7

78.	Phosgene (carbonyl chloride)	750 kg	750 kg	75-44-5
79.	Phosphamidon	100 kg		13171-21-6
80.	Phosphine (Hydrogen phosphide)	100 kg		7803-51-2
81.	Promurit (1-(3,4 dichlorophenyl)-3-triazenthioiccarboxamide)	100 kg		5836-73-7
82.	1,3-Propanesultone	1 kg		1120-71-4
83.	1-Propen-2-chloro-1,3diol diacetate	10 kg		10118- -6
84.	Pyrazoxon	100 kg		108-34-9
85.	Selenium hexafluoride	10 kg		7783-79-1
86.	Sodium selenite	100 kg		10102-18-8
87.	Stibine (Antimony hydride)	100 kg		7803-52-3
88.	Sulfotep	100 kg		3689-24-5
89.	Sulphur dichloride	1 t		10545-99-0
90.	Tellurium hexafluoride	100 kg		7783-80-4
91.	TEPP	100 kg		107-49-3
92.	2,3,7,8,-Tetrachlorodibenzo-p-dioxin(TCDD)	1 kg		1746-01-6
93.	Tetramethylenedisulphotetramine	1 kg		80-12-6
94.	Thionazin	100 kg		297-97-2
95.	Tirpate (2,4-Dimethyl-1,3-dithiolane-2-carboxaldehyde O-methylcarbamoyloxime)	100 kg		26419-73-8
96.	Trichloromethanesulphonyl chloride	100 kg		594-42-3
97.	1-Tri (cyclohexyl) stannyl 1H-1,2,4-Triazole	100 kg		41083-11-8
98.	Triethylenemelamine	10 kg		51-18-3
99.	Warfarin	100 kg		81-81-2
GROUP -2 TOXIC SUBSTANCES				
100.	Acetone cyanohydrin (2-Cyanopropan-2-ol	200 t		75-86-5
101.	Acrolein (2-Propenal)	20 t	¹ [200t]	107-02-8
102.	Acrylonitrile	20 t	200t	107-13-1
103.	Allyl alcohol (Propen-1-ol)	200 t		107-18-6
104.	Alylamine	200 t		107-11-9
105.	Ammonia	50 t	500t	7664-41-7
106.	Bromine	40 t	¹ [500t]	7 6-95-6
107.	Carbon disulphide	20 t	200t	75-15-0
108.	Chlorine	10 t	25t	7782-50-5
109.	Diphneyl ethane di-isocynate (MDI)	20 t	² [200t]	101-68-8
110.	Ethylene dibromide (1,2-Dibromoethane)	5 t	¹ [200t]	106-93-4
111.	Ethyleneimine	5 t		151-56-4
112.	Formaldehyde (concentration <90%)	5 t	¹ [50t]	50-00-0
113.	Hydrogen chloride (liquified gas)	25 t	250t	7647-01-0
114.	Hydrogen cyanide	5 t	20t	74-90-8
115.	Hydrogen fluoride	5 t	50t	7664-39-3
116.	Hydrogen sulphide	5 t	50t	7783-06-4
117.	Methyl bromide (Bromomethane)	20 t	¹ [200 t]	74-83-9
118.	Nitrogen oxides	50 t		11104-93-1

¹ Inserted by Rule 14 (a to h) of MSIHC (Amendment) Rules, 1994 notified vide notification S.O. 2882 dated 3rd October, 1994

² Inserted by Rule 14 (a to h) of MSIHC (Amendment) Rules, 1994 notified vide notification S.O. 2882 dated 3rd October, 1994

119.	Propyleneimine	50 t		75-55-8
120.	Sulphur dioxide	20 t	250t	7446-09-5
121.	Sulphur trioxide	15 t	75t	7446-11-9
122.	Tetraethyl lead	5 t		78-00-2
123.	Tetra methyl lead	5 t	¹ [200t]	75-74-1
124.	Toluene di-isocyanate (TDI)	10 t	¹ [100t]	584-84-9
GROUP 3-HIGHLY REACTIVE SUBSTANCES				
125.	Acetylene (ethyne)	5 t		74-86-2
126.	a. Ammonium nitrate (1)	350 t	2500 t	6484-52-2
	b. Ammonium nitrate in form of fertilizer (2)	1250 t		
127.	2,2 Bis (tert-butylperoxy) butane) (concentration ≥ 70%)	5 t		2167-23-9
128.	1, 1-Bis(tert-butylperoxy) cyclohexane (concentration ≥ 80%)	5 t		3006-86-8
129.	tert-Butyl peroxyacetate (concentration ≥ 70%)	5 t		107-71-1
130.	tert-Butyl peroxy isobutyrate (concentration > 80%)	5 t		109-13-7
131.	Tert-Butyl peroxy isopropyl carbonate (concentration > 80%)	5 t		23 -21-6
132.	Tert-Butyl peroxyacetate (concentration > 80%)	5 t		1931-62-0
133.	Tert-Butyl peroxyisobutyrate (concentration > 77%)	50 t		927-07-1
134.	Dibenzyl peroxydicarbonate (concentration > 90%)	5 t		2144-45-8
135.	Di-sec-butyl peroxydicarbonate (concentration > 80%)	5 t		19910-65-7
136.	Diethyl peroxydicarbonate (concentration > 30%)	50 t		14666-78-5
137.	2,2-dihydroperoxypropane (concentration > 30%)	5 t		2614-76-08
138.	di-isobutyl peroxide (concentration > 50%)	50 t		3437-84-1
139.	Di-n-propyl peroxydicarbonate (concentration > 80%)	5 t		16066-38-9
140.	Ethylene oxide	5 t	50t	75-21-8
141.	Ethyl nitrate	50 t		625-58-1
142.	3,3,6,6,9,9 Hexamethyl - 1,2,4 5-tert oxacyclononane (concentration > 75%)	50 t		22397-33-7
143.	Hydrogen	2 t	50 t	1333-74-0
144.	Liquid Oxygen	200 t	¹ [2000t]	7782-41-7
145.	Methyl ethyl ketone peroxide (concentration > 60%)	5 t		1338-23-4
146.	Methyl isobutyl ketone peroxide (concentration > 60%)	50 t		3 06-20-5
147.	Peracetic acid (concentration > 60%)	50 t		79-21-0
148.	Propylene oxide	5 t	¹ [50t]	75-56-9
149.	Sodium chlorate	25 t		7775-09-9
GROUP 4-EXPLOSIVE SUBSTANCES				
150.	Barium azide	² [100] kg		18810-58-7

¹ Inserted by Rule 14 (a to h) of MSIHC (Amendment) Rules, 1994 notified vide notification S.O. 2882 dated 3rd October, 1994

² Substituted entries by 11(i) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19th January, 2000

151.	Bis(2,4,6 -trinitrophenyl) amine	50 t		131-073-7
152.	Chlorotrinitro benzene	50 t		28260-61-9
153.	Cellulose nitrate(containing 12.6% Nitrogen)	50 t		9004-70-0
154.	Cyclotetramethyleneteranitramine	50 t		2691-41-0
155.	Cyclotrimethylenetiraniramine	50 t		121-82-1
156.	Diazodinitrophenol	10 t		7008-81-3
157.	Diethylene glycol dinitrate	10 t		693-21-0
158.	Dinitrophenol, salts	50 t		
159.	Enthylene glycol dinitrate	10 t		628-96-6
160.	1-Gyanyl-4-nitrosaminoguanyl-1-tetrazene	¹ [100 kg]		109-27-3
161.	2, 2, 4, 4, 6, 6, -Hexanitrositibene	50 t		20062-22-0
162.	Hydrazine nitrate	50 t		13464-97-6
163.	Lead azide	¹ [100 kg]		13424-46-9
164.	Lead Styphnate (Lead 2,4,6-trinitroresorcinoxide)	¹ [100 kg]		15245-44-0
165.	Mercury fulminate	¹ [100 kg]		20820-45-5
				628-86-4
166.	N-Methyl-N,2,4,6-tetranitroaniline	50 t		497-45-8
167.	Nitroglycerine	10 t	10t	55-63-0
168.	Pentacrythritol tetra nitrate	50 t		78-11-5
169.	Picric acid, (2,3,6-Trinitrophenol)	50 t		88-89-1
170.	Sodium picramate	50 t		831-52-7
171.	Styphnic acid (2,4,6-Trinitroresorcinol)	50 t		82-71-3
172.	1,3,5-Triamino-2,4,6-Trinitrobenzene	50 t		3058-38-6
173.	Trinitroaniline-	50 t		26952-42-1
174.	2,4,6-Trinitroanisole	50 t		606-35-9
175.	Trinitrobenze	50 t		25377-32-6
176.	Trinitrobenzoic acid	50 t		35860-50-5
				126-66-8
177.	Trinitrocresol	50 t		28905-71-7
178.	2,4,6-Trinitrophenitole	50 t		4732-14-3
179.	2,4,6-Trinitrotoluene	50 t	50 t	118-96-7

¹ Substituted entries by 11(i) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19th January, 2000

¹[PART II**Classes of Substances as Defined in Part I, Schedule-1 and not specifically named in Part I of this Schedule**

1	2	3	4
GROUP 5 - Flammable substances			
1.	Flammable Gases	15 T	200 T
2.	Extremely flammable liquids	1000 T	5000 T
3.	Very Highly flammable liquids	1500 T	10000 T
4.	Highly Flammable liquids which remains liquid under pressure	25 T	200 T
5.	Highly Flammable liquids	2500 T	20000 T
6.	Flammable liquids	5000 T	50000 T]

(1) This applies to ammonium nitrate and mixtures of ammonium nitrate and mixtures of ammonium nitrate where the nitrogen content derived from the ammonium nitrate is greater than 28% by weight and aqueous solutions of ammonium nitrate where the concentration of ammonium nitrate is greater than 90% by weight.

(2) This applied to straight ammonium nitrate fertilizers and to compound fertilizers where the nitrogen content derived from the ammonium nitrate is greater than 28% by weight (a compound fertilizer contains ammonium nitrate together with phosphate and/or potash).

SCHEDULE 4

[See Rule 2(h)(i)]

1. Installation for the production, processing or treatment of organic or inorganic chemicals using for this purpose, among others:
 - (a) alkylation
 - (b) Amination by ammonolysis
 - (c) carbonylation
 - (d) condensation
 - (e) dehydrogenation
 - (f) esterification
 - (g) halogenation and manufacture of halogens
 - (h) hydrogenation
 - (i) hydrolysis
 - (j) Oxidation
 - (k) Polymerziation
 - (l) Sulphonation
 - (m) desulphurization, manufacture and transformation of sulphur-containing compounds
 - (n) nitration and manufacture of nitrogen-containing compounds
 - (o) manufacture of phosphorous-containing compounds

¹ Substituted entries by 11(ii) of the MSIHC (Amendment) Rules, 2000 notified by S.O.57(E), dated 19th January, 2000

- (p) formulation of pesticides and of pharmaceutical products
 - (q) distillation
 - (r) extraction
 - (s) solvation
 - (t) mixing
2. Installation for distillation, refining or other processing of petroleum or petroleum products.
 3. Installations for the total or partial disposal of solid or liquid substances by incineration or chemical decomposition.
 4. Installations for production, processing, 1[use] or treatment of energy gases, for example, LPG, LNG, SNG.
 5. Installations for the dry distillation of coal or lignite.
 6. Installations for the production of metals or non-metals by a wet process or by means of electrical energy.

SCHEDULE 5

(See Rules 2(b) and 3]

S. No.	Authority(ies) with legal backing	Duties and corresponding Rule
(1)	(2)	(3)
1.	Ministry of Environment and Forests under Environment (Protection) Act, 1986.	1. Notification of hazardous chemicals as per Rules 2(e)(i), 2(e) (ii) & 2(e) (iii).
2.	Chief Controller of Imports & Exports under Import & Exports (Control) Act, 1947.	Import of hazardous chemicals as per Rule 18.
3.	Central Pollution Control Board or ² [State Pollution Control Board or Committee] under Environment (Protection) Act, 1986 as the case may be.	(1) Enforcement of directions and procedures in respect of isolated storage of hazardous chemicals, regarding - (i) Notification of major accidents as per Rules 5(1) and 5(2) (ii) Notification of sites as per Rules 7 to 9. (iii) Safety reports in respect of isolated storages as per Rule 10 to 12. (iv) Preparation of on-site emergency plans as per Rule 13. (2) Import of hazardous Chemicals and enforcement of directions and procedures on import of hazardous chemicals as per Rule 18.
4.	Chief Inspector of Factories appointed under the Factories Act, 1948.	Enforcement of directions and procedures in respect of industrial installations and isolated storages covered under the Factories Act, 1948, dealing with hazardous chemicals and pipelines including inter-state pipelines regarding-

¹ Inserted by Rule 12 of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

² Subs by Rule 13(i) of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

		(i) Notification of major accidents as per Rule 5(1) and 5(2).
		(ii) Notification of sites as per Rules, 7 to 9.
		(iii) Safety reports as per Rules, 10 to 12.
		(iv) Preparation of on-site emergency plans as per Rule 13.
		(v) Preparation of off-site emergency plans in consultation with District Collector or District Emergency Authority as per S. No. 9 of this schedule.
5.	Chief Inspector of Dock Safety appointed under the Dock Workers (Safety, Health and Welfare) Act, 1986.	Enforcement of directions and procedures in respect of industrial installations and isolated storages dealing with hazardous chemicals and pipelines ¹ [inside a port {covered under the Dock Workers (Safety, Health and Welfare) Act, 1986}] regarding -
		(i) Notification of major accidents as per Rules 5(1) and 5(2).
		(ii) Notification of sites as per Rules 7 to 9.
		(iii) Safety reports as per Rules 10 to 12.
		(iv) Preparation of on-site emergency plans as per Rule 13.
		(v) Preparation of off-site emergency plans in consultation with District Collector or District Emergency Authority as per S. No.9 of this Schedule.
6.	Chief Inspector of Mines appointed under the Mines Act, 1952	Enforcement of directions and procedures in respect of industrial installations and isolated storages dealing with hazardous chemicals ² [***] regarding -
		(i) Notification of major accidents as per Rules 5(1) and 5(2).
		(ii) Notification of sites as per Rules 7 to 9.
		(iii) Safety reports as per Rules 10 to 12.
		(iv) Preparation of on-site emergency plans as per Rule 13.
		(v) Preparation of off-site emergency plans in consultation with District Collector or District Emergency Authority as per S. No.9 of this Schedule.
7.	Atomic Energy Regulatory Board appointed under the Atomic Energy Act, 1972.	³ [Enforcement of directions and procedures regarding :-
		(a) Notification of major accidents as per rule 5(1) and 5(2)
		(b) Approval and Notification of Sites as per rule 7;

¹ Substituted by Rule 13(ii) of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

² Omitted by Rule 13(iii), *ibid*;

³ Substituted by Rule 13(iv), *ibid*.

		(c) Safety report and safety audit reports as per rule 10 to 12;
		(d) acceptance of On-site Emergency plans as per rule 13;
		(e) assisting the District Collector in the preparation of Off-Site emergency plans as per serial number 9 of this Schedule]
8.	Chief Controller of Explosives appointed under the Indian Explosive Act and Rules, 1983.	Enforcement of directions and procedures as per the provisions of the Indian Explosives Act, and Rules, 1983.
		¹ [(i) The Explosives Act, 1884(4 of 1884) and the rules made there under, namely] :-
		(a) The Gas Cylinders Rules, 1981;
		(b) The Static and Mobile Pressure Vessel (Unified) Rules, 1981;
		(c) The Explosive Rules, 1984
		(ii) The petroleum Act, 1934 (30 of 1934) and the Rules made there under, namely;
		(a) The Petroleum Rules, 1976;
		(b) The Calcium Carbide Rules, 1987;
		² [and in respect of Industrial installation and isolated storages dealing with hazardous chemicals and pipelines including inter-state pipelines regarding :-
		(a) Notification of major accident as per rule 5;
		(b) Approval and notification of Sites as per rule 7;
		(c) Safety report and safety audit reports as per rules 10 to 12;
		(d) acceptance of On-site Emergency plans as per rule 13;
		(e) Assisting the District Collector in the preparation of Off-Site emergency plans as per serial number 9 of this Schedule.]
9.	District Collector or District Emergency Authority designated by the State Government.	Preparation of off-site emergency plans as per Rule 14.
³ [10.	⁴ {Centre for Environment and Explosive Safety (CEES)}, Defense Research and Development of Organisation (DRDO). Department of defence Research & Development, Ministry of Defence.	Enforcement of directions and procedures in respect of laboratories, industrial establishment and isolated storages dealing with hazardous chemicals in the Ministry of Defence].

¹ Substituted by Rule 15 of the MSIHC (Amendment) Rules, 1994, notified vide S.O.2882, dated 3rd October, 1994

² Inserted by Rule 13 (v) of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

³ Inserted by G.S.R.584(E), dated 9th June, 1990

⁴ Substituted by Rule 13(ii) of the MSIHC (Amendment) Rules, 2000 notified vide S.O.57(E), dated 19th January, 2000

SCHEDULE 6

[See rule 5(1)]

INFORMATION TO BE FURNISHED REGARDING NOTIFICATION OF A MAJOR ACCIDENT

Report number.....
of the particular accident.

1. General data :

(a) Name of the site

(b) Name and address of the manufacturer

(Also state telephone/telex number)

(c)(i) Registration number

(ii) Licence number

(As may have been allotted under any status applicable to the site, e.g., the Factories Act)

(d)(i) Nature of industrial activity
(Mention what is actually manufactured, stored etc.)

(ii) National Industrial Classification, 1987 at the four-digit level.

2. Type of major accident:

Explosion

Fire

Emission of
dangerous
substance

Substance(s) Emitted

3. Description of the major accident

(a) Date, shift and hour of the accident

(b) Department/Section and exact place where the accident took place

(c) The process/operation undertaken in the Department/section where the accident took place

(Attach a flow chart if necessary)

(d) The circumstances of the accident and the dangerous substance involved

4. Emergency Measures taken and measures envisaged to be taken to alleviate short term effects of the accident.**5. Causes of the major accident.**

Known (to be specified)	
Not Known	
Information will be supplied as soon as possible	
6. Nature and extent of damage	
(a) Within the establishment - casualties	Killed Injured Poisoned
Persons exposed to the major accident	
material damaged	
danger is still present	
danger no longer exists.	
(b) Outside the establishment-casualties	Killed Injured Poisoned
Persons exposed to the major accident	
material damaged	
damage to environment	
the danger is still present	
the danger no longer exists	
7. Data available for assessing the effects of the accident on persons and environment.	
8. Steps already taken or envisaged -	
(a) to alleviate medium or long term effects of the accident	
(b) to prevent recurrence of similar major accident	
(c) Any other relevant information	

SCHEDULE 7

[See Rule 7(1)]

INFORMATION TO BE FURNISHED FOR THE NOTIFICATION OF SITES**PART I**

Particulars to be included in a notification of a site:

1. The name and address of the employer making the notification.
2. The full postal address of the site where the notifiable industrial activity will be carried on.
3. The area of the site covered by the notification and of any adjacent site which is required to be taken into account by virtue of b(ii) of schedule 2 and 3.
4. The date on which it is anticipated that the notifiable industrial activity will commence, or if it has already commenced a statement to that effect.
5. The name and maximum quantity liable to be on the site of each dangerous substance for which notification is being made.
6. Organisation structure, namely, organisation diagram for the proposed industrial activity and set up for ensuring safety and health.
7. Information relating to the potential for major accidents, namely-
 - (a) identification of major accident hazards;
 - (b) the conditions or events which could be significant in bringing one about;
 - (c) a brief description of the measures taken.
8. Information relating to the site, namely-
 - (a) a map of the site and its surrounding area to a scale large enough to show any features that may be significant in the assessment of the hazard or risk associated with the site, -
 - (i) area likely to be affected by the major accident.
 - (ii) Population distribution in the vicinity.
 - (b) a scale plan of the site showing the location and quantities of all significant inventories of the hazardous chemicals;
 - (c) a description of the process or storage involving the hazardous chemicals and an indication of the conditions under which it is normally held;
 - (d) the maximum number of persons likely to be present on site.
9. The arrangement for training of workers and equipment necessary to ensure safety of such workers.

PART II

Particulars to be included regarding pipeline-

1. The names and address of the persons making the notification.
2. The full postal address of the place from which the pipeline activity is controlled, addresses of the places where the pipeline starts and finishes and a map showing the pipeline route drawn to a scale of not less than 1:400000.
3. The date on which it is anticipated that the notifiable activity will commence, or if it is already commenced a statement to that effect.

4. The total length of the pipeline, its diameter and normal operating pressure and the name and maximum quantity liable to be in the pipeline of each hazardous chemical for which notification is being made.

SCHEDULE 8

[See Rule 10(1)]

INFORMATION TO BE FURNISHED IN A SAFETY REPORT

1. The name and address of the person furnishing the information.
2. Description of the industrial activity, namely-
 - (a) site,
 - (b) construction design,
 - (c) protection zones explosion protection, separation distances,
 - (d) accessibility of plant,
 - (e) maximum number of persons working on the site and particularly of those persons exposed to be hazard.
3. Description of the processes, namely -
 - (a) technical purpose of the industrial activity,
 - (b) basic principles of the technological process,
 - (c) process and safety-related data for the individual process stages,
 - (d) process description,
 - (e) Safety-related types of utilities.
4. Description of the hazardous chemicals, namely -
 - (a) chemicals (quantities, substance data, safety-related data, toxicological data and threshold values),
 - (b) the form in which the chemical may occur on or into which they may be transformed in the event of abnormal conditions,
 - (c) the degree of purity of the hazardous chemical.
5. Information on the preliminary hazard analysis, namely-
 - (a) types of accident
 - (b) system elements or events that can lead to a major accident,
 - (c) hazards,
 - (d) safety-relevant components.
6. Description of safety -relevant units, among others;
 - (a) special design criteria,
 - (b) controls and alarms,
 - (c) special relief systems,
 - (d) quick-acting valves,

- (e) collecting tanks/dump tank,
 - (f) sprinkler system,
 - (g) firefighting etc.
7. Information on the hazards assessment, namely-
- (a) identification of hazards,
 - (b) the causes of major accidents,
 - (c) assessment of hazards according to their occurrence frequency,
 - (d) assessment of accident consequences,
 - (e) safety systems,
 - (f) known accident history.
8. Description of information or organisational systems used to carry on the industrial activity safety, namely-
- (a) maintenance and inspection schedules,
 - (b) guidelines for the training of personnel,
 - (c) allocation and delegation of responsibility for plant safety,
 - (d) implementation of safety procedure.
9. Information on assessment of the consequences of major accidents, namely-
- (a) assessment of the possible release of hazardous chemicals or of energy,
 - (b) possible dispersion of released chemical,
 - (c) assessment of the effects of the releases (size of the affected area, health effects, property damage)
10. Information on the mitigation of major accidents, namely -
- (a) fire brigade,
 - (b) alarm systems,
 - (c) emergency plan containing system of organisation used to fight the emergency, the alarm and the communication routes guidelines for fighting the emergency, information about hazardous chemicals, examples of possible accident sequences,
 - (d) co-ordination with the District Emergency Authority and its off-site emergency plan,
 - (e) notification of the nature and scope of the hazard in the event of an accident,
 - (f) antidotes in the event of a release of a hazardous chemical.

SCHEDULE 9

(See Rule 17)

SAFETY DATA SHEET**1. CHEMICAL IDENTITY**

Chemical Name		Chemical Classification	
Synonyms		Trade Name	
Formula		C.A.S. No	U.N. No. :
Regulated Identification	Shipping Name Codes/Labels		Hazchem No. :
	Hazardous Waste I. D. No.:		
Hazardous Ingredients	C.A.S. No.	Hazardous Ingredients	C.A.S. No.:
1.		3.	
2.		4.	

2. PHYSICAL AND CHEMICAL DATA

Boiling Range/Point °C	Physical State	Appearance
Melting/Freezing Point °C	Vapour Pressure @ 35 °C mm/Hg	Odour
Vapour Density (Air =1)	Solubility in water @ 35 °C Others	
Specific Gravity (Water =1)	pH	

3. FIRE AND EXPLOSION HAZARD DATA

Flammability	Yes/No	LEL	% Flash Point °C	Autoignition °C Temperature
TDG Flammability		UEL	% Flash Point °C	Hazardous Combustion Products
Explosion Sensitivity to Impact			Explosion Sensitivity to State Electricity	
Hazardous Polymerization				
Combustible Liquid		Explosive Material	Corrosive Material	
Flammable Material		Oxidizer	Others	
Pyrophoric Material		Organic Peroxide		

4. REACTIVITY DATA

Chemical Stability
Incompatibility with other Material

Reactivity
Hazardous Reaction
Products

5. HEALTH HAZARD DATA

Routes of Entry					
Effects of Exposure/Symptoms					
Emergency Treatment					
TLV(ACGIH)	ppm	mg/m ³	STEL	ppm	mg/m ³
Permissible Exposure Limits	ppm	mg/m ³	Odour Threshold	ppm	mg/m ³
LD ₅₀			LD ₅₀		
NEPA Hazard Signals		Health	Flammability	Stability	Special

6. PREVENTIVE MEASURES

Personnel Protective Equipment
Handling and Storage Precautions

7. EMERGENCY AND FIRST AID MEASURE

FIRE	Fire Extinguishing Media
FIRE	Special Procedures
	Unusual Hazards
EXPOSURE	First Aid Measures
	Antidotes/Dosages
SPILLS	Steps to be taken
	Waste Disposal Method

8. ADDITIONAL INFORMATION/REFERENCES

9. MANUFACTURER/SUPPLIER DATA

Name of Firm	Contact Person in Emergency
Mailing Address	Local Bodies Involved
Telephone/Telex Nos.	Standard Packing

Telegraphic Address	Tremcard
	Details/Ref.
	Other.

10. DISCLAIMER

Information contained in this material data sheet is believed to be reliable but no representation, guarantee or warranties of any kind are made as to its accuracy, suitability for a particular application or results to be obtained from them. It is upto the manufacturer/seller to ensure that the information contained in the material safety data sheet is relevant to the product manufactured/handled or sold by him, as the case may be. The Government makes no warranties expressed or implied in respect of the adequacy of this document for any particular purpose.

SCHEDULE 10

[See Rule 18(5)]

(Format for maintaining records of hazardous chemicals imported)

1. Name and address of the Importer:
2. Date and reference number of issuance of permission to import hazardous chemicals:
3. Description of hazardous chemicals:
 - (a) Physical form:
 - (b) Chemical form:
 - (c) Total volume and weight (in kilogram's/Tones)
4. Description of purpose of Import:
5. Description of storage of hazardous chemicals:
 - (a) Date:
 - (b) Method of storage:

¹[SCHEDULE 11]

[See Rule 13(1)]

Details to be furnished in the on-site Emergency Plan

1. Name and address of the person furnishing the information.
2. Key personnel of the organization and responsibilities assigned to them in case of an emergency.
3. Outside organisations if involved in assisting during on-site emergency.
 - (a) Type of accidents
 - (b) Responsibility assigned

¹ Inserted by Rule 16 of the MSIHC (Amendment) Rules, 1994 notified by S.O.2882, dated 3.10.1994.

4. Details of liaison arrangement between the organizations.
5. Information on the preliminary hazard analysis:
 - (a) Type of accidents
 - (b) System elements or events that can lead to a major accident
 - (c) Hazards
 - (d) Safety relevant components
6. Details about the site:
 - (a) Location of dangerous substances
 - (b) Seat of key personnel
 - (c) Emergency control room
7. Description of hazardous chemicals at plant site:
 - (a) Chemicals (Quantities and toxicological data)
 - (b) Transformation if any, which could occur.
 - (c) Purity of hazardous chemicals.
8. Likely dangers to the plant.
9. Enumerate effects of:
 - (i) Stress and strain caused during normal operation;
 - (ii) Fire and explosion inside the plant and effect, if any, of fire and explosion outside.
10. Details regarding:
 - (i) Warning, alarm and safety and security systems.
 - (ii) alarm and hazard control plans in line with disaster control and hazard-control planning, ensuring the necessary technical and organizational precautions;
 - (iii) Reliable measuring instruments, control units and servicing of such equipments.
 - (iv) Precautions in designing of the foundation and load bearing parts of the building.
 - (v) Continuous surveillance of operations.
 - (vi) maintenance and repair work according to the generally recognised rules of goods engineering practices.
11. Details of communication facilities available during emergency and those required for an off-site emergency.
12. Details of fire fighting and other facilities available and those required for an off-site emergency.
13. Details of first aid and hospital services available and its adequacy.

¹[SCHEDULE 12

[See Rule 14(1)]

Details to be furnished in the off-site Emergency Plan

1. The types of accidents and release to be taken into account.
2. Organisations involved including key personnel and responsibilities and liaison arrangements between them.
3. Information about the site including likely locations of dangerous substances, personnel and emergency control rooms.
4. Technical information such as chemical and physical characteristics and dangers of the substances and plant.
5. Identify the facilities and transport routes.
6. Contact for further advice e.g. meteorological information, transport, temporary food and accommodation, first aid and hospital services, water and agricultural authorities.
7. Communication links including telephones, radios and stand by methods.
8. Special equipment including fire-fighting materials, damage control and repair items.
9. Details of emergency-response procedures.
10. Notify the public.
11. Evacuation arrangements.
12. Arrangements for dealing with the press and other media interests.
13. Longer term clean-up.]

Note: Principal rules were published in Gazette of India vide Notification S.O. 966(E), dated 27.11.1989. Amending rules were published vide GSR No.681, dated 9.6.1990, S.O.115 (E), dated 5.2.1990, S.O.2882, dated 3.10.1994 and S.O.57 (E), dated 19.1.2000.

¹ Ins. by Rule 16 of the MSIHC (Amendment) Rules, 1994 notified by SO. 2882, dated 3.10.1994.

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EXECUTIVE SUMMARY

1. THE INCIDENT

1.1 In the evening shift of October 29, 2009, the Indian Oil Corporation's POL (Petroleum Oil Lubricants) Terminal at Sanganer in Jaipur was preparing to transfer Kerosine (SKO) and Motor Spirit (MS) to the neighbouring BPCL Terminal, a routine operation for these Installations. A crew of four (one shift officer and three operators) were manning the IOC Installation. Kerosine was "lined up" (pipeline made through) first and thereafter the operating crew proceeded to prepare the MS tank (tank 401-A) for pumping to BPCL installation.

1.2 In the process of lining up the MS tank, at about 6.10 PM, a huge leak of the product took place as a jet of liquid from the "Hammer Blind Valve" on the delivery line of the tank leading to the MS pump.

1.3 This liquid MS which rapidly generated vapours, soon overwhelmed and incapacitated the operator carrying out the "line up" operation. The shift officer, who was nearby, tried to help the operator, but he too was affected by the vapours and liquid, and had to be removed to hospital in a semi-conscious state. The 2nd operator, who was incidentally in the canteen at the time, also rushed to the spot, but he was also completely overpowered by the strong MS vapours and liquid and could not be rescued. The 3rd operator on the shift, who was supposed to be on site, had earlier left for home on some personal work and was thus not available to initiate any rescue or mitigating steps.

- 1.4** With none of the operating crew being available any more for initiating any control actions, the leak continued unabated, and by the time the senior staff and civil authorities could reach the site, had already engulfed almost the entire installation, making their entry not only difficult but also dangerous.
- 1.5** After about an hour and 15 minutes of the leak having started, there was a a massive explosion followed by a huge fireball covering the entire installation. It is estimated that in this one hour and 15 or 20 minutes of uncontrolled leak, about 1000 tons of MS could have escaped out, which would have generated enough vapour to cause an explosion with the equivalence of 20 tons of TNT.
- 1.6** The source of ignition, which triggered the explosion and fire could have been from one of the non flame proof electrical equipment in the Administrative Block, or from a vehicle being started in the installation.
- 1.7** The fire which followed the explosion soon spread to all other tanks and continued to rage for about 11 days. The management of IOCL had taken a considered decision to allow the petroleum products to burn out to avoid further possibilities of accident in the installation in the interest of public safety.
- 1.8** Ultimately the entire, about 60,000 KL of petroleum products stored in the Terminal (equivalent of about 1000-1200 retail outlets) at the time of the accident was consumed in the fire, and the installation was totally destroyed. Buildings in the immediate neighbourhood were heavily damaged with minor damages and window panes breakages occurring up to around 2 Km from the site.

The total loss estimated on account of the fire and explosion as reported by IOC in the Press, which includes the loss for finished products, stores, fixed assets and compensation for third party losses, amount to approx., Rs. 280 crores.

1.9 Eleven people lost their lives in the accident – six from IOC and five outsiders, and several others were injured.

1.10 The Ministry of Petroleum & Natural Gas (MoP&NG) immediately thereafter i.e. on 30.9.2009 constituted a seven member Independent Inquiry Committee to inquire into the incident.

IMMEDIATE CAUSES

1.11 The immediate cause of the accident was the **non-observance of normal safe procedure** involving sequence of valve operation in the line up activity and an engineering design which permitted use of a “Hammer Blind Valve”, a device which is used for positively isolating a pipeline. The design of the Hammer Blind valve allows a large area at the top of the valve (at the valve bonnet) to be completely open every time the valve position needed to be changed. It was through this open area that the liquid MS had gushed out, when the tank was being lined up (made ready for pumping to BPCL) because another valve connecting to the tank was also open when the Hammer Blind was in the changeover position

ROOT CAUSE

1.12 The basic or root causes were an absence of site specific written operating procedures, absence of leak stopping devices from a remote location (the facility for remote closing of the “Motor Operated Valve”

connecting to the tank side, which could have stopped the leak) and insufficient understanding of hazards and risks and consequences.

CRITICAL FACTORS

1.13 The critical factors which resulted in the Catastrophic Accident are:

- Loss of primary containment of Motor Spirit (Petrol)
- Loss of secondary containment
- Incapacitated Operating Personnel
- Inadequate mitigation measures
- Shortcomings in design and engineering specifications of facilities and equipment
- Absence of Operating Personnel from site and also from vital operational area

RESPONSE

1.14 Information about the leak and the hazard was conveyed by the Security staff on site to the Terminal senior management staff and others. The state and local civil authorities were alerted by IOC state level officers and within about 30-45 minutes almost all personnel and agencies in the city and around had come to the site. However, the sheer enormity of the unconfined vapour cloud which had by then spread till the gate of the installation, made the affected area unapproachable. Non-availability of a Self Contained Breathing Apparatus (SCBA) and Fire Suit immediately, left the entire response team as mere helpless spectators in preventing the incident.

However, the civic authorities took commendable steps in evacuating the injured and ensuring immediate medical attention and in redirecting

and controlling traffic and cordoning off areas thereby minimizing damages outside the Installation.

RECOMMENDATIONS:

1.15 Immediate measures have been recommended keeping in view that there are a large number of Installations and Terminals existing in the country where improvements in technical and operational measures can ensure safety and emergency preparedness. Such measures include the ensuring of safety back up systems, modifications to make human error less likely, making emergency action possible from remote locations ensuring availability and observance of site specific operating procedures, improving operating discipline, communication facilities and ensuring availability and knowledge regarding the use of Personal Protective Equipment (PPE). Manning levels have also been recommended for a review. Other recommendations include enhancing automation levels, and other measures like design features such as dual level gauges and alarms to avoid possibility of a tank overflow, (which can create a similar hazard), installation of Hydrocarbon detectors, and CCTV with alarm feature. An important requirement is that for large sized installations and especially those in highly congested areas, a quantitative risk assessment exercise should be undertaken and based on the risk assessment, mitigation measures to reduce the risk should be initiated.

1.16 Long term measures for planned implementation deal with the technical and operational issues for phased implementation and also wider issues at the managerial and industry level which can be considered.

1.17 Major areas of recommendations in this category are:

- a) Improving the design and layout for preventing loss of hydrocarbon containment and providing better monitoring of Terminal operations.
- b) New terminal and installation should incorporate the state of the art technology for terminal automation which can improve reliability and safety of operation and reduce the chance of human error
- c) Standardisation of the Marketing Terminal covering all aspects including design, marketing and operations on the lines of standards developed for LPG OISD:STD 144.
- d) Augmenting fire fighting capabilities/automation and developing joint facilities of all Oil Marketing Companies wherever they are present in close proximity.
- e) Improving human factor through better training, performance evaluation criteria and safety oriented corporate policies.
- f) The Committee recommends the setting up of a dedicated group for Terminal operations as a separate joint venture or subsidiary organisation.
- g) Strengthening the Safety function in the Corporation by professionalizing its cadre and making it directly report to the senior most executive (the CEO of the company) and for the Marketing and Pipeline functions, making Safety independent and autonomous of the functions (similar to the Vigilance and Internal Audit functions).

- h) Strengthening the internal safety auditing functions by making it cross-functional and providing professional safety auditing training.
- i) The recommendations also discussed the siting criteria and recommend that a quantitative risk analysis should be carried out for this purpose..
- j) The Committee has also suggested legislation for preventing damage to life and property outside the boundary of such installations regarding appropriate land use surrounding such installations and the role of local and state governments in such matters.
- k) The Committee also suggested for reviewing of all Major Accident Hazard Installations as defined under Manufacture, Storage and Import of Hazardous Chemicals Rules 1989 from security threat perceptions point of view.
- l) As an illustration the report also indicates that if a leak such as this can be arrested within eight minutes, the impact zone would be about 200 meters from the point of ignition of any vapour cloud. Any delay in arresting the leak would increase the radius of the impact zone.
- m) Safety considerations in siting of major installations and facility may also require amendments to the existing Petroleum Rules 2002 to empower the Government for ensuring a buffer safety zone around High Hazard Petroleum Installations.

OVERALL LESSONS LEARNT

1.18 Based on the Jaipur incident a few lessons learnt are highlighted:

- a) Facilities and installations with inherently high hazards should incorporate redundancy in safety systems and ensure their upkeep at all times.
- b) Management should ensure that reliable systems are in place to give timely feedback on the current practices and state of readiness in different facilities.
- c) Management must ensure that identified actions are being carried out.
- d) A high priority on safety from the senior and top management groups will send the right signals down the line to ensure safety and production.
- e) High degree of operational competence should be maintained at all times by building on the combined knowledge and experience of all the professional groups. The lessons learnt from all major incidents should be shared and widely disseminated in the entire Industry preferably through an appropriate website..

CONCLUSION

1.19 Jaipur incident was first of its kind in India and the third one reported globally. Loss of containment in terms of time and quantity was never considered a “Credible Event” and accordingly not taken into account in “Hazard Identification”. HAZOP as well as Risk

Assessment for Petroleum Instalaltions. Notwithstanding this the incident would not have been occurred if the basic procedures of operating Hammer Blind valve before opening tank body valve (MOV) were followed. Further even after the leak started the “Accident” could have been managed if Safety Measures provided in the Control Room were not made and kept defunct. The lack of back up for emergency shut down from control room and absence of company official in the control room and lack of any “Emergency Response for long period (75 minutes or so)” allowed leakage to go uncontrolled resulting in the Massive Vapour Cloud Explosion.

CHAPTER-1

INTRODUCTION

A devastating fire/explosion accident occurred on 29.10.2009 at about 7.30 pm in the POL installation of M/S Indian Oil Corporation at Sitapura (Sanganer), Jaipur, Rajasthan killing 11 persons and injuring 45. The product loss of around 60,000 KL has been reported. In this accident the entire installation was totally destroyed and buildings in the immediate neighborhood were also heavily damaged.

This accident occurred while officials of M/S IOCL were preparing for Pipeline Transfer (PLT) operations for transferring Motor Spirit (MS) and Superior Kerosene Oil (SKO) from their tanks to the tanks of nearby installation of M/S Bharat Petroleum Corporation Ltd (BPCL). During the PLT operations there was leakage of MS from a valve in the outlet line of MS tank of IOCL which continued uncontrolled for about 75 minutes. This massive loss of containment of MS resulted generation of colossal quantities of petroleum vapours forming a vapour cloud which covered the entire installation. This vapour cloud found a source of ignition and a devastation blast occurred. The blast which completely destroyed the facilities and building within the Terminal resulted in 9 of the 11 tanks catching fire in immediate succession, which also spread subsequently to other two product tanks.

Fire tenders from various organisations like ONGC, IOC Mathura Refinery, IOCL Panipat Refinery and local fire brigades rushed to the site and were in position within hour but no fire fighting action was initiated since a decision was taken by the IOC Management to allow the fire to burn till such time the products get completely burnt out. The last tank fire extinguished itself after 11 days on 10.11.09.

The blast also caused extensive damage to the buildings, structures and to some of the neighbouring industries. The effect of the blast extended to almost 2 Km from the terminal which resulted in devastating immediate adjacent other factory buildings and in glass panes shattering and some other incidental damage to buildings in this area.

The incident caused the death of 11 people, out of which 6 were company personnel (includes one contractor's personnel) and the other 5 were from neighbouring industry/factories.

The Ministry of Petroleum and Natural Gas (MoPNG) immediately thereafter i.e. on 30.9.2009 constituted an Independent Inquiry Committee to inquire into the incident.

Terms of reference of the Committee are:

To inquire into the incident of fire at POL Terminal of IOCL at Sanganer, Jaipur and to arrive at the causes of the incident and suggest the remedial measures to prevent recurrence of such incidents; and

The Committee is to submit its report within 60 days from the date of its constitution.

The Committee consists of the following:

1. Shri M B Lal, Ex C&MD, HPCL - Chairman
2. Dr. Govind Sharma, Principal Secy. Deptt. Of Mines and Minerals, Govt. of Raj. – Member
3. Sh. M K Joshi, Director (Technical), EIL – Member
4. Sh. J.B. Verma, Executive Dir, OISD – Member

5. Sh. P.B. Yedla, Jt.Chief Controller of Explosives In -charge – PESO) – Member
6. Sh. S.K. Hazra, Ex-MD, Aegis Logistics – Member
7. Sh. B.K. Datta, Executive Dir. (Supply Chain Optimisation), BPCL – Member

The MoPNG's circular No.F.P-19012/35/2009-IOC dated 30.10.09 to this effect is enclosed as **Appendix 1**. Further, MoPNG vide its letter No.P19012/35/2009-IOC dated 30.12.2009 granted extension of time for submission of the final report by 31.1.2010.

The Committee constituted by the MoPNG visited the site immediately and members from the Committee were present at the site from 30th October, 2009 onwards till the 3rd of November to gather first hand evidence and information. Subsequently, the Committee made several other visits to Jaipur site and to IOC Jodhpur Terminal as well besides conducting interview until January 14, 2010. The information thus collected was used to analyse the sequence of events and deduce the causes thereof. In the absence of hard disk of computers (TFMS System), records of CCTV which were collected and remained in police custody, the conformity assessment could not be carried out.

ACKNOWLEDGEMENT

The Committee has interviewed & interacted with IOC officials, Local Civil Authority, Government of Rajasthan, Government agencies and Industry Associations who provided invaluable inputs to the Committee. The Committee would like to acknowledge the contributions made by organizations like PESO, OISD and the oil companies.

Dr S Kamal, Dy Chief Controller of Explosives, Dr. D.J Roy, Deputy Chief Controller of Explosive, Jaipur, Shri A Misra, Director (Mktg. Coordination) OISD, and Shri Narendra Puranik, Deputy Manager & Executive Assistant to Chairman, who all deserve special mention for their active involvement in the activities of the Committee, which included providing technical inputs and contribution in preparation of the report.

CHAPTER-2

BACKGROUND

2.1 DESCRIPTION OF THE FACILITY:

At the time of the incident the IOC Sanganer Marketing Terminal had been in operation for almost 12 years, and was spread over a plot area of approx., 120 acres. The plot housed the facilities for the marketing terminal i.e. the 11 storage tanks for SKO, MS and HSD, the truck loading facilities for delivery of these products into truck and product pumping facilities to the neighbouring installations of HPCL and BPCL through pipeline. In addition the plot accommodated the facilities for pipeline division which operated the cross country pipeline, viz. the Koyali Sanganer product pipeline feeding this terminal. The marketing terminal occupied 105 acres and the pipeline division facilities were located in 15 acres in the north east corner of the facility.

The location was chosen at Sanganer as the plot was far away from the then residential localities of Jaipur city and at that time there were no neighbouring industries or factories located within few Kms from the plot boundary at that time. Subsequently a large industrial area was developed by the State Government all around the terminal area.

It was the first automated oil terminal in the country (with storage capacity of slightly over 1 lac KL) and had been doing an annual through put of approximately 11 lac KL. This Terminal was fed by the Koyali – Sanganer Product Pipeline and received products (MS, HSD and SKO) from the Koyali Refinery. The terminal also used to receive and distribute lube oils in drums through trucks

The terminal delivered petroleum products through tank trucks to retail outlets and also supplied lube oil to local market.

The Terminal also supplied petroleum products to the neighbouring terminals of other oil companies. BPCL – Sanganer Terminal is dependent entirely on receipt of products from this IOCL Terminal. Until recently the HPCL Jaipur terminal in Sanganer in close proximity was also solely dependent on supplies from this facility only. After the commissioning of the Mundra- Delhi pipeline (MDPL) , the HPCL's Jaipur terminal at Sanganer has been closed down for operations since the commissioning of HPCL's own pipeline terminal at Bagaru is only 30 Km from Jaipur.

The IOC crude oil pipeline which runs from Mundra to Mathura and Panipat Refineries also passes through this Terminal and a pipeline booster pumping station of the pipeline division was also located and operated within this marketing terminal of IOC. Accordingly, IOC Jaipur facility, in addition to being a marketing terminal also accommodated the critical crude pumping stations to the two major refineries at Mathura and Panipat.

2.2 MARKETING TERMINAL:

2.2.1 Storage facilities:

The storage facilities originally consists of 9 number of tanks for petroleum products and subsequently 2 Number tanks for MS tanks were added followed by one more tank (not yet commissioned) under pipeline division for receiving the pipeline interface.

Table 2. 1 Overground Tankage details

S.No.	Material Stored	Nominal capacity (m3)	Nos.	Ht. (m)	Dia (m)	Type	Tank Nos.
1	Motor spirit	6,110 + 8400	2 3	15 15	24 28	Floating Roof -do-	401 A/B/C/ 409A/B
2	SKO	5,080	3	20	18	Cone Roof 2	402 A/B/C
3	HSD	20,000	3	20	36	Cone Roof	403 A/B/C
	Total Cap.	1,10,370					
	Fire Water	2,460	Two	18	14	Cone Roof	T-401 A/B
	Total:	4920					

In addition to the above, there are 5 nos. of underground tanks, each of 70KL capacity for storage of Petroleum product and Anhydrous alcohol

Tanks of each product were grouped together in independent dykes. The capacity of the dykes as per statues and such as to hold the volumes of the largest tank within the dyke in case of leak from a tank.

Each tank had facilities of three modes of operations i.e. pipeline receipt, inter tank transfer and despatch (through tank lorries and pipeline). The facility was designed in a way that at one time, only one mode of despatch will be carried out i.e. either tank lorry or pipeline transfer. Each mode of operation was achieved by positive isolation of the tank,

from other operation modes, using two isolation valves (gate type) and a blind in between them. The first isolation valve on the tank was provided as a motor operated gate valve (MOV) and the second one (Line Valve) is a hand operated gate valve (HOV) with a Hammer Blind Valve between the MOV and HOV (See **Appendix-2** for Hammer Blind Valve drawing).

As per the original design feature, the Motor Operated Valve (which moves because of the action of a motor) can be operated either remotely from the control room for closing the valve or locally by the operation of push button's. There are three push buttons, one for opening the valve when it is pushed, the other for closing the valve when it is pushed and the third for Pausing the movement when it is pushed (stopping the valve movement). The valve can also be operated by means of a hand wheel just like any other hand operated valve. The valve was to close automatically in case of power failure as per original design feature.

At the time of the incident, and for the past several years, the facility of remote closing of the valve from control room and automatic closure of the valve on power failure has not been operational (as reported in interviews this facility has been made defunct since 2003).

The Hammer Blind Valve drawing is shown in Appendix-2. As can be seen from the drawing, there is a hollow wedge (open eye) and a solid wedge (solid eye) to be used, depending on whether one wants to block the line or make the line through for flow. When the Hammer Blind is being reversed from open to close or vice versa, there is a time when both wedges are pulled out of the valve's body and the pipeline in effect is open to atmosphere. The design of the valve is such that in a 10" pipeline a Hammer Blind opening to the atmosphere when both wedges are out, will be fairly large, approximately measuring 12"x 6".

The blind provided at the terminal between two isolated valves is a hammer – blind type valve which most likely was chosen on account of ease of operations enabling rapid opening and closing. The piping and instrumentation provided for each tank (**refer P&ID in Figure 1**) is similar for all the tanks.

2.2.2 Other Associated Facilities:

2.2.2.1 Pump House

The pump house accommodates 9 pumps, three number dedicated for each products i.e. (MS, HSD and SKO). These pumps are general electric driven centrifugal type.

2.2.2.2 Truck Loading Facility (TLF):

The thirty numbers loading gantries are provided for truck loading of MS, SKO and HSD. These consisted of 30 loading bays with 33 loading points.

2.2.2.3 Exchange Pit:

For pipeline transfers at the south battery limit, an exchange pit is provided consisting of 2 number isolation valves (HOV) again with a hammer blind type valve for positive isolation, on each of the product transfer pipelines.

2.2.2.4 Control Room:

The control room consisted of digital screens and other instruments including emergency shut down provision for the entire installation.

2.3 BUSINESS COMMUNITY CENTRE (BCC)

This terminal also had the Business Community Centre (BCC), which housed the back up for the corporate ERP system. BCC was provided with a DG set to provide necessary power back up, which was designed to start on auto mode in case of power failure in BCC.

The corporate ERP was based on the system by SAP. The terminal was equipped with a Tank Farm Management System (TFMS) which covered tank gauging (mechanical float system), tank lorry filling operations and gate entry records for lorries. However this TFMS was not integrated with corporate ERP system (SAP) due to which the data on tank dips needed to be entered manually (daily once in the morning).

2.4 FIRE PROTECTION SYSTEM

The fire water system for marketing division comprised of two number fire water tanks, three number main pumps (diesel operated), two number jockey pumps (diesel operated) fire water network, foam shed and spray rings around the tanks (MS & Diesel) for cooling purpose in case of adjoining product tank fire. The fire water system was adequate to provide primary protection for four hours, as stipulated in the OISD standard.

The fire water system for pipeline division comprised of one fire water tank, two main pumps (diesel operated), fire water network etc.

Both the fire water systems were interconnected including the fire water tanks.

2.5 SAFETY SYSTEM

The safeguards provided in the design for the storage and despatch systems for the facility are indicated in Table 2.1 below:

Table 2.1 Control Room Safety Feature

Location	Interlock/Hardware	Corrective Action	Status prior to accident
Tanks	High High Level	Closes Motor operated valves at inlet and outlet of tanks	**Status post 2003 not known at the time of incident
	Low low level	Trips connected pumps to avoid pump damage	--do--
	Motor operated valve	Can be closed/started from Control Room as well as locally	**Defunct since Many years earlier
	Hand operated Valve	Position is entered in control room based on inputs from field operator	Not known
Pump House	Emergency push buttons	Shut down the pumps in the event of an emergency	**Reportedly "Functioning"

As per original design, safety facilities were provided in the control room included: auto shut off switch which put off the entire system as well as can make the electrical isolation of the terminal in case of emergency. These were found functional during first OISD External Safety Audit (ESA) in August 1997 and second ESA in October 2003.

All the interlock and safety systems sometime after October 2003 were disconnected and were defunct. No records or information thereof were

available at the site. The site management were not aware of the safety features in the control room as seen during their interviews.

Only emergency shut down push buttons for shutting down TLF Pumps were reportedly functional prior to the incident.

2.6 DRAINAGE SYSTEM

The drainage facility of the tank farms was designed to channel any leaks from valves, flanges, instruments connection, vents and drains, as well as rain water to a pit (sand trap) located in tank bund area. After going through the sand trap the drained material can be diverted either to an oily water soil or to the storm water channel through diverter valves provided outside the dykes. In normal operation both the valves are to be kept shut.

The overall plant layout is shown in **Figure.2**. The storm water system is shown in **Figure 3**.

2.7 ENTRY / EXITS

The Terminal facility was provided with three gates, two on the south west side and one on the north east side. Entry, however, was only through a single gate, south west. The second south west gate is kept locked and the north east gate (emergency gate) was walled up.

2.8 EFFLUENT TREATMENT FACILITY

Oily waste water from pump house area and tankage area is routed via a close system to a RCC sump in the ETP area. It is then pumped by effluent feed pumps to the inlet of Tilted Plate Interceptors, wherein the

free oil droplets are intercepted and form a floating layer of oil, which is skimmed through rotatable skim pipes. The de-oiled water flows over adjustable where sockets in the effluent chamber and sent to the effluent pit for disposal via the storm water channel, while oil is routed to an underground drum, from where it is periodically loaded via a submerged pump into a truck for outside sale.

Contaminated rain water flows through a storm water sewer network, which comprises a number of open drains. Initially, the water is sent to ETP and after visual check do not indicate the presence of oil, it is diverted to the storm water channel for discharge outside the plant.

2.9 PERSONNEL

The Jaipur Terminal worked under the overall guidance of the General Manager, Rajasthan State Office. The organogram showing the positions and the levels of personnel connected with the Jaipur terminal also indicating the role and responsibility is attached as **Appendix 3**. The Terminal is headed by a Senior Terminal Manager (STM), who reports to the Chief Operations Manager, Rajasthan State Office (RSO). The Senior Manager (Terminal) who is also in the same job group as the Senior Terminal Manager reports to the Senior Terminal Manager. Apart from this there are 10 other officers with different responsibilities and 24 blue collar workers and 4 clerical staff.

The terminal operated on 3 shifts for the terminal operation with the timings 6.00 am to 2.00 pm, 2.00 pm to 10.00 pm and 10.00 pm 6.00 am, TLF (Truck Loading Facility) operation was restricted to the morning general shift operation i.e. from 8.00 am. To 5.00 pm. The three shift operations were manned by one officer and three operators in each shift. The control room was supposed to be manned but there was no

dedicated person and, occasionally, when all the four people were out in the field for different jobs, it remained unmanned.

2.10 PIPELINE DIVISION

2.10.1 Control Room:

A separate control room for pipeline division housed SCADA panel along with the tank details which used to indicate all tank levels from the TFMS.

2.10.2 Storage facilities:

The pipeline division was close to commissioning a new tank (12th tank in the terminal) newly constructed for storing pipeline inters face products.

2.10.3 Pumping facilities:

The booster pumping station for crude oil consisting of two diesel driven pumps was located in a pump house.

2.11 CORPORATE SET UP

The IOC corporate Operations function organogram as received from IOCL is attached as **Appendix. 4.**

2.12 MAJOR FIRE INCIDENTS

A list of major fire incidents for the period 1991 -2009 in the oil sector in the country is attached as **Appendix. 5.**

CHAPTER 3

DESCRIPTION OF THE INCIDENT

Based on the information obtained through interviews, site visits, and data collection by the Investigating Committee events leading to the incident are found to be:

- 3.1** BPCL put an indent in the morning at 10.00 a.m. of 29th October for receiving MS (1567 KL) and SKO (850 KL) to be received in their neighbouring installation by pipeline transfer on 30th October. Shri G.S Chambal, Manager Operations BPCL who was on a half day duty on 29th came to IOC control room around 2.30 p.m. to plan the activities for next day's PLT operations of both MS & SKO. However when he met Shri A.B. Gupta, Shift Officer of IOC, Shri A.B. Gupta informed him that he, (A.B. Gupta) had received directions from his superior (Shri Poddar, Senior Manager IOC) to start SKO transfer today (i.e. on 29th October). Thereafter a telephonic discussion took place between Shri Poddar, Shri Chambal and Shri Gupta in which Shri Chambal requested that in case SKO transfer was being preponed to 29th, then MS transfer should also take place on 29th. Since by then Shri Poddar had received the product quality results for MS from Quality Control (QC), and the product were certified meeting quality standards, he (Poddar) agreed to the request of BPCL to transfer MS also on 29th in addition to SKO.
- 3.2** It was decided that the PLT will start after TLF operation at 17.30 hrs. and Shri D.S. Chambal agreed to arrive at that time for necessary witnessing of tank gauging and lining up for PLT start up operations. Shri A.B. Gupta the Shift Officer in second shift had three operators present in his shift at the beginning of his shift - Shri. K.N. Agarwal, Shri. K.R Meena and Shri R.N. Meena. Shri K.R. Meena was continuing on overtime from first shift (morning) operations. In fact, from the overtime

records it is found that Shri K.R. Meena had worked 16 hours on 27th October and also on 28th October and was doing the third consecutive day of 16 hours of work on 29th, the day when the accident happened. Shri K.N. Agarwal, the other operator on Shri Gupta's shift approached Shri Gupta seeking permission for two hours leave for attending some Puja at his house. Shri Gupta reportedly indicated his unwillingness to accede to Shri Agarwal's request in view of the considerable job load involving transfer operations of two products MS and SKO and few other activities. Shri Agarwal was at that time assigned the job of draining water from MS tank 409-A and subsequent dipping of the tank. Shri Agarwal after completing the job and taking the dip of the tanks left the site apparently without specific permission of Shri Gupta around 5.30 pm taking the general shift bus. Shri Agarwal's leaving the premises has also been confirmed by the gate security.

- 3.3** At around 5.10 p.m. Shri Gupta called Shri Gangal, Shift Officer, Pipeline Division of IOC for taking over a SKO tank No.402-A from pipeline custody to marketing custody and proceeded towards the tank along with both the available operators Shri K.R. Meena and Shri R.N. Meena. After reaching SKO tank 402-A, all valve positions were checked as correct in the presence of both Shri Gupta and Shri Gangal and the water was drained from the tank. Thereafter the inlet valve to the tank was closed including the hammer blind valve and the lock earlier put on the outlet line hammer blind valve was taken out and put on the inlet line hammer blind valve. On completion of this operation, Shri Gupta and Shri Gangal along with Shri K.R. Meena went on the tank top and took the dip. Thus the custody of the SKO tank 402-A was taken over by Marketing from Pipeline. At this time Shri Gupta from top of the tank 402-A noticed two BPCL contractors' men who carry out sealing of the valves for BPCL prior to PLT approaching the tank farm. Normally when inter company pipeline transfer took place for any product, the receiving

company personnel checked the line up and sealed the valve to make sure that no product inadvertently went to any other destination other than the intended tank in the receiving company. This practice had been adopted because the accounting practices were based on the difference of between the opening and closing dips of the delivery (supplying company, i.e. IOC) tanks. After the dipping and taking over of tank from the Pipeline, the two operators Shri K.R. Meena and Shri R.N. Meena lined up SKO tank 402-A to SKO pumps for pumping to BPCL by first reversing the outlet line hammer blind valve in the line up position, opening the HOV and lastly then MOV in the outlet line, in the end.

- 3.4** Shri Gupta thereafter along with Shri Gangal proceeded with his team to MS tank farm area for taking over and lining up of MS tank 401-A in a similar manner. On reaching there first the valve positions were checked and water drained and lock on the Hammer Blind was reversed from outline to inlet line. Thereafter Shri Gupta and Shri Gangal went to the tank 401-A top along with Shri R.N. Meena and completed the dip operation while Shri K.R. Meena stayed at the ground level. On climbing down after dipping of the tank, Shri Gupta did not find Shri K.R. Meena in the tank bund area though he was supposed to carry out the line up operation along with Shri R.N. Meena. Shri Gupta in his deposition before the Committee stated that when he was on the tank 401-A top, he had heard Shri K.R. Meena trying to tell him something but he could not make out what he was trying to say. As per Shri Gupta, he instructed Shri R.N. Meena to wait for Shri K.R. Meena and on his arrival carry out the line up operation. Thereafter Shri Gupta along with Shri Gangal went on the other side of tank 401-A and completed the dip memos for SKO tank 402-A and MS tank 401- A. The copy of the dip memo which was found in Shri Gupta's pocket indicated the timing as 17.20 hrs. for SKO tank and 17.50 hrs. for MS tank. Thereafter Shri Gupta noticing that Shri D.S. Chambal is yet to arrive (expected at 17.30 p.m.) and decided to

call him using his cell phone and for this purpose went out of the bund and crossed the plant road.

- 3.5** Soon thereafter (around 18.10 hrs) Shri. Gupta heard Shri R.N. Meena shouting (not visible being on other side of the tank) stating that there is a major MS leak and that he (Shri R.N. Meena) is blinded with MS (Guptaji bahut petrol leek ho gaya, meri ankhon mein gaya). Shri Gupta shouted “close the valve” (valve bandh karo, valve bandh karo) and rushed towards Shri R.N. Meena .

Then Shri Gupta on reaching near Shri Meena observed the following:

(a) MS was leaking in vertical direction as a fountain, the height being little higher than man’s height (presumably 7/8 feet) but rose gradually to a higher levels and finally being observed almost up to 25/30 feet.

(a) Shri R.N. Meena was in completely dazed condition, drenched entirely in MS and close to asphyxiation.

- 3.6** Shri Gupta carried Shri R.N. Meena, intending to bring him to safe area outside bund but very soon himself was overcome by MS vapours which compelled him to drop Shri R.N. Meena and to get himself over the bundwall to save him. Shri Gupta managed to cross the dyke but was nearly immobilised and managed to shout in his walkie-talkie stating “huge MS leak, I am dying (bahut leak ho gaya, main mar gaya)”.

a. The other operator Shri K.R. Meena at that time was having tea in the canteen and he overheard the distress call of Shri Gupta through walkie-talkie of Shri Hoshiyar Singh, the contractor electrician who was also having tea in the canteen at that time. Shri K.R. Meena immediately ran at top speed and went to tank T-401-A

entering the dyke area presumably to control the situation. However, he apparently could neither stop the leaking MS nor was able to get Shri R.N. Meena or even himself out from the affected dyke. The remains of Shri K.R. Meena were identified only because of his small personal belongings like key chain on the eastern side of the tank pad of 401-A. The remains of Shri R.N. Meena were also found on the eastern side close to partition tank of 401-A and B.

- b. Following, Shri K.R. Meena, Shri Hoshiyar Singh (the contractor electrician also in-charge of the DG supervision in whose walkie-talkie Shri Gupta's distress call was received), Shri Mukesh Sain of SB Enterprises (building water tank repair contractor) who was also present in the canteen at that time rushed towards tank 401-A. The distance from canteen to tank 401-A is approx. 250 M.
- c. At the same time the security personnel at gate who also received Shri Gupta's call in walkie-talkie rushed towards tank 401-A. The security gate is approx. 500 M away from tank No.401-A.

3.7 Almost at the same time Shri G.S. Chambal, Manager Operations of BPCL, who had come to take joint dip of the tanks (402-A and 401-A), along with Shri Gupta had reached the control room found none, and learnt that IOC personnel had gone to the tank area, of tank 401-A. He also heard loud shouts and rushed towards the tank. He found that Shri A.B Gupta coming down from the dyke of tank 401-A and then lie down on the road intersection (southern side) between tank No.401-A and 403-C. Shri A.B. Gupta was found drenched in MS. By this time, all the people mentioned above had also reached the same spot and Shri Chambal too reached the spot. Then the security personnel assisted by Shri Mukesh Sain carried Shri Gupta towards the control room followed

by Shri G.S. Chambal whose vehicle was parked outside control room. Shri Gupta was put in Shri Chambal's (BPCL's vehicle) which was pushed to the gate by security personnel. The car was started thereafter and Shri Gupta was taken to the hospital by Shri Chambal, leaving the gate reportedly around/after 18.30 hrs. Around the same time the siren was sounded by the security personnel.

- 3.8** During this period, around 06.15 pm, Shri S.S. Gupta, Chief Operations Manager of IOC pipe line division who was leaving pipeline division office in his car after duty hours had experienced strong smell of MS vapour. However, he just informed pipeline control room officer about the smell asking him to investigate and left the site. After leaving the Terminal while on his way home he received a message from his colleagues present in the pipeline division that a profuse leak had occurred at MS tank area of Marketing Division. Shri S.S. Gupta immediately tried to contact Shri Poddar and after several tries, could get him on phone and Shri Poddar informed him about the uncontrollable leakage of MS and also said that an emergency had been declared. At this, Shri S.S. Gupta immediately intimated all the officials present in the Pipeline area to evacuate immediately and escape for the safety of their lives. As emergency gate near the Pipeline Division had been walled up, the only exit for the Pipeline Division officials was through the Terminal, which became inaccessible due to heavy concentration of MS vapours. Hence they were trapped inside. Even in this situation, Shri Gangal took all the steps to close the valves in the Pipeline Division to ensure safe shut down of the pipeline systems. Unfortunately, they failed to gauge the imminent danger looming on their lives.

Computer records indicated that at 18.36 hrs., crude oil booster pumps (diesel operated) stopped

- 3.9** Shri D.C. Verma, Manager - IS also heard the sound of the siren while he was inside BCC building at around 18.30 hrs. came out and enquired about the situation. On being intimated about the dangerous situation, he went back to office room, spoke to his colleagues/seniors, gave command for safe shutdown of the system and came to the main gate at around 19.20 hrs. He also found strong vapour smell which was unbearable. This was clear indication that MS vapour, which was gushing out of open hammer blind, had by then spread through length and breadth of the terminal and was waiting for the catastrophe to happen.
- 3.10** During the time Shri Gupta was put in Shri Chambal's car near the control room and the car was being pushed, Shri Chambal had phoned Shri A.K. Poddar, Senior Manager (Terminal) around 18.24 hrs. informing about the incident. Shri Poddar, who had reached home, immediately informed Shri Shashank Shekhar, Senior Operations Manager (SOM)/other colleagues and Shri Shashank Shekhar, in turn, informed Shri Gautam Bose, GM, Rajasthan State Office. Shri Bose immediately along with his other colleagues at the Guest House rushed to the site and picked up Shri Kanaujia, Senior Terminal Manager, In-charge, from a gymnasium. On the way Shri Bose informed senior government officials, district authorities, police etc., requesting fire tenders and personnel and also informed other IOC sites.
- 3.11** While Shri A.B. Gupta was brought to the Marketing Division control room around/before 18.30 hrs., main gate security personnel called Shri Jagdish, driver of the pipeline division jeep, parked at the pipeline gate to carry Shri Gupta to the hospital. Shri Jagdish however, in spite of his repeated attempts could not start the jeep, presumably because of heavy MS vapour formation in the area already by that time in the area, which made the air too rich for ignition in the engine.

- 3.12** In this situation Shri Sher Singh, Chief of Security (ex-army man, now employed by the security contractor) made valiant repeated efforts to rescue Shri R.M. Meena and K.R. Meena along with a security guard each time. However, due to very heavy MS vapour concentration, non availability of Self Contained Breathing Apparatus (SCBA), absence of any training to deal with such emergency, he could do little and finally had to withdraw because other security personnel fearing for their lives refused to assist him.
- 3.13** Because of non-availability of SCBA site IOC officials went to BPCL terminal and finally brought 2 Nos. BPCL SCBA sets around 19.15/19.20 hrs. By that time Shri Gautam Bose and other local senior IOC officials reached the site assembling in the gate unable to enter tank farm area because of heavy MS vapour which had by that time reached plant entry gate.
- 3.14** On receiving SCBA sets (around 7.20 pm), attempt was on to persuade Shri Mukesh Sain of S.D Enterprise to put on a SCBA set and approach tank farm area for attempting stopping the MS leak. In spite of having no training on SCBA set use, Shri Mukesh Sain agreed to put on the same and move inside.
- 3.15** While this exercise was on at the gate around 7.35 pm, the heavy vapour cloud which by that time had spread over almost entire plant area and was very dense found an ignition source (yet to be identified) and resulted in a massive explosion identical to detonation.
- 3.16** Almost simultaneously after explosion, small blasts followed by fire occurred in nine of the eleven tanks and the fire continued till the fuel contents were totally burnt. Two MS tanks (409 A & B) which did not

ignite immediately caught fire after a few hours. These two tanks experienced seal fire and their roof was not blown.

3.17 A few selected photographs are shown in the subsequent pages.

CHAPTER 4

SCENE AFTER THE EXPLOSION

It is not very clear how the local authority, IOCL (Marketing and Pipeline Division) and other oil company officials (HPCL & BPCL) present during the time of accident reacted or put up effort just after the explosion, because everybody was awestruck by the ferocity of the incident and totally at a loss what to do. But it is learnt that the district authorities immediately geared up for emergency, police and army personnel started evacuating people around, barricaded the national highway, railway tracks, running next to the terminal and all roads around, brought all fire fighting tenders from local administration, HPCL, BPCL, army cantonment to the site for fire fighting. But since there were intermittent explosions occurring and all the tanks burning with full fury inside the terminal by then, it was decided not to venture inside or making any attempts to douse the fire, to avoid any further risk of greater danger involving lives. By next morning (30.10.2009) fire and foam tenders with fire fighting team from Mathura and Panipat Refinery also reached the site but none was permitted to carry out any fire fighting operation.

On 31.10.2009, Hon'ble Petroleum Minister Shri Murli Deoraji along with IOCL Chairman, Shri S. Behuria, reached the terminal location. Along with local administration, State Ministers and officials, emergency meetings were held and instructions were given for giving compensation to dead and injured and also to constitute an independent enquiry committee under the aegis of MoPNG to investigate into the root cause of the accident and suggest remedial measures.

4.1 DAMAGE ASSESSMENT

Following the blast the steel structures as well as all buildings inside the terminal were extensively damaged; specific details are given hereunder:

- i. the RCC buildings, viz., S&D office/BCC, Amenity building, Administrative building, Canteen, Control Room, Car Parking Shade, Temple at Plant Gate, Maintenance & Repair Office had most of their walls collapsed and in case of few ones e.g., Car Parking Shade roof along with the columns, collapsed totally. Distinct burning marks were seen on the northern and part of the north western wall of the BCC building.
- ii. A large industrial building belonging to M/s Genus Industries, very close to the western boundary wall has been extensively damaged and it has collapsed from west to easterly direction. Three personnel of this factory were killed and reportedly a large number (approx. 45 persons) were injured.
- iii. Structural buildings/shades and other structures including tank lorry loading bay had their roof totally blown out and certain structures had bent in the eastern direction.
- iv. A major portion of the hydrant line running north south on the western side of the plant road approaching Tank 401 tank farm area was moved substantially towards east.

- v. A number of large diameter pipelenghts kept in the open storage area in the north south direction parallel to the same road on the western side have been blown substantial distance from west to east.
- vi. A large number of lube oil drums in the drum yards along the western side of the same were found flattened.
- vii. The empty fire water tanks roof had been blown out in the south easterly direction.
- viii. Among five MS tanks (floating roof), tank No.401-A roof had collapsed inside its heavily deformed shell. Tank No.401-B was partly deformed with its roof inside. This tank had little material. Tank No.401-C is in better shape than the other two with its roof too collapsed inside. This tank too had little material. Shells of both 409 A&B were deformed with 409-A (had large inventory) being the worse and had collapsed roof inside.
- ix. Six numbers fixed roof tanks (SKO and HSD) have heavily deformed shell again because of fire and roof of one of the SKO tanks being blown away a large distance towards south.
- x. In the pipeline division the explosion damages appear to be more extensive with control room building front and other buildings/structures totally collapsing and the roof blown out. The roofs of DG buildings totally collapsed with the structural roof blown out.

- xi. The crude pumping shed was very extensively damaged and some of its tall structure was found significantly bent again from west to east.
- xii. At a short distance from this pumping shed the direction of the explosion damage reversed as structures/poles beyond this area have been bent from east to westerly direction.
- xiii. A large industrial building (RCC construction) very close to eastern boundary wall have been extremely damaged and portion of the building as well as the IOC terminal eastern boundary wall (RCC) have collapsed from east to westerly direction. A number of heavy structures including a steel stair case of this industrial building have been blown sufficient distance from west to east and found lying inside the IOC boundary at a substantial distance inside eastern boundary wall.
- xiv. The IOC Terminal had extensive greenery with large number of fully grown trees covering large part of the plot. The road running north south direction starting from plant gate up to the approach of tank farm 401 area had closely lined trees fully grown as well as substantial growth of apparently thick bushes along the big tree lines. In addition there were extensive greenery along the boundary on the southern side and south western side. The south western corner of the plot as well as a large rectangular patch between control room and the tank farm area had closely laid large trees. All trees and bushes, except very few ones, close to the southern area, have been completely charred, and snapped at different heights and were totally devoid of any leaves because of the effect of the blast.

- 4.2** The position and the status of the valves connected with the tank from which the leak had initially started is discussed in detail in Chapter 7 under “Site Observations”.

Out of the 3 Km boundary wall, around 1.7 Km had collapsed.

- 4.3** The following photographs depict the magnitude of devastation at site after the explosion and fire.

CHAPTER 5

EVIDENCE AND DATA COLLECTION

- 5.1** Since the incident involved a massive explosion and fire which resulted in extensive structural damage, it made the task of collecting documentary evidence a very difficult and time consuming exercise. Many of the documents were received after considerable time had lapsed and still some are awaited.
- 5.2** Evidence gathering started immediately following the incidence as soon as the investigation committee member could enter the premises.
- 5.3** Extensive photographs were taken during the time of fire was razing and subsequently, during inspections of damage in the site.
- 5.4** The Investigation Committee has all along been attempting to obtain data/information to understand the manner of loss of containment (immediately prior to the blast) through available recorded data in the control room but was given to understand that all these which were recorded in hard disk had been destroyed. Subsequently, the committee took the initiative of getting a search conducted in the debris of the control room and other buildings destroyed in the blast. The hard disks of the computer and the CCTV recordings which were located in good condition were taken in police custody for forensic investigation. The committee has requested for a copy of the available records but the same is awaited as of now. During subsequent interviews it was revealed as late as 23rd December that though the ERP/TFMS recorded data in the marketing control room has been destroyed in all likelihood, another set of the same data is recorded in the software in the pipeline division control room wherein tank levels are recorded every minute. Thereafter on the instance of the Investigating Committee, the pipeline division was instructed to re-check and to make renewed efforts to locate and retrieve this hard disk. Immediately thereafter on 24th December morning the pipeline division located the hard disk retrieved the same as well as its back up disk, both

of which were immediately taken possession of by the local police. The Chairman, Investigation Committee had immediately requested one of its Members (Principal Secretary, Mines & Minerals, Govt. of Rajasthan) to retrieve the duplicate disk at least for making it available to the investigating committee. This is awaited.

5.5 WITNESSES

Interview process of evidence gathering commenced on 2nd November, 2009 and the last interview was held on 11th January, 2010.

5.6 During the course of the investigation, interviews were conducted with 21 IOCL employees and 9 IOCL contractors' personnel, 1 BPCL employee and 2 BPCL contractors' personnel. Most of the interviews were sound recorded and transcripts from the sound recordings were made.

5.7 SOME SIGNIFICANT PRIOR EVENTS

During the course of the investigations, though the committee did not get information from any of the interviews, it did gather through other sources that just about two months ago i.e. in August 2009, there was a case of theft of HSD detected by the CBI from the IOC terminal in collusion with a neighbouring company oil terminal official. Some personnel of the IOC terminal were taken into custody for this.

The committee felt this was relevant information which should have been provided earlier by the concerned officials in Jaipur.

5.8 DOCUMENTATION

The committee submitted a list of documents to the concerned IOC officials which the company wishes to pursue during the course of the investigations. These included the following:

The committee was informed that many of these were probably destroyed in the blast since they were normally kept in the control room/site office. However, subsequently after several days, some of these could be reassembled or reconstructed from elsewhere in the Corporation. While interviewing Shri Syal, COM on 18.12.2009 in OISD offices, it emerged that the operating log book had also been located in the rubble of the control room. The committee asked that this be made available to the committee which was done on 18.12.2009.

The committee also asked IOC if the hard disk drives of the pipeline control room which also receives the TFMS data could be retrieved. IOC informed that this was also traceable in the P/L control room rubble, but that it would have to be obtained only after proper procedure and permission from necessary authorities are obtained. The committee has not accessed the data in this hard disk also.

5.10 PROCESS MODELING

The Committee has carried out processing modeling studies based on computer programmes PHAST version 6.53 available with EIL. These studies indicate the extent of vapour clouds spread and the boundary of the lower explosivity limit in which any spark could trigger and explosion/detonation. The modeling also indicates the extent of shock waves for different pressure levels and this has been done for different cases of wind direction, wind speed. The weather conditions prevailing at that time has been taken from the website of the Indian Meteorological Department.

A detail analysis of process modeling is discussed in CHAPTER 6.

From the evidence pieced together from interviews, it comes out that the leak of gasoline (MS) continued for about one hour and 20 minutes before

the explosion took place. The computer programme however is based on a maximum time of one hour only and therefore the results of the process modeling study could be a little more conservative than the actual event.

5.11 VISIT TO JODHPUR TERMINAL

The committee visited Jodhpur terminal on 13.12.2009 to see the operating practices and facilities. An experiment with water in the tank was conducted to see extent of leakage with Hammer Blind open. This is discussed in detail in Chapter 7.

CHAPTER 6

INCIDENT MODELLING

6.1 INTRODUCTION

- 6.1.1 In an analysis of this nature, the failure scenario is examined in detail. All possible outcomes of every failure identified are assessed, taking into account the size and nature of the failure, the process parameters prevalent at the point of the release and the weather conditions.
- 6.1.2 Normally, the factors analysed are dispersion distances (Lower Flammability Limit or **LFL**) of the substance released, the probable radiation from any fire that results, and the possible shock wave and domino effect upon equipments and structures that could arise from an explosion, should one occur.
- 6.1.3 A very important factor to be borne in mind is that volatile petroleum products such as MS will form substantial amount of vapour if it is allowed to leak for considerable amount of time, and the flammable material will spread further if the leak is allowed to spread beyond dyke to a larger area. The vaporisation in the present case was higher as the MS pool resulting from loss of containment was not confined to the dyke but spread over a much larger area of the Terminal Plot through storm water drains. Further, high velocity vertical jet of MS emanating from Hammer Blind could lead to enhanced MS carry over into the vapourized mass through wind losses through entrainment.
- 6.1.4 Explosion mechanism of inflammable vapours envisages the formation of an "Explosive Mass" which is the quantity of vapour formed within "Lower Flammability Limit" (LFL) and "Upper Flammability Limit" (UFL). The quantity of explosives mass determines the effect of the explosion blast. The time required for forming the explosives mass will be dependent on rate of vaporisation which, in turn will depend on "vapour Pressure of the liquid which "vaporises" and the "liquid pool area" resulting from "loss of containment" and also to an extent on "nature of loss of containment

(rate/velocity of release, direction i.e. horizontal/vertical). Based upon these calculations, effect zones for each of the outcomes are determined, to reveal what facilities or installations were likely to have been affected by the scenarios investigated.

6.2 SCENARIOS INVESTIGATED IN THE ANALYSIS

6.2.1 In a consequence assessment dealing with refinery process and storage facilities, which primarily handle hydrocarbons, the possible scenarios that merit investigation are:

1. Fires

- a. Flash Fires

- b. Pool Fires

- c. Jet Fires

2. Explosions

- a. Unconfined Vapour Cloud Explosions (UVCE)

- b. Boiling Liquid Expanding Vapour Explosions (BLEVE)

6.2.2 Flash Fire – A Flash Fire, in effect, is a sheet of flame that moves through a cloud of gaseous or vaporised hydrocarbons, without any accompanying shock-wave. It rarely lasts for more than a few seconds, and causes little damage to equipment and installations, but is fatal to individuals in its path.

6.2.3 Pool Fire – A Pool Fire is a fire on a stationary liquid surface, such as that of a pool of liquid hydrocarbon. The nature of the flame depends upon the fuel burning, with more smoke being generated by heavier hydrocarbons on fire. Its thermal radiation can affect all individuals and facilities in its vicinity, but its intensity depends upon the volume available, and the duration of the fire.

- 6.2.4 Jet Fire – A Jet Fire occurs when a hydrocarbon release from a pressurised source is ignited close to the source of the release. It is, for all practical purposes, a jet of flame that will last as long as the supply of fuel lasts under pressure and whose radiation and effect zone, depend as much upon the fuel as on the pressure at which it is released. In addition to damage inflicted by thermal radiation, the flame can also cut through metal, if it were to impinge upon the metallic surface, setting off a domino effect.
- 6.2.5 Unconfined Vapour Cloud Explosion – A UVCE is similar to a flash fire, except that in addition to the flame front, a pressure front, generated by the fire, moves through the cloud, at speeds of 100 m/s or greater.
- 6.2.6 Boiling Liquid Expanding Vapour Explosion – A BLEVE occurs when a liquefied, or occasionally a liquid, hydrocarbon is contained in a vessel exposed to an external fire. The fire weakens the shell of the vessel, while also causing the hydrocarbon to boil, thereby pressurising the vessel. Once the vessel's pressure exceeds the threshold limit of the metal, the shell would fail spilling out the rest of the hydrocarbon, which would then undergo an explosion or a fireball.

6.3 SCENARIOS APPLICABLE TO THE INCIDENT AT THE SANGANER MARKETING TERMINAL, JAIPUR

- 6.3.1 Flash Fire: When the cloud came in contact with a source of ignition, it would have undergone a flash fire, which flashed back to the source of the leak in the MS Tank outlet manifold, igniting the fuel spilt. This would have been fatal to all individuals in the area but would not have damaged any structures or equipment.
- 6.3.2 UVCE: Considering that the leak and subsequent dispersion occurred for well over one hour and a quarter, sufficient mass is likely to have accumulated in the cloud, for the flash fire to accelerate into a UVCE. The overpressure from such a UVCE would have extensively damaged the

Administrative Building, Control Room and other buildings, as well as the tanks, besides igniting the fuel accumulated in the tank bund.

- 6.3.3 Pool Fire: With the flame-front of the UVCE acting as a source of ignition, the fuel in the bund would have been ignited. Since fuel from the spill had been accumulating for more than an hour, the radiation from the Pool Fire would have caused some amount of damage to the tanks in the vicinity.

6.4 MODELING AND ANALYSIS

- 6.4.1 The distance covered by the vapour cloud arising out of huge loss of containment of MS in Jaipur and the damage contour in the vapour cloud explosion was determined using the well known software "PHAST 6.53" (a software developed by DNV). However, this software considers/restricts calculations for one hour leak. This itself shows that the scenario as it happened in Jaipur i.e. loss of containment beyond one hour, was never considered a credible accident scenario even by globally established expert safety consulting firms such as DNV. However, in the absence of any better software, the Investigation team was constrained to model the consequent scenario using PHAST 6.53. The loss of containment was considered to happen in 1.5 D weather conditions, i.e. with a wind velocity of 1.5 m per second and absolutely normal weather conditions. There was approx., 75 minutes interval between the perceived start of the leak and the explosion. Though the model here considered one hour leak duration, it must be observed that the additional vaporisation that would have occurred over the extra 15 minutes further add to the hazard, due to increased vaporisation of MS.
- 6.4.2 MS considered in this model is composed of 36.5 mole % Pentane and 63.5 mole % of Hexane, in the liquid state at 35o C at atmospheric pressure being released from a hydrostatic head of 12 m as reported in the incident, without overflowing for the tank in question (401-A).

MS PHYSICAL PROPERTIES

Test	Method	Specification	
Grade		MS 91	MS 95
Density @ 15oC, kg/m ³	P : 16	720-775	720-775
Colour, Visual		Orange	Red
Copper Strip Corrosion (3 hrs. @ 50oC)	P : 15	Class 1	Class 1
Existent gum (gm/m ³)	P : 29	Max. 40	Max. 40
Lead Content (as Pb), gm/litre	IP 352	Max. 0.005	Max. 0.005
Research Octane Number (RON)	P : 27	Min. 91	Min. 95
Motor Octane Number (MON)	P : 26	Min. 81	Min. 85
Reid Vapour Pressure @ 38oC, kPa(4)	P : 39	Max. 60	Max. 60
Distillation	P : 18		
Recovery upto 70oC, %v		10-45	10-45
Recovery upto 100oC, %v		40-70	40-70
Recovery upto 150oC, %v		Min. 75	Min. 75
FBP, oC		Max. 210	Max. 210
Residue, %v		Max. 2.0	Max. 2.0
Benzene content, %v	ASTM D3606	Max. 1	Max. 1
Total Sulphur, %wt.	ASTM D2622/ D5453	Max. 0.015	Max. 0.015
Vapour Lock Index (VLI): a) Summer (5)		750	750
b) Other months (Winter)		950	950
Oxidation Stability, minutes	P:28	Min. 360	Min. 360

Olefin content, %v	ASTM D1319	Max. 21	Max. 18
Aromatics content, %v	ASTM D1319	Max. 42	Max. 42
Oxygen content, %wt.	ISO 1601	Max. 2.7	Max. 2.7
Oxygenates content, %v	ASTM D4815		
a) Methanol		Nil	Nil
b) Ethanol		Max. 5	Max. 5
c) Iso-propyl alcohol		Max. 10	Max. 10
d) Iso-butyl alcohol		Max. 10	Max. 10
e) Tertiary-butyl alcohol		Max. 7	Max. 7
f) Ethers containing 5 or more carbon atoms per molecule		Max. 15	Max. 15
g) Other oxygenates		Max. 8	Max. 8
Engine intake system cleanliness (7)	As per IS 2796	Report – MFA used	Report – MFA used
Water Tolerance of gasoline alcohol blends, temperature for phase separation, oC,			
a) Summer		Max. 10	Max. 10
b) Winter (6)		Max. 0	Max. 0

6.4.3 The loss of containment scenario that has been assessed is as follows:

- A vertical release with an aperture of a diameter equivalent to 12" x6" size as in actual case it was a vertical case.
- A full – bore rupture of the 10" outlet line of the tank, since the cross section of this pipeline is smaller than the failure aperture of the hammer blind valve, and would act as a limiting factor.

6.4.4 The formation and spread of the vapour cloud has been examined for the following cases:

- Wind direction from MS tank farm towards TLF (north to south) at 23o east of north.
- Wind direction from 23o west of north.

6.4.5 These two scenarios have been considered to account for the plant personnel observations that:

- The wind from the MS tank to TLF area
- And the wind north easterly direction

6.4.6 The extent of the vapour cloud has been plotted in Figures 4 a, b and 5 a, b. It is repeated that vapour cloud had covered a major area of the facility and the stimulated impact of the subsequent fire and explosion (s) is indicative of the damage that was observed at site. The vapour cloud plots have been further supplemented with plots of vapour dispersion from the drainage system at two locations namely, tank dyke and ETP. These essentially indicate that the vapour clouds formed by a major leak at the hammer blind valve of 401-A got supplemented by a number of other clouds that had formed along with the drainage system around the tank farm.

6.5. As an alternative scenario, it was considered that the outlet line of the tank had given away in a full bore rupture, and that MS released would form a liquid pool in the dyke area, before vaporising during the time that lapsed between the start of the release and its ignition.

Case 1 Line rupture

Weather condition 1.5 D

After one hour

Mass released = 790,096 Kg

Mass vaporised = 67,753 Kg

Vaporisation rate = 18.54 kg/s

LFL distance = 200 m

Refer figure 4.a

6.6. Case 2 : Vertical release

6.6.1 Since a jet fuel was observed at the start of the incident, the release was modeled so that the substance would spout out as a jet, and land 6.10 m away, before forming a pool that would vaporise during the time that elapsed between start of the release and the ignition.

Weather condition 1.5 D

Angles of release 10° & 20°

After an hour:

Mass released = 600,000 Kg

Mass vaporised= 33,000 Kg

Vaporisation rate= 8...50 kg/s

LFL distance= 325 m

Refer Figures 5 a,b

6.6.2 It is evident from the plots that depending on the wind direction, specific areas of the plant can come within the parameter of the cloud. However, going by the most prevalent wind direction, as well as the wind directions that was supposedly prevailing at the time of the incident, the major facilities would have come inside the area where concentration of MS vapours was within inflammable limits. The presence of vapours along the storm water drains would add to a bigger consequence.

6.7 IGNITION

6.7.1 When the concentration of liquid hydro carbons (HC) as MS in the HC-air mixture falls within the inflammable limit between (1.2% and 7.2% of MS vapours), a fire will occur immediately in presence of an ignition source which can be a spark or an open flame. Source of ignition may be:

- Auto ignition. However in the present case it is ruled out as the product was stored well below auto ignition temperature.
- Electrical apparatus covering machines and fittings in which conductors are used and of which they are a part, namely, electric switches, push buttons, socket plugs, circuit breakers, instruments, motors and so on, these may act as a source of ignition by electrical Arcs and sparks raising the surface temperature of the apparatus above auto ignition temperature. Such possibility cannot be rejected outright as there were a number of buildings with electrical fittings, more specifically, the BCC building and control room had PCs and associated wiring and electrical fittings on the top floor. The location where PCs were housed showed signs of fire damage and one of the scenarios examined while plotting the contours of the blast considered this location as a possible location of ignition source.
- Static electricity. This was not considered as the factors leading to static electricity generation did not apply.
- Lightning. This also does not apply. In this case as weather conditions were good.
- Non-electrical ignition sources include IC engines, Pyrophoric iron, frictional impact/falling of iron tools etc. Out of these, first cause has been examined as it was found efforts were made to start a jeep in pipeline division gate. A case has also been examined for a motor cycle in a road behind a SKO tank 402-B. Although the possibility of its engine being on appears remote as the motor cycle stand is out and hence presumably stopped by the rider, whose body was later found on the same road behind tank 402-C. However, the possibility of the rider trying to restart the motor cycle cannot be ruled out and hence this case too was examined.

- 6.7.2 Going by the consequences observed, the more serious of which were restricted to the facility, although explosion damages occurred outside as well, the source of ignition was certainly within or close by the facility. In this regard there could also be a possibility that cloud is ignited by kitchen fire in a building immediately east of the facility.
- 6.7.3 Ignition occurred within 75 to 90 minutes after the leak began. Therefore, the source of ignition was available only 75 to 90 minutes after the leak. Accordingly ignition could not have been by any pre-existing source inside the tank terminal.
- 6.7.4 This leads to the possibility of ignition source as either on electrical spark from a running engine or a spark vehicle/motor bike through the flammable range of the cloud.
- 6.7.5 There were no tankers in the TLF shed at the time of ignition. Other points which refute the possibility of ignition source at TLF is the shock-wave pattern, since all light masts in the administrative building have been bent towards south east rather than away from it, as may be expected if the explosion originated through ignition source at TLF shed.
- 6.7.6 As per security personnel statement a mist of MS vapour had formed in the area prohibiting vehicular movement from the gate towards the facilities located inside. . Thus the possibility of extra ordinary vehicle movement from the main gate towards the tank farm as an ignition source is precluded. However personnel in the pipeline division, who, too would have to travel along the roads to tank farm through approach the main gate, would have to start their vehicles (a jeep and a motorbike). There are possibilities of spark from either of these vehicles. Coming to the possibility of electrical sparking, most sparking occurs when the

equipment is started or shut down. From all information available, none pointed towards any attempt by any personnel in the facility to start or shut down any electrical equipment around the time vapour cloud ignited. Though there are provisions for auto start of the emergency back up generators both for SAP server as well as pipeline division, these could not have been started as neither any grid failure was reported nor had the state electricity board switched off the supply before the blast.

6.7.7 Therefore, only possible source of ignition which were likely are follows:

1. Motor bike engine of one of the pipeline division officer - However, in this case the stand of the motor bike was in out position which indicated the motor bike was parked on the northern side of the SKO tank and the body of the rider was found some distance away. In all likelihood the motor bike engine stalled due to lack of enough air in the air-fuel mixture and the rider after parking the vehicle ran towards a safe area. The motor bike rider who eventually died in the blast was the morning shift officer of the pipeline division who stayed back in the pipeline division even after his duty hours were over (2.00 p.m.). One intriguing fact which could not be explained to the satisfaction of the investigating team is why the morning time shift officer stayed back long hours after his duty hours were over.
- 2 The pipeline division jeep driver in all likelihood repeatedly tried to start the jeep which failed to start again because of insufficient air-fuel mixture. If the vehicle would not have started, no sparking is possible (diesel engine). Even if the vehicle would have started, being fitted with a spark arrester of standard design, no spark at exhaust pipe is feasible. However, if the vehicle starts and the spark arrester is defective or not there, the chance of which is remote, a spark generation may be possible.
- 3 As mentioned in the foregoing, the upper floor of the BCC building, where the computers were located, shows distinct signs of fire damage. Some of the structures and trees also appear to be bent towards the MS tanks,

indicating a possible source of ignition in the BCC/DG building area and causing the subsequent blast(s). If the source of ignition was within the BCC building, the initial extent of the blast would be quite limited as the quantity of Hydrocarbon vapour present inside would be quite low depending on the air change rate followed. However, once the blast occurred, it would expose the fire to the vapour cloud that was present outside and create a flash back to the MS tank as well as the subsequent explosion(s) that occurred. The fact that witnesses at the site mentioned seeing a streak of light followed by a major cloud of smoke rising into the sky, seems to corroborate this hypothesis.

6.8 The nature of explosion damage strongly points to the ignition source being in pipeline division area or in the location around the BCC/DG buildings. The exact location and the reason of its initiation could, however, not be established so far.

1. Depending on the location of the ignition source, the key facilities/buildings are subjected to overpressures that are high enough to cause significant damage.
2. The extent of the damage on account of fire and resulting explosion has been accentuated by the spreading of hydrocarbon liquids into the storm water network, which encircles all the facilities/buildings.
3. The uncontrolled leak over a period exceeding one hour led to the release of almost 700-800 tons of motor spirit (in actual case, quantities would be higher as PHAST model considered only 60 minutes leak) and resulted in unprecedented damage. It may have been possible to limit the damage to the tank farms had all the leak been contained within the tank dyke and the fire water system been operative.

4. As can be seen from the various plots, certain combinations of wind direction and ignition source can cause a fire and explosion resulting in the extensive damage that occurred.

6.9 The cloud attained a maximum LFL distance of 323 metres about 7min 45 seconds after the start of the release. Since this is no different from the LFL distance 1hr 15 min after the leak started ,i.e. when the explosion actually occurred ,the damage resulting from a flash fire would have been similar in both cases, but the damage on account of an explosion would have been much lower.

S.No.	Time of explosion(s)	Mass involved (Kg)	Overpressure distances (m)		
			5 psi	3 psi	2 psi
1	467.2	4,416.7	99.15	135.33	174.93
2	4500	39,808	451.82	499.92	552.56

As will be seen from the results, the distance attained by shock waves from an early explosion would be much lower than that attained by the shock waves of a later explosion, on account of the very great difference in mass involved. Had an explosion occurred early on, facilities more than 200 m away from the point of ignition would have emerged unscathed from the incident.

6.10 On the other hand, were a flash fire to occur instead of an explosion, most equipment have been damaged, since a fire is an instantaneous phenomenon, causing the same damage in the area of its spread irrespective of mass involved or time elapsed. Once the flash fire had consumed the vapours generated from the released substance, the conflagration would have been sustained by the material split from the

tank, and contained within the dyke. Thus, a localized pool fire would have ensued.

6.11 The simulations were repeated using alternative methods and the results generally corroborated the findings of the incident modeling. These are briefly discussed in the following paragraphs.

6.12 Vaporisation from Liquid Pool

From Page 3.38, Yellow Book (3rd edition, 1997), mass transfer coefficient is given by

$$k_m = 0.004786 (u_w)^{0.78} (2r)^{-0.11} (Sc)^{-0.67}$$

where, k_m is mass transfer coefficient (m/s), u_w is wind speed (m/s), r is the pool radius (m) and Sc is Schmidt number.

Assuming $u_w = 3$ m/s and $Sc = 0.8$ (a typical value for hydrocarbons),

$$k_m = 0.013 (2r)^{-0.11}$$

Further assuming motor spirit to be equivalent to n-hexane, vapour pressure at 25 °C is 151 mm Hg. This gives concentration of hexane in air at saturation to be 0.7 kg/m³.

Then, evaporation rate q (in kg/h per m²) is given by

$$q = k_m C = 32.76 (2r)^{-0.11}$$

Substituting various values of r, we get:

R	q (kg/h per m ²)
50 m	19.74
100 m	18.3
200 m	16.95

Take a value of 18 kg/h per m².

Assuming an outflow rate of 1000 tones per hour and allowing 10% evaporation during initial rain-out, the pool area at steady state is $(900 \times 1000) / 18 = 50,000 \text{ m}^2$.

This gives a pool diameter of 252 m.

Tank 401A Leakage Rate calculation:

Tank Dia = 24M, Vol/M Ht. = $0.7854 \times 24 \times 24 = 452.4 \text{ M}^3$

Vel. = $\sqrt{2gh} = 4.429 \sqrt{h}$

MS Sp.grv = 0.7

1) Assume tank dia = 24 M, initial height of liquid = 11 m, liquid height after time $t = 7 \text{ M}$. This gives a total volume outflow = 1809.6M³ or 1809.6KL.

- 2) At 250 mm dia outflow pipe, assuming full-bore flow, leakage area = 0.049 m².
- 3) Assume an average liquid head of 9.5 m in the tank during the above leakage period and also a discharge coefficient of 0.61. This gives a volumetric outflow rate of 0.40 M³/Sec, or 1440 M³/Hr. ie 1440KL/Hr, **Release rate = 1000T/Hr**
- 4) Therefore, time required for 1809.6 KL to flow out = $1809.6/1440 = 1.25$ h
= 1 h 15 min
- 5) **Total mass outflow during this period is $1809.6 \times 0.7 = 1266$ MT**

6.13 VCE Blast Pressure Calculation:

Calculation of flammable mass for continuous emission from an area source would be very involved. Inaccuracy are involved due to many assumptions which may be debatable .

Therefore, for an order of magnitude estimate, one can use an approximate empirical correlation due to J. G. Marshall, quoted in Lees (page 15/290). Assuming motor spirit to be equivalent to hexane, flammable conc. limits to be 1.2% and 7.4% by volume, and heat of combustion to be 45000 kJ/kg, stable category F for weather, 3 m/s wind speed and 1000 te/h emission rate, flammable mass in the cloud has been estimated to be 8.8 te.

For the above flammable mass, and assuming TNT model, severity of damage has been estimated to be as follows:

- At 200 m radius, estimated overpressure is 9.4 kPa (Not habitable without major repair work. Roofs fail partially and 25% of all walls fail with serious damage to remaining carrying elements. Damages to window frames and doors).
- At 400 m radius, estimated overpressure is 3 kPa ((Habitable after relatively easy repairs. Minor structural damage).
- At 750 m radius, estimated overpressure is 1.1 kPa (Damage to roofs, ceilings, minor crack formation in plastering, more than 1% damage to glass panels).

6.14 CONCLUSIONS

The modeling of the leak and generation of explosion contours was based on the evidence gathered during the site visits and interactions with various personnel and agencies. It was carried out with the objective of ascertaining whether the circumstances leading to the loss of containment and the subsequent explosion and fire would have caused the devastation that occurred. The steps involved in this exercise were as follows:

- Modeling of the leak to confirm the observation of eye witnesses regarding the fountain like emission of MS from the Hammer Blind opening at the outlet of tank 401-A.
- Modeling of vapour cloud formation and the extent of its dispersion to verify that vapours had spread all over the plant and that it was impossible to approach the tank valve manifold.
- Modeling of the explosion contours to verify the extent of damage that had occurred.

The modeling of the leak as depicted in figures 12 (a) and (b) indicates that the MS would have spilled out as a jet at high velocity and reached a height of about 10 meters before spilling back on the ground about 10 meters away. This continued for almost 75 minutes resulting in the accumulation of a huge quantity of MS in and around the tank dyke.

The dispersion of MS vapours from the leak led to the formation of a vapour cloud extending to a distance of almost 335 meters. Except for the area immediately adjacent to the leak source, the concentration of MS in the cloud ranged between 1.2% and 7.8% i.e. the lower and upper flammability limits of MS. This implies that the facilities covered by the vapour cloud would be vulnerable in the event of a fire. These include the non plant buildings, TLF facilities, fire water system, portions of the pipeline terminal etc.

The vapour generated during this period was about 40 tons and posed a great hazard even in the absence of fire, as prolonged exposure to MS could have consequences ranging from giddiness and drunkenness to paralysis and even death. This would explain the conditions of M/s. RN Meena and AK Gupta when they were seen by Mr. Chambal Singh. It also explains the inability of the plant/security personnel to approach the source of leak especially without any PPE like self contained breathing apparatus, safety glasses etc.

The modeling of vapour dispersion corroborates the observations of plant personnel that MS vapours had spread over large areas of the facility.

The evidence/observations as elaborated subsequently in Chapter 7, point to the following possible locations which could have provided the ignition source:

- BCC buildings, where definite indications of fire damage are visible.
- Pipeline terminal, where hot metallic surface(s) could have present in the pump (diesel driven) of pump house.

This is based on the nature of damage that has been observed and eye witness accounts of a streak of light (flame) followed by a huge explosion and secondary explosions.

In the event that prevalent weather conditions and the turbulence of a cloud permit sufficient mixing with air, an Unconfined Vapour Cloud Explosion (UCVE) can occur when the cloud encounters a source of ignition. The flame front moves through the cloud fast enough to compress the surrounding air into a shock wave and facilities within the overpressure distances of the blast will be damaged. The table below indicates the effects of different levels of overpressure:

Blast Overpressure (psi)	Damage level
5.0	Major structural damage; fatal to people indoors
3.0	Oil Storage tank failure
2.5	Ear drum rupture
2.0	Repairable damage: light structures collapse
1.0	Window Panes shatter: light injuries

From the overpressure contours that have been generated, the following scenarios are plausible:

- A fire/blast could have occurred in the BCC building with a shock wave of 5 psi extending to about 77 meters (Fig.10). The damage to the walls, windows etc., would have exposed the fire to the MS vapour cloud,

leading to a delayed UCVE with a consequential dyke fire and tank roof failure, on account of pressurization of the tank by the dyke fire (Fig 3). The radiation on account of the tank fire was enough to cause a roof damage in the adjoining tanks through pressurization (Fig.6).

- Ignition from the pipeline terminal side would have created a blast with explosion contours as depicted in Fig 5. This would damage the MS followed by similar consequences as above.

The modeling corroborates the observation at site and an inference that could be drawn from this is that such eventualities should form part of a quantitative risk analysis for approval/clearance for similar facilities are granted.

The cases examined and the accompanying plots/graphics are annexed to this chapter.

Figures 1a & 1b

The figures depict the dispersion of motor spirit vapours, spilt by the full-bore rupture of a 10" line, under 1.5D weather conditions, with the wind from 20° East and West of North, in Figures a and b respectively. The distances from the source of the release are:

UFL Distance (green) = 81 m
LFL Distance (blue) = 216 m

Figures 2a and 2b

The figures depict the dispersion of motor spirit vapours, spilt by a 12"x6" hammer blind assembly failure, under 1.5D weather conditions, with the wind from 20° East and West of North, in Figures a and b respectively.

The distances from the source of the release are:

UFL Distance (green) = 45 m
LFL Distance (blue) = 337 m

Figure 3

The figure depicts the delayed explosion of motor spirit vapours, released over 1 hour by a hammer blind assembly failure, under 1.5D weather conditions, with the wind from 20° East of North and the DG Set acting as the source of ignition. The distances from the epicentre of the explosion are:

5 psi (blue)	= 254 m
3 psi (yellow)	= 346 m
2 psi (green)	= 448 m
1 psi (red)	= 710 m

Figure 4

The figure depicts an explosion that could arise if the motor spirit vapours were to disperse to the north of the MS Tank Farm, and be ignited by a motorcycle there. The distances from the epicentre of the explosion are:

5 psi (blue)	= 254 m
3 psi (yellow)	= 346 m
2 psi (green)	= 448 m
1 psi (red)	= 710 m

Figure 5

The figure depicts an explosion that could arise if the motor spirit vapours were to disperse to the east of the MS Tank Farm, and be ignited by the Pipelines Jeep there. The distances from the epicentre of the explosion are:

5 psi (blue)	= 254 m
3 psi (yellow)	= 346 m
2 psi (green)	= 448 m
1 psi (red)	= 710 m

Figure 6

The figure depicts a pool fire of motor spirit spilt in the dyke from a hammer blind assembly failure, under 1.5D weather conditions. The diagram helps infer the radiation from the fire that would be necessary to account for a roof failure such as that considered for Figure 9. The distances from the centre of the fire are:

8 kW/m² (green) = 42 m

4 kW/m² (blue) = 69 m

Figures 7a & 7b

The figures depict the dispersion of motor spirit vapours, evaporated from the MS Tank Farm Storm Water Drain, under 1.5D weather conditions, with the wind from 20° East and West of North, in Figures a and b respectively. For the purpose of calculations, the storm water network was divided into discrete lengths, each of which could act as an independent source. The MS Storm Water Drain was considered to be 130 m long, 1 foot wide and 1.5 feet deep, with MS to half its depth. The distances from the point of the release are:

LFL Distance (blue) = 115 m

Figures 8a & 8b

The figures depict the dispersion of motor spirit vapours, evaporated from the ETP section of the Storm Water Drain Network, under 1.5D weather conditions, with the wind from 20° East and West of North, in Figures a and b respectively. For the purpose of calculations, the storm water network was divided into discrete lengths, each of which could act as an independent source. The ETP section was considered to be 30 m long, 1 foot wide and 1.5 feet deep, with MS to half its depth. The distances from the point of the release are:

LFL Distance (blue) = 50 m

Figure 9

The figure depicts the explosion of motor spirit vapours, released by a tank roof failure, on account of pressurization of the tank by the dyke fire. The distances from the epicenter of the explosion are:

5 psi (blue)	= 189 m
3 psi (yellow)	= 258 m
2 psi (green)	= 333 m
1 psi (red)	= 528 m

Figure 10

The figure depicts the explosion of motor spirit vapours, spilt over 426 s. *i.e.* 7 min. 2 sec. (the time required for the cloud to stabilise), by a hammer blind assembly failure, under 1.5D weather conditions, with the wind from 20° East of North and the DG Set acting as the source of ignition. The distances from the epicentre of the explosion are:

5 psi (blue)	= 77 m
3 psi (yellow)	= 105 m
2 psi (green)	= 135 m
1 psi (red)	= 215 m

Figure 11

The figure depicts the explosion of motor spirit vapours, spilt over 426 s. (the time required for the cloud to stabilise), by a hammer blind assembly failure, under 1.5D weather conditions, with the wind from 20° East of North. This figure considers a source of ignition close to the source of the release just beyond the Upper Flammability Limit. The distances from the epicentre of the explosion are:

5 psi (blue)	= 77 m

3 psi (yellow) = 105 m

2 psi (green) = 135 m

1 psi (red) = 215 m

Figure 12a & 12b

Each of the figures, depicts the vertical jet that could arise from a hammer blind assembly failure, under 1.5D weather conditions, but at different angles. While 13a depicts the jet at 10° from the vertical, 13b depicts the jet at 20° from the vertical. The heights and distances reached by the jets are given below:

Jet at 10° from the vertical:

Horizontal distance covered = 6 m (approximately)

Height of jet = 11 m (approximately)

Jet at 20° from the vertical:

Horizontal distance covered = 10 m (approximately)

Height of jet = 10 m (approximately)

Since the tank bund was about 10 m from the hammer blind assembly, the motor spirit released may have spilled over the bund, in addition to flooding the area within it.



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Figure 1b Dispersion of Motor Spirits Vapour Weather Conditions: 1.5 D Model: Line Rupture Wind from: 30° West of North

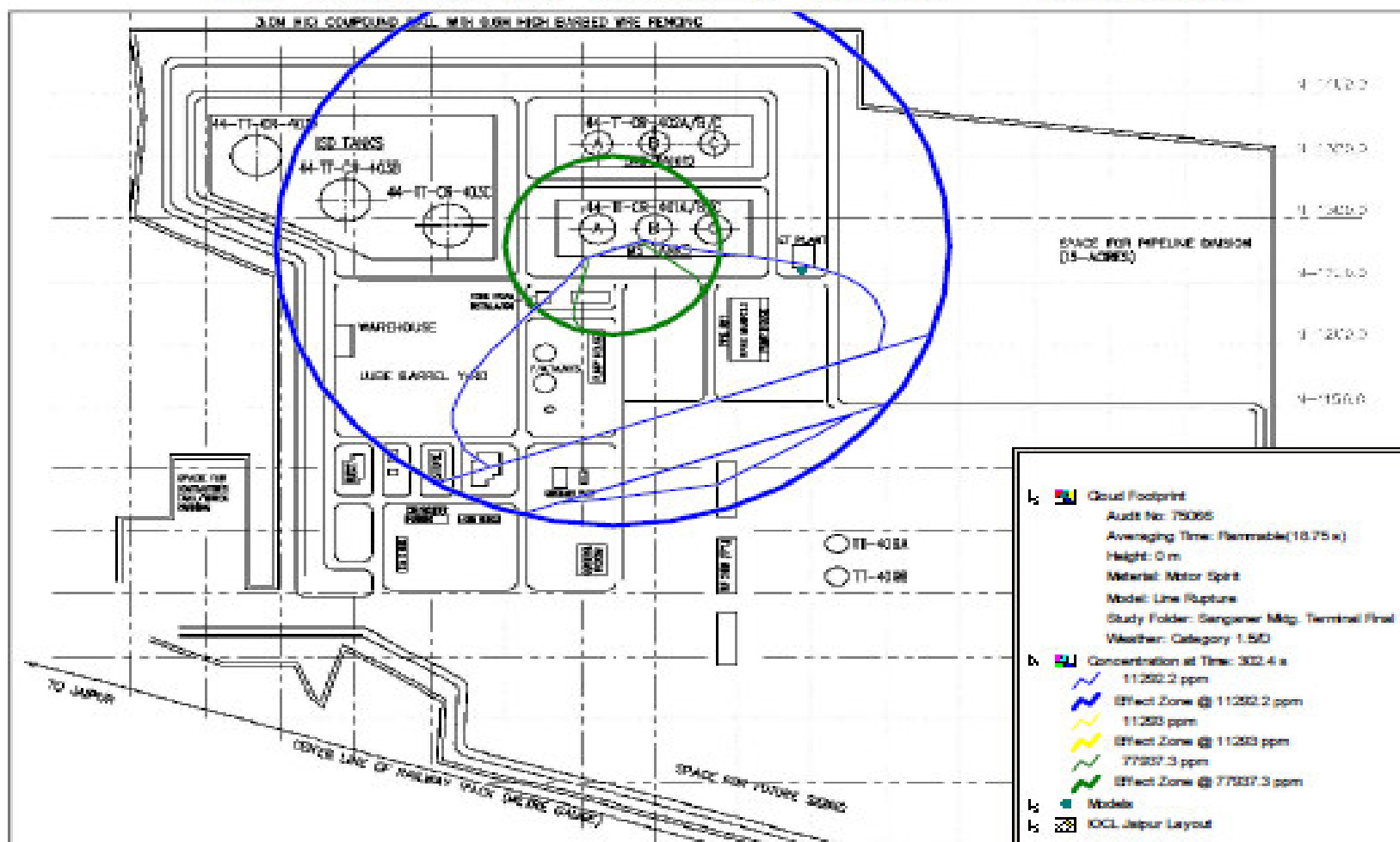






Figure 4 Explosion Overpressure Contours Weather Conditions: 1.5 D Source of Ignition: Motor-cycle

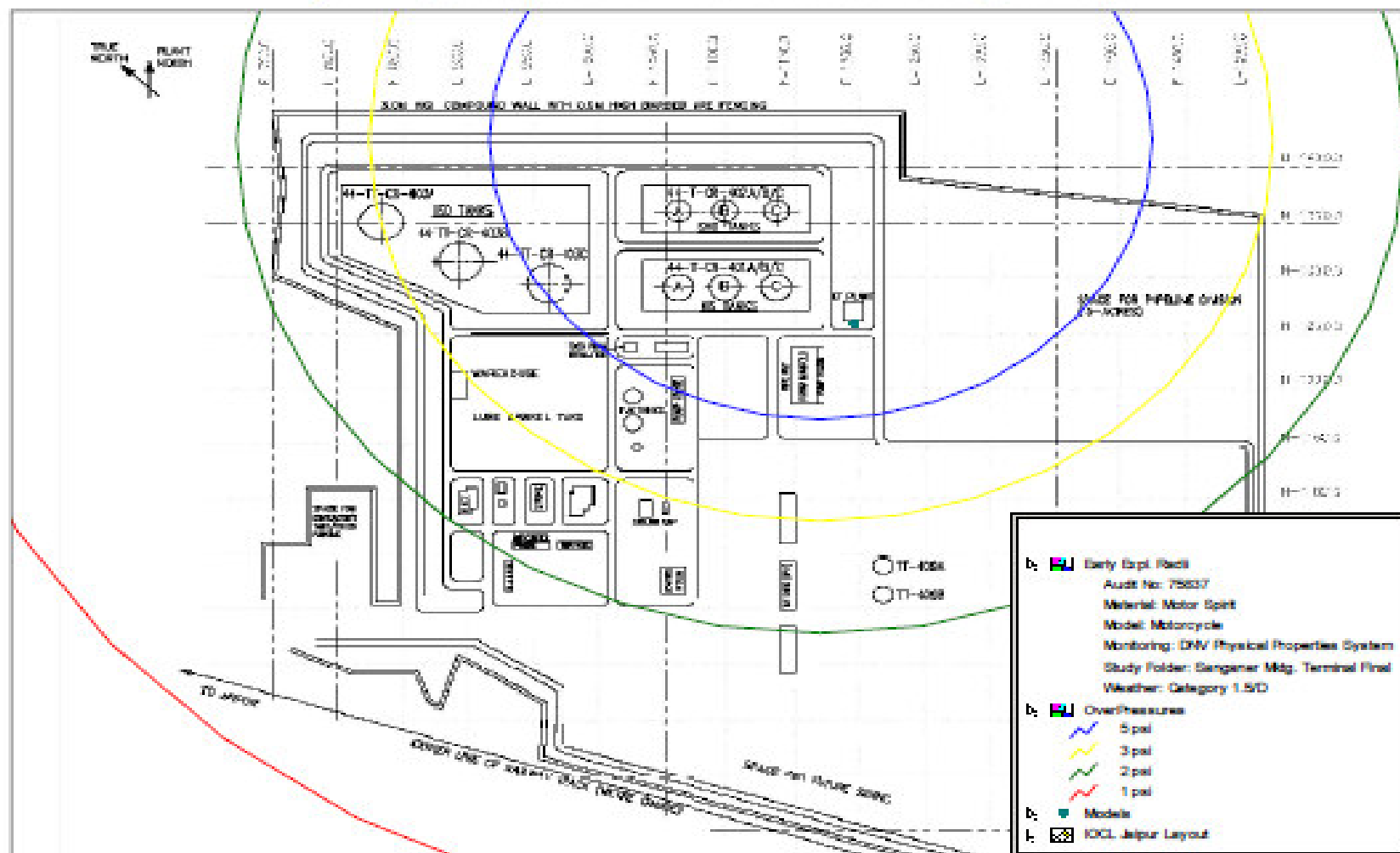


Figure 3 Explosion Overpressure Contours Weather Conditions: 1.5 D Source of Ignition: Jeep

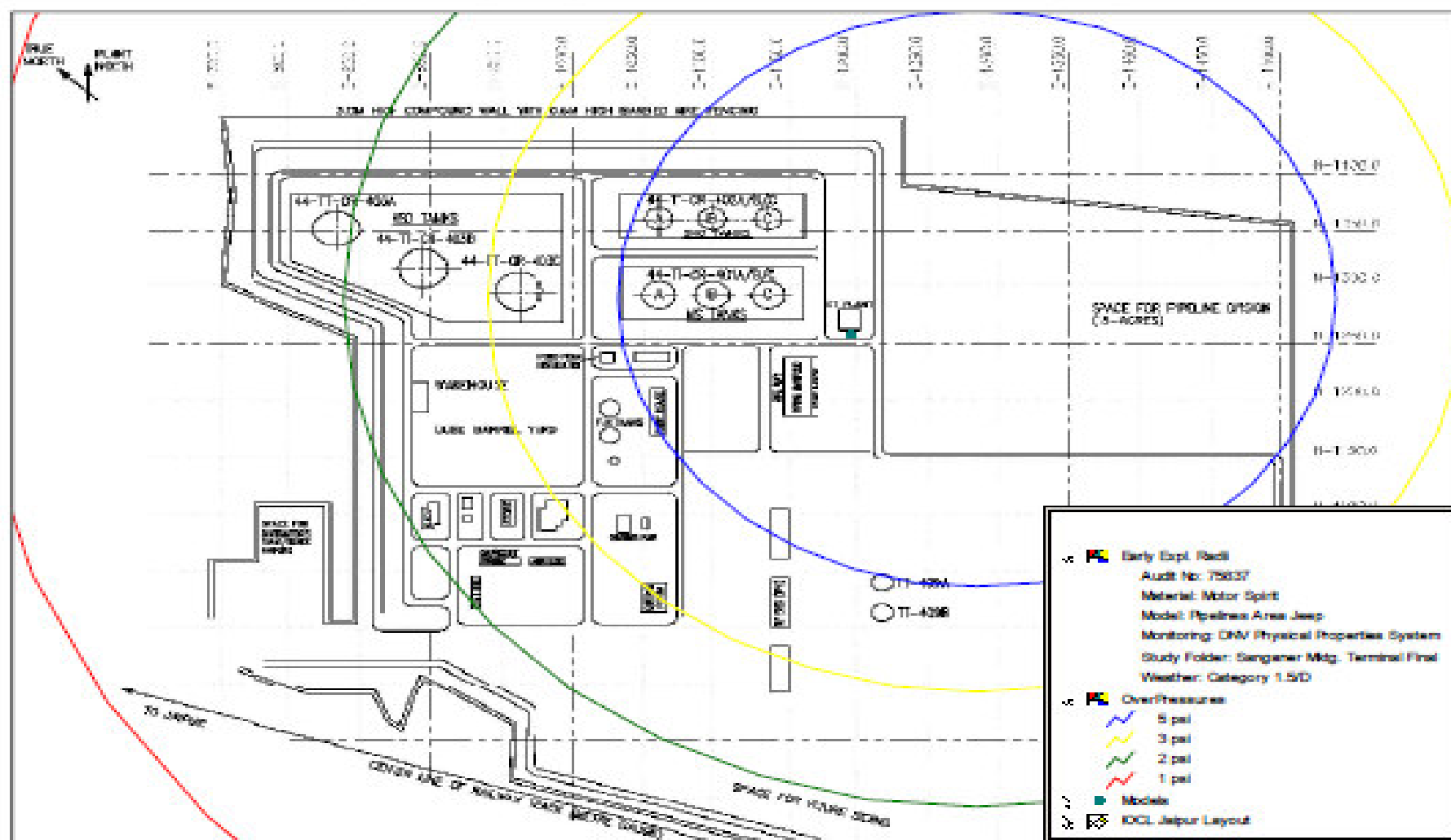
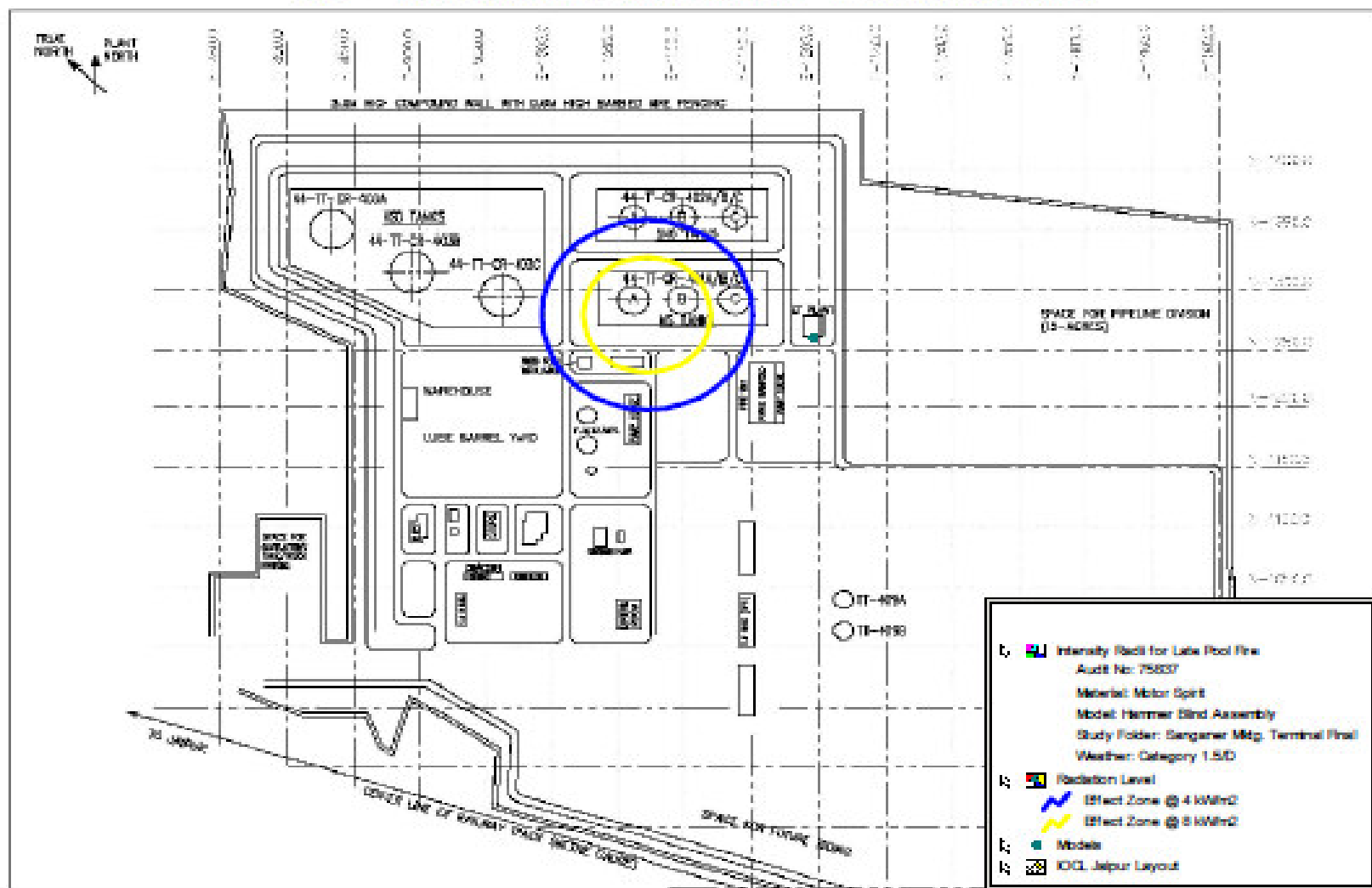
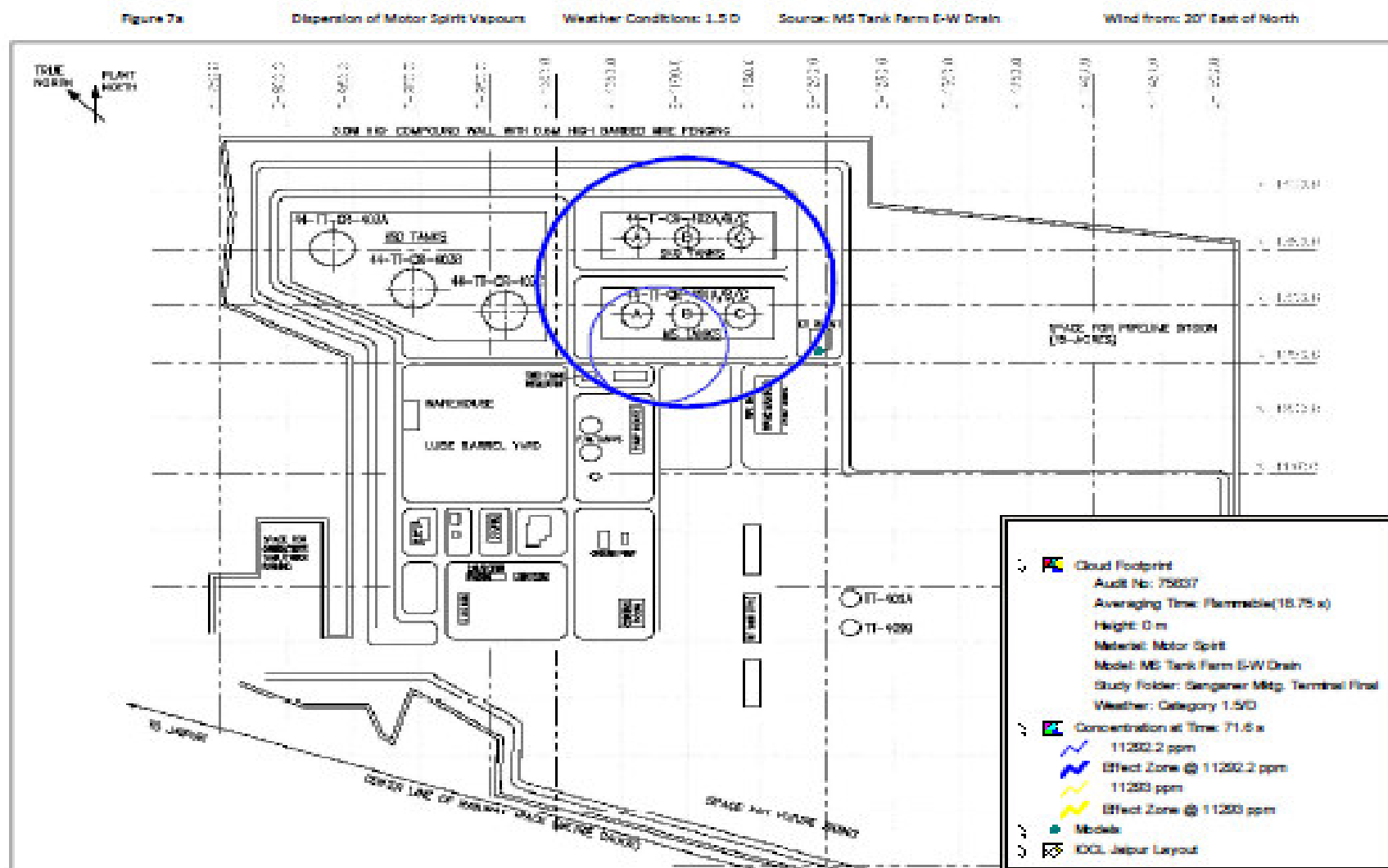


Figure 6 Dyke Fire Radiation Distances Weather Conditions: 1.5 D Model: Hammer Blind Assembly Failure





Wind from: 30° West of North



Figure 8a

Dispersion of Motor Spirit Vapour

Weather Conditions: 1.5 D

Source: ETP Drain

Wind from: 20° East of North

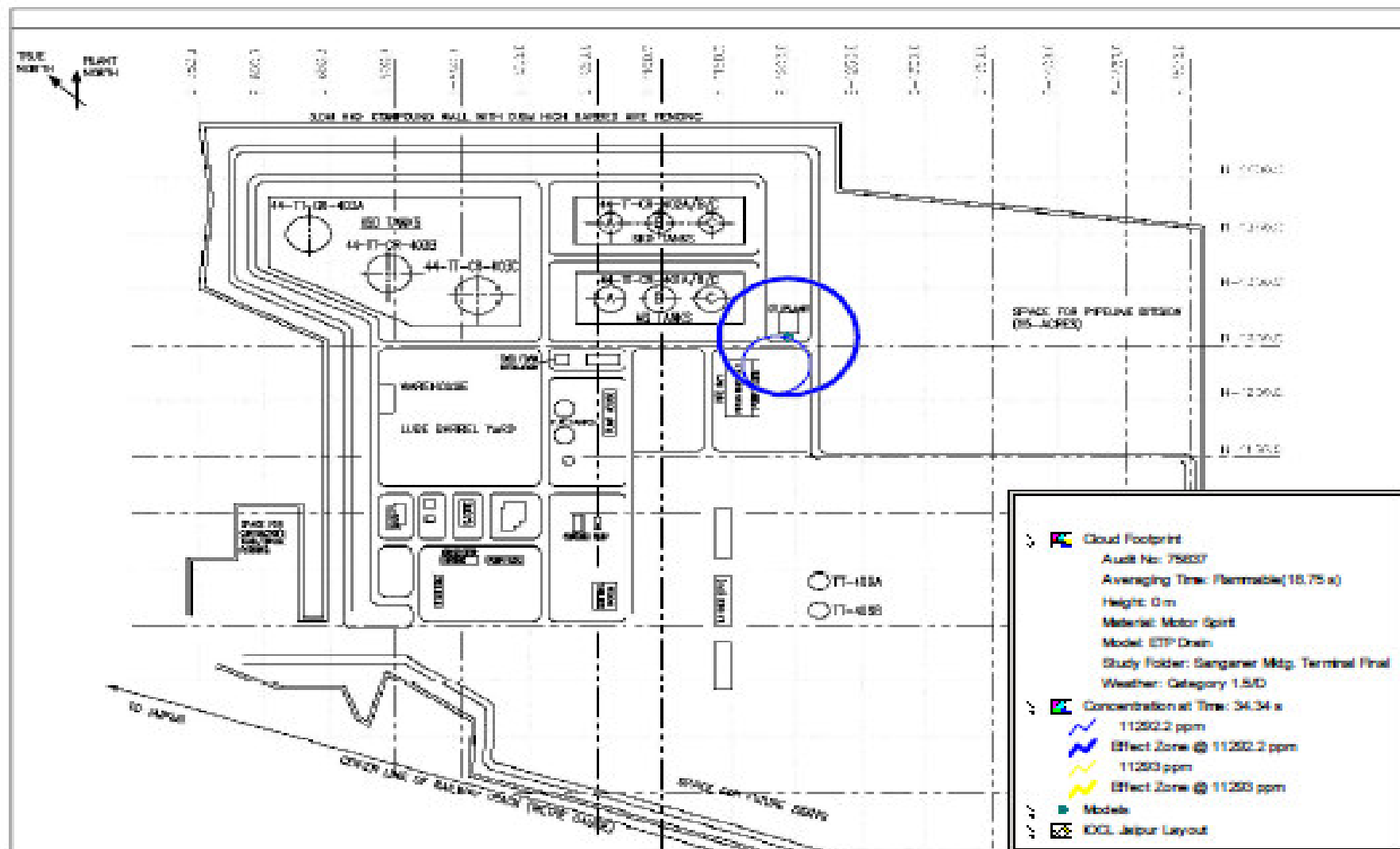




Figure 10

Explosion Overpressure Contours

Weather Conditions: 1.5 D

Source of Ignition: DG Set

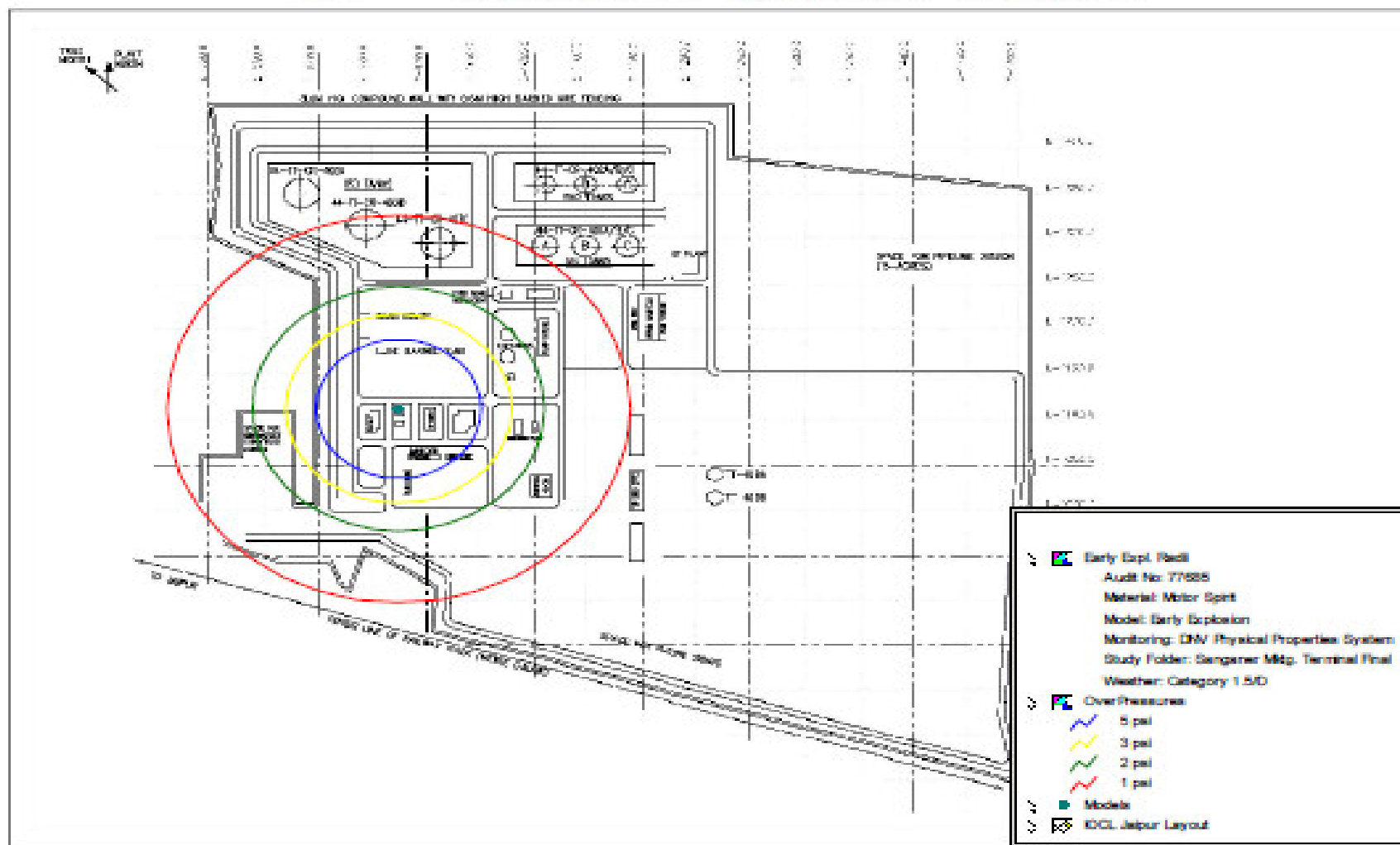


Figure 12a

Jet Distribution under 1.5D Weather Conditions

Angle of Release: 10° from the vertical

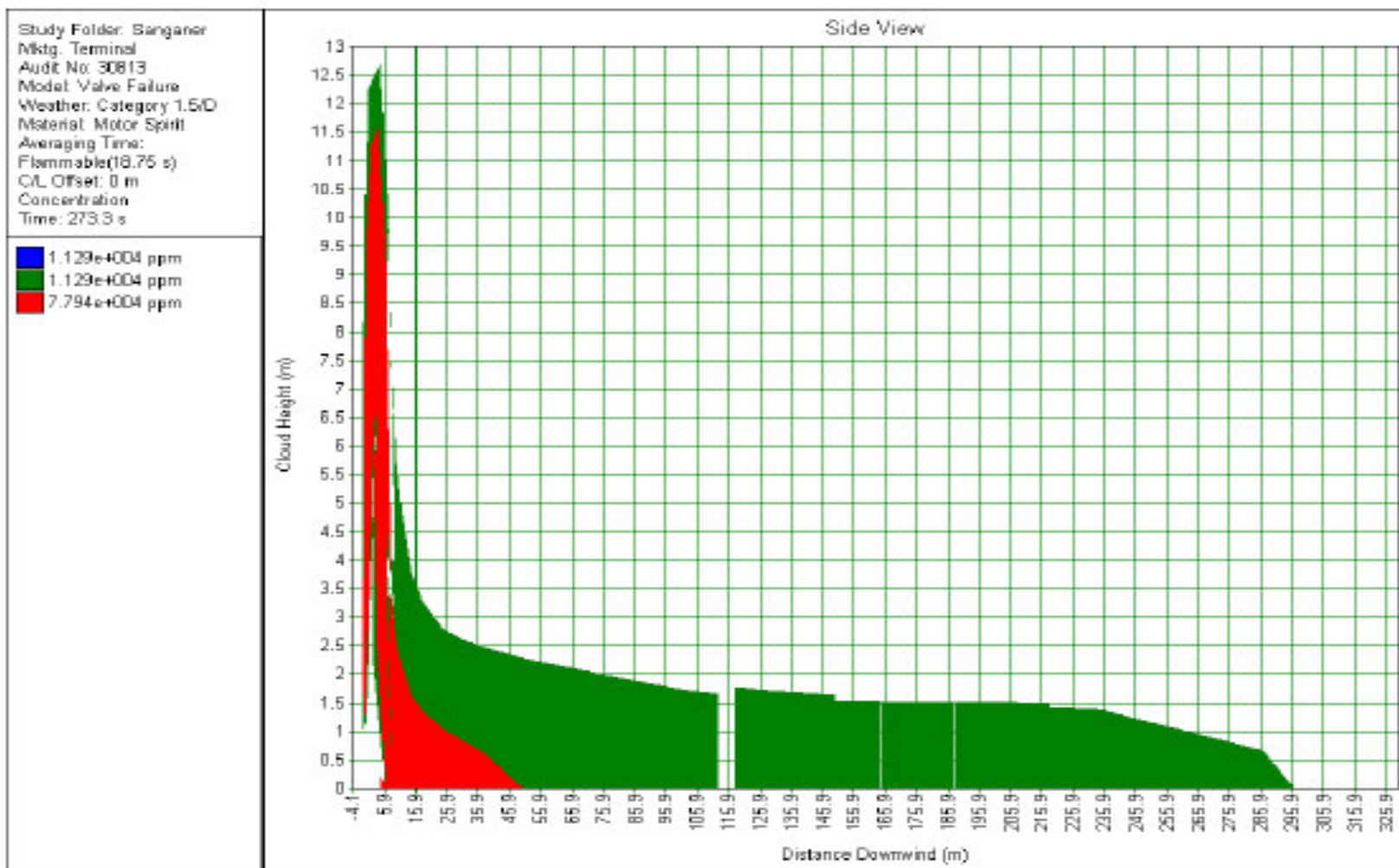
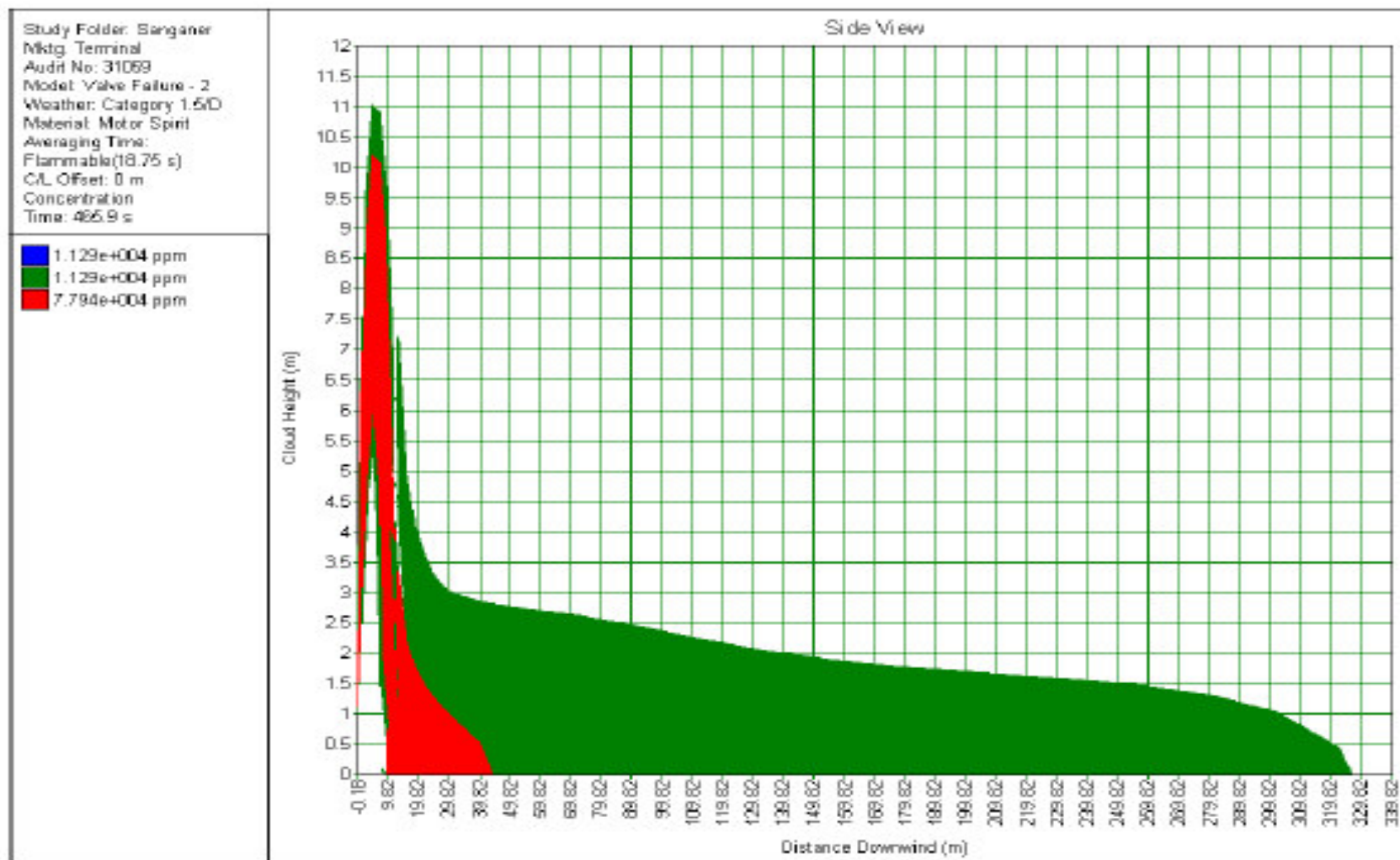


Figure 12b

Jet Distribution under 1.5 D Weather Conditions

Angle of Release: 20° from the vertical



CHAPTER 7

FACILITIES, OBSERVATION AND ANALYSIS

BACKGROUND INFORMATION

7.1 VAPOUR CLOUD EXPLOSION

Prior to the Buncefield and now Jaipur incident, the most likely consequences from a failure of volatile liquid hydrocarbon containment, such as from a storage tank or from any other location in an installation, would have been assumed to be a flash fire and/or pool fire. The size of the flash fire would probably have been limited because the influence of the vaporization from atomized liquid cascade as it happened in the present case from a Hammer Blind Valve but was not identified as a hazard and the flash fire would have been associated with evaporation from an assumed quiescent pool in the bund. This incident, however, very clearly demonstrates that future risk analysis should consider the probability of an explosion resulting from enhanced vaporization of free falling or escape of liquid.

The tank terminal facility was only for storage of liquid petroleum products, namely MS, HSD & SKO, besides having a large storage of lube oil in drums. This is the first instance in the country and perhaps the second or third in the world in which storage and handling of these products (MS) under atmospheric pressure has resulted into such a catastrophic accident. Normally loss or escape of containment of any petroleum products of this nature occurs for a short duration and the release caused if ignited causes a pool fire, and in any case the situation is brought under control quickly. Certain scenarios have been considered in the consequence analysis appearing in the report submitted to the Committee titled "HAZOP Study", (agency name not given and also undated). The scenario considered therein included pool fire. Further, major tank fires are normally roof fires

which have also been considered in the said report. The scenario which emerged in the IOC Jaipur Terminal was not envisaged in such study, perhaps because it had not occurred anywhere else at the time the “Hazop” study was done.

The incident as the one which occurred at Jaipur Oil Terminal i.e. massive vapour cloud explosion has so far only one established precedent which happened in December 2005 in a very similar oil terminal (Buncefield Oil Terminal) Near Heathrow Airport in U.K. In this incident a large quantity of MS (reportedly 300 tons) had leaked because of overflow from a MS tank, which went unnoticed because of malfunction of tank level control and associated safety inter locks. Very recently on 23rd October, 2009, reportedly a similar incident occurred in a petroleum oil terminal in the Caribbean Refinery (which was under shutdown) at Puerto Rico, where too, a massive MS leak due to overflow of MS tank during ship unloading reportedly resulted loss of around 800 tons of containment which caused a massive explosion. Both these accidents were of catastrophic nature similar to Jaipur. No other such incident i.e. massive vapour cloud explosion in a petroleum product storage terminal has occurred/reported.

7.2 FACILITIES

In Major Accident Hazard (MAH) units such as the Jaipur Oil Terminal the location of facilities and plants as well as developments in land use around the facility over time, need to be critically reviewed regularly over a period learning from similar accidents both in the country and worldwide.

7.3 DESIGN

1. The IOC Jaipur POL Terminal built around 1995/96 and commissioned in early 1997 was engineered and constructed by well reputed public sector engineering company M/s Engineers India Ltd., (EIL) on LSTK basis. The

Terminal was designed as per the applicable national and international codes and engineering standards prevailing at that point of time, namely, API-650, ASME, ANSI, B31.3/16.5/16.29, NEMA etc. The material of construction was selected as per the best prevalent engineering codes internationally namely, ASTM, A-285 – Gr.C, A-106-Gr. B, ASTM A182 Gr. F-6, A-216, Gr.WCB, API 5L, etc.

2. The plant lay out design was carried out as per the then prevailing applicable statutes, (e.g, Petroleum Rules), OISD Standards/guidelines as applicable as well as good lay out design concepts as prevalent at that point of time. Fire fighting facilities were provided strictly as per the then applicable OISD standards. Other safety features namely, control system, interlocks etc., for safe operation as per good practice prevalent at that point of time, was provided by EIL.
3. The Jaipur POL Terminal, when commissioned in 1997 was termed as most modern and automated Marketing POL Terminal of IOC.
4. The Jaipur Terminal, in earlier years, had good safety records and received National Safety Council's Award for "Best of its Class" for three successive years from 2001 to 2003. Further it was adjudged "Runners up" in 2004.
5. In 1997, when this facility was commissioned, the location was decided by IOC keeping in mind that it was sufficiently away from Jaipur city, with residential/commercial/industrial areas few Kilometers from the block boundary and at the same time it was in proximity to the major product consuming centre. The earlier operating site which was very close to the then Jaipur city was relocated here.

6. The construction of this Terminal was done by M/s ATV Projects, a contractor with experience in construction of petrochemicals and refinery projects, short listed by EIL based on their competence.

The overall process design of tank operations (which involves delivery, receipt of product etc.), viz. the first valve on the tank being a MOV followed by Hammer Blind and a hand operated valve is such that it makes it highly vulnerable to human error. However, in the event of operator error a fall back (check to undo it) was in the form of a remote closing facility from the control room. This was made defunct since 2003 or thereabout and the only way that the MOV could be closed was to go near it and press the 'close' button or else to close it manually by hand wheel which, of course, required being at the valve.

7.4 LAYOUT

Though the Installation was constructed quite recently, in 1995-96, a few areas where design could have been better done are worth pointing out. The installation ground area is very vast comprising of 105 acres for the marketing installation and 15 acres at the NE corner for pipeline, for facilities consisting of interface manifold, control room and crude oil booster pump with auxiliaries.

The terminal is in 105 acres area and in Phase I, storage facility around 80,000 KL capacity was constructed .All tanks of three products i.e. MS, HSD and kerosene were located in three separate dykes close to each other on the North West corner of the plot. The initial layout did not prudently consider the future expansion of the tank terminal. This was evident from the fact that additional two numbers MS tanks constructed in Phase II were to be located far away from three MS tanks of Phase I.

The marketing terminal fire water pump house and fire water tank location though complying with the statutes (Petroleum Rules) and was not violating the OISD guidelines was not ideally located. Experience gained from other accidents such as Cochin Refinery (1984) and similar incident elsewhere showed that fire water pump house as well as fire water tanks should be located far away from areas wherein fire and other emergency incidents can occur. This concept appears to have been taken into consideration in Jodhpur Oil Terminal.

7.5 ENGINEERING

As a good practice, the inside of the dyke should have minimum flanges and piping and any normal day to day operating facilities, like manifold, should be outside the dyke. Here, it was observed that the tank isolating facilities for different line-ups, the Hammer Blind assembly consisting of downstream hand operated gate valve (HOV) and from the tank side, a motor operated gate valve, were provided inside the dyke area. This appears to be the operating / design philosophy followed by IOCL for all their Terminals set up at that time. The motor operated valve was having 3 knobs of identical size, one for 'Open' operations, another for 'Close' operations and yet another for 'Stop' Operations at any intermediate position. All these knobs or push buttons were mounted on a panel close to each other and therefore vulnerable to human error, especially in times of an emergency when very quick responses are required, and also during dark hours when lighting in the area may not be adequate. In the absence of appropriate lighting at these control points for immediate and correct approachability, it would have been prudent to think of designing these operating points through a different type of mechanism.

Bleed valves have been shown on the P&IDs between MOV/HB/HOV. These were envisaged to check possible passing before opening any of the valves. However in the plant these have not been provided. From interview/discussions it transpired that none of the terminal personnel was aware of the purpose of the provision of these bleed valves on the P&IDs.

7.6 ILLUMINATION

No separate lighting other than the general tower lighting was available. The lighting arrangement in the terminal was poor. Operations after dusk had to be carried out in general lighting provided by light masts which provided insufficient lighting in the operating points resulting in operator's poor visibility. Separate lighting in tank area had not been provided at crucial operating points.

7.7 GREENERY IN TERMINAL

Extensive research was carried out into the Buncefield accident. This included phase (i) modeling and recreation of the blast conclusively indicated that the presence of extensive greenery i.e. dense rows of big trees along with low level raw vegetation greatly contributed to accelerate the "Deflagration" which first occurs in "Unconfined Vapour Cloud Fire/flash fire" to "Detonation" due to very fast acceleration of flame speed beyond 500 meters per second or higher. Jaipur terminal too had extensive greenery and rows of trees along the plant road leading to MS tank 401-A and also good growth of large trees both close to tank farm area as well as near portions of the boundary. The concept of providing green belt along the periphery of hazardous facility and also encouraging greenery within/close to plant area itself had been a practice for long. However, this practice needs to be re-examined for petrochemicals, refinery/petroleum terminals and such facilities wherein vapour cloud may

form. The trees provide protection against fire (radiation effect) as well as toxic release. However, as seen in Buncefield and most likely in Jaipur in case of a “Vapour Cloud Explosion”, they greatly enhance the blast effect and accordingly the severity of damage and accordingly from Buncefield experience there is a possibility of having a re-look in the extensive greenery in terminals such as Jaipur.

The investigation committee into the fire/explosion incident in the BP Texas Refinery in 2005 (where too a massive vapour cloud explosion took place) had also observed similarly, “As the degree of congestion (number of obstacles due to process equipment, pipe work) and confinement (extent of enclosure in 3 dimensions) of a vapor cloud increases, the magnitude of the resulting vapour cloud explosion also increases in the event of ignition...”. In the Jaipur incident too, there was confinement of vapour due to buildings and trees which may have enhanced the effect of the blast. While the greenery interspersed with the plant and facilities may enhance any explosion effect in case of a leak, the Committee feels that as per current reckoning the green belt along the periphery of the site can be retained.

7.8 CRITICAL SITE EVIDENCE

1. Both the isolating valves in the outlet line of the MS tank T-401-A i.e. the tank MOV, and the hand operated valve were found fully open.
2. The hammer blind valve provided in between the above two isolation valves had both of the eye plates (blind and the open one) outside the hammer blind valve body casing, thus making its entire bonnet fully open to atmosphere.

3. The solid wedge position was such that it had been pushed to the wrong direction (west) and the open eye position was vertically on top of it and the open eye was hooked in that position. However, our experiments conducted (refer Appendix 6, Case No.4) reveal that this position of wedges can result with very high flow of liquid from the bonnet of the Hammer Blind valve.

4. The position of blind eye being in wrong position, at that position it would not have been possible to lower the open eye.

5. The open eye of the hammer blind had partially burnt PTFE gasket whereas no gasket was existing on the blind eye. Hence the blind eye was apparently not fitted with PTFE gasket.

6. The tank 401-A dyke drain valve leading to open storm water drain, was in open position with hand wheel missing, and the 401-A dyke drain valve leading to ETP was fully closed with its hand wheel also missing. These hand wheels could not be located.

7. Drains - the one starting from tank 401 running in west to east direction and the drains connected to it had thick black soot marks clearly indicating a drainage channel fire.

8. During subsequent visit it was seen that the spindle of both the dyke valves (Refer point No.5 above) were missing. The Investigation Committee, therefore, carried out close examination of this valve by arranging dismantling of its top bonnet at site. Very surprisingly following were seen:

- a) The dyke drain valve leading to open storm water drain, whose gate was earlier found open, is now fully closed.

- b) This valve spindle as well as the spindle of dyke drain valve leading to ETP was both of their stems broken at a point about inch from the root.
- c) Broken stems position of both the spindles was blackish.

On rubbing the broken portions, it was observed that these spindles were made of brass, which is not as per the engineering specifications.

The above site observations can be well understood by referring following site photograph

Photograph of the broken spindle of the drain valve outside the dyke wall of Tk 401A

9. The BCC building had marks of thick soot on the first floor towards east, north and west sides. The building was totally damaged. The west side walls of the building had bulged outwards indicating a possible explosion of petroleum vapours accumulated inside the building. This building which was outside the danger zone of Installation had all kinds of ordinary electrical equipments, lighting and Air Conditioning equipments which are self regulating by on or off mechanism. Thus, this building had sources of ignition of petroleum vapours in the form of sparks generated from the electrical equipments.

10. The Installation had lot of trees in almost all the areas. After the accident it was noticed that the trees in the area of BCC building, Administrative building, canteen, stores, DG shed, PMCC building and car

parking area were snapped off in the middle and the fallen portion all were pointing towards tank No.401-A where the leakage occurred.

11. In between car shed and DG shed two tank lorries were seen. The tanks on these lorries had come off the chassis and had fallen towards the direction of tank No.401-A.

12. The trees in the areas of pump house, open areas beyond that, ETP area as well as the area of two MS tanks opposite to tank truck gantry all had snapped similarly but the fallen portions were pointing towards the Pipeline Division facilities.

13. The Pipeline Division housed booster pumping station for the Mundra to Mathura/Panipat pipeline. The pipeline pumping station was severely damaged in the accident. Pumping operations were reportedly stopped by the Pipeline Division staff after emergency alarm was sounded after 6.30 p.m. However, the huge capacity motors of booster pumps might still have high surface temperatures enough to ignite petroleum vapours accumulated there.

14. Thus, apparently there were two centres of ignition of petroleum vapours – one in the BCC building and another in the Pipeline Division facility.

15. A motor-bike was found on the northern side of SKO tank and the rider's body was found away from the bike. It is possible that sparks from the exhaust of the bike could have provided the source of ignition to petroleum vapours.

16. Similarly, it was reported that jeep of Pipeline Division was about to be pressed into use but the attempt to start its engine failed. During these

attempts any spark from the exhaust pipe (which may not have been fitted with spark arrester) also could provide the source of ignition.

7.9 OPERATING SCENARIOS

All the three valves on the delivery line of Tank 401-A were found in fully open position. The Hammer Blind was not only fully open but both sides of the valve i.e. the hollow wedge and the solid wedge were outside the body and kept one on top of the other (open eye in hooked condition and blind eye resting on the body).

The above condition of the valves indicates a grossly irregular operation which can never happen if a Standard Operating Procedure was followed.

The fact that the solid wedge is resting below the hollow wedge shows either lack of understanding and skill because in this position, the hollow wedge cannot move inside the valve body, or it may be due to the fact that only one operator was performing the operation of reversing the Hammer Blind.

When both the wedges of the Hammer Blind are outside the valve body, both the MOV and the Hand Operated Valve (HOV) should have been in closed position whereas both were found in fully open position. It may be worth noting that there was no physical indication available at the site to indicate whether the MOV was in the fully open (or fully shut) position. Only an approximate idea of the valve position can be understood from the threads on the valve stems. Since both the operators who operated the system did not survive the accident, and there are no recordings of valve positions, or other recorded evidence available to the Committee, we may not know exactly what led them to this condition, but the position of the valves does indicate that whatever operation was done immediately

prior to the incident was a highly irregular one. Some likely sequences of valve operations, which may have been possible, are discussed below:

- a HOV opened first – then Hammer Blind (HB) opened – some leak occurs due to reverse flow – RN Meena thinks passing MOV – some material goes in his eyes – he presses wrong button on MOV panel, – “open”, instead of “close”, and leak becomes huge. Reverse flow may occur in the event of sucking of air when the vent valve on the MS pump delivery line near exchange pit is open by the BPCL contractor’s man before sealing the valve. However, the MS transfer pump has no bypass (from delivery to suction) and accordingly any reverse flow first has to come through the pump valve and then to the pump. Further it being a centrifugal pump, the impeller will have to rotate in reverse direction in case of reverse flow. It is most unlikely that non-return valve failed. Even if the non-return valve passes the pressure on the upstream side of the non-return valve will be too small to cause reverse rotation of the impeller resulting in reverse flow. Further, this small difference in height cannot result in a vertical jet of MS through the open bonnet of Hammer Blind valve, blinding Shri R N Meena. Hence this seems improbable. Even so, a clear violation is the opening of the HOV before the Hammer Blind is reversed.
- b MOV was by mistake fully open before the entire operation started and leak started when HB was pulled out. However, this seems improbable as the leak would have been very heavy for anyone to be able to open the valve (HB) fully with the leak on.

- c HOV was full open first, MOV was passing – RN Meena operates hammer blind valve and continues despite some material leaking – material goes in his eyes – again he goes to MOV to press close button but by mistake presses open button – situation worsens. On hearing the distress call over VHF, KR Meena enters the dyke to rescue RN Meena but succumbs to the leak. All persons interviewed in Jaipur and Jodhpur have said that they had never experienced any of the MOVs to be passing beyond a very small quantity. It must, however, also be pointed out that the internal investigation committee set up by IOC has observed “it is common knowledge that MOVs pass at times”.
- d HOV was full open first, MOV was open just a fraction before the line up operation was to be started in order to pressurize the pump section line (which was not supposed to be done at this stage) – RN Meena operates hammer blind valve and continues despite some material leaking – material goes in his eyes – again he goes to MOV to press close button but by mistake presses open button – situation worsens. On hearing the distress call over VHF, KR Meena enters the dyke to rescue RN Meena but succumbs to the leak. Again the violation of procedure is that HOV should not have been opened before reversing the Hammer Blind. In this case not only the HOV was first opened making it a violation, but also the MOV was not checked for being shut before attempting the Hammer Blind operation.
- e RN Meena opened the Hammer Blind valve by pulling out the solid wedge, but forgot to put the hollow wedge inside the valve body thus leaving the bonnet open at the top. Due to absent mindedness, which incidentally Shri RN Meena was prone to, he

pressed the open button of the MOV, and the situation got out of control.

In many of the cases above, it is assumed that the HOV was opened first, perhaps with a view to reduce back pressure and the leakage when Hammer Blind solid wedge was being reversed from close to open position, and in the event that MOV was passing.

It may also be pointed out that within the first few minutes of the start of the leak, all the available operating personnel were incapacitated – two of them lying presumably unconscious within the tank dyke area and the officer on duty having been rushed to the hospital. Had the third operator been available on site, had he been trained and acted in right manner such as using fire water fog nozzles or starting of the MS pump so that product could be diverted to any other tank (thereby the extent of the leak) by pumping to any of the other tanks and/or donning on the protective equipment (breathing mask and fire suit) and closed the MOV, the incident would have been very largely mitigated.

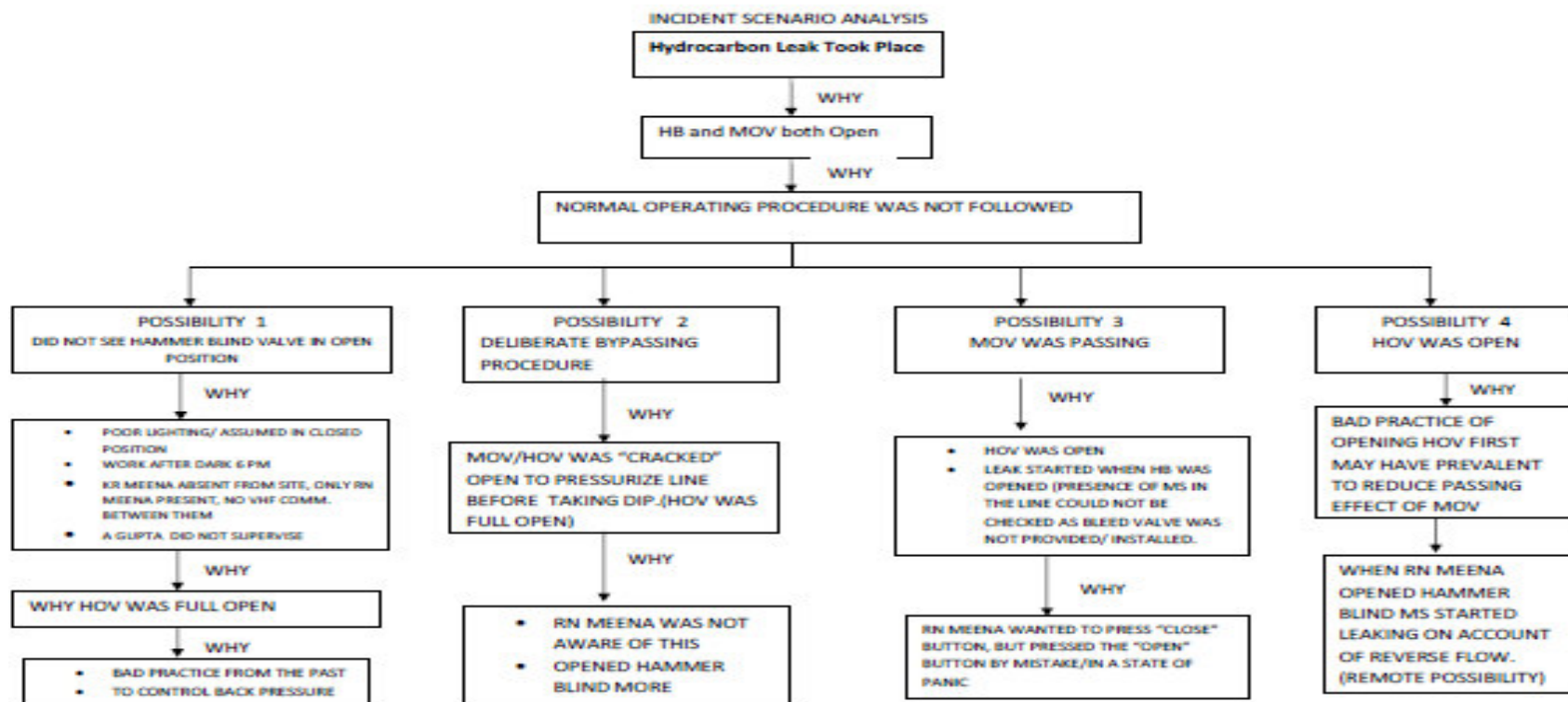
- f Another possibility is when Shri RN Meena was on top of tank 401-A along with Shri Gupta and Shri Gangal for taking joint dip Shri K R Meena, who was standing in ground level inside the dyke area, had tried to communicate some message to Shri R N Meena, which Shri Ashok Gupta could not understand (as per the statement of Shri Gupta). KR Meena may have opened Hammer Blind Valve for making the line through may have left it open with both the wedges out and had gone perhaps to bring the O-ring and also to take tea, as the canteen was about to close. In the meantime, RN Meena came down and due to poor illumination may not have observed the proper condition of Hammer Blind Valve and may have thought that the Hammer Blind Valve have

already been reversed by KR Meena. Therefore to pressurize the line he might have operated MOV. After opening the MOV there was a splash of MS from the opening of Hammer Blind Valve which had perhaps blinded RN Meena when the line was filled MS started escaping through the opening of Hammer Blind Valve with full pressure.

Amongst the contributory reasons for the incident, one need to highlight that the approachability of the Hammer Blind and the open/close button of MOV and the proximity of the two buttons making it possible that the operator may press the wrong button. Poor lighting in the area, lack of local indication showing whether MOV is fully open or close, may well result in human error.

On the likelihood of MOV passing the Internal Inquiry Committee, which was constituted by IOC to inquire into the incident, had made the observation, "it is common knowledge that MOV's pass at times". However, repeated enquiries by this enquiry committee with several operating personnel both at Jaipur as well as Jodhpur indicated that they had never experienced passing of MOV's. The committee would have liked to check this point through an experiment but could not do so because of paucity of time. Other major contributory reason was the dyke valves, which, was also open and further aggravated the situation as there was no secondary containment.

The diagrammatic analysis of the above chronology of event is as given below:



Experiments were conducted with water in the fire water tank of the Pipeline Division with different openings of the tank body valve (equivalent to MOV) and Hammer Blind valve. These simulations provided an idea of the leak under different combinations of valve openings and the results are given in **Appendix 6**.

The entire operation clearly indicates:

- a) Gross procedural violation
- b) Absence of written down Standard Operating Procedures (SOPs) for Terminal Operation e.g. tank line up, tank receipt, emergency shut down of the entire tank farm etc
- c) Gross dilution of work ethics/operating discipline and safety culture
- d) Lack of adequate manning at vital operating points & supervisory control

7.10 FIRE FIGHTING READINESS

It was indicated to us that mock drills based on different scenarios were being carried out by the Jaipur IOC Installation. However, since no records could be furnished, it was not possible to ascertain the efficacy, effectiveness, the extent of the people's involvement and capability of the fire fighting operations. It was also not very clear as to who was really trained on the fire fighting operations, as their training records do not indicate so. During the interviews, it also came to light that the security personnel were never trained for fire fighting equipment use or on safety equipment and protective equipment use. However, the security

personnel had some basic knowledge, as they came from para military forces. Fire water tank and fire fighting water pumps were supposed to be operated and maintained under the electrical contract, by the contract person, Mr. Hoshiar Singh of G&G Contractor. It was observed in the responses to the questionnaire from the security personnel that on the second shift, Mr. Hoshiar Singh was alone on the job as both of his assistants who were supposed to be manning the shift, had left duty since they were agrieved & agitated for not being paid their monthly dues over the last few months.

The electrical contractor, Mr. Hoshiar Singh, was also responsible for maintaining the fire header pressure and on need, subsequent operation of DG Pump sets, on the instruction of IOC shift officer/Manager. In the absence of officer (who was injured and who had collapsed), it was **not** clear in the Contract Management, during this absence period, whether Mr. Hoshiar Singh had any decision making capability to start the water fog nozzles, tank cooling, etc. Anyhow, it can be stated that no fire fighting activity was initiated for almost one and a half hours during which the MS leak was taking place, following which the explosion occurred. It was also observed that one of the fire fighting water tanks was completely empty as it was under maintenance since the last few months, leaving only one tank with gross tankage capacity of 2460 cubic meter which was inadequate though the same was complimented by the water storage facility of pipeline division through interconnection.

CHAPTER 8

REVIEW OF SAFETY MANAGEMENT SYSTEM

8.1 SAFETY POLICY

The company has a well formulated safety policy which reads as under:

“Indian Oil Corporation is committed to conduct business with strong environment conscience ensuring sustainable development, safe workplaces and enrichment of quality of life of employees, customers and the community. We, at Indian Oil, believe that good S, H & E performance is an integral part of efficient and profitable business management. We shall:

- establish and maintain good standards for safety of the people, the processes and the assets
- comply with all Rules and Regulations on Safety, Occupational Health and Environment Protection
- Plan, design, operate and maintain all facilities, processes and procedures to secure sustained Safety, Health and Environment Protection
- Remain trained, equipped and ready for effective and prompt response to accidents and emergencies
- Welcome audit or our S, H & E conduct by external body so that stakeholder confidence is safeguarded
- Adopt and promote industry best practices to avert accidents and improve our S,H & E performance

- Remain committed to be a leader in Safety, Occupational Health and Environment Protection through continuing improvement
- Make efforts to preserve ecological balance and heritage”.

However, the Committee did not find any evidence of display of the safety policy within the site premises. On questioning on some of the supervisory staff, none of them could recount any of the tenets contained in the safety policy.

8.2 OISD STANDARDS

The Committee reviewed all applicable OISD Standards, Guidance Notes and Recommended Practice. Though all Marketing Installations were observed to use Hammer Blind Valves (IOC Jaipur had almost 30 valves), but no mention of Hammer Blind is available in the standards on their Installations, their Operating Practice and Maintenance/Inspection. Probably, Industry so far neither had any Risk Perception on it nor any reported case of failure or leakages so far any where in the Marketing terminals & Refineries (in case they are also using).

8.3 EXTERNAL SAFETY AUDIT

1. A pre-commissioning safety audit of Jaipur IOC Terminal was conducted by OISD as per established procedure in 1995.
2. A post commissioning full safety audit (the first one) was carried out by OISD in August 1997. The Safety Audit Team after audit noted the systems provided in the control room of the terminal and made following observations:

- a. “ensures very high level of security and safety for the terminal”
 - b. “gives on-the-spot picture of the various operational activities”
 - c. “provides auto shut off switch which puts off the entire system as well as can make the electrical isolation of the terminal in case of emergency which can be spotted on fire alarm panel stationed inside the control room”.
3. A second external safety audit by OISD was carried out in October 2003. The audit team noted that the terminal has been honoured (by Ministry of Labour with national Safety Award consecutively for the last three years) and also that it was recognised as “Best All India M&I Terminal”. The audit team, however, made some specific recommendations, and most important of which stated that *“considering extensive facilities over a large area, it requires very close and continuous supervision and maintenance functions need to be further strengthened”*. The audit had also pointed out that *five MOVs were found defective and cabling of MOVs needed rectification*. The audit team’s observations including the above one were communicated by OISD to IOCL at highest level in 2003.
4. After 2003 there was no external safety audit done for the marketing location
5. The OISD external safety audit of Pipelines Division in Sanganer station location was separately carried out in February 2001 and in April 2006. In the 2006 safety audit the lack of adequate training for fire fighting activities in the location was brought out.

8.4 INTERNAL SAFETY AUDIT

1. The Terminal was also subjected to periodic Multi Disciplinary Audit (MDA) by IOC's in-house experts. Though a number of such audits appear to have taken place at regular intervals, only the last MDA report of last audit carried out in February 2009 was made available to the investigating team (This report indicated that earlier MDA was conducted in December 2007). However, this audit report format at various places was too general and did not focus on the most critically important areas, viz, operation, fire fighting & safety, emergency and disaster management etc. Further, it appears the audit was done in a very ritualistic manner as neither the documents and procedures related to operation were adequately examined nor were field interviews conducted. To give an example under Sl.No.1.2 Procedures under Para (a) under point 'operation', the audit team noted that "the operating procedures are well defined and manuals are available and accessible plant/facility-wise". However, in actual practice "Standard Operating Procedures" (SOP) for specific operations which is a foremost requirement for safe operation of such hazardous facilities, did not exist. Further, operating manual referred to in audit report, was very general, which had been prepared by the consultant (EIL) during Project handover. On completion of the project, such documents provide only guidelines to senior operating personnel based on which specific "Standard Operating Procedures (SOP)" need to be developed "which it appears was not done". Similarly, in the same para while the audit team noted that "fire fighting and safety procedures" are well defined it did not observe that any trained fire fighting personnel are available in the terminal round the clock, nor that any specific training had been imparted to Security staff (who all are ex-service men capable of being trained) to make them competent to act as first responders during fire or any such emergency event. The audit team also observed that

“emergency and disaster management plan” are well defined but failed to indicate that this plan does not consider a major MS leak resulting in a large vapour cloud and the measures needed to deal with it. This very important aspect was surprisingly overlooked inspite of the fact that the audit was done by experts in February 2009 over three years after a major Vapour Cloud Explosion (VCE), very similar to what happened in Jaipur, occurred in Buncefield Petroleum Product Terminal near Heathrow Airport in U.K.

Multi Disciplinary Audit (MDA) was observed to be based on tick mark basis on a preformatted check list.

2. Neither the OISD audits, nor the MDA made any observations on the operating risks of Hammer Blind valve. Perhaps this was because there had been no reported case of leak or failure so far either from Marketing terminals or Refineries, where these are being used since long for positive isolation for quality control. It would be pertinent to note that OISD audit in 2003 pointed out that “defective MOV cabling needs rectification”. Had this been done the “Loss of containment” could have been mitigated to “a very large extent-.

During the mock drills conducted in the installation the aspect of full emergency shut down of the system was not included as a part of mock drill.

Audit was also silent on the adequacy of the Plant drainage system, tank dyke operations/maintenance and tank earthing protection system. They have made no mention of the appropriateness of operations training, or about the safety perceptions/attitude and the alertness of the operating staff. The audits were also silent about the absence of site specific Standard Operating Procedures (SOPs) in the installation. The Committee

was told that safety meetings were regularly held among the appropriate team members and were being recorded for necessary dissemination of communication and follow up on the pending items. However, none of these could be shown to the Committee as it was mentioned by IOC that these were destroyed by the fire/explosion. No clarifications were forthcoming on the circulation list of the minutes of these meetings. (State office also could not show us any records of safety meetings available).

8.5 HAZOP AND SAFETY STUDIES

- As per the information given to the Committee by IOC, only one Hazop study has been done on the installation. The Hazop study booklet handed over to the committee does not indicate who or which agency has done the study and when (the date) of the study was done.
- The report though titled “HAZOP Study” does not include any “Hazop work” but contains “Consequence Analysis
- Internal safety audit report of February 2009 gave a positive indication of almost all the aspects listed in the audit check list. The audit did not show any major shortcomings in the systems, procedures or practices though post incident the investigation now points towards these deficiencies.
- The Committee did not receive any evidence showing that a Job Safety Analysis of the Hammer Blind Operation had been done in the past.
- No standard operating procedures were available specific to the terminal. In response to our queries, the Committee was informed that they follow procedures from past practice only.
- Safety audit done internally apparently has no record of Hammer Blind operation, drainage system, its maintenance and operation. Also, the audit study does not cover tankage and earthing connections.

8.6 EMERGENCY / DISASTER MANAGEMENT PLAN

The Disaster Management Plan (DMP) booklet which is also undated appears to be generalised and not specific to the site. A lot of general items are mentioned not specific to the site, e.g. references to railway siding which is not there, hoses for loading and unloading when there is not even an unloading operation, LPG carousels, FO/LDO etc. The DMP also does not have any page numbers.

The Committee was surprised to read the comments in the DMP which reads as under:

“The long term view could be to slowly shift away the depot to a safer location well away from the city centre to avoid the hazard due to operations, roads/rail tanker movement etc., in such dense populated areas.”

1. The primary purpose of Emergency/Disaster Management Plan (DMP) is to conceive all possible/credible incident scenarios and stipulate the required mitigating measures. The present DMP prepared for Jaipur oil terminal, submitted to investigation team substantially falls short of this objective. Among the credible incident scenarios a major loss of containment of MS inside tank farm area as well as the possibility of spread of MS either through open storm water drain or through a channel has not been considered. Accordingly, no mitigation measures were specified in the DMP, which, if done, and fire responders adequately trained would have in all likelihood either prevent it or greatly mitigate it the present accident.
2. Most important fact to be borne in mind is that volatile petroleum products such as MS will form substantial amount of vapour if it is allowed to leak for considerable amount of time, and further if the leak is allowed to

spread beyond dyke to a larger area. The vaporisation rate in the present case was faster as the MS pool resulting from loss of containment was not confined to the dyke but spread on a much larger area of the Terminal Plot through open storm water drains. Further high pressure vertical jet emanating from Hammer Blind lead to a higher rate of evaporation. This clearly shows that the Emergency Disaster Management Plans in future should take into account a possibility of vapour cloud formation leading to an explosion.

8.7 COMMUNICATIONS

The shift log entry system should clearly communicate to the next shift control officer, the operational and maintenance status of the terminal in a comprehensive and fool proof manner. In shift log books, the position of the important items, valves, pumps etc., if different from the earlier shift, should be clearly noted so that following Shift Officer gets clear understanding.

VHF handsets were available in shifts only with the officer and not with the operators. However, the electrical contractor's man responsible for DG set and fire water pump operations had one set, while another handset was with the Security at main gate and the third one was with the Pipeline gate Security staff. In order to ensure effective and continuous communication amongst all operating personnel, individual hand sets should have been provided to all the operators.

Though other sets were available at the terminal, they remained in the control room in the evening shift but were not used by the operators. If communication was there with all the operators the following would have most likely happened:

- a) A.B. Gupta could have found out KR Meena's location and called him;
- b) R N Meena could have disclosed his problem and actions;
- c) A.B. Gupta would have been able to ask his operators to locate the BPCL officer and thereby he need not leave his supervision at site.

8.8 TRAINING OF OPERATORS AND OFFICERS / MANAGERS RESPONSIBLE FOR TERMINAL

From the records available it appears that:

- Safety training was not compulsory for everyone.
- Proceedings of Safety Committee meetings in the Terminal were not circulated widely to State office.
- A minimum training requirement per year per person was not visible (training records prior to 2002-03 not available).
- RN Meena had only one day safety training and KR Meena had attended two training programs - one on health care, other on customer relationship (no training on PLT operation or related safety)
- Performance appraisal – no operator has contributed any suggestions for any improvement
- Some operators had no training even for three years
- Due to company transfers there were far too many officers with insufficient length of experience in the Jaipur terminal.
- Qualifications not matching in many cases with job requirements e.g. maintenance being looked after by Managers with B.Com qualification and with no experience in maintenance function & M.A. in Public Administration being in-charge of safety
- Most operators had not even finished school level education and had no technical or science based qualifications.

- Vital activities of operating Firefighting System, electrical/instrumentation maintenance of Safety systems were entrusted to Contractors of inadequate expertise/experience/manpower.
- OISD has been active in conducting yearly workshops/symposiums regularly and has in these programmes covered the lessons learnt from various incidents around the world such as BP Texas, Buncefield (U.K.) and other major fire incidents within the country. These programs are widely attended by officers across the industry, at different levels and are meant to disseminate this information in the ranks and file in the respective organizations. However from the information gathered, even the senior level personnel in the Terminal and State office did not show familiarity with even the one large similar incident of 2005 in Buncefield, UK. There was no evidence of company having taken steps to disseminate such information from the OISD sessions widely within the organization.
- An established procedure to check safety competence of senior managers in running hazardous facility such as oil terminal either does not exist or if exists is ineffective.

8.9 MANAGEMENT OF CHANGE (MOC)

It was observed that safety shut down system envisaging closure of all Motor Operated Valves (MOV) at the inlet and outlet, immediate to the tanks was provided in design and installation but had been decommissioned, a few years ago, probably after 2003, due to some operational issues. The exact timing of the above is not known to the current operating officers of Jaipur and no records could be traced even from the State/Head Office. Such critical emergency shut down system from the original design and installation, when **removed**, should have followed the Management of Change procedure, as per OISD GDN 178

going through the full analysis and various approvals of the appropriate authorities. This aspect has been an important component of any safety management system ever since the Flixborough accident in UK in 1974.

8.10 PERFORMANCE EVALUATION

The Performance Evaluation System for Group D, E, F Managers which includes Terminal in charges (Sr. Terminal Managers) has identified 17 Key Result Areas, which by the sheer number, does not provide for a focused approach. Safety is one of the 17 parameters and 5% of weight age. In the performance criteria the overall evaluation carries 60% weight age, which means safety carries only 3% of weight-age from overall evaluation.

8.11 MANPOWER

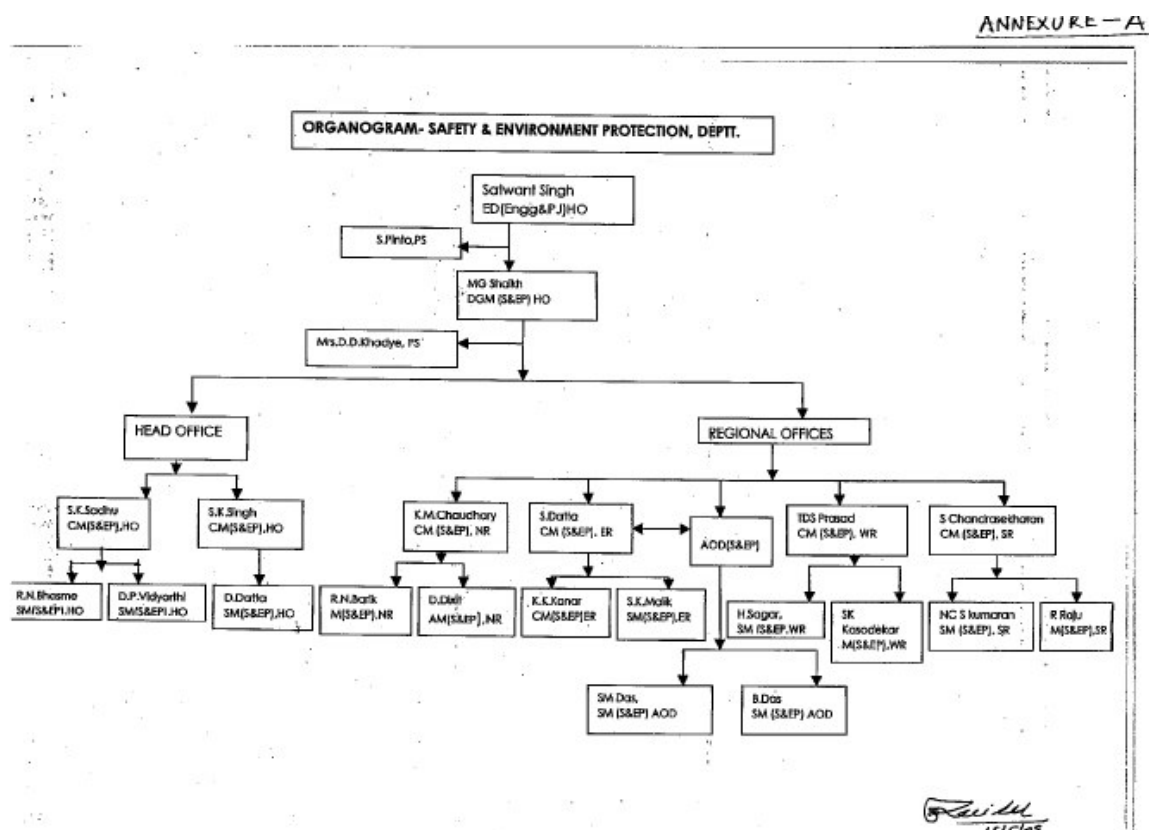
Jaipur Installation had a manpower of 12 officers including Installation Manager, 24 Blue Collar Workers (BCWs) and 4 White Collar Workers (WCWs). Though the Committee was informed that the Control Room of the facilities was manned, there was no dedicated manning with clear roles and responsibilities. Shift operations were supposed to be manned by one officer and 3 BCWs. It appeared that persons would sit in the control room as and when available. With 24 BCWs and observing that the shift people had frequent Over Time, it was felt that out of 24 people, more people were probably would have been on General Shift operations for tank truck loading. With 3 BCWs on relieving duty, it comes to a minimum requirement of 12 persons out of 24. It was observed that one of the deceased men, Mr. K.R. Meena, was on Over Time from the 1st shift to the second shift and this was happening over the last 3 days. Similarly, it was observed that Mr. K.N. Agarwal, who came on duty for the

2nd shift, though on relieving duty, went home to perform puja without appropriate permission, although he had been advised to stay on at the plant in view of two PLT operations planned in the evening. Mr. K.N Agarwal was also supposed to be on overtime in the third shift.

8.12 TRANSFER POLICY

It was also observed that too many transfers and new placements had taken place in the year 2009 and some of the placements were done with persons who had no appropriate background (for e.g. one person with a B.A. qualification was placed in Maintenance Management). It was also observed that while placing people on the job, there was no certification system in vogue specifically for the technical jobs.

8.13 SAFETY ORGANOGRAM (Marketing Division}



8.14 COORDINATION BETWEEN MARKETING AND PIPELINE DIVISION

Based on the different interviews and people's specified different timings, it could be deduced that Chief Operations Manager (Pipeline), was leaving at around 6.15 p.m., from his Pipeline Division which is situated at the corner of the Marketing Installation of IOC, Jaipur, at the time when the leakage/commotion took place. It was mentioned in the statement that the Chief Manager had done several communications to various levels like security, his officers at the pipeline control room and Sr. Terminal Manager (Marketing). There is no information that he did a turn around and got back to the job which may be due to several reasons like not being aware of the complications of the tankage operations. It is felt by the team that generally, two departmental set-ups such as Marketing group and pipeline group generally operate on Silo rather than having the corporate functional attitude and it is a suggestion that for reducing this type of attitude and behaviour, the organization should be looking at how to make a better interface of these groups while working in a single location/cluster e.g. there could have been a common control room for both Marketing and Pipeline divisions rather than at 2 different corners in the same installation.

8.15 OIL ACCOUNTING PROCEDURE

It was observed that Oil Accounting Procedure was not fool proof. In the Jaipur Installation, the tanks were provided with mechanical float gauge having local indication and also connected to the control room operating monitor console, through TFMS (Tank Farm Management System), displaying tank dips every 15 minutes (as mentioned by IOC). Tank dips also get duplicated at pipeline control room at every 1 minute. We could not lay our hands on both the hard disks of the operating console, to analyze the actual situation (pipeline's hard disk was retrieved on

24/12/2009 and it is in police custody). The SAP ERP system was not directly connected with TFMS to have the Real Time data visibility. Daily, data used to get uploaded into SAP manually, every morning, by the Marketing Installation and as well as by the Pipeline division. There is observed to be a discrepancy between these two sets of data and more so, when the tank was in custody at pipeline, marketing installation used to maintain a constant dip though the tank used to be operating and dips are changing.

It is observed through the collected log book that they had a system of planning dip checks almost once in the month and used to record the Drift (the variation between TFMS and physical verification data) which used to be generally 1mm to 2mm, except on some occasional case, where Tanks 409 A/B had shown even 10 mm variation (this is based on last 3 sets of data observed).

On various queries about the stock loss daily reconciliation and their actual over the month, the Committee got contradictory data. Sr. Terminal Manager denied that any abnormality was ever observed. However, the Committee found on subsequent discussions with Chief Operations Manager, State Office, that there was a stock loss audit on 18/7/09 and it was observed then, that there were losses of MS, in the month of June and July 2009. Not satisfied with the explanations given by the STM, the Chief Operations Manager had directed that a second audit be done to establish the factual position regarding the losses.

The Committee during the process of interviewing the Chief Operations Manager was handed over a copy of a note (**Appendix 12**) in which the GM (RSO) had said that the check must be further carried out.

The team noted that the tank farm management data did not automatically updated in the SAP System and had to be done manually. Therefore, there was always a possibility that the data could have been adjusted.

8.16 TANK INVENTORY

After pilferage case initiated by the CBI, management should have taken corrective measures through online tank level monitoring (possible by installing radar gauges) and integrated the same with SAP. This can help in detection of pilferages/deviations if it happens. It is suggested that a core group should be formed to study this aspect in detail.

CHAPTER 9

PRIMARY AND ROOT CAUSES

Immediate and system causes were analyzed using the evidence compiled. The evidence was broken down into discrete building blocks of events or conditions from which the Critical (Causal) Factors were identified. Critical Factors are those events or conditions that, if removed, might eliminate or reduce the possibility of the event occurring, or reduce the severity of it. For each Critical Factor, Possible Immediate Causes and Possible Management System Causes (Root Causes) were identified

9.1 CRITICAL FACTORS

1. Loss of primary containment
2. Loss of secondary containment
3. Inadequate mitigation measures
4. Shortcomings in design and engineering specifications of facilities and equipment
5. Defunct Vital emergency shutdown system
6. Absence of Operating Personnel in Vital area (Control Room, Field)
7. Absence of On-site and Off-site Emergency Measures immediately on loss of containment

The observations given below are primarily based on the information and feedback gathered during the course of investigation from the Terminal

and Marketing Operation of Indian Oil Corporation Ltd. Their applicability to other areas may need to be verified by a separate study.

9.2 CRITICAL FACTOR CASUAL ANALYSIS

Critical Factors	Immediate Cause	Root Cause (Management System Cause)	Policy Issues
1.Uncontrolled Loss of Primary Containment in the form of a jet of gasoline	- Wrong Operation of valves by operator - Improper Equipment (Hammer Blind valve) - Absence of Second Operator - Lack of supervision	- Ineffective Training - Poor design Awareness - Indiscipline - Poor leadership at supervisory level - Ineffective internal safety audit - No external safety audit in 6	- Safety not given adequate priority - Lack of enforcement of discipline - Leadership development program not effective - Safety function not independent/autonomous - No ESA conducted in last 6 years

		years	
2. Operating personnel incapacitated	- All operating crew overcome by leaking gasoline liquid and vapour - Second operator attempting rescue also entered the affected area and was overcome - No PPE was used	- Lack of operational skill and poor mental alertness - Lack of training in emergency management - Non-availability/lack of awareness on PPE use	- Lack of Risk awareness - Lack of Training program
3. Loss of Secondary Containment	- Open dyke Valve in Tank 401A dyke	- Poor operating Discipline - Lack of Supervision	- Leadership development not effective - Independence of safety functions lacking

		- Position .not monitored in control room	- Risk awareness
4. Inadequate Mitigation measures	- MOV closure from control room made defunct - Non availability of self controlled breathing apparatus (SCBA) - No emergency plan for the scenario - No emergency responder	- No "Management of Change Procedure" - Improper PPE (Personnel Protective Equipment) Policy - Quantitative Risk Assessment not done - Absence of Training in Emergency Management - Inadequate Leadership	- Safety not given adequate priority - Risk perception - Risk awareness - Emergency awareness - Leadership development not effective - Independence of safety functions lacking

	- Absence of command and control during emergency	- Ineffective internal safety audit - No external audit in 6 years	
5.Shortcomings in design and engineering	- Selected device for positive isolation is potentially hazardous - Operating area was inside dyke - MOV operation was from inside dyke - Operating area access/escape unsatisfactory	- Old practice not reviewed - No Hazard Analysis - Improper HAZOP - No Hazard Analysis - Improper HAZOP	Acceptance of status quo No formal structure to scan latest industry development /best practices etc. and picking up best industry practice - -

	- MOV was used for tank isolation as well as for Hammer Blind isolation. No fall back provision.		
6. Absence from site of one operator	- Poor operating discipline - Lack of Supervisory Control	- Lack of Supervision and monitoring through surprise checks - Laxity in strict enforcement of Conduct & Discipline Rules -Incompetency at Supervisory Level	- Inadequate monitoring by senior management - Leadership development not effective

7. Absence of Immediate Response to On-site and Off-site Emergency	- Poor emergency awareness	- Lack of understanding of Hazard potential	- Risk Awareness
	- No emergency responders	- Absence of Training in Emergency Management	- Safety not given adequate priority
	- Unavailability of PPE	- Lack of PPE Policy	- Lack of risk perception

The root causes are aggregated under the following heads and the indications of:

9.3 ROOT CAUSES INDICATORS AND REASONS

ROOT CAUSE	INDICATED BY	REASONS
Inadequate leadership at Terminal in-charge and state level management	Absence of written Standard Operating Procedures (SOPs)	Inadequate leadership training KRA's too many & diverse
	No review of operating practices even after CBI investigation in August 2009	
	Safety rules not enforced	

	Operating discipline very poor	
	PLTs carried on after dark, never with manager or senior manager present	
Inadequate Safety Priorities	Vital safety devices made non functional since long	Safety Management System not properly implemented
	No adequate safety check list	Management of change, safety training ensuring competency of people not adequately done
	Risk assessment, Hazop, What If analysis not done	
	Communication facilities inadequate	
	Vital PPEs like SCBA not readily available and people not trained for emergency use	
	Emergency preparedness for major events missing or totally inadequate	
	Fire fighting resources (manpower, water) inadequate	
	Near-miss reporting system absent	
	No safety campaigns or	

	posters visible	
	Did not indicate awareness about safety policy, safety policy not displayed	
	Security staff and the contractor had no instructions on emergency handling on their own	
	Inadequate safety messages displayed through posters, billboards; safety policy not displayed	
	No External Safety Audit for last 6 years	
	Internal Safety Audit inadequate as it could not point out any deficiency in design or procedures & practices	
	Safety performance based on lagging indicators (accident statistics) not on adherence to system and procedures	
Inadequate Design and	Push buttons of MOV too	Hazard potential of

Construction	close to each other	hammer blind not realized Deficient design review
	Locations of push buttons difficult to see while standing in front of MOV	
	Entire assembly of hammer blind and isolating valve should be outside the dyke area	
	Approachability of valves poor, very congested	
	One additional valve should have been there on tank body before hammer blind and its isolating valve	
	Location of fire pumps and tanks poorly conceived though meeting statutory distances	
	Bleed valve between hammer blind and MOV not provided even though on P&ID	
	Second escape route from installation near pipeline area was blocked by a wall which had been constructed to close the gate	

Quality of supervision inadequate	No checking or guidance from Shift Supervisor when emergency occurred	Focused Supervisor Training and its certification
	Poor judgement of Shift Supervisor – taking on too much workload in shift with one operator gone out, 2 nd operator working 3 rd consecutive day 16 hrs, 3 rd operator being emotionally stressed	
	Miscommunication between KR Meena & RN Meena	
Working in Silos	Marketing and Pipeline Divisions did not display coordinated emergency management	Interface Management Focus
	Pipeline Division failed to realize Hazard potential of the loss of containment	

9.4 ESTABLISHING REASONS FOR OPERATOR ACTION

1. The Committee tried to examine the underline reasons that may have led to the experienced operators' making such a

basic mistake in the operation of the valves. Some likely causes which could lead to such an event are listed below:

- a) Was it because of human error?
- b) Was carelessness the cause?
- c) Could it be due to operators' taking a short cut to the procedures?
- d) Were the operators misled due to an equipment deficiency such as a passing valve?
- e) Was bad practice of the past a reason?
- f) Was there any possibility of any ulterior or personal motive?

- 2. It was also known that Shri RN Meena, the operator who actually operated the Hammer Blind and other valves which resulted in the leak, was somewhat absent-minded and had a withdrawn personality, and also was under some stress due to family problems.
- 3. Human error, though it can happen any time, seems a little unlikely because the same group of operating personnel had just a few minutes ago carried out an identical operation on another product tank for lining up (SKO). Further, the same group of operators have been carrying out the PLT operation for the last 15 years or so.
- 4. Carelessness could have been a starting point, especially if we take into account the emotional situation of the concerned operator Shri RN Meena. There is always a likelihood that he might have forgotten to check the position

of the Hammer Blind or the HOV before commencing line up operation.

5. Being misled by a passing valve like the MOV is also a possibility, though such passing of the valve was never reported earlier.
6. Operators taking a short cut is also likely as for example if they were trying to hasten the activity of line pressurizing, even before the tank gauging exercise was completed.
7. Bad practice of the past such as keeping HOV open first seems to have been prevalent but this itself may not be the cause for the incident.
8. As regards ulterior or personal motive the Committee has noted the presence of some unusual circumstances, viz,
 - i) just prior to tank 401-A lining up operation both the operators had lined up the SKO tank barely 10-15 minutes earlier, when both the operators were present and SKO tank was successfully lined up.
 - ii) The same procedure was not followed in case of MS. While one operator had gone up the tank, the other operator remained at the valve line up position and was reportedly doing something. Before the crew could come down from top of the tank and be briefed about what he (Shri K R M) had done, for some inexplicable reason he left the work place and was later found having tea in the canteen. This does lead to some doubts and suspicion about what could have compelled him to leave the site.
 - iii) There has been a case of unusual stock losses in MS sometime in July 2009 which was under internal investigation at the time of the incident. Almost a week prior to the incident a letter had also been written to Senior Terminal Manager by the GM (RSO) regarding these unusual stock losses.

- iv) It is also known that there was an incident being investigated by the CBI regarding diesel (HSD) pilferage which happened in June/July 2009.
- v) Both the operators were highly experienced and normally not be expected to commit such a mistake of leaving the hammer blind open and opening the MOV.
- vi) In the light of what is stated above the Committee feels that motivated actions by the operators for whatsoever reasons cannot be entirely ruled out. In case the delivery line pressurizing is done before the tank is gauged it would distort the tank receipt figures from the pipeline group and reduce the stock loss figure of Marketing Installation.
- vii) However, as it was not strictly in the remit of this Committee to collect any concrete evidence or records related to pilferage/mal-intention, the Committee has no means of establishing, with any degree of certainty, that this was indeed a driving motive for the action.
- viii) Since both the operator are no more, the committee could not concretely substantiate these issues

9.5 POSSIBILITY OF SABOTAGE

There is no concrete evidence of any sabotage as per the extensive field surveys, analysis/equipment conditions.

9.6 SUMMARY OF BASIC CAUSES

Human Factors

- Operational safety rules, procedures were not being effectively enforced
- Experience level of supervisory staff in installation was considerably diluted as a result of company policy on transfers

- No effort made to assess competency and aptitude of officers and managerial staff and use this for company postings
- Even though plant had some degree of automation, in the tankage operation and pipeline transfer area, considerable human intervention was called for, and therefore human back up should have been carefully assessed.
- One of the shift operators, who was quite experienced and well versed with the Installation and its operation was not at site as he had reportedly gone home for 3-4 hours for some work.

Technical and Engineering Factors

- Design of system inadequate – use of Hammer Blind. MOV used for isolating HB. Only one press of a wrong button when HB is open can result in extreme hazard. No fallback in case of leak except remote shutting provision. This can always be defeated but an additional valve on tank cannot be removed that easily. Location of HB and MOV inside dyke is unsafe.
- Construction and equipment – congested area, approachability poor. Push buttons placed inconveniently.
- Drainage system – tank dyke is connected to storm water drain also which is open to atmosphere, Hydrocarbon entering this allows vapor to spread throughout installation.
- Fire water, fire pumps & storage tanks – water adequacy norms not based on major fire explosion. Location of five pumps and FW storage not ideal.

- Restricted VHF communication facility, paging facility for operating staff and no Public Address System.
- Flow meter on product lines from the Installation was not provided.

Organisational Factors

- No contingency plans in place for dealing with major incidents. Hazards in operating large installation like Jaipur were not fully understood.
- Safety and loss management systems were inadequate (e.g. Internal Safety Audit, risk reduction strategies etc), No near miss reporting system seems to be in place, there was no evidence of any accident records, even minor ones, absence of safety posters/slogans etc.
- Corporate Safety Group being inadequate, professional training to safety and line managers in quantitative methods and risk assessment techniques etc., was not provided.
- In terms of overall corporate priorities, terminal operations, primarily being a cost center, may be getting less management time and attention than direct revenue earners like sales or production or other external facing departments like retail sales and lubes etc.
- Manpower requirement and quality of personnel not assessed properly.
- Discontinuity in senior management in the Terminal. During the about 14 years of operation since commissioning, the installation had 8 managers (incharges). Result was that systems, procedures and training and follow up suffered greatly.

- Emergency/Contingency plans for dealing with major incidents were inadequate.
- Internal Safety Audits conducted did not point out the non availability of the emergency remote close facility on the critical motor operated valves since several years. External Safety Audit had been conducted about six years ago which had pointed out a deficiency in these valves.
- A growing corporation with bigger sizes of installations and plants and also increasing numbers of such installations needs greater sophistication in both technology and engineering controls as well as in management systems. No evidence seems to be in place of a review mechanism to periodically oversee these aspects.

Environment

- The original location about 15 years ago had hardly any industrial establishment around it.
- .Rapidly developing Jaipur city resulted in industries being set up contiguous to the installation.

Overall Lessons Learnt

- Management must always ensure that systems to provide realistic feedback to them about the safety and operational readiness and the practices in the field areas, are always in place and a system of checks and balances is maintained.
- Terminals and installations should be subjected to a QRA and treated as a high hazard location

- Combined knowledge and experience of operations maintenance and management personnel must be maintained at a high level
- Senior management both at local and corporate level need to give more attention to monitor installation actual practices
- Greater coordination required between local Land Planning Authorities and major high hazard and other Industries.

CHAPTER 10

RECOMMENDATIONS

10.1 DESIGN/ENGINEERING IMPROVEMENT

Upgrading of design to avoid potential loss of containment from any reasons such as:

- Tank Overflow
- Tank Floor Corrosion and Leak
- Tank Roof Water Drain pipe leak (internally)
- Flange leak

The Committee recognizes that there are a number of installations where similar equipment and configuration have been adopted in the corporation, and any major change in the design could be time consuming (besides being expensive). Therefore, the Committee has made the technical recommendations under two categories, viz, for immediate implementation and secondly for planned implementation.

10.2 IMMEDIATE MEASURES

(Technical & Operational)

- i) Push buttons on the MOV should be brought just outside the dyke
- ii) Push button operation should be modified so that action required for opening is different than action required for closing (e.g. pull type and push type).
- iii) The push button assembly should be mounted at a place where it is easily visible to the operator.

- iv) Lighting adequacy should be checked so that visibility is adequately ensured at the push button of MOV & HOV location)
- v) A technical group should study the feasibility of providing a limit switch on the hammer blind with interlocking for MOV operation
- vi) Main emergency shut down switch which should be located in the control room should also activate the MOVs to close.
- vii) A separate pad locking arrangement on each of the hammer blinds on the inlet and outlet lines should be provided so that they can be independently locked as required.
- viii) The pad lock on the hammer blind on the outlet line should not be removed before the tank joint dipping is completed.
- ix) If any MOV is observed to be passing, it should be immediately attended and records maintained
- x) VHF handsets to be provided to each of the operating crew.
- xi) Supervisor should be present to oversee the pipeline transfer line up and related operation.
- xii) Site specific, Standard Operating Procedures (SOPs) should be prepared which not only give what the procedures are, but also why they are needed. These must be made with the involvement of procedure users and approved by the operations and safety team.

xiii) Emergency procedures should be written and available to all personnel in the installation outlining the actions to be taken by each during a major incident.

xiv) A Check list for operators for checking safety system and equipment should be prepared and check records kept in safe custody.

xv) Mock drill whenever conducted should include the full shut down system activation also.

xvi). Shift manning should always be maintained. Only in serious exigencies, permission can be granted by Terminal Manager subject to obtaining a reliever forthwith. The person leaving site should only be allowed on a valid gate pass issued by the immediate officer.

xvii) A dedicated, qualified and experienced officer should be designated as 'Safety Officer' of the Terminal after training. He should be given exposure to Hazop, risk assessment, safety audit and upkeep of fire fighting facilities and conducting safety meetings.

xviii) The security supervisor at the gate should be provided with external telephone. The supervisor shall be provided with telephone numbers of all officers. A board displaying the names, address and phone numbers of the emergency contact points of the company as well as the local authorities shall be provided therein.

xix) A system should exist for informing neighbouring industries about impending danger.

xix) The company should approach and coordinate with the district authority for conducting "Off Sites Mock Drills".

xx) The critical operating steps should be displayed on the board near the location where applicable.

xxi) Any bad practice of HOV being opened first before opening of hammer blind should be done away with and conveyed throughout the organization.

xxii) Control room should be manned on continuous basis.

xxiii) Immediately the feature of remote shut off of the MOV from the control room should be restored. The cable leading to the control room should be fire safe.

xxiv) The pipeline transfer should preferably be commenced during day light hours

xxv) Personal protective equipment such as safety glasses must be worn while carrying out all operations

xxvi) All other PPEs should be available at location and easily identified.

xxvii) All PPEs as well as safety equipment required for emergency use such as breathing apparatus, fire suit, fire extinguishers, monitors and sprinklers should be regularly tested in presence of safety officers and records maintained.

xxviii) All PPEs required during emergency shall be located in designated safe areas.

xxix) Hydrocarbon (HC) detectors shall be installed near all potential leak sources of class 'A' and 'B' petroleum products e.g. tank dykes, tank

manifolds, pump house manifolds, etc. Further, HC detectors of proper type should be selected and should be proof tested and maintained in good condition.

xxx) Medium expansion foam generators shall be provided to arrest vapour cloud formation from spilled volatile hydrocarbons.

xxxi) An emergency kit shall be provided consisting of safety items viz. fire suites, various leak plugging gadgets, oil dispersants and oil adsorbents, lifting jacks (for rescue of trapped workers), high intensity intrinsically safe search lights for hazardous area, etc. and shall be readily available at the terminals.

xxxii) Regular inspection of pipelines including thickness survey and pipeline support systems shall be carried out and records maintained.

xxxiii) All terminal operating personnel including regular contractors and security personnel should be given safety and fire fighting training with the help of reputed training institutes.

xxxiv) The security staff should be trained as first responders for fire fighting and rescue operations along with plant operating personnel.

xxxv) Near miss reporting system should be immediately implemented.

xxxvi) Management of change procedure should be immediately implemented.

xxxvii) Manning level in the shift should be reviewed to have adequate coverage in the emergencies.

xxxviii) Vehicles with spark ignition engine should not be allowed inside the Installation area except up to the Administrative Block and also to ensure continuous manning at the control room.

xxxix) Advancements in technology make it possible to automate tanks and terminals with sophisticated systems both in hardware and software. This enhances the safety and can greatly reduce possibility of human error by having interlock permissive and recording and measurement of events like valve opening or closing and measurement of flow rate/level etc. Existing Terminal managements should review the technology for retro-fitment which can reduce risk levels.

10.3 MEASURES FOR PLANNED IMPLEMENTATION

Note: All the recommendation under the Immediate Measures category above should also be considered for new installations

a) Avoid hammer blind as an equipment in the plant design. Only a closed system design should be adopted. It is understood that other OMCs/MNC's are already using such designs in their installations. Using a Plug valve or a Ball Valve in place of the Hammer Blind should be an acceptable option.

b) The first body valve on the tank should be Remote Operated Shut Off Valve (ROSOV) on the tank nozzle inside the dyke with Remote Operation only from outside the dyke as well as from the control room. ROSOV should be fail safe and fire safe. It should have only 'close' feature and not 'open' and 'stop' from control room. However, it should have 'close', 'open' & 'stop' operation from the panel located outside the dyke.

- c) All operational valves must be outside dyke area.
- d) SIL (Safety Integrity Level) of the tank level control must be improved and independent overfill protection meeting the requirement of Part 1 of EN 61511 shall be provided. For this purpose, radar gauges must be provided at least in class 'A' tanks in addition to presently existing positive displacement level indicator/control. The MOVs which are the primary items for cut off must be always kept in proper and best working order and the SIL level of the entire interlock loop to be raised to meet the requirement of EN 61511.
- e) Dyke should be constructed and tested to be leak proof.
- f) The floating roof tank design may be reviewed to avoid the possibility of a cascade or splash of product in the event of an overflow due overfilling.
- g) Design, inspection and repair as per latest API Codes.
- h) High level alarm from the radar gauge and high high level alarm from a separate tap off should be provided.
- i) For floating roof tanks, roof drain to be of more robust design to prevent oil coming out when roof drain is open for water draining operation.
- j) Piping design inside tank dyke area should ensure easy accessibility for any operations inside dyke in the tank farm.
- k) Adequate lighting in operational areas should be ensured.
- l) Thermal Safety Valve (TSV) should be provided at the operating manifold (outside dyke).

m) The dyke volume has been revised to 110% of largest tank in certain international standards. This should be reviewed by OISD for tank terminals and refinery tankage.

n) Wherever PLT transfers take place, to avoid pilferages, a Mass Flow Meter with Integrator shall be provided on delivery pipelines.

o) Tank Dyke Valves should be provided with position indicator (open or close) in control room and necessary hardware and instrumentation should be provided for this.

p) The TFMS system should be upgraded and integrated with SAP and provision for recording of all critical events in SAP as well as TFMS (such as critical valves position, start/stop of pumps, levels in tanks, alarms etc.).

q) A CCTV should be installed covering tank farm areas and other critical areas. The CCTV can nowadays provided with an alarm to provide warning in case of deviation from any normal situation. The CCTV monitoring station should be provided both in the control room as well as in the Security cabin/office.

r) Advancements in technology make it possible to automate tanks and terminals with sophisticated systems both in hardware and software. This enhances the safety and can greatly reduce possibility of human error by having interlock permissive and recording and measurement of events like valve opening or closing and measurement of flowrate/level etc.

Most of the operations are controlled from control room and giving the control room operator an overview of terminal operation. Right sequence of operation is ensured through interlocks and permissive which bar the operator from opening the wrong valves. Recording of all events in the control room computer can provide effective monitoring of operation.

Measurement of flow rates and quantities can give more accurate stock control.

It is recommended that new installations should evaluate the technology options in this area and safety enhancing configuration should be incorporated.

10.4 PROCESS SAFETY MANAGEMENT

- a) Carry out HAZOP and Quantitative Risk Assessment (QRA) on large sized installations through well qualified agency and implement recommendations forthwith.
- b) The Terminal Managers should be trained in Hazard Identification techniques and be familiarized with risk assessment and risk mitigation methods.
- c) Annual Safety Audit by well qualified third party, which should ensure that systems and procedures and safety back-ups are in place, their requirements are understood by all concerned and they are properly operated by the concerned personnel.
- d) Site specific "Standard Operating Procedure (SOP)" to be developed.

10.5 PLANT LAYOUT

- a) The control room should be located far away from potential leak sources as far as practical. Otherwise, the control room should be made blast proof.
- b) Fire water tank and fire water pump house should be located far away from potential leak sources/tankage area.

- c) Locate buildings and structures in the upwind direction (for the majority of the year) as far as practicable.
- d) Avoid congestion in the plant site because of buildings, structures, pipelines, trees etc. The location of these individual facilities should be decided based on Quantitative Risk Assessment.
- e) All buildings which are not related to terminal operation shall be located outside the plant area. This includes the canteen also where any spark or open flame may exist.
- f) Wherever the tank terminal site also have pipeline division operational area in the same site, the control rooms for both the tank terminal and pipeline shall be located in the same operational building.
- g) The emergency exit gate shall be away from the main gate and always be available for use for personnel evacuation during emergency.

10.6 FIRE FIGHTING FACILITIES

- a) The fire water requirement for terminals shall be based on two fire contingencies simultaneously as is the case in Refineries. The fire water storage, therefore, shall be reviewed accordingly. The sprinkler flow rate which is presently 3 LPM (OISD standard) may be reviewed. The NFPA (US) Standard recommends 10 LPM where as IP-55 (UK) Standard recommends much lower figure. The review should be based on actual heat load calculations to fight fire and protect the adjacent tanks. Water storage requirements should also keep in mind whether adequate supplies are available if not, the storage should be increased appropriately. It is also recommended that auto start of the fire water pumps be linked with the Hydro Carbon leak detection and alarm system in order to start the

sprinkler system automatically especially in tank farm area and pump house.

- b) The Rim Seal fire detection and protection system shall be installed in all Class 'A' products in the terminal.
- c) Remote operated long range foam monitors (1000 GPM and above) to fight tank fires shall be provided which should be of variable flow.
- d) Wherever there is a cluster of terminals of different companies, an emergency response centre equipped with advanced fire fighting equipment viz. fire tenders and trained manpower shall be considered on cost sharing basis or on outsourcing basis.
- e) All terminal operating personnel should be given safety and simulated fire fighting training based on simulated modules of live fires in tanks, pipeline manifold and pumps, process platforms etc., in reputed training institutes equipped with these facilities. These training performances should be linked to their KRAs and promotions. Personnel from security services should be trained fully for fire fighting and rescue operations using Personal Protective Equipment.
- f) There is a present trend internationally wherein for fighting major tank fires (in most such cases the built in static fire and foam systems gets partially or largely de-capacitated), fire fighting equipment which are quickly installable at sites are made readily available with specialized agencies so that these equipment could be put in use from a safe distance to fight major tank fires. This new practice need to be studied and its applicability in case of tank terminals should be explored.

- g) Sprinklers shall also be provided in lube oil drum areas.
- h) During all operations even after the general shift a dedicated fire fighting team should be present.
- i) There should be a minimum level of manning maintained apart from the security personnel for monitoring the facilities even during non operational hours.

10.7. ORGANIZATIONAL AND MANAGERIAL ISSUES

Our observations are based on the feedback provided in relation to the Terminals and Installations activities and for a corporate wide recommendation further study may be required.

10.8 TRAINING

a) Training for Safety is currently based on OISD 154 for all categories. Safety training for operators should be based on the needs of the operation, the procedures and why these are needed. Fire training will always be an important part of his training, which is best provided by realistic fire fighting exercises in an area designated for this purpose. Training should also be given to prevent operational malpractices such as shortcuts, on safety provision being bypassed and how they can create unmanageable risks to life and property. Training should be based on the needs of the job, and relevant to the trainee.

b) For Supervisors, intimate knowledge of the operator's job is essential and this should be ensured. In addition Leadership Training should be provided on Manpower management and motivation, and also on

Communication which should enable them to give proper task instructions to the operators.

c) For Terminal Managers, safety training should include areas like

- Basics of Safety Management System
- The causes and effects of accidents
- Hazard identification
- Risk Assessment and risk mitigation
- Controlling risks and Preventing Accidents
- Emergency preparedness
- Critical Task Analysis
- Crisis Management
- Importance of trip/alarm and Safety Procedures and systems
- Learnings from case histories

Training activities should include Safety Training for contract employees since a number of activities have been outsourced.

10.9 COMPETENT PERSONNEL

a) Selection of Operators: Apart from the technical capabilities, a process operator should have certain personal qualities which should be assessed during selection. A process operator should be:

- i) Responsible – with training and experience his judgment in matters of discretion should be such that it does not require frequent checking by superiors.
- ii) Conscientious – ready to take extra care and trouble without prodding.
- iii) Reliable – never make mistakes, forget instructions or otherwise fail in his prescribed duties

- iv) Trustworthy – honest and truthful in reporting to senior, not concealing facts when his own actions might have had an adverse impact

Persons with proven chronic illnesses or those who cannot cope with stress may not be suitable as process operators and should be taken off critical operational duties.

10.10 TRANSFERS

Knowledge and experience accumulation is a critical factor at the managerial level especially in critical operation areas. Frequent transfers (8 terminal changes in last 14 years) with some of the tenures less than one year only goes against this principle. Preferably three to five years minimum tenure should be ensured for the key Managers.

c) For supervisory and managerial staff, a competency assessment and exercise which identifies the aptitude of the person and the gap between competencies of the person and requirements of the job should be done.

d) The Corporation must ensure that a reasonable percentage of the high performers in the organisation at any time, are deployed in managing such high hazard installations.

e) Similarly, for manning the safety department at least a fair percentage of the people must be of high calibre who can comprehend and lead with conceptual understanding using quantitative techniques etc. They should be given the best possible exposure through collaborating with international safety experts and agencies.

f) The performance evaluation system for Terminal incharges has 17 key result areas identified and safety is one of them with a rating of 5% in the performance criteria which amounts to 3% only in overall. For high hazard locations like Terminals, LPG Plants, Refinery Plants etc., the safety parameter weightage should be increased to minimum of 20% of performance parameters to get the due attention.

10.11 SAFETY AWARDS

The certifications such as ISO, NSC awards, Greentech awards, Ministry of Labour awards etc., are all based on documentation submitted by the organizations and not on field verifications and safety practices. The awards/recognitions mesmerize the higher management besides giving wrong signals about safety management systems leading to complacencies. It is, therefore, recommended that time and efforts be directed towards annual safety audits by involving non-company experts so as to have unbiased reports. The companies should be cautioned to be circumspect about utilizing agencies and organizations who claim to be providing expert safety advice and assessment.

10.12 CORPORATE SAFETY SET UP

i) Corporate Safety Department should be strengthened by making it directly report to the CEO.

The Safety department should be professionally trained in the use of quantitative techniques of Risk Assessment/Hazop and Hazard identification and Safety Auditing. A Process Safety Group should be part of the set-up.

ii) The Corporate Safety department should take responsibility for:

- a) being an advisor to the senior and top management and raise alarm at the highest level whenever need arises on any safety issues.
- b) implementing and monitoring a Safety Management System in the organization.
- c) Initiate and oversee safety related activities/programs. Improve the quality of audits to make them more sensitive to any deficiency in systems and procedures.
- d) Carry out audits (Including Surprise Audits) and ensure suitable follow up actions
- e) Providing Safety Training, based on assessment of training needs and effectiveness. Training should also be provided in quantitative and risk assessment areas.
- f) Scan the environment to seek information on Case Histories of accidents globally, on changes in regulations in India and elsewhere, on developments in technology and practices especially related to Safety.
- g) Communicate lessons learnt from Case Histories, and other updated information to in company personnel
- h) The agenda of the safety meeting should be more focused on root cause analysis of accidents and near misses and lessons learnt for thereof for risk reduction strategies.
- i) Install appropriate Safety Measurement Systems for different areas. Whereas personal safety can be monitored easily by accident statistics, safety from major hazards which happens infrequently, may be measured more appropriately by the degree of adherence to systems and procedures.
- j) Periodically review changes in the land use around running Installations and assess any increased risk and identify additional risk reduction measures and ensure its speedy implementation.

The corporate safety department should clearly bring out the high hazard areas to the top management and outline the steps being taken for risk mitigation.

10.13 FUNCTIONAL HEAD OFFICE AND REGIONAL SAFETY DEPARTMENTS

In addition to the corporate safety set up, reporting to the CEO, the safety department of respective divisions viz, Pipeline, Marketing (except Refinery) shall report to the ED-HSE Corporate office in order to function as an independent autonomous entity like Internal Audit, Vigilance etc. Regular reviews as with Vigilance and Internal Audit at the CEO level will go a long way in enhancing safety consciousness and safety culture. Since the safety performance of the refineries is quite satisfactory the present set up on safety may be continued with policy direction from corporate safety group.

The safety departments in the regions should look after safety in all the functional areas in the region viz. Marketing, Pipeline & LPG and the safety officers attached to the various locations should be directly reporting to this Regional set up. This will provide independence and autonomy to the Safety Department and personnel in the entire Marketing and associated activities.

10.14 STRENGTHENING INTERNAL SAFETY AUDIT

The Internal Safety Audit functions can be strengthened by Ensuring the audit team to comprise of people from outside the functional areas eg. Marketing, audit can have people from Pipeline, LPG or Refinery etc.

- a) Providing professional training in auditing and continuously updating from global best practices in the industry.
- b) By the reorganization of the corporate safety group as proposed above.

10.15 MANAGEMENT COMMITMENT

Management commitment to Safety should be made visible by several actions such as:

- a) In depth Board level reviews on a quarterly basis of Safety in different sections of the organization, and especially focus on Risk and steps being taken for its mitigation in the different operations.
- b) Senior Management group from across functions and departments (ED's and GM's) should make Inspection visits of two major Installations per year, preferably in group of 2, with appropriate checklists, standard of performance with a recording system and assess the Safety preparedness of field locations and report back to the CEO. Depending on the numbers of ED's/GM's and number of locations to be visited, such visits may be undertaken once every six months. In addition to improving safety preparedness this should generate some inter-functional inter-actions and greater cohesiveness.
- c) Management meeting agendas should start with a review of recent safety performance and progress.

- d) CEO must review Safety especially on site visits to important locations. Audit, esp. external safety audit deficiencies should get the personal attention of the CEO.
- e) The accumulated knowledge and experience of operating, technical, and management personnel in such installations should not be lost, and should be maintained always at a high level. A separate specialist group for Terminal and Installations either on an outsourced basis or as a JV with 50% company participation and 50% public (Petronet LNG model) can be considered. This will develop specialist skills and provide a bottom line focus and a sense of ownership and pride in the work, esp. in Terminal operating areas. CEOs of such companies will have undivided attention on safety and other connected issues for these activities.
- f) The lessons learned from this investigation should be widely disseminated and shared with the Industry so that recurrence of these accidents can be prevented and there is better emergency preparedness for eventualities. The Government may consider appropriate website for displaying such information.

10.16 EMERGENCY PLAN

For Maximum Accident Hazard sites, MSHIC Rule requires the preparation Of both on-site and off-site emergency plans to minimise as far as possible the consequences of a major incident. The Company should revise the emergency plans to take into account scenarios such as vapour cloud explosions (before first Buncefield and now Jaipur, VCE had not been considered credible by the sector or Controlling Authority).and severe multi- tank fires.

10.17 OISD STATUS

OISD, is a technical Directorate under The Ministry of Petroleum & Natural Gas that formulates and coordinates implementation of a series of self regulatory measures aimed at enhancing the safety in the oil and gas industry in India. A small group of technical experts on deputation from the industry (Government owned oil and gas companies), forms a core group in OISD. OISD, headed by an Executive Director, gets its direction and guidance from the Safety Council, the apex body consisting of senior officials of Ministry of Petroleum & Natural Gas, Chief Executives of Oil/Gas Companies and Heads of concerned statutory and advisory bodies. The apex body meetings are chaired by the Secretary, Ministry of Petroleum & Natural Gas.

While OISD has served an extremely useful purpose as they have formulated several standards and guidelines applicable to the oil and gas industry, in order to make their functions more independent, it is recommended that OISD can be developed as an autonomous body totally independent from the public sector oil and gas companies and free to develop its own cadre of safety professionals with no affiliations to any company.

OISD shall keep itself abreast of all major industrial accidents globally maintain a data base and conduct sessions for safety and operational managers of oil and gas companies on these incidents and lessons learnt thereof.

10.18 STANDARDIZATION OF MARKETING TERMINALS

It is observed that oil companies are following different standard and practices in design, operation and maintenance of POL Terminals.

Although the layout, fire fighting facilities etc., are as per relevant OISD Standards, considering the above aspect it is recommended that a comprehensive standard covering all aspects including design, operation and maintenance should be brought out by OISD on the lines of LPG Installation OISD STD.144.

10.19 SITING CRITERIA

One of the major issues raised by this event is the siting of petroleum storage sites with such major hazard potential. These sites are set up to maintain the supply of essential products and their strategic importance of the location must be balanced by highest standards of safety and control. Major Hazard sites are identified for regulatory purpose based on nature and quantities of materials they store, and are subject to MSHIC Rule under Environment Protection Act.

The starting point is therefore, the proper design, installation, operation and maintenance of the equipment/systems intended to maintain primary containment allied with a consistent approach to ensure its integrity.

The potential of any major accident can only be reduced, not entirely eliminated, as there will always be some degree of residual risk in any operation. This residual risk should be comparable with risk associated with daily life of an individual. To ensure that the residual risk of a maximum accident hazard installation is within acceptable limit, the means of early detection of loss of containment (from a tank or any other source), therefore, needs to be integrated with appropriate primary and secondary and tertiary containment measures to prevent the release from escalating into a serious accident.

Secondary containment is the enclosed area around storage tanks/containers called dykes or bunds constructed generally by concrete or earthen walls with leak proof measures. Their purpose is to hold any escaping liquid as well as any water or chemicals used in fire fighting. Tertiary containment includes measures such as drains, design to limit the passage of products/water or chemicals (used in fire fighting) into the effluent treatment plant wherein products/chemicals are separated ensuring that they do not find passage outside the plant.

The risk control measures and the emergency response arrangements at such sites would have to be primarily directed at the possibility of major incidents which includes formation of a “large flammable vapour cloud” as it happened in Jaipur. The location of hazardous sites and land use (nature of habitation/industry in the vicinity) should be decided on the basis of a sound “Quantitative Risk Analysis (QRA)”.

MoP&NG. may suitably review this at later date.

10.20 REGULATION FOR SITING HIGH HAZARD PETROLEUM/PETROCHEMICAL FACILITIES

i) New Statutes

Government may consider regulating by an Act, the planning and use pattern of land around major petroleum and petrochemical high hazard installations and plants which will make it mandatory to institute process of consultation between the major industries and the land planning authorities (both state and local). This will ensure that vulnerable sections of society are kept at a safe distance from the installation and the industries on their part adopt best available technology and systems to minimize risk. Also that roads and infrastructure and escape routes are adequately provided and maintained around the high hazard areas.

ii) Amendment of Existing Statutes:

The Petroleum Rules 2002 which regulates the Safety in Petroleum Installations do not specify any distances to be kept clear or unoccupied beyond the boundaries of the Installation. The Committee has studied the vapour cloud dispersion models in this incident and is of the opinion that a distance of 250 to 300 meters from the likely point of ignition is necessary to be kept clear. The Committee recommends that the Petroleum Rules 2002 may be suitably amended for a buffer safety zone around the Petroleum Installations.

10.21 SECURITY ISSUES

In high hazard locations such as the Jaipur installation it will be preferable to deploy the services of CISF for security responsibility.

It would be desirable to get a complete study done from the security angle from a competent agency like CISF or others and take appropriate steps for ensuring security.

During the interactions with the site security personnel the Committee learned of the exemplary courageous action taken by the Head of the security of the Terminal, Shri Sher Singh, who risked his life and made valiant efforts to save the lives of the two operators who perished in this accident. The Committee recommends that the efforts of Shri Sher Singh be recognized through appropriate bravery award.

ABBREVIATIONS

BCC	Business Community Centre
BPCL	Bharat Petroleum Corporation Limited
BLEVE	Boiling Liquid Expanding Vapour Explosion
CEO	Chief Executive Officer
COM	Chief Operations Manager
CBI	Central Bureau of Investigation
DG	Diesel Generator
ERP	Entrepreneur Resource Planning
ESA	External Safety Audit
ETP	Effluent Treatment Plant
HAZOP	Hazard and Operability Study
HSD	High Speed Diesel
HOV	Hand Operated Valve
HPCL	Hindustan Petroleum Corporation Limited
IOC	India Oil Corporation
IC	Internal Combustion
LPG	Liquefied Petroleum Gas
LFL	Low Flammability Limit
MAH	Major Accident Hazard
MS	Motor Spirit
MoP&NG	Ministry of Petroleum & Natural Gas
MOV	Motor Operated Valve
MDPL	Mundra Delhi Pipe Line
OISD	Oil Industry Safety Directorate
PPE	Personal Protective Equipment
P&ID	Piping and Instrumentation Diagram
PLT	Pipeline Transfer
QC	Quality Control
RCC	Reinforced Cement Concrete
RSO	Rajasthan State Office
STM	Senior Terminal Manager
SKO	Superior Kerosene Oil
SCBA	Self Contained Breathing Apparatus
TLF	Truck Loading Facility
TFMS	Tank Farm Management System
UFL	Upper Flammability Limit
UVCE	Uncontrolled Vapour Cloud Explosion

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**STANDING COMMITTEE ON
PETROLEUM & NATURAL GAS
(2018-19)**

(SIXTEENTH LOK SABHA)

MINISTRY OF PETROLEUM & NATURAL GAS

[Action Taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Standing Committee on Petroleum and Natural Gas (2017-18) on the subject Safety, Security and Environmental Aspects in Petroleum Sector]

TWENTY SIXTH REPORT



**LOK SABHA SECRETARIAT
NEW DELHI**

January, 2019/Pausha, 1940 (Saka)

CP&NG NO.**TWENTY SIXTH REPORT****STANDING COMMITTEE ON
PETROLEUM & NATURAL GAS
(2018-19)****(SIXTEENTH LOK SABHA)****MINISTRY OF PETROLEUM & NATURAL GAS**

[Action Taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Standing Committee on Petroleum and Natural Gas (2017-18) on the subject Safety, Security and Environmental Aspects in Petroleum Sector]

Presented to Lok Sabha on 07.01.2019

Laid in Rajya Sabha on 07.01.2019

**LOK SABHA SECRETARIAT
NEW DELHI**

January, 2019/Pausha, 1940 (Saka)

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COMPOSITION OF THE STANDING COMMITTEE ON PETROLEUM & NATURAL GAS (2018-19)

Sl. No.	Names of Members

LOK SABHA

Shri Pralhad Venkatesh Joshi - Chairman

2	Shri Rajendra Agrawal
3	Dr. Ravindra Babu Pandula
4	Dr. Parayamparambil Kuttappan Biju
5	Shri Kalikesh Narayan Singh Deo
6	Smt. Rama Devi
7	Shri Elumalai V.
8	Shri Naranbhai Bhikhabhai Kachhadiya
9	Dr. Thokchom Meinya
10	Smt. Pratima Mondal
11	Shri Ashok Mahadeorao Nete
12	Smt. Jayshreeben Patel
13	Shri A.T. (Nana) Patil
14	Shri Arvind Ganpat Sawant
15	Shri Raju alias Devappa Anna Shetti
16	Vacant
17	Shri Ravneet Singh
18	Shri Rajesh Verma
19	Shri Om Prakash Yadav
20	Shri Laxmi Narayan Yadav
21	Shri Santosh Kumar

RAJYA SABHA

22	Shri Bhubaneswar Kalita
23	Shri Om Prakash Mathur
24	Smt. Raneer Narah
25	Shri Bhaskar Rao Nekkanti
26	Shri Narayan Lal Panchariya
27	Shri Ahmed Patel
28	Shri V. Lakshmikantha Rao
29	Shri Kanakamedala Ravindra Kumar
30	Shri A. Vijayakumar
31	Ch. Sukhram Singh Yadav

SECRETARIAT

1	Shri Ganapati Bhat	-	Additional Secretary
2	Dr. Ram Raj Rai	-	Director
3	Shri H. Ram Prakash	-	Additional Director

INTRODUCTION

I, the Chairperson, Standing Committee on Petroleum & Natural Gas having been authorised by the Committee to submit the Report on their behalf, present this Twenty Sixth Report on Action Taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Committee on the subject 'Safety, Security and Environmental Aspects in Petroleum Sector'.

2. The Twenty Fourth Report of the Standing Committee on Petroleum & Natural Gas was presented to Lok Sabha on 25.07.2018. The Action Taken Replies of the Government to all the recommendations contained in the Twenty Fourth Report were received on 17.10.2018.

3. The Standing Committee on Petroleum & Natural Gas (2018-19) considered and adopted the Report at their sitting held on 02.01.2019.

4. An analysis of the action taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Standing Committee on Petroleum & Natural Gas is given in Annexure-II.

5. For facility of reference and convenience, the observations and recommendations of the Committee have been printed in bold letters in the body of the Report.

6. The Committee place on record their appreciation for the valuable assistance rendered to them by the officers of the Lok Sabha Secretariat attached to the Committee.

***New Delhi;
2 January, 2019
12 Pausha, 1940 (Saka)***

***PRALHAD VENKATESH JOSHI,
Chairperson,
Standing Committee on
Petroleum & Natural Gas.***

REPORT

CHAPTER I

This report of the Standing Committee on Petroleum and Natural Gas deals with the action taken by the Government on the recommendations contained in the Twenty Fourth Report (Sixteenth Lok Sabha) of the Standing Committee on Petroleum and Natural Gas (2017-18) on the subject 'Safety, Security and Environmental Aspects in Petroleum Sector', which was presented to Lok Sabha and laid in Rajya Sabha on 25.07.2018.

2. Action Taken Notes were received from the Ministry on 17.10.2018 in respect of all the 16 recommendations/observations contained in the report. These have been categorized as per the following:

- (i) Recommendations/Observations that have been accepted by the Government:- Reco. Nos. 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15 and 16 (Total 12)
(Chapter- II)
- (ii) Recommendations/Observations which the Committee do not desire to pursue in view of the Government's replies:- Reco. Nos. Nil
(Chapter- III)
- (iii) Recommendations/Observations in respect of which replies of the Government have not been accepted by the Committee:- Reco. Nos. 1 and 9 (Total 2)
(Chapter- IV)
- (iv) Recommendations/Observations in respect of which final replies of the Government are still awaited:- Reco. Nos. 5 and 10 (Total 2)
(Chapter- V)

3. The Committee desire that the Action Taken Notes on the recommendations/observations contained in Chapter-I of this report and final replies in respect of the recommendations for which interim replies have been furnished by the Government (included in Chapter-V) should be furnished expeditiously.

4. The Committee will now deal with the action taken by the Government on some of its recommendations.

Recommendation 1

Safety, Security And Environmental Aspects in Petroleum Sector

5. The Committee had recommended as under:

"The Committee note that the petroleum and natural gas industry of the country comprises of three major streams namely exploration and production, refineries, marketing & distribution. The country has 23 refineries with installed capacity of 231 MMTA, 15 gas processing plants, 4 LNG terminals, 680 oil and LPG installations and more than 39,000 KM cross country pipelines spread across the length and breadth of the country. In offshore exploration and production, there are 21 production complexes, 252 well platforms and 33 rigs while in on-land exploration and production, there are 301 production installations & 230 rigs. This industry handles highly inflammable hydrocarbons in all forms namely solid, liquid and gas and operates processes under high temperature and pressure. Moreover, Petroleum industry has a significant influence on the total pollution of the environment by exploration and production operations, oil spillage, gas flaring and oil refining operations. Therefore, the safety and security and environment protection in petroleum and natural gas industry is of paramount and vital importance and its operation in a safe mode is necessary both for the employees and the society at large. The hydrocarbons are essential for economic development and propriety of nation for decades to come. The Committee, therefore, desire that, the Ministry should accord the top priority to the safety, security and environmental aspects relating to the petroleum and natural gas industry. All these aspects should be continuously monitored and necessary changes in statutes, rules and regulations be made so that the legislations enforcing these measures are strengthened regularly to enhance the level of safety and security of the installations and minimize the adverse impact on environment from the activities at installations at par with the current global situation".

6. In this regard, the Ministry has submitted the following reply:

"Ministry of Petroleum and Natural Gas (MoP&NG) regularly monitors and reviews the various safety issues in the Oil & gas Sector and directs the oil companies from time to time to take suitable measures to ensure safety of these vital installations.

Safety, health and environmental aspects of the Oil & Gas installations is of paramount importance; and concerted efforts are being made by the Industry and MoP&NG to preserve such national assets without compromising the safety.

OISD, technical body under the Ministry, makes necessary Safety Standards depending upon the emerging needs of the safety of oil installations and these standards are adopted after a due process and included in various rules/regulations".

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Comments of the Committee

7. The Committee had observed that since the petroleum industry handles highly inflammable products in its operations and transportations the safety, security and environmental protection is of paramount and vital importance both for the employees and the society at large. Therefore, the Committee had recommended that the Ministry of Petroleum and Natural Gas should accord top priority to safety, security and environmental aspects and should continuously monitor and bring in changes in statutes rules and regulations in order to enhance them at the petroleum installations from time to time at par with global standards.

The Ministry has submitted a too general action taken reply stating that the MoPNG regularly monitors and reviews various safety issues in oil and gas sector and directs oil companies to take suitable measures to ensure safety of the installations and efforts are made by the industry to preserve such national assets without compromising on safety. The Ministry has also stated that OISD, a technical body under the Ministry makes safety standards depending upon the emerging needs which are adopted after due processes and included in various rules and regulations. The Committee are not convinced with the reply of the Ministry as it does not mention about the availability of any mechanism for continuous monitoring and enhancing the level of safety and security of the installations. Moreover, the steps taken to study various safety aspects in other parts of globe as well as any institutionalized mechanism for regular interaction, coordination and cooperation with external agencies in these aspects have also not been spelt out in the reply this shows that the Ministry has not carried out any review exercise in the light of the observation of the Committee. In Committee's view OISD being a technical body under the Ministry and manned by the officials drawn from oil PSUs on deputation may not be able to effectively enforce the safety rules and regulations. The Committee, therefore, reiterate their recommendation that safety, security and environmental aspects in the oil and gas sector particularly in its various installations, plants, units etc. should be given utmost priority and direct the Ministry to take appropriate steps to institutionalize the review of rules and regulations governing the industry in a time bound manner so that their standards are at par with international standards.

Recommendation 3

Role of Safety Council

8. The Committee had recommended as under:

"The Committee note that OISD carries out investigations of all the process safety related major incidents to determine root causes and recommend corrective actions to eliminate or control these hazards. The accident data analysis submitted to the Safety Council by OISD, indicates that the major causes of the incidents / accidents across the oil and gas industry include not following the Standard Operating Procedures, violation of work permit system and knowledge gap. It has further been stated that maximum number of such incidents could be avoided by ensuring strict adherence to SOPs and proper supervision. The Committee note with concern that Safety Council, an apex body under MOP&NG have not played their regulatory role in safety matters and procedures in respect of hydrocarbon sector. They have not been even able to ensure that all the companies strictly comply with safety audit recommendations. In Committee's view, after observing the deviations of SOPs during safety audits, compliance should be sought within a fixed time frame followed by punitive action / penalty so that not only the objective nil fatalities but nil incidents is achieved. The Committee therefore, desire that Safety Council should ensure to liquidate all the pending recommendations made in all the audit reports carried out by OISD within a fixed time frame.

The Committee also find that there is no set procedure to fix the accountability for the accidents in oil and gas installations. The Committee feel that each major or minor incident should be taken seriously and any violation of SOPs should be dealt with firmly and decisively along with fixing of responsibility in each case. The Committee, therefore, recommend that the Ministry and other agencies entrusted with enforcement of safety rules and regulations should fix accountability for violation of SOPs whenever any violation takes place. The Committee would also like to be apprised of the causes of accidents in the oil industry during the last three years and the action taken against the erring officials".

9. In this regard, the Ministry has submitted the following reply:

"OISD carries out investigation of all the Process Safety related major incidents to determine root causes & recommend corrective actions to eliminate or control these hazards. All such significant incidents occurring in Petroleum & Natural Gas Industry are investigated in-depth by multi-functional OISD team to establish:

- The exact sequence of events leading to the incident
- The root cause of the incident
- Concomitant corrective and/or preventive measures to obviate recurrence in future.

Findings of the Investigation Committee is widely circulated not only to the concerned Industry establishment but also shared with all the industry members enabling them to take proactive measures. Further, the findings are

also utilized as a feedback mechanism for updation of OISD standards. Compliance report of all such incidents investigations recommendations is also regularly reviewed by OISD/MoP&NG.

Findings of root causes of incidents across the Industry segments i.e. Refineries & Gas Processing Plants, Marketing Installations (LPG/POL), Cross Country Pipelines and Exploration & Production reveal that majority of such accidents have occurred due to soft reasons like Disregard to established Standard Operating Procedures (SOPs), Violation of work permits, Poor Supervision, Non-compliance to Personal Protective Equipment (PPEs) etc. Most of these incidents could have been avoided as major root cause of the incidents, year on year basis, continues to be attributed to soft reasons. Industry and OISD is putting concerted efforts to review extant safety management system so that effective measures can be taken to avoid recurrence of avoidable incidents.

In the 33rd Safety Council meeting held on 07.06.2016 all Oil PSUs was instructed to view all pending OISD recommendations seriously and liquidate them on top most priority. Further, a meeting to review the pendency of Audit recommendation with Oil PSUs in the Ministry was held on 19.07.2018. wherein the Oil PSUs were instructed as follows:-

- (a) To fix responsibility for delay in implementation of safety audits recommendations which are pending for more than 3 years and action must be initiated against responsible officers , if no reasonable reason is present.
- (b) To submit a latest status with detailed action plan along with timelines for implementation of all the safety audits recommendations which are pending for more than three years.
- (c) OISD should prepare year wise compliance status of pending safety audits recommendations of more than 3 years in the forthcoming safety council meeting.

It was also decided to review of pending OISD safety audits recommendations on quarterly basis by Ministry.

Regarding action taken against errand officers during last 3 years, IOCL has informed that major penalty have been imposed on 2 employees and disciplinary action against 8 officers is in progress. Moreover, fine has been imposed on 6 contractors & 3 dealers as per contract conditions.

ONGC has informed that four officials were issued Memorandum against the failure to adhere to the Safe Operating Procedures (SOPs).

OIL has informed that punitive action have been taken against officers found responsible for the incident.

BPCL has informed that Show Cause Notice has been issued to 2 errand employees and Caution letter to 2 errand employees.

HPCL has informed that Major penalty has been imposed on two errand employees and penalty proceedings against three officer are in progress. Further, minor penalty has been imposed against 4 errand employees".

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10. The Committee in their report had recommended that the Safety Council under MOP&NG should ensure to liquidate all the pending recommendations made by OISD in the safety audit reports about oil installations within a fixed time frame. The Committee had further recommended that the Ministry and other agencies should fix accountability for violation of SOPs and take action against officials responsible for such violations during the last three years. The Committee are happy to note that as per the recommendation of the Committee, the Ministry has directed the oil PSUs to submit the latest status and action taken plan along with timelines for implementation of audit recommendations which are pending for the last three years and has also directed them to take action against the officers responsible for delay in implementation of safety audits recommendations. It has also been decided to review the pending OISD safety audit recommendations on quarterly basis and details of action taken against erring PSU officials. The Committee, however, note that the disciplinary action or penalty proceedings are in progress in certain cases. The Committee, therefore, would like to reiterate that the Safety Council / Ministry should analyse all the details received from the PSUs and OISD regarding implementation of safety audit recommendations and ensure the compliance by each PSU without delay. Further the Ministry should also fix the accountability and responsibility for the delays in implementation of safety audits recommendations and the Committee may be informed accordingly.

Recommendation 5

Safety of Pipelines

11. The Committee had recommended as under:

"The Committee note that OISD carries out periodic audits including pre-commissioning audit of cross country pipelines, other additional safety checks and measures to ensure protection of oil and natural gas pipeline network in the country. It includes monitoring of the pipeline through 'Pipeline Integrity Management System', Supervisory Control and Data Acquisition (SCADA), sustained ground patrolling, inspection of Right of Way (RoW), surge analysis etc. However, despite such measures in place, a major accident occurred in the GAIL pipeline at Nagaram in East Godavari District of Andhra Pradesh in the year 2014 which caused extensive damage to life and property. The

explosion and fire tragically claimed 22 lives. The cause of the accident was pipeline / equipment failure due to violations of SOPs. In this case it has been reported that wet gas was being carried in the pipeline meant for dry gas without taking adequate precautions like pigging of pipeline at regular intervals. The Committee are deeply anguished on this incident and feel that accident could have been prevented by following proper procedures in the first place. The Committee also note that in this case other safety measures also seem to have failed pointing towards the failure of monitoring system. The Committee note that the PESO has submitted its report on the incident to the MoEF for further action. The Committee, therefore, desire that MoP&NG should take up the matter with MoEF and ensure an action against those found responsible for lapses and negligence which caused the accident.

Looking at the serious impact of such incidents of leakage of gas, the Committee strongly recommend that there should be a fool proof mechanism for monitoring of pipeline infrastructure network of the country both through human and sensor based system and any deviations should be reported and preventive action initiated immediately. There should also be backup measures for operation of remote valves and these should be such that they are not damaged due to fire etc. The communications lines could be placed underground or away and secured from tampering. There should also be audible warning system to warn the people of leaks etc. so that they can take precautions. The Committee, further, note that the safety of the population that lives around those places where the oil and gas pipelines pass is the responsibility of the owner of the pipeline and should not be compromised in any way. Any report from the public about anything wrong like leaks in the pipeline or tampering should be taken seriously and investigated immediately to prevent any accident. Besides this, people should also be sensitized on the do's and don'ts in the event of any accident on the pipeline. The Committee may also be apprised of all the initiatives for safety of pipelines taken in this direction".

12. In this regard, the Ministry has submitted the following reply:

"Regarding action taken against officers responsible for major accident in the GAIL pipeline at Nagaram in East Godavari District of Andhra Pradesh in the year 2014 Gail has informed that based on assigned roles and responsibilities disciplinary proceedings were initiated against 5 officials. Penalty of non-consideration for promotion & withholding performance related payments was immediately imposed on charges officials with the initiation of disciplinary proceedings. Disciplinary authority has examined the submissions of charged officials which are yet to be concluded.

Further, each of the oil companies both in private and public sector are required to maintain highest level of safety standards for ensuring safe operations in the respective pipelines. Some of the major safety measures undertaken by the Oil & Natural Gas Industry include:

- Incorporation of in-built safety aspects in the i.e. during the design phase itself. These include process safety, instrumentation & safety interlocks, safety while design of equipment following the best International Standards, etc.

- Each installation has its own dedicated firefighting facilities which are equipped with gadgets, well trained crew to fight fire in case of any eventuality.
- The industry also carries out regular Internal Safety Audits and conducts periodic mock drills both on-site and off-site to ensure emergency preparedness. It has also developed its own Disaster Management Plan.
- For real time monitoring of movement of line Patrolmen through Global Positioning System (GPS) has been adopted by pipeline industry.
- Monitoring of Repeater-cum-Cathodic Protection Stations through Close Circuit Television (CCTV) based surveillance has been adopted by pipeline industry.
- OFC based Pipeline Intrusion detection system/ acoustic sensor based leak detection system is being implemented.
- Application software based Leaked Detection System (LDS) in liquid pipelines is implemented in liquid pipelines.
- Provision of remote operation of pipeline"s sectionalizing valves is kept for closing in case of any emergency.
- Provision of alternate communication means (in addition to OFC based communication/ radio communication) such as leased line /GSM network from telecom operators etc. as stand-by for closure of remote valves in case of OFC / radio communication failure.
- The pipeline is provided with electrical sirens of high range (3Km range) at all originating, intermediate pump / delivery stations, terminal station and all sectionalizing valve (SV) stations which are spread evenly along the length of pipeline.
- Toll free number on all route markers along the ROU of pipelines are provided.
- Regular interaction with villagers to sensitize them by conducting awareness programs like Hastakshar Abhiyaan/Sarpanch Meet/free medical check-up camps/Samyojak scheme/Sahyogi scheme etc.
- Regular interaction is being held with respective Police & District Administration.

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13. The Committee had recommended for creation of a fool proof mechanism for monitoring of pipeline infrastructure network through both human and sensor based systems to ensure safety, security and also enable reporting of leakage incidents. Further, the Committee had desired that measures should be in place for the public to inform any leak, tampering etc. and the authorities of concerned companies should investigate these

incidents and take necessary action to prevent any accidents. In this regard, the reply of the Ministry has enumerated various safety measures taken by the oil and gas industry to maintain highest level of safety standards for ensuring safety operations of their respective pipelines. But the Ministry has not mentioned any specific precautions being taken to check and prevent the flow of wet gas in the pipelines meant for dry gas and for regular pigging of the pipelines for cleaning. The Committee, therefore, reiterate that the safety of pipelines should be accorded priority by all PSUs particularly to prevent incidents caused due to lack of checking for moisture in gas and cleaning of pipelines by the pigging process and desire that continuous measures should be taken to create sufficient awareness among the public and make them partners in their efforts to ensure collection of information about tampering, leakage, damage etc. of pipelines. The Committee may be apprised about all these measures.

The Ministry has also informed that in connection with accident in GAIL pipeline in East Godavari district in Andhra Pradesh in 2014, disciplinary proceedings were initiated against five officials and penalty was imposed on them immediately. However, the Committee note that the disciplinary authority has not yet concluded the issue and would like to await the outcome of the disciplinary proceedings and expect the Ministry/GAIL to conclude them at the earliest and apprise the Committee of the outcome.

Recommendation 8

Butcher Island Fire Incident

14. The Committee had recommended as under:

"The Committee note that the fire at one of the tank farms of BPCL situated at Butcher Island, near Mumbai on 06.10.2017 was the most recent major accident in the oil Industry. There was no loss of life but one tank that was used for storing HSD was fully damaged. For fire fighting, High Volume Long Range Monitors - HVLR (2000 GPM) of tank number 13 was started and foam was also applied. Despite this the fire could not be put out and the HSD in the tank was allowed to burn in a controlled manner. The cause of the fire was attributed to intense Lightning strike. The Committee were informed that a Committee constituted by OISD to investigate the incident has concluded that roof plates of tank were thinned out / pitted which got punctured due to lightning strike. The tank was also inspected by BPCL officials before the incident and was certified for use. However, the Marine Oil Terminal (MOT) facilities at Butcher Island was not audited by OISD in the last External Safety

Audit (ESA) of BPCL, Mumbai Refinery on 26th – 30th September, 2016 and these facilities were not offered for safety audit. The Committee are of the view that the frequency of safety audits of tank farms should be reviewed in view of this incident. The Committee specifically desire that the frequency of ESA should be increased in those areas that are susceptible to particular vagaries of weather more often and preventive measures taken.

While analyzing the quality of firefighting equipment the Committee feel that at Butcher Island it was inadequate to put out the tank fire. While the Ministry and PSUs claim their capabilities for managing the fire incidents have improved after the implementation of M.B. Lal committee recommendation, the way the fire incident in Butcher Island was handled belie this, even though the adjacent tanks in the site were safeguarded from Fire, the entire fuel in the storage tank was allowed to burn out instead of fire fighting to put out the fire.

The Committee, therefore, recommend that the firefighting capabilities at all the storage sites of petroleum products across the country be upgraded to ensure quick extinguishing of fire.' The Committee would like to be apprised of the further safety measures including the installation of advanced lightning protection system undertaken by the oil industry to prevent the recurrence of such incidents at par with the worldwide practices being followed to deal with such situation".

15. In this regard, the Ministry has submitted the following reply:

"Regarding reviewing the frequency of Safety Audits in Oil and Gas installations especially tank farm areas; the following steps have been taken by OISD:

- Central Tank Farms (CTFs) will be considered as standalone facilities and shall be audited at a frequency of 3 years from earlier 5 years
- For POL marketing installations having aggregate storage capacity of more than 1 Lac KL, the audit frequency is reduced to 5 years from earlier 7 years.
- Clubbing the external & Surprise Safety Audits of the installations in a particular city/ neighbouring locations so that coverage of audits increases. In the process, OISD has audited 112 locations in the year 2017-18 against the original plan of 70 numbers.

Regarding upgrading the fire fighting capabilities at all the storage sites of petroleum products across the country and to ensure quick extinguishing of fire, it is submitted that OISD has already taken initiatives for evaluation of functionality checks of the critical firefighting equipment like HVLRLMs, ROSOVs, RSFPS, MEFG etc. at Marketing (POL) Installations. Presently, 115 (out of total 276 nos.) POL locations have already been covered & compliance being monitored for 100% accomplishment of functioning of such equipment.

Further, OISD has already undertaken revision of its Standard-180 on lightning protection through functional committee".

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16. The Committee, while analyzing the fire incident at Butcher Island had pointed out that the fire fighting capabilities were found inadequate in dealing with the fire incident and had recommended that the fire fighting capabilities at all storage sights of petroleum products across the country be upgraded to ensure quick extinguishing of fire. As the lightning protection system was the main reason attributed to the fire incident at Butcher Island, the Committee had also desired that advance lightning protection system should be installed to prevent recurrence of such incidents. The Ministry in its reply has mentioned that OISD had already taken initiatives for evaluation of critical fire fighting equipment at marketing installations. Also, compliance is being monitored for hundred per cent accomplishment of functioning of such equipment. OISD has further undertaken to revise its Standard-180 on lightning protection through a functional committee. The Committee while expressing their satisfaction about the steps being taken would like to highlight that no commitment has been provided regarding the time by which upgradation of the lightning protection system at installations would be completed to prevent any Butcher Island type incident. Therefore, the Committee would like to reiterate that the steps may be taken by Ministry/PSUs to upgrade lightning protection system immediately at all the oil installations without waiting for the revision of OISD standard.

Recommendation 9

Setting up of Emergency Response Centres (ERCs)

17. The Committee had recommended as under:

"The Committee note that after the Jaipur major fire incident, the M.B. Lal Committee which investigated the incident had recommended for the setting up of Emergency Response Centre (ERCs) in the country to handle major oil fires like storage tank fire in fastest and specialized way.

The Committee also note that M.B. Lal Committee recommendations were approved by OMC and Ministry to be implemented immediately and all the recommendations including setting up of ERCs were to be completed by 2014. The Committee note that even after approval of the Ministry, the recommendation of setting up of ERCs is still pending.

The Committee further note that it has now been decided to set up five ERCs to be piloted by each of the oil companies at the following locations:

IOCL-Jaipur, HPCL-Vizag, BPCL-Manmad, ONGC-Hazira, and GAIL at Guna. The Fire Advisor, Ministry of Home Affairs too has recommended in 2006 & 2017 for establishing and positioning of ERCs at strategic locations. The Committee note that initially EIL was appointed as a consultant but was dropped due to high rates quoted by it, and now a global tender for appointment of consultant for Fire Expertise with PMC work for setting up of 5 ERCs has been floated. The Committee desire that engaging a Fire Consultant for setting up ERC before PMC work be expedited to ensure setting up of ERC, supply of equipment and operation of ERC at the earliest.

The Committee deplore the casual approach of the Ministry resulting in inordinate delay in the setting up of ERCs. It appears that the oil industry is waiting for another major disaster to happen to get on its feet. The Committee disagrees with the Ministry's contention that the firefighting capabilities of the industry is adequate to meet any major fire emergency and that the concept of ERC is a second line of defence in case of catastrophic events for which various other avenues like mutual aid partner industry, state fire brigade etc., are already in place. The Committee further note that an ERC would take up 3 to 4 years to be set up and any incident during the intervening period may cause huge losses. The Committee, therefore, strongly recommend that for the interim period the OMCs should procure required advanced firefighting equipments viz. robotic monitors, high capacity pumps with portable foam monitors, large hoses etc. for all the 22 locations for the proposed ERCs and later such equipments could become a part of the ERC. The Committee also desire that till the ERCs are set up, the OMCs should appoint an experienced agency on temporary basis who can provide 24x7 emergency firefighting services with advanced equipments as mentioned above immediately without any further delay.

The Committee agree with the views of the industry experts who deposed before them and are of the opinion that OMCs should consider procuring equipments/setting up of ERCs as they are an investment in safety. The Committee, therefore, desire the Ministry to take immediate action for the setting up of all 22 ERCs starting with 11 ERCs at strategic locations specially where there is cluster of oil companies/terminals to meet any disaster, taking into consideration the requirements of a rapidly growing industry".

18. In this regard, the Ministry has submitted the following reply:

"With the installation of state of the art equipment at installations of all the OMCs, the firefighting capability of our Oil & Gas Installations in the country is adequate to meet any major fire emergency arising out on account of routine operations. With in-plant firefighting facilities, all the OMCs are equipped with fire fighting facilities to handle emergency scenarios like tank fires, leakages etc. for a duration of four hours.

Further, in addition to the installed firefighting facilities, which are adequate for any operational related emergency as mentioned above, other avenues like mutual aid partner industries, state fire brigade etc. can also be pressed into service in case any catastrophic event occurs in these installations as a second line of defense. It may be reiterated that ERCs once available, shall also act as second line of defense to the installed firefighting facilities.

With regard to setting of ERCs in the country, it is mentioned that it has now been decided to set up five ERCs to be piloted by each of the oil companies at the following locations:

IOCL-Jaipur, HPCL-Vizag, BPCL-Manmad, ONGC-Hazira, GAIL, Dibiyaapur (Earlier location Guna is changed).

It is submitted that for appointment of consultant for PMC for setting up 5 ERCs as above, a Global tender was floated but there was no response to get PMC services to establish 5 pilot ERCs by IOC/BPC/HPC/GAIL/ONGC. Based on inputs provided by prospective vendors during pre-bid meeting of the last tender, detailed **BQC (bid qualification criteria) and Tender scope** for engagement of PMC consultant have been finalized. To invite more no of bids, JVs/Consortium are being allowed in the new tender to have wider participation from prospective PMC consultants. Global/open tender is likely to float shortly".

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19. The Committee had highlighted the need for setting up of Emergency Response Centres (ERCs) to handle major oil fires at petroleum installations in the country and had desired that Ministry to take immediate action to set up 22 ERCs starting with 11 ERCs at strategic locations especially where there is cluster of oil companies/terminals to meet any disaster. The Ministry in its reply has stated that ERCs shall act as a second line of defence along with mutual aid partner industry, state fire brigade etc., in addition to fire fighting facilities installed at installations. The reply also states that it has now been decided to set up 5 ERCs to be piloted by each of the oil companies and global tender for engagement of the PMC consultant for setting up of five ERCs are likely to be floated shortly.

The Committee are, however, dismayed with the reply of the Ministry particularly the line of approach being taken with regard to ERCs treating them as a second line of defence along with mutual aid partner and state fire brigade. The Committee would expect the Ministry to change this approach and make ERCs as one of the first and main line of defence in addition to fire fighting facilities available in the plants/units/installation in responding to major fire emergency arising out of routine operations at oil and gas installations. The Committee would also like to observe that the MB Lal Committee had also recommended setting up of ERCs which the Ministry was

to implement by 2014. The Ministry has not given any cogent reasons for rejecting the need to set up ERCs at 22 locations which have cluster of oil and gas installations in the country. The Committee, therefore, reiterate their recommendation and would like to point out that the process of appointment of PMC for setting up of ERCs have been dragging for too long and it would expect the Ministry to accord highest priority for the same and finalize the PMC for five ERCs at the earliest so that the process for setting up of 11 ERCs on priority may gain momentum and completed within the shortest possible time frame.

Recommendation 10

Formation of Unified Safety Board

20. The Committee had recommended as under:

"The Committee note that depending on the type of installations, there are various statutory authorities involved in the safety enforcement in the Petroleum and Natural Gas Industry. In the E&P onshore and offshore industry segments Exploration and Production the DGMS and OISD under the administrative Ministries of Labour and Employment and P&NG respectively have jurisdiction. In the Downstream & Gas (Natural) Processing Plants (GPP) segments the PESO and PNGRB under the administrative Ministries of Commerce & Industry and P&NG respectively are enforcing safety. The Committee also note that the proposal for having a unified Petroleum and Natural Gas Safety Board has been under consideration since the last four years and nothing has been finalised as yet. The Committee were informed that the matter was considered by the Committee of Secretaries (CoS) and they were of the view for strengthening the existing regulatory bodies over creation of a new organization. Thereafter, the recommendations of the CoS were considered by the Ministers of the Ministry of Petroleum and Natural Gas, Commerce and Labour. They have decided that a report should be prepared after studying the safety and security aspects keeping in view the international practice. The Committee are not satisfied with the current state of affairs as such an important issue is being unduly delayed. It appears that the three Ministries are reluctant to give up their role in the safety related aspects as they perceive it akin to losing power.

The Committee have been informed that among the three bodies namely PESO, DGMS and OISD, almost 97 percent of the premises are regulated for safety by PESO and 2 percent by DGMS and 1 percent by OISD. PESO has been handling the safety regulations in hazardous premises like refineries, cross country pipelines, manufacturing, storage and transportation of exploring storage & use of explosives in oil mines, Auto LPG and CNG dispensing stations. The Committee feel that the MoPNG wants to retain its dominant role through the OISD. The Committee would like to point out here that the OISD has no permanent staff of its own and most of its officers are on deputation from the Oil Companies. Therefore, the concept of arm's length in

the safety aspect is certainly not fulfilled here. Due to conflict of interests, such officers cannot be expected to give adverse reports against their own employers. Therefore, in Committee's view, considering the capabilities, infrastructure and proportion of work administered in Hydrocarbon sector, PESO is more suitable body to reposition it to administer safety regulations in entire hydrocarbon sector. The Committee, therefore, strongly recommend that PESO may be empowered to work as a single framework for regulation of safety in entire hydrocarbon sector. For that purpose the capacity of PESO should be enhanced by providing it prosecution powers and strengthening the Human Resource and coordination with District authorities, upgradation of Research and Testing infrastructure and capacity building of external stakeholders".

21. In this regard, the Ministry has submitted the following reply:

"The Ministry has brought a proposal before the Committee of Secretaries (CoS) for establishment of Petroleum and Natural Gas Industry Safety Board (PNGISB) to regulate the safety of petroleum and Natural Gas Industry in the entire country. The proposal also envisage establishment of Directorate General of Natural Gas and Industry safety. Three meetings of the CoS have been held on 01.07.2014, 7.11.2014 and 19.08.2016. After detailed deliberations held in the third meeting of CoS on 19.08.2016, it was interalia decided that MoPNG may weigh the option of strengthening the existing upstream and mid/downstream regulators vis-à-vis, a single safety regulator for all segments and take a considered view in this regard.

In order to settle the issues an inter-ministerial meeting involving Ministry of Petroleum and Natural Gas (MoP&NG), Ministry of Labour and Employment (MoLE) & Ministry of Commerce & Industry was held on 20.12.2016 and it was agreed to examine further the issue of existing structure of Safety in Petroleum and Natural Gas Industry and also examining best practice of Safety issues in Hydrocarbon Industry in other countries.

OISD was requested on 06.04.2017 to examine the best practices of safety issues in the hydrocarbon industry in other countries and submit a report. OISD has since submitted a report in the matter.

Further, Performance Audit Report of PESO has been obtained. Forensic Audit report of DGMS has not been received from Ministry of Labour.

From above, it would be evident that inter-ministerial consultation is going on to settle the issue".

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22. The Committee had observed that various statutory authorities are involved in regulating different standards in petroleum and natural gas sector thereby causing difficulty in enforcement and compliance. Considering PESO

as the most suitable body to administer the safety regulation in Hydrocarbon sector, the Committee, had recommended that it should be empowered to work as a single framework for regulation of safety in the entire hydrocarbon sector.

The Ministry in its reply has stated about the initiatives taken in the direction of establishment of Petroleum and Natural Gas Industry Safety Board (PNGISB) to regulate the safety of Petroleum and Natural Gas in the entire country and Directorate General of Natural Gas and industrial safety. It is stated that OISD had submitted a report on the best practices of safety issues in hydrocarbon industry in other countries. A performance audit report of PESO has been obtained and forensic audit report on DGMS has not been received from the Ministry of Labour. The Ministry has further stated that inter ministerial consultation is going on to settle the issue of establishment of PNGISB. However, the Committee are not satisfied with the reply as no meeting seems to have been held with the Ministries and organizations concerned after the presentation of the report by the Committee to expedite the matter. The last deliberation among the Ministries concerned was held on 20.12.2016 and two years have passed with little progress on the issue. The Committee therefore, reiterate their recommendation for the need of a single regulator on safety and other issues for the entire hydrocarbon industry with statutory powers and expect the Ministry to show pragmatism, accommodative spirit and farsightedness in order to consider the recommendation and accordingly, would expect the MoPNG to take the lead to settle the issue on priority.

Recommendation 12

Geo-physical Mapping of Potential Disasters

23. The Committee had recommended as under:

"The Committee have been informed that ONGC has developed an in-house GIS mapping of its pipelines laid in onshore locations and the mapping is nearly complete. ONGC is also undertaking a conceptual study in this regard. The Committee also note that no guidelines for GIS mapping of upstream assets has been brought out by OISD.

The Committee desire that all the oil and gas companies should mandatorily carry out GIS mapping of their assets. This will not only enable for tracking purpose both onshore and offshore but also as a tool for risk assessment of

the areas around petroleum and gas installations/pipelines during major accidents. The Committee recommend that the world wide practice should also be studied for adopting the same in the Indian scenario for advance planning to minimise damage and to deal with accidents efficiently and effectively".

24. In this regard, the Ministry has submitted the following reply:

"IOCL has informed that GIS based Pipeline Asset Integrity Management System has been implemented in new cross country pipelines. Maps indicating pipeline routes are shared with respective police stations/administration as part of Emergency Response Disaster Management Plan (ERDMP).

ONGC undertakes survey of all the offshore pipelines inclusive of GIS mapping once every five years. An in-house common portal has also been developed for mapping of the pipelines. GIS mapping is done regularly for the areas where seismic survey is carried out.

GAIL has mapped its existing pipelines assets on GIS platform. Further, with the expansion of the truck pipeline in other parts of the country including providing the last mile connectivity, the same will also be mapped on the platform periodically".

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Comments of the Committee

25. The Committee in their report had observed that ONGC had developed in house GIS mapping of its pipelines at its onshore locations and undertaking a conceptual study and had pointed out no guidelines for mapping are available. As this practice helps in advance planning to minimize damage and deal with accidents, the Committee had desired that all oil and gas companies should mandatorily carry out GIS mapping of their assets. The Ministry in its reply has stated that IOCL has implemented a GIS based Pipeline Asset Integrity Management System and further, GAIL has mapped its existing pipelines Assets on GIS platform. Though the Committee are satisfied at the initiatives being taken by IOCL and GAIL, the reply remains silent on the work carried out by BPCL, HPCL and OIL in GIS mapping about their pipelines and other assets. The Committee therefore, would reiterate their recommendation and expect the Ministry/PSUs to undertake GIS mapping of their assets at the earliest and inform the Committee about the action taken by them in this regard.

CHAPTER II

RECOMMENDATIONS/OBSERVATIONS WHICH HAVE BEEN ACCEPTED BY THE GOVERNMENT

Recommendation 2

Safety aspects in Petroleum sector

The Committee understands that oil installations handle hazardous and highly inflammable hydrocarbons. Therefore, safety of vital plants, installations, employees and public at large is accorded the highest priority. Safety Management System relating to oil wells, pipelines, refineries and oil marketing installations is governed by Safety Management Practices starting from careful selection of technology and design and incorporation of best engineering services and include well laid down systems and procedures for operation, maintenance, inspection, safety audits and fire protection systems. Despite, all these systems, accidents occur in oil sector causing significant damage to property / loss of lives. As per the data provided by the Ministry for the period 2014-17 (up to 30.11.2017) pertaining to both the upstream / downstream oil companies, a total number of 309 accidents took place in which there were 81 fatalities and 193 people were injured. The Committee although find that the number of accidents has come down in some of the PSUs but in HPCL and ONGC the numbers are still high which is alarming.

While going into the details of investigation process of accidents, the Committee note that the Oil Industry Safety Directorate (OISD) carries out safety audits and investigations and sends the report to the concerned company with recommendations for compliance. Besides this, the oil companies also carry out Internal Safety audit through their multi-disciplinary teams annually as per OISD standards. In addition to this, there are other statutory authorized Agencies like Directorate General of Mines Safety (DGMS), The Petroleum and Explosives Safety Organisation (PESO), Petroleum and Natural Gas Regulatory Board (PNGRB) who also have a mandate to oversee and enforce safety measures under various Acts and Rules in the oil and gas installations including pipelines and transport. The Committee, therefore, fail to understand that despite the provision of regular external and internal safety audits of installations and defined responsibilities of various enforcing organizations, the accidents keep recurring in the oil and gas sector installations. In Committee's view there should be zero tolerance towards fire incidents/accidents in oil and gas installations as the products are highly inflammable and any carelessness and casual approach may lead to serious problems. The Committee, therefore, recommend that the all concerned with safety of oil and natural gas sector installations should review the causes for accidents/ fire incidents and overcome the shortcomings identified in design, process, procedures, supervision, training, etc. so that safe working culture becomes a habit and the goal towards an accident free work is achieved.

REPLY OF THE GOVERNMENT

Any Safety related incident in the Oil & Gas Industry is taken very seriously and Industry at large has adopted a policy of zero tolerance towards such incidents. Ministry of Petroleum & Natural Gas, remains committed to ensure that the vital Oil & Gas installations in the country that provide security to the Nation and its safety are

given highest priority and focused attention that it deserves. Every incident which occurs in the Industry, be it small or major, is viewed very seriously by the Ministry and suitable measures are taken to ensure that companies concerned take adequate preventive measures so that such incidents do not occur again.

To identify root cause & prevent the recurrence of any incident, the concerned industry and OISD are advised to investigate all the major onsite incidents which occur in oil installations and follow-up action is taken on the findings of the investigation.

In the Safety Council meeting chaired by Secretary, P&NG, which is represented by CEOs of both PSU and Private sector Oil & Gas Companies, safety performance of the Industry is reviewed.

Further, it is mentioned that the number of incidents is showing decreasing trends for recent years. Nevertheless, MoP&NG is making all efforts for making Oil & Gas industries not only accident free but incident free by ensuring that industries are following all statutory guidelines & safe practices.

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Recommendation 3

Role of Safety Council

The Committee note that OISD carries out investigations of all the process safety related major incidents to determine root causes and recommend corrective actions to eliminate or control these hazards. The accident data analysis submitted to the Safety Council by OISD, indicates that the major causes of the incidents / accidents across the oil and gas industry include not following the Standard Operating Procedures, violation of work permit system and knowledge gap. It has further been stated that maximum number of such incidents could be avoided by ensuring strict adherence to SOPs and proper supervision. The Committee note with concern that Safety Council, an apex body under MOP&NG have not played their regulatory role in safety matters and procedures in respect of hydrocarbon sector. They have not been even able to ensure that all the companies strictly comply with safety audit recommendations. In Committee's view, after observing the deviations of SOPs during safety audits, compliance should be sought within a fixed time frame followed by punitive action / penalty so that not only the objective nil fatalities but nil incidents is achieved. The Committee therefore, desire that Safety Council should ensure to liquidate all the pending recommendations made in all the audit reports carried out by OISD within a fixed time frame.

The Committee also find that there is no set procedure to fix the accountability for the accidents in oil and gas installations. The Committee feel that each major or minor incident should be taken seriously and any violation of SOPs should be dealt with firmly and decisively along with fixing of responsibility in each case. The Committee, therefore, recommend that the Ministry and other agencies entrusted with enforcement of safety rules and regulations should fix accountability for violation of SOPs whenever any violation takes place. The Committee would also like to be apprised of the causes of accidents in the oil industry during the last three years and the action taken against the erring officials.

REPLY OF THE GOVERNMENT

OISD carries out investigation of all the Process Safety related major incidents to determine root causes & recommend corrective actions to eliminate or control these hazards. All such significant incidents occurring in Petroleum & Natural Gas Industry are investigated in-depth by multi-functional OISD team to establish:

- The exact sequence of events leading to the incident
- The root cause of the incident
- Concomitant corrective and/or preventive measures to obviate recurrence in future.

Findings of the Investigation Committee is widely circulated not only to the concerned Industry establishment but also shared with all the industry members enabling them to take proactive measures. Further, the findings are also utilized as a feedback mechanism for updation of OISD standards. Compliance report of all such incidents investigations recommendations is also regularly reviewed by OISD/MoP&NG.

Findings of root causes of incidents across the Industry segments i.e. Refineries & Gas Processing Plants, Marketing Installations (LPG/POL), Cross Country Pipelines and Exploration & Production reveal that majority of such accidents have occurred due to soft reasons like Disregard to established Standard Operating Procedures (SOPs), Violation of work permits, Poor Supervision, Non-compliance to Personal Protective Equipment (PPEs) etc. Most of these incidents could have been avoided as major root cause of the incidents, year on year basis, continues to be attributed to soft reasons. Industry and OISD is putting concerted efforts to review extant safety management system so that effective measures can be taken to avoid recurrence of avoidable incidents.

In the 33rd Safety Council meeting held on 07.06.2016 all Oil PSUs was instructed to view all pending OISD recommendations seriously and liquidate them on top most priority. Further, a meeting to review the pendency of Audit recommendation with Oil PSUs in the Ministry was held on 19.07.2018. wherein the Oil PSUs were instructed as follows:-

- (a) To fix responsibility for delay in implementation of safety audits recommendations which are pending for more than 3 years and action must be initiated against responsible officers , if no reasonable reason is present.
- (b) To submit a latest status with detailed action plan along with timelines for implementation of all the safety audits recommendations which are pending for more than three years.
- (c) OISD should prepare year wise compliance status of pending safety audits recommendations of more than 3 years in the forthcoming safety council meeting.

It was also decided to review of pending OISD safety audits recommendations on quarterly basis by Ministry.

Regarding action taken against errand officers during last 3 years, IOCL has informed that major penalty have been imposed on 2 employees and disciplinary

action against 8 officers is in progress. Moreover, fine has been imposed on 6 contractors & 3 dealers as per contract conditions.

ONGC has informed that four officials were issued Memorandum against the failure to adhere to the Safe Operating Procedures (SOPs).

OIL has informed that punitive action have been taken against officers found responsible for the incident.

BPCL has informed that Show Cause Notice has been issued to 2 errand employees and Caution letter to 2 errand employees.

HPCL has informed that Major penalty has been imposed on two errand employees and penalty proceedings against three officer are in progress. Further, minor penalty has been imposed against 4 errand employees.

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Comments of the Committee
(Please see Para No. 10 of Chapter-I)

Recommendation 4

Training to workers handling risk operations

The Committee note that in the oil and gas industry several works are being done through the contractors. One of the important reasons of accidents at the oil installations has been found as the poorly trained personnel of these contractors and lack of their proper supervision. During the period 2014-17, 78 accidents were caused due to such workers of these contractors in which 43 contract workers lost their lives. The oil installations are hazardous work places and therefore, all the persons working here should be properly trained, skilled and alert at all times to prevent any accidents. Untrained workers and supervisors increases the risk of accidents due to human errors. The Committee note that as per OISD guidelines all the workers including the contract and security personnel involved in risk operations should be imparted regular training and refresher training. But such large number of incidents caused due to untrained contractual workers and loss of life creates an apprehension that whether OISD guidelines are being followed by the companies in letter and spirit or not. The Committee, therefore, strongly recommend that special attention should be paid for imparting regular training and refresher training of all the workers including contract workers and security personnel. OISD should also strictly check the aspect of training during their audits and fix the responsibility, if there is any gap in that regard. The Committee also desire that appropriate clauses regarding training to workers handling risk operations should be incorporated in the agreements with contractors and in case of violation, responsibility should be fixed against all the responsible persons either the contractor or PSU officials for any such violation.

REPLY OF THE GOVERNMENT

A number of training courses are being conducted by the Companies intended to develop the skills and safety consciousness of employees including of those on contract also.

As per stipulations laid down in OISD standards all the workers including the contract and security personnel involved in risk operations are imparted regular training and refresher trainings as per the guidelines prescribed in the standards i.e. OISD-STD-154, OISD-GDN-228, OISD-GDN-176, OISD-GDN-192 and OISD-GDN-207.

Monitoring of Compliance with OISD Standards by OISD

During External Safety Audits of the Oil & Gas Installation by OISD, efficacy of the trainings imparted is checked and gaps, if any, are recommended for corrective actions. Compliance of audits recommendations is monitored by OISD/MoP&NG on quarterly basis. All the clauses regarding incorporation of training to workers such clauses are already part of the contract agreement in the form of either General Contract Condition (GCC) or Special Contract Conditions (SCC) of the companies concerned.

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Recommendation 6

Safety during Transportation of Petroleum Products

Petroleum products viz. Petrol, Diesel, LPG etc. are distributed from refineries, bottling plants to retail outlets and LPG distributors by roads using trucks. Since they carry hazardous and inflammable material, their movement on road has to be done with utmost care and safety to avoid accidents. During the year 2014-15 there were 484 accidents, in 2015-16 it was 597 and in 2016-17, 517 accidents took place that involved trucks transporting petroleum products of the three major oil marketing companies viz. IOCL, BPCL and HPCL. The Committee note that various measures have been taken by oil marketing companies to prevent transportation related incidents. This includes the provision of Vehicle Tracking System (VTS), speed governors and fabrication drawing approved by PESO in the Tank Trucks and Lorries. The Committee desire that these measures should be enforced strictly for compliance to ensure safe and accident free transportation of petroleum products on road. The Committee, however, note that at present it is not mandatory to install GPS along with VTS in the tank trucks. The Committee, therefore, recommend that it should be made mandatory along with geo-fencing so that the movement of trucks is monitored in real time. PESO which is the nodal body should examine this matter and come out with appropriate rules / guidelines. The Committee, further, note that with the implementation of PMUY and proposed targets under the scheme would increase the number of consumers considerably. The Government also has ambitious targets for PNG and CNG consumers under city gas distribution network. Also the transportation, storage and usage of petroleum products in rural areas will also increase swiftly. The Committee desire that, therefore, consumers and other stakeholders like distributors, agencies, etc. should be educated for the safe handling of LPG cylinders in particular and other products like kerosene, petrol and diesel, PNG and CNG.

REPLY OF THE GOVERNMENT

The movement of the Petroleum products on road are done with utmost care and safety to avoid accidents. Transportation contract conditions stipulates that Carrier shall engage TT driver who has undergone training on transportation of hazardous goods as stipulated under the Motor Vehicle Acts/Rules. The driving license of the

driver should be endorsed by Road Transport Authorities to this effect. The tender document of OMC includes clauses for provision of "Any Vehicle Tracking System (VTS) (for e.g.: Global Tracking System) to track the movement of the Tank Truck".

OISD, during the course of its audit of locations reviews the implementation of VTS and makes observations / recommendations on efficacy of the same. Training to consumers and other stakeholders like distributors, agencies etc. is undertaken by the respective Oil Companies. The officers are trained to provide knowledge on hazards associated with LPG sales and to evoke correct and prompt response in any emergency situation covers customer education on safety. The delivery boys are trained in safe handling of LPG cylinders and handling of emergencies covers safe handling of cylinders at customer's premises and guidance to customer on safety aspects. OISD-STD-154 laid down detailed guidelines on preparation and execution of typical training programme, use of appropriate training technique of evaluation of the effectiveness of training programme.

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Recommendation 7

Pilferage from Pipelines

The Committee observe that pilferage from oil pipelines by anti-social elements is a major concern. Such instances pose a major hazard and such activities put the lives of many at risk. The Committee note that preventive measures include maintaining regular interaction with the civil administration, electronic surveillance, patrolling by local police. The Petroleum and Mineral Pipelines (Acquisition of Right of Use in Land) Act, 1962 has also been amended and made more stringent against the offenders. Despite all this, such pilferage from pipelines has not been stopped. The Committee, therefore, recommend that pilferage from the pipelines should be prevented by proper monitoring of the pipeline network especially in those areas from where the pipeline runs through vacant land. The Committee, further, desire that appropriate warning signages requiring dangers and punishment for tampering with the pipeline should also be put up along the pipelines and those found involved in such pilferage activities should be punished severely.

REPLY OF THE GOVERNMENT

Various safety measures taken by pipeline operators, including the steps to avoid pilferage, are already explained under the reply to observation/recommendation No 5 above. With regard to appropriate warning signages requiring dangers and punishment for tampering with the pipeline, it is mentioned that as on date all pipeline operators are installing warning boards as stipulated in OISD standard which informs the general public about dangers involved with hydro carbon pipeline. In all such signages and signboards punishment admissible under the Petroleum and Mineral Pipelines (Acquisition of Right of Use in Land) Act, 1962 is clearly mentioned.

Some of the other measures taken by industry to minimize pilferages are:

- Provision of Leak Detection System (LDS) for online monitoring and detection of any leakage in the pipeline.
- Provision of CCTVs at all Stations as well as SV/RCP stations.

- Carrying out night patrolling at all vulnerable pipeline stretches in addition to day patrolling.
- For better co-ordination and with law enforcing agencies, regular Oil Security Co-ordination Committee (OSCC) meetings are being held with top brass of each state police where all the oil industry members are being present.
- Implementation of installing Pipeline Intrusion Detection System (PIDS) phase wise in all the cross country pipelines to have early warning for any kind of pilferage activity and any leakage.

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Recommendation 8

Butcher Island Fire Incident

The Committee note that the fire at one of the tank farms of BPCL situated at Butcher Island, near Mumbai on 06.10.2017 was the most recent major accident in the oil Industry. There was no loss of life but one tank that was used for storing HSD was fully damaged. For fire fighting, High Volume Long Range Monitors - HVLR (2000 GPM) of tank number 13 was started and foam was also applied. Despite this the fire could not be put out and the HSD in the tank was allowed to burn in a controlled manner. The cause of the fire was attributed to intense Lightning strike. The Committee were informed that a Committee constituted by OISD to investigate the incident has concluded that roof plates of tank were thinned out / pitted which got punctured due to lightning strike. The tank was also inspected by BPCL officials before the incident and was certified for use. However, the Marine Oil Terminal (MOT) facilities at Butcher Island was not audited by OISD in the last External Safety Audit (ESA) of BPCL, Mumbai Refinery on 26th – 30th September, 2016 and these facilities were not offered for safety audit. The Committee are of the view that the frequency of safety audits of tank farms should be reviewed in view of this incident. The Committee specifically desire that the frequency of ESA should be increased in those areas that are susceptible to particular vagaries of weather more often and preventive measures taken.

While analyzing the quality of firefighting equipment the Committee feel that at Butcher Island it was inadequate to put out the tank fire. While the Ministry and PSUs claim their capabilities for managing the fire incidents have improved after the implementation of M.B. Lal committee recommendation, the way the fire incident in Butcher Island was handled belie this, even though the adjacent tanks in the site were safeguarded from Fire, the entire fuel in the storage tank was allowed to burn out instead of fire fighting to put out the fire.

The Committee, therefore, recommend that the firefighting capabilities at all the storage sites of petroleum products across the country be upgraded to ensure quick extinguishing of fire.' The Committee would like to be apprised of the further safety measures including the installation of advanced lightning protection system undertaken by the oil industry to prevent the recurrence of such incidents at par with the worldwide practices being followed to deal with such situation.

REPLY OF THE GOVERNMENT

Regarding reviewing the frequency of Safety Audits in Oil and Gas installations especially tank farm areas; the following steps have been taken by OISD:

- Central Tank Farms (CTFs) will be considered as standalone facilities and shall be audited at a frequency of 3 years from earlier 5 years
- For POL marketing installations having aggregate storage capacity of more than 1 Lac KL, the audit frequency is reduced to 5 years from earlier 7 years.
- Clubbing the external & Surprise Safety Audits of the installations in a particular city/ neighbouring locations so that coverage of audits increases. In the process, OISD has audited 112 locations in the year 2017-18 against the original plan of 70 numbers.

Regarding upgrading the fire fighting capabilities at all the storage sites of petroleum products across the country and to ensure quick extinguishing of fire, it is submitted that OISD has already taken initiatives for evaluation of functionality checks of the critical firefighting equipment like HVLRLMs, ROSOVs, RSFPS, MEFG etc. at Marketing (POL) Installations. Presently, 115 (out of total 276 nos.) POL locations have already been covered & compliance being monitored for 100% accomplishment of functioning of such equipment.

Further, OISD has already undertaken revision of its Standard-180 on lightning protection through functional committee.

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Comments of the Committee
(Please see Para No. 16 of Chapter-I)

Recommendation 11

Creation of Buffer Zones around installations

The Committee note that one of the recommendations of the M.B. Lal Committee was to create a buffer zone around installations and regulating land use pattern around high hazard petroleum installations. Accordingly, all the Chief Secretaries of States/UTs were requested in April 2013 to ensure adequate provisions in their land allotment rules to prohibit habitations to come up within a band of at least 250-300 meters around the periphery of the oil installations and to maintain a buffer zone to minimize the impact on the surrounding areas in case of a major accident. In this regard, the Committee were informed that no feedback has been received from the state governments. The Committee understand that buffer zones around petroleum installations are an important aspect for maintenance of safety and therefore, desire that there should be no let-up in pursuing the matter with the States/UTs and the importance of creation of buffer zones should be impressed on them so that M.B. Lal Committee recommendation regarding safety of high hazard installations is implemented without any further delay.

REPLY OF THE GOVERNMENT

In order to regulate the land use around Oil installations, a communication was sent to all the Chief Secretaries of States/UT in the matter on 02.04.2013 wherein it was requested to issue appropriate instructions to the concerned authorities to make adequate provision under the relevant Acts and Rules to prohibit proliferation of unauthorized hutment, shops or residential houses within a band of at least 250-300 metres around periphery of the Oil installation. The communication was followed by a reminder on 20.01.2016. Reports were received only from 4 States/UTs. As

response was very poor, another communication has been sent to States/UT on 30.08.2018.

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Recommendation 12

Geo-physical Mapping of Potential Disasters

The Committee have been informed that ONGC has developed an in-house GIS mapping of its pipelines laid in onshore locations and the mapping is nearly complete. ONGC is also undertaking a conceptual study in this regard. The Committee also note that no guidelines for GIS mapping of upstream assets has been brought out by OISD.

The Committee desire that all the oil and gas companies should mandatorily carry out GIS mapping of their assets. This will not only enable for tracking purpose both onshore and offshore but also as a tool for risk assessment of the areas around petroleum and gas installations/pipelines during major accidents. The Committee recommend that the world wide practice should also be studied for adopting the same in the Indian scenario for advance planning to minimise damage and to deal with accidents efficiently and effectively.

REPLY OF THE GOVERNMENT

IOCL has informed that GIS based Pipeline Asset Integrity Management System has been implemented in new cross country pipelines. Maps indicating pipeline routes are shared with respective police stations/administration as part of Emergency Response Disaster Management Plan (ERDMP).

ONGC undertakes survey of all the offshore pipelines inclusive of GIS mapping once every five years. An in-house common portal has also been developed for mapping of the pipelines. GIS mapping is done regularly for the areas where seismic survey is carried out.

GAIL has mapped its existing pipelines assets on GIS platform. Further, with the expansion of the truck pipeline in other parts of the country including providing the last mile connectivity, the same will also be mapped on the platform periodically.

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Comments of the Committee
(Please see Para No. 25 of Chapter-I)

Recommendation 13

Onshore Security

The Committee note that the security for the on-shore installations is provided by the owner oil companies owned security staff along with the Central Industrial Security Force (CISF), through patrolling. Technology such as Intrusion Detection System (IDS), remote surveillance, GIS, GPS, is also extensively being used for monitoring security of installations and pipelines. There is an Onshore Security Committee Chaired by the DGPs which acts as an inter-state linkage. The same pattern is being

followed in securing the Oil & Gas installations in the North-Eastern region. The Committee desire that the security of such vital installations should be fool proof to deal with all possible types of threats in the current security scenario. Security audit should be carried out at periodic intervals to update and upgrade the security systems in all the oil and gas installations. Worldwide practices in this area should also be examined and adopted wherever feasible. Apart from the internal security mechanisms, the State Governments and the local administration also have a major role in the security of the oil & gas installations. Regular interaction with the state authorities should be an essential feature of the security system for sharing of information on threats and for timely action during an emergency. The illegal encroachments/construction around the periphery of the oil & gas installations and on the Right of Way (RoW) around pipelines should not be allowed to come up as they pose a security threat. In this regard the Committee desire that Central Industrial Security Force (CISF) should be empowered to register cases against violators. The Committee further desire that the security risk assessment of all the onshore oil and gas installations should be carried out and the security strengthened by addressing and filling the gaps found therein. The Committee further desire that the best of the equipment and technology is used by the oil industry to secure their installations.

REPLY OF THE GOVERNMENT

The security of all installations is being ensured by deploying unarmed and armed security guards 24x7 through CISF. The security audit of all the vital installations are carried out by Intelligence Bureau (MHA) and state Intelligence Bureau in coordination. Mock drills are also conducted periodically. Moreover internal security audits are also carried out by security in charge on regular intervals. All the locations are declared as „Prohibited Areas“ by administration and notices displayed along with peripheral patrolling and ROW patrolling. Provisions of technology-based devices including Intrusion Detection System, forced entry barriers, GPS/RFID based patrolling monitors are in the process of implementation at critical installations.

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Recommendation 14

Offshore Security

The Committee note that Navy, Indian Coast Guard, Offshore Defence Advisory Group (ODAG) a dedicated group of the Navy, are presently engaged to provide security to the Western and Eastern Offshore Oil and Gas platforms. The on boat security is exclusively been done by ONGC. The state police or the coastal police looks after the security from onshore to 12 nautical miles. The Offshore Security Co-ordination Committee (OSCC) comprising of the members from the Indian Coast Guard, Navy and the Ministry of Shipping reviews the security issues. The Committee were further informed that the offshore activity of vessels both sea borne and air is closely monitored through the Vessel and Air Traffic Management System (VATMS), besides this the Navy, ODAG, and the Indian Air Force also keep a watch on the movement of vessels. The Immediate Support Vessels of the Navy carry out regular patrolling of the waters. The Committee also note that to address underwater threats a comprehensive security solution is also being developed.

The Committee are satisfied to note the present security mechanism in place for protection of offshore oil and gas installations, nevertheless, desire that the maritime security and surveillance should keep abreast with the latest technology and further enhanced with equipment that are required for the protection of important offshore assets of the nation.

REPLY OF THE GOVERNMENT

The Offshore Security Co-ordination Committee (OSCC) forum is utilized to review, explore and improve existing offshore security apparatus and introduction of new pragmatic methods. Being a multi agency forum, inputs and expertise from various agencies is discussed to evolve Credible Response Mechanism. The Comprehensive Security Solution is being developed by ONGC taking inputs from Indian Naval Specialists and other expertise to include latest technologies for security and surveillance.

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Recommendation 15

Environment Protection in and around oil refineries

Today India's oil refining capacity is of about 5 million barrels per day and it exceeds the countries demand of oil products resulting in exports of more than one million barrel per day. Efforts are also being made to develop India as a refining hub in coming years. Surging demands in domestic and export market offers at attractive growth for Indian refineries. The Committee, however, feel that the growth if the Indian's refinery industry and country's sustainable future are closely linked tightening emission standards of international levels. Refineries emit a wide variety of pollutants. Common air pollutants coming out of refineries are Sulphur Dioxide, Oxides of Nitrogen, Carbon Monoxide, green house gases and other carcinogenic air pollutants. Similarly, pollutants from the refineries are also responsible for pollution of water bodies and contamination of ground water. Noise pollution from the refineries is also cause of concern. All these pollutants have harmful health effects relating to respiratory system, heart, eyes, skin, digestion etc and other serious health disorders. Prevention and control of air, water and noise pollution is being done under various acts of environment protection. This includes water pollution, air pollution and noise pollution monitoring and control, developments of green belts and eco parks, carbon management, use of renewable and alternate energy and solid waste and e-waste management etc. The committee, however, are not sure whether refining emission standards are strictly being followed by the refineries and also whether the effluent treatment facilities in all the refineries are of global level because the population living around the refineries face respiratory and other problems and water bodies in the adjoining areas to the refineries are heavily polluted. There are refinery modernization/expansion projects in progress and in pipeline. The Committee caution the Ministry that such projects should not be undertaken at the cost of increase in pollution of environment and contamination of water. The committee desires, in view of global environment standards improvement, the environment management in Indian refineries also need shift from conventional to more pragmatic approaches. Refineries should ensure that there is a regular monitoring and control of environment pollution and the level is not disturbed further due to expansion/modernization of refineries. They should put in efforts for mitigating

environmental pollution using the latest and cleaner technology, recovery of the byproducts and resource conservation and effluent treatment facilities and all these factors should be monitored and upgraded regularly at par with the international standards. The committee may be apprised about the efforts made in this direction and the outcome thereof.

REPLY OF THE GOVERNMENT

The pollution levels are monitored and meet the MoEF&CC & Pollution Control Board's stipulations and are online uploaded to the CPCB/KSCB servers. As per the Hazardous waste and other (Management and Trans boundary Movement) Rules, 2016 and consent to operate, low oily sludge is treated by adopting bioremediation using bacteria specialized for oil degradation with faster rate and thereby converting the low oily sludge into fertile soil.

All continuous air monitoring stations have been upgraded. Additional analyzers for monitoring of parameters namely Ozone, Benzene, Ammonia and H₂S have been added along with new Sox and NO_x analyzer. Data from these stations have been uploaded on Central Pollution Control Board website.

The refineries have various Environmental system and procedures in place to control and mitigate significant aspects and their impacts. State of the art New Integrated Effluent Treatment Plant consisting of primary, secondary and tertiary treatment section has been in operation consistently. The technology conforms to existing MINAS (Environmental Standards) and can also cater to further stringent standards in the future.

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Recommendation 16

Incidents of Oil Spill

The Committee notes that oil spill is a major problem in hydrocarbon sector which adversely effects the environment. There have been few incidents of oil spill, notably the recent one in Chennai coast in January, 2017 due to the collision of the two vessels. Similarly many incidents of the oil spill due to accidents involving vessels, oil platforms/rigs/pipelines etc have happened in the past in Indian coast. As the country has long coast both on the Easterner and Western side, there has to be an effective monitoring mechanism to avoid such incidents.

The Committee note that oil spill causes enormous impact on environment on marine life as well as to environment along with the economic cost associated with the cleaning and treating oil sludge. The management of oil spill involves significant financial, technical and human resource. The Committee are surprised to note that oil companies have not undertaken any serious R&D activities to develop the best capabilities in this regard. Therefore, the Committee recommends that the Ministry should coordinate with other agencies like NDMA, Indian Coast Guard, Ministry of Environment, Forest and Climate change, Ministry of Shipping, etc. to monitor and enhance the indigenous capabilities of managing the oil spill effectively.

REPLY OF THE GOVERNMENT

Indian Coast Guard (ICG) is the nodal agency for dealing with the incidents of oil spill within territorial limits of India. It has established Pollution Response Team (PRT) at Mumbai, Chennai and Port Blair. ICG has commissioned three dedicated pollution control Vessels based at Porbandar, Mumbai and Vizag. ICG regularly interacts with Oil Handling Agencies. The ICG has prepared Nation Oil Spill Disaster Contingency Plan (NOS-DCP) for oil spill response. Further, ICG is entrusted with responsibility of surveillance of Maritime Zones and coordinating authority for combating oil pollution against oil spills, combating oil spills (except for water in ports and within 500 meters of off-shore exploration and production platforms, coastal refineries and associated facilities), implementing NOS-DCP which obliges all ports (Major and Non-major ports), oil equipment for tier-I response (i.e. Oil spills up to 700 tons) & coastal State Administration to be suitably equipped for undertaking shoreline clean-up in their area of responsibility and conducting regular training and national level pollution response exercise with active participation of stakeholders viz. Ports, Oil handling agencies. Further, the International Convention for Prevention of Pollution from Ships (MARPOL) is being implemented by Ministry of Shipping.

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CHAPTER III**RECOMMENDATIONS/OBSERVATIONS WHICH THE GOVERNMENT DO NOT
DESIRE TO PURSUE IN VIEW OF THE GOVERNMENT'S REPLIES****-NIL-**

CHAPTER IV

RECOMMENDATIONS/OBSERVATIONS IN RESPECT OF WHICH REPLIES OF THE GOVERNMENT HAVE NOT BEEN ACCEPTED BY THE COMMITTEE

Recommendation 1

Safety, Security And Environmental Aspects In Petroleum Sector

The Committee note that the petroleum and natural gas industry of the country comprises of three major streams namely exploration and production, refineries, marketing & distribution. The country has 23 refineries with installed capacity of 231 MMTPA, 15 gas processing plants, 4 LNG terminals, 680 oil and LPG installations and more than 39,000 KM cross country pipelines spread across the length and breadth of the country. In offshore exploration and production, there are 21 production complexes, 252 well platforms and 33 rigs while in on-land exploration and production, there are 301 production installations & 230 rigs. This industry handles highly inflammable hydrocarbons in all forms namely solid, liquid and gas and operates processes under high temperature and pressure. Moreover, Petroleum industry has a significant influence on the total pollution of the environment by exploration and production operations, oil spillage, gas flaring and oil refining operations. Therefore, the safety and security and environment protection in petroleum and natural gas industry is of paramount and vital importance and its operation in a safe mode is necessary both for the employees and the society at large. The hydrocarbons are essential for economic development and propriety of nation for decades to come. The Committee, therefore, desire that, the Ministry should accord the top priority to the safety, security and environmental aspects relating to the petroleum and natural gas industry. All these aspects should be continuously monitored and necessary changes in statutes, rules and regulations be made so that the legislations enforcing these measures are strengthened regularly to enhance the level of safety and security of the installations and minimize the adverse impact on environment from the activities at installations at par with the current global situation.

REPLY OF THE GOVERNMENT

Ministry of Petroleum and Natural Gas (MoP&NG) regularly monitors and reviews the various safety issues in the Oil & gas Sector and directs the oil companies from time to time to take suitable measures to ensure safety of these vital installations.

Safety, health and environmental aspects of the Oil & Gas installations is of paramount importance; and concerted efforts are being made by the Industry and MoP&NG to preserve such national assets without compromising the safety.

OISD, technical body under the Ministry, makes necessary Safety Standards depending upon the emerging needs of the safety of oil installations and these standards are adopted after a due process and included in various rules/regulations.

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Comments of the Committee
(Please see Para No. 7 of Chapter-I)

Recommendation 9

Setting up of Emergency Response Centres (ERCs)

The Committee note that after the Jaipur major fire incident, the M.B. Lal Committee which investigated the incident had recommended for the setting up of Emergency Response Centre (ERCs) in the country to handle major oil fires like storage tank fire in fastest and specialized way.

The Committee also note that M.B. Lal Committee recommendations were approved by OMC and Ministry to be implemented immediately and all the recommendations including setting up of ERCs were to be completed by 2014. The Committee note that even after approval of the Ministry, the recommendation of setting up of ERCs is still pending.

The Committee further note that it has now been decided to set up five ERCs to be piloted by each of the oil companies at the following locations:

IOCL-Jaipur, HPCL-Vizag, BPCL-Manmad, ONGC-Hazira, and GAIL at Guna. The Fire Advisor, Ministry of Home Affairs too has recommended in 2006 & 2017 for establishing and positioning of ERCs at strategic locations. The Committee note that initially EIL was appointed as a consultant but was dropped due to high rates quoted by it, and now a global tender for appointment of consultant for Fire Expertise with PMC work for setting up of 5 ERCs has been floated. The Committee desire that engaging a Fire Consultant for setting up ERC before PMC work be expedited to ensure setting up of ERC, supply of equipment and operation of ERC at the earliest.

The Committee deplore the casual approach of the Ministry resulting in inordinate delay in the setting up of ERCs. It appears that the oil industry is waiting for another major disaster to happen to get on its feet. The Committee disagrees with the Ministry's contention that the firefighting capabilities of the industry is adequate to meet any major fire emergency and that the concept of ERC is a second line of defence in case of catastrophic events for which various other avenues like mutual aid partner industry, state fire brigade etc., are already in place. The Committee further note that an ERC would take up 3 to 4 years to be set up and any incident during the intervening period may cause huge losses. The Committee, therefore, strongly recommend that for the interim period the OMCs should procure required advanced firefighting equipments viz. robotic monitors, high capacity pumps with portable foam monitors, large hoses etc. for all the 22 locations for the proposed ERCs and later such equipments could become a part of the ERC. The Committee also desire that till the ERCs are set up, the OMCs should appoint an experienced agency on temporary basis who can provide 24x7 emergency firefighting services with advanced equipments as mentioned above immediately without any further delay.

The Committee agree with the views of the industry experts who deposed before them and are of the opinion that OMCs should consider procuring equipments/setting up of ERCs as they are an investment in safety. The Committee, therefore, desire the Ministry to take immediate action for the setting up of all 22 ERCs starting with 11 ERCs at strategic locations specially where there is cluster of oil companies/terminals to meet any disaster, taking into consideration the requirements of a rapidly growing industry.

REPLY OF THE GOVERNMENT

With the installation of state of the art equipment at installations of all the OMCs, the firefighting capability of our Oil & Gas Installations in the country is adequate to meet any major fire emergency arising out on account of routine operations. With in-plant firefighting facilities, all the OMCs are equipped with fire fighting facilities to handle emergency scenarios like tank fires, leakages etc. for a duration of four hours.

Further, in addition to the installed firefighting facilities, which are adequate for any operational related emergency as mentioned above, other avenues like mutual aid partner industries, state fire brigade etc. can also be pressed into service in case any catastrophic event occurs in these installations as a second line of defense. It may be reiterated that ERCs once available, shall also act as second line of defense to the installed firefighting facilities.

With regard to setting of ERCs in the country, it is mentioned that it has now been decided to set up five ERCs to be piloted by each of the oil companies at the following locations:

IOCL-Jaipur, HPCL-Vizag, BPCL-Manmad, ONGC-Hazira, GAIL, Dibiyaapur (Earlier location Guna is changed).

It is submitted that for appointment of consultant for PMC for setting up 5 ERCs as above, a Global tender was floated but there was no response to get PMC services to establish 5 pilot ERCs by IOC/BPC/HPC/GAIL/ONGC. Based on inputs provided by prospective vendors during pre-bid meeting of the last tender, detailed BQC (bid qualification criteria) and Tender scope for engagement of PMC consultant have been finalized. To invite more no of bids, JVs/Consortium are being allowed in the new tender to have wider participation from prospective PMC consultants. Global/open tender is likely to float shortly.

Ministry of Petroleum & Natural Gas
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Comments of the Committee
(Please see Para No. 19 of Chapter-I)

CHAPTER V

RECOMMENDATIONS/OBSERVATIONS IN RESPECT OF WHICH FINAL REPLIES OF THE GOVERNMENT ARE STILL AWAITED

Recommendation 5

Safety of Pipelines

The Committee note that OISD carries out periodic audits including pre-commissioning audit of cross country pipelines, other additional safety checks and measures to ensure protection of oil and natural gas pipeline network in the country. It includes monitoring of the pipeline through 'Pipeline Integrity Management System', Supervisory Control and Data Acquisition (SCADA), sustained ground patrolling, inspection of Right of Way (RoW), surge analysis etc. However, despite such measures in place, a major accident occurred in the GAIL pipeline at Nagaram in East Godavari District of Andhra Pradesh in the year 2014 which caused extensive damage to life and property. The explosion and fire tragically claimed 22 lives. The cause of the accident was pipeline / equipment failure due to violations of SOPs. In this case it has been reported that wet gas was being carried in the pipeline meant for dry gas without taking adequate precautions like pigging of pipeline at regular intervals. The Committee are deeply anguished on this incident and feel that accident could have been prevented by following proper procedures in the first place. The Committee also note that in this case other safety measures also seem to have failed pointing towards the failure of monitoring system. The Committee note that the PESO has submitted its report on the incident to the MoEF for further action. The Committee, therefore, desire that MoP&NG should take up the matter with MoEF and ensure an action against those found responsible for lapses and negligence which caused the accident.

Looking at the serious impact of such incidents of leakage of gas, the Committee strongly recommend that there should be a fool proof mechanism for monitoring of pipeline infrastructure network of the country both through human and sensor based system and any deviations should be reported and preventive action initiated immediately. There should also be backup measures for operation of remote valves and these should be such that they are not damaged due to fire etc. The communications lines could be placed underground or away and secured from tampering. There should also be audible warning system to warn the people of leaks etc. so that they can take precautions. The Committee, further, note that the safety of the population that lives around those places where the oil and gas pipelines pass is the responsibility of the owner of the pipeline and should not be compromised in any way. Any report from the public about anything wrong like leaks in the pipeline or tampering should be taken seriously and investigated immediately to prevent any accident. Besides this, people should also be sensitized on the do's and don'ts in the event of any accident on the pipeline. The Committee may also be apprised of all the initiatives for safety of pipelines taken in this direction.

REPLY OF THE GOVERNMENT

Regarding action taken against officers responsible for major accident in the GAIL pipeline at Nagaram in East Godavari District of Andhra Pradesh in the year 2014 Gail has informed that based on assigned roles and responsibilities disciplinary proceedings were initiated against 5 officials. Penalty of non-consideration for

promotion & withholding performance related payments was immediately imposed on charges officials with the initiation of disciplinary proceedings. Disciplinary authority has examined the submissions of charged officials which are yet to be concluded.

Further, each of the oil companies both in private and public sector are required to maintain highest level of safety standards for ensuring safe operations in the respective pipelines. Some of the major safety measures undertaken by the Oil & Natural Gas Industry include:

- Incorporation of in-built safety aspects in the i.e. during the design phase itself. These include process safety, instrumentation & safety interlocks, safety while design of equipment following the best International Standards, etc.
- Each installation has its own dedicated firefighting facilities which are equipped with gadgets, well trained crew to fight fire in case of any eventuality.
- The industry also carries out regular Internal Safety Audits and conducts periodic mock drills both on-site and off-site to ensure emergency preparedness. It has also developed its own Disaster Management Plan.
- For real time monitoring of movement of line Patrolmen through Global Positioning System (GPS) has been adopted by pipeline industry.
- Monitoring of Repeater-cum-Cathodic Protection Stations through Close Circuit Television (CCTV) based surveillance has been adopted by pipeline industry.
- OFC based Pipeline Intrusion detection system/ acoustic sensor based leak detection system is being implemented.
- Application software based Leaked Detection System (LDS) in liquid pipelines is implemented in liquid pipelines.
- Provision of remote operation of pipeline"s sectionalizing valves is kept for closing in case of any emergency.
- Provision of alternate communication means (in addition to OFC based communication/ radio communication) such as leased line /GSM network from telecom operators etc. as stand-by for closure of remote valves in case of OFC / radio communication failure.
- The pipeline is provided with electrical sirens of high range (3Km range) at all originating, intermediate pump / delivery stations, terminal station and all sectionalizing valve (SV) stations which are spread evenly along the length of pipeline.
- Toll free number on all route markers along the ROU of pipelines are provided.
- Regular interaction with villagers to sensitize them by conducting awareness programs like Hastakshar Abhiyaan/Sarpanch Meet/free medical check-up camps/Samyojak scheme/Sahyogi scheme etc.
- Regular interaction is being held with respective Police & District Administration.

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Comments of the Committee
(Please see Para No. 13 of Chapter-I)

Recommendation 10

Formation of Unified Safety Board

The Committee note that depending on the type of installations, there are various statutory authorities involved in the safety enforcement in the Petroleum and Natural Gas Industry. In the E&P onshore and offshore industry segments Exploration and Production the DGMS and OISD under the administrative Ministries of Labour and Employment and P&NG respectively have jurisdiction. In the Downstream & Gas (Natural) Processing Plants (GPP) segments the PESO and PNGRB under the administrative Ministries of Commerce & Industry and P&NG respectively are enforcing safety. The Committee also note that the proposal for having a unified Petroleum and Natural Gas Safety Board has been under consideration since the last four years and nothing has been finalised as yet. The Committee were informed that the matter was considered by the Committee of Secretaries (CoS) and they were of the view for strengthening the existing regulatory bodies over creation of a new organization. Thereafter, the recommendations of the CoS were considered by the Ministers of the Ministry of Petroleum and Natural Gas, Commerce and Labour. They have decided that a report should be prepared after studying the safety and security aspects keeping in view the international practice. The Committee are not satisfied with the current state of affairs as such an important issue is being unduly delayed. It appears that the three Ministries are reluctant to give up their role in the safety related aspects as they perceive it akin to losing power.

The Committee have been informed that among the three bodies namely PESO, DGMS and OISD, almost 97 percent of the premises are regulated for safety by PESO and 2 percent by DGMS and 1 percent by OISD. PESO has been handling the safety regulations in hazardous premises like refineries, cross country pipelines, manufacturing, storage and transportation of exploring storage & use of explosives in oil mines, Auto LPG and CNG dispensing stations. The Committee feel that the MoPNG wants to retain its dominant role through the OISD. The Committee would like to point out here that the OISD has no permanent staff of its own and most of its officers are on deputation from the Oil Companies. Therefore, the concept of arm's length in the safety aspect is certainly not fulfilled here. Due to conflict of interests, such officers cannot be expected to give adverse reports against their own employers. Therefore, in Committee's view, considering the capabilities, infrastructure and proportion of work administered in Hydrocarbon sector, PESO is more suitable body to reposition it to administer safety regulations in entire hydrocarbon sector. The Committee, therefore, strongly recommend that PESO may be empowered to work as a single framework for regulation of safety in entire hydrocarbon sector. For that purpose the capacity of PESO should be enhanced by providing it prosecution powers and strengthening the Human Resource and coordination with District authorities, upgradation of Research and Testing infrastructure and capacity building of external stakeholders.

REPLY OF THE GOVERNMENT

The Ministry has brought a proposal before the Committee of Secretaries (CoS) for establishment of Petroleum and Natural Gas Industry Safety Board (PNGISB) to regulate the safety of petroleum and Natural Gas Industry in the entire country. The proposal also envisage establishment of Directorate General of Natural Gas and Industry safety. Three meetings of the CoS have been held on 01.07.2014, 7.11.2014 and 19.08.2016. After detailed deliberations held in the third meeting of

CoS on 19.08.2016, it was interalia decided that MoPNG may weigh the option of strengthening the existing upstream and mid/downstream regulators vis-à-vis, a single safety regulator for all segments and take a considered view in this regard.

In order to settle the issues an inter-ministerial meeting involving Ministry of Petroleum and Natural Gas (MoP&NG), Ministry of Labour and Employment (MoLE) & Ministry of Commerce & Industry was held on 20.12.2016 and it was agreed to examine further the issue of existing structure of Safety in Petroleum and Natural Gas Industry and also examining best practice of Safety issues in Hydrocarbon Industry in other countries.

OISD was requested on 06.04.2017 to examine the best practices of safety issues in the hydrocarbon industry in other countries and submit a report. OISD has since submitted a report in the matter.

Further, Performance Audit Report of PESO has been obtained. Forensic Audit report of DGMS has not been received from Ministry of Labour.

From above, it would be evident that inter-ministerial consultation is going on to settle the issue.

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O.M. No.R-11037/12/3/2018-OR-II/E-26376 Dated 17.10.2018
Comments of the Committee
(Please see Para No. 22 of Chapter-I)

New Delhi;
2 January, 2019
12 Pausha, 1940 (Saka)

PRALHAD VENKATESH JOSHI,
Chairperson,
Standing Committee on
Petroleum & Natural Gas.

Annexure I

MINUTES
STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS
(2018-19)
FOURTH SITTING
(02.01.2019)

The Committee sat on Wednesday, the 2 January, 2019 from 1500 hrs. to 1530 hrs. in Committee Room 'D', PHA, New Delhi.

PRESENT

Sh. Pralhad Venkatesh Joshi - Chairperson

MEMBERS**LOK SABHA**

- 2 Shri Rajendra Agrawal
- 3 Shri Kalikesh Narayan Singh Deo
- 4 Smt. Rama Devi
- 5 Shri Naranbhai Bhikhabhai Kachhadiya
- 6 Dr. Thokchom Meinya
- 7 Smt. Pratima Mondal
- 8 Smt. Jayshreeben Patel
- 9 Shri Arvind Ganpat Sawant
- 10 Shri A.T. (Nana) Patil
- 11 Shri Laxmi Narayan Yadav

RAJYA SABHA

- 12 Shri Bhubaneswar Kalita
- 13 Smt. Ranee Narah
- 14 Shri V. Lakshmikantha Rao
- 15 Shri Kanakamedala Ravindra Kumar
- 16 Shri A. Vijayakumar

SECRETARIAT

1. Shri H. Ram Prakash - Additional Director
2. Shri Vinay Pradeep Barwa - Deputy Secretary
3. Shri Mohan Arumala - Under Secretary

2. At the outset, the Hon'ble Chairperson welcomed the Members of the Committee to the sitting. Thereafter, the Committee took up the draft Action Taken Report on the recommendations contained in Twenty Fourth Report (Sixteenth Lok Sabha) on the subject 'Safety, Security and Environmental Aspects in Petroleum Sector', for consideration and adopted the same without modification.
3. The Committee, thereafter, authorised the Chairperson to present/lay the Report in both the Houses of Parliament.

The Committee then adjourned.

Annexure II

(Vide Para 4 of the Introduction)

ANALYSIS OF THE ACTION TAKEN BY THE GOVERNMENT ON THE RECOMMENDATIONS CONTAINED IN THE TWENTY FOURTH REPORT (SIXTEENTH LOK SABHA) OF THE STANDING COMMITTEE ON PETROLEUM AND NATURAL GAS (2017-18) ON THE SUBJECT 'SAFETY, SECURITY AND ENVIRONMENTAL ASPECTS IN PETROLEUM SECTOR'.

I	<u>Total No. of Recommendations</u>	16
II	Recommendations/Observations which have been accepted by the Government (Vide Recommendations Nos. 2, 3, 4, 6, 7, 8, 11, 12, 13, 14, 15 and 16)	12
	Percentage to Total	75%
III	Recommendations/Observations which the Committee do not desire to pursue in view of Government"s (Vide Recommendations No. NIL)	NIL
	Percentage of Total	0
IV	Recommendations/Observations in respect of which replies of the Government have not been accepted by the Committee (Vide Recommendations Nos. 1 and 9)	2
	Percentage of Total	12.50%
V	Recommendations/Observations in respect of which final replies of the Government are still awaited (Vide Recommendations Nos. 5 and 10)	2
	Percentage of Total	12.50%

STANDARD OPERATING PROCEDURE (SOP) FOR PETROL DEPOTS

Submitted in Compliance to Hon'ble National Green Tribunal, EZ,
Bench, Kolkata vide order dated 17.04.2023 in the matter of
Original Application No. 154/2022/EZ (I.A. No.236/2022/EZ)



CENTRAL POLLUTION CONTROL BOARD
(Ministry of Environment, Forest & Climate Change, Government of India)
'Parivesh Bhawan', East Arjun Nagar Shahdara,
Delhi – 110032

Standard Operating Procedure (SOP) for Petrol Depots

Background

Hon'ble National Green Tribunal, Eastern Zone Bench, Kolkata in the matter of Original Application No.154/2022/EZ (I.A. No.236/2022/EZ) vide order dated 17.04.2023 directed Central Pollution Control Board to prepare Standard Operating Procedure (SOP) for Petrol Depots within three months.

Accordingly, Central Pollution Control Board prepared Standard Operating Procedure (SOP) for Petrol Depots.

This SOP shall be applicable for Petrol Depots (other than Petrol Pumps / Retail Outlets) having facilities for storing, handling, distribution, transportation, loading or unloading of petrol and that are liable to take approval / license from the Chief Controller of Explosives for storage of petrol.

Standard Operating Procedure (SOP) for Petrol Depots is as follows :

A. General Compliance :

1. Petrol depots shall have to obtain Consent to Establishment prior to establishment and Consent to Operate prior to starting operations from the concerned State Pollution Control Board / Pollution Control Committee (SPCB / PCC).
2. Prior to commissioning, petrol depots shall take out one or more insurance policies in accordance with the stipulations of The Public Liability Insurance Act, 1991 as amended.
3. Prior to commissioning, petrol depots shall provide a baseline monitoring data of ambient air, soil and groundwater quality (of the locations situated between the boundary of the planned storage and 50 m outwards) covering relevant pollutant parameters ; from any laboratory recognized under Environment (Protection) Act 1986 / laboratory accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) to concerned SPCB / PCC. The existing petrol depots may obtain baseline data from any earliest date within a year subsequent to issuance of this SOP.
4. Any major leakage/spillage occurring inside the petrol depot or around the petrol depot during transportation / supply of petrol / any other activity related to the concerned petrol depot shall be reported by petrol depot to the concerned SPCB/ PCC, Petroleum and Explosive Safety Organization (PESO), Oil Industry Safety Directorate (OISD) and District Administration under intimation to CPCB within 24 hours of occurrence.

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M. K. Choudhury
Regional Director
Regional Directorate (NE)
CPCB, Shillong-793001

5. Petrol Depots shall conduct groundwater monitoring to detect any contamination. Ground water sampling and monitoring for detection of any contamination shall be done through existing piezometer / bore well located within premises of petrol depot or within 50 m from petrol depot (in case no piezometer /bore well exists in petrol depot) from at least three different directions with reference to the expected point of groundwater contamination or in the upstream and downstream direction to the flow of groundwater with reference to the expected point of groundwater contamination.
6. Groundwater monitoring wells should be monitored within 30 days of commissioning of the petrol depots. Thereafter, groundwater sampling and analysis should be undertaken annually. Groundwater should compulsorily be sampled and analyzed under information to the concerned SPCB / PCC when any leakage occurs or suspected to have occurred.

The parameters for which groundwater samples shall be analyzed and their respective screening values are as follows:

Sr. No.	Parameter	Screening Values
1.	Total petroleum hydrocarbons (C ₁₀ -C ₄₀)	0.6mg/L
2.	Benzene , Toluene and Xylene	i. Benzene- 0.01mg/L ii. Toluene- 0.7mg/L iii. Xylene-0.5mg/L
3.	Methyl Tertiary Butyl Ether	13µg/l
4.	Total Polycyclic aromatic hydrocarbons (PAH)	0.0001mg/l

7. Further, soil sample shall be collected from a borehole within the premises of the petrol depot adjacent to the underground storage tank or above ground storage tank. The depth of bore hole should be up to 1m below the bottom of the storage tank level.

The parameters for which soil samples shall be analysed and their respective screening values are as follows:

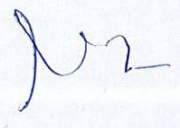
M. K. Choudhury
Regional Director
Regional Directorate (NE)
CPCB, Shillong-793001



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Sr. No.	Parameter	Screening Values(mg/kg)
1.	Total petroleum hydrocarbons (TPH)	5000
2.	Benzene	5
3.	Toluene	30
4.	Xylene	50
5.	Methyl Tertiary Butyl Ether	100
6.	Total PAH	40

8. Ground water and soil quality monitoring shall be conducted by petrol depots once a year through Environment (Protection) Act, 1986 approved laboratories / NABL accredited laboratories and the reports shall be submitted to concerned SPCB / PCC.
9. In case of exceedance of screening values for any parameter or ; in case of any major deviation from the baseline data or ; in case of leakage resulting in soil/groundwater contamination, the Petrol Depot shall immediately inform the concerned SPCB / PCC and shall take immediate action to detect and prevent the leakage ; and shall carry out further environmental remediation.
10. The petrol depots shall submit ambient air monitoring report w.r.t. notified ambient hydrocarbon parameters on six monthly basis from any laboratory approved under Environment (Protection) Act, 1986 / laboratory accredited by National Accreditation Board for Testing and Calibration Laboratories (NABL) to concerned SPCB / PCC.
11. Petrol depots shall compulsorily provide adequate Effluent Treatment Plant or Oil Water Separator to treat any effluent generated because of tank cleaning or cleaning of storage area, contamination of storm water, any other effluent generating activity and shall ensure that the treated effluent complies with the prescribed standards.
12. Petrol depots shall take necessary steps to prevent entry of storm water to the storage area. In case storm water gets contaminated, there must be adequate arrangements for collection and treatment of storm water prior to its discharge.
13. Petrol depots shall obtain authorization for managing hazardous and other wastes under Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 from the concerned SPCB / PCC. Storage, collection , handling and disposal of hazardous and other wastes generated because of tank cleaning , effluent treatment or other activities shall be strictly carried out as per stipulations of the aforementioned authorization.
14. The petrol depots shall install Vapour Recovery Systems w.r.t. pertinent directions issued by CPCB / concerned SPCBs / PCCs.


 M. K. Choudhury
 Regional Director
 Regional Directorate (NE)
 CPCB, Shillong-793001

B. Prevention of Leakage :

1. For preventing fugitive emissions and standards for equipment leaks, the petrol storage depots may comply with the relevant stipulations stated in Section C (under subheading Fugitive Emissions and Standards for Equipment Leaks) of the Petroleum Oil Refinery standards notified by the Ministry of Environment and Forests (Now the Ministry of Environment, Forests & Climate Change) vide Notification no. GSR 186 (E) dated 18.03.2008, as applicable (Annexed as Annexure -I) **OR** any other applicable norms / guidelines issued by Ministry of Petroleum and Natural Gas / other statutory bodies.

It is clarified that petrol depots may provide the storage tanks and seals as specified in the aforementioned standards notified by the Ministry of Environment and Forests or any other applicable norms / guidelines issued by Ministry of Petroleum and Natural Gas / other statutory bodies. However, the norms (for vapour removal efficiency, Emission control standards for Road tank truck/Rail Tank wagon loading in respect of VOC reduction and Emission, Standards for Equipment Leaks including Leak Detection and Repair, Frequency of monitoring of leaks etc.) that are more stringent among the aforementioned standards shall be complied by the petrol depots.

2. Petrol depots shall install hydrocarbon detectors along with alarming system at the leakage prone locations to detect any leakage at the earliest.
3. Petrol depots shall install spill prevention equipment and overfill prevention equipment as per extant and applicable standards and guidelines.
4. The separation between above ground petrol storage tanks shall be as per extant norms / guidelines of Ministry of Petroleum and Natural Gas (MoPNG)/ OISD or other statutory bodies.
5. The tanks and pipework of petrol storage tanks should meet the following requirements:
 - i. The material of construction and design of storage tanks and pipelines should be in accordance with the extant and applicable standards.
 - ii. Efficient secondary containment (as detailed in Section C) shall be provided to prevent release of any leakage to the environment.
 - iii. There should be adequate monitoring system to detect any leakage from the tank or pipelines as per norms / guidelines of MoPNG / OISD or other statutory bodies.

C. Secondary containment :

Secondary containment systems must be designed, constructed, and installed to contain leakage / spillage released from the storage tank and shall have system to detect the failure / breach of the containment system and shall prevent the release of leaked petrol to the environment at any time during the operational life of the storage tank system; and may be checked for leakage regularly.

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M. K. Choudhury
Regional Director
Regional Directorate (NE)
CPCB, Shillong-793001

There should be proper arrangements so that any leakage within the secondary containment area may be timely detected and disposed in an environmentally safe and sound manner.

1. Secondary containment for underground tanks :

All the underground petrol storage tanks shall provide secondary containment system to prevent the leakage to escape to the environment by providing enclosure which is impervious for petrol and able to contain and withstand the hydraulic pressure of the leaked petrol.

Secondary containment can be provided by providing double walled tanks or by constructing concreted and impervious enclosure around storage tanks.

Double walled tanks must be capable of:

- (1) Contain a leak from any portion of the inner tank within the outer wall;
- (2) Detect the failure / breach of the inner wall.

2. Secondary containment for above ground petrol tanks :

All the above ground petrol storage depots shall provide secondary containment system to prevent the leaked petrol to escape to the environment. The secondary containment may be provided by constructing a dyked enclosure. The dyked area should prevent the interference of storm water or groundwater intrusion, should surround the tank completely and should be impervious and capable of preventing migration of leaked petrol.

Alternatively, any other secondary containment system for above ground / underground storage tanks as per norms / guidelines of MoPNG / OISD / PNGRB or other statutory authorities / internationally best practiced containment systems that are adequate to contain the leakages may be provided.

The secondary containment system shall be routinely inspected for its structural stability and adequacy for providing containment.

D. Monitoring

1. **Interstitial monitoring:**

Interstitial monitoring system having hydrocarbon detectors and alarming system / other monitoring devices shall be installed between the petrol storage tanks and secondary containment barrier to detect any leakage.

2. **Vapour monitoring wells:**

In case interstitial monitoring (of underground tanks) is not feasible, vapour monitoring wells may be installed as alternative leak detection system that can be used either continuously or regularly to monitor for hydrocarbon vapours in the soil surrounding the tanks (beyond secondary containment). It should be ensured that the soil / filler material between secondary containment and the vapour monitoring wells has a sufficient liquid / vapour conductivity for passage of petrol vapours. The vapour monitoring system should not be affected by rainfall or moisture or any contamination which can interfere with monitoring.

3. Other routine leakage detection systems :

All new petrol storage tanks will have automation system (automatic tank gauging) installed which will provide reports on volume balance after every day operation and records shall be maintained. If feasible, manual gauging shall be done at least once in a month for determining the accuracy of Automatic Tank Gauging ; alternatively the automatic tank gauging system should be calibrated as per equipment manufacturer's guidelines.

The leakage detection system may be provided as per any other applicable norms / guidelines issued by Ministry of Petroleum and Natural Gas / OISD / other statutory bodies.

4. In case of leakage resulting in soil/groundwater contamination:

- i. Concerned Petrol Storage Depot shall report to the concerned State Pollution Control Board / Pollution Control Committee, OISD, PESO and District Administration under intimation to CPCB within 24 hours of occurrence. Operation of such underground storage tank and its ancillary components shall be stopped immediately.
- ii. Petrol shall be removed immediately from petrol storage tank to prevent further release to environment. Measures to prevent explosion due to vapors release due to leakage as recommended by PESO / OISD or other statutory body shall be implemented immediately.
- iii. The petrol storage depot may be held liable for Environmental Compensation (to be imposed by CPCB/ concerned State Pollution Control Board / Pollution Control Committee) and environmental remediation on the basis of proven negligence or violation resulting in environmental damage.
- iv. Operation of petrol storage tank and its ancillary components shall not be resumed till corrective measures to contain and stop leakages are implemented to the satisfaction of PESO and concerned State Pollution Control Board / Pollution Control Committee.

5. Equipment Integrity Test for underground petrol tanks:

The Equipment Integrity Test (EIT) measures the containment integrity of the tanks, fittings and pipes. An EIT should be conducted to evaluate if an underground petrol storage tanks can cause any leakage to the environment and to evaluate if it can provide containment as required

An Equipment Integrity Test should be performed :

- I. Before any new underground petrol storage tank is commissioned
- II. After any modification or up gradation of underground petrol storage tanks .
- III. After any repair following the discovery of a leak in the system or replacement of tanks or piping.

The Equipment Integrity Test should be done as per approved Indian or international procedure.

E. For prevention of accidents :

1. Subject to the quantity of petrol that may be stored in a depot and the threshold quantity specified for extremely flammable liquids in The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 as amended , a petrol depot shall ensure compliance of the aforementioned rules including but not limited to :
 - i. General responsibility of the occupier during industrial activity ;
 - ii. Notification of Major accident;
 - iii. Approval and Notification of sites ;
 - iv. Updating of the site notification following changes in the threshold quantity;
 - v. Safety audit reports and their updating ;
 - vi. Quantitative risk assessment /Cumulative risk assessment ;
 - vii. Preparation of offsite/ on-site emergency plan and carrying out of mock drills;
 - viii. Information to be given to persons liable to be affected by a major accident etc.
2. A petrol depot shall ensure compliance of all the provisions of The Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 (as amended) , as applicable.
3. A petrol depot must obtain no objection certificate from the fire department, as per applicable laws of the concerned State / Union Territory. Approval from the concerned authority as stipulated in Rule 7 of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 (as amended) must invariably be taken by the Petrol Depot.
4. A petrol depot must invariably comply with the extant laws / guidelines concerned with safety or prevention of accidents issued by Ministry of Petroleum and Natural Gas / PESO /OISD/ any other statutory organization, as applicable.
5. In case, a major accident occurs, the petrol depot shall within 48 hours notify the concerned authority as identified in Schedule 5 (of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 as amended) of that accident, and furnish thereafter to the concerned authority a report relating to the accidents in Schedule 6 (of the Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 (as amended)). However, the concerned authorities, local crisis group, District emergency authorities etc. have to be informed by the petrol depot as early as possible.
6. The petrol storage depots must provide proper arrangements to prevent and contain the spread of fire / explosion, as per extant and applicable norms and guidelines issued by Ministry of Petroleum and Natural Gas / PESO /OISD/ any other statutory organization.
7. The petrol storage depots must have alarming system to inform and alert the surrounding inhabitants in case of any accident or emergency.
8. The Petrol Depot shall ensure carrying out routine leakage detection and leakage monitoring in case of temporary shutdown.

9. The petrol depots shall adhere to the provisions of the National Disaster Management Act and accordingly, prepare onsite and offsite Emergency Response and Disaster Management Plan(DMP) and shall comply with the Petroleum and Natural Gas Regulatory Board (Codes of Practices for Emergency Response and Disaster Management Plan) Regulations, 2010.
10. The petrol depots must ensure that overall safety measures taken by the depot and other ancillary procedures viz. safety audit, risk analysis, risk management etc. shall cover its own premises as well as the area beyond its premises which is vulnerable to risk in case of any incident. Adequate safeguarding measures must be taken so that there may be no risk to the life and property of inhabitants beyond the premises of depot in case of incident.

F. Location and Siting of Petrol Depot:

1. The location and siting of petrol depot shall strictly be in accordance with the extant law / guidelines issued by Ministry of Petroleum and Natural Gas / PESO / any other statutory organization as applicable.
2. The petrol depots shall comply with the MoPNG accepted recommendations of the M.B. Lal Committee (which was constituted by MoPNG to probe the incident of fire at IOC's POL Terminal at Jaipur in 2009) regarding creation of a buffer zone around oil installations and terminals as per extant rules and policies of MoPNG. The quantitative/cumulative risk of all tanks of petrol depots should be zero at petrol depot boundary wall by providing adequate mitigation measures.
3. The SPCBs / PCCs while granting Consent to Establish / Operate to new petrol depots shall give due consideration to the pollution causing potential and ecological sensitivity of the pertinent region as well as extant local government laws regarding setting of such major accident hazard industries and extant law / guidelines issued by MoPNG / PESO / any other statutory organization as applicable.
4. New / upcoming petrol depots shall be located at least 100 m away from the surface water bodies including lakes, ponds, streams, rivers, wetlands, canals and creeks. In case of streams and rivers, the distance shall be considered from the flood way. In case, flood way is not defined, the distance shall be considered from firm banks / edges of the river.

G. Decommissioning of tanks :

1. In case any above ground or underground petrol storage tank has to be dismantled, the following must be ensured :
 - i. Removal of all petrol and its disposal in an environmentally sound manner.
 - ii. Removal of any residual flammable vapour and its safe disposal.
 - iii. Removal of any hazardous waste like tank sludge in an environmentally sound manner and its disposal as per extant hazardous waste management rules.
2. The petrol depot before dismantling of tanks shall take permission from the concerned statutory authority and concerned SPCB / PCC.
3. The petrol depot at the time of permanent decommissioning must ensure that the site is investigated for any potential environmental contamination from an expert institution and submit the report to the concerned SPCB / PCC .

Annexure -1

Section C (under subheading Fugitive Emissions and Standards for Equipment Leaks) of the Petroleum Oil Refinery standards notified by Ministry of Environment and Forests vide Notification no. GSR 186 (E) dated 18.03.2008.

Fugitive Emission**Storage of Volatile Liquids : General Petroleum Products**

1. Storage tanks with capacity between 4 to 75 m³ and total vapour Pressure (TVP) of more than 10 kpa should have Fixed Roof Tank (FRT) with pressure valve vent.
2. Storage tank with the capacity between 75 to 500 m³ and total vapour Pressure (TVP) of 10 to 76 kpa should have Internal Floating Root Tank (IFRT) or External Floating Root Tank (EFRT) or Fixed Roof Tank with vapour control or vapour balancing system.
3. Storage tanks with the capacity of more than 500 m³ and total vapour Pressure (TVP) of 10 to 76 kpa should have Internal Floating Roof Tank or External Floating Roof Tank or Fixed Roof Tank with vapour control system.
4. The tanks with the capacity of more than 75m³ and total vapour Pressure (TVP) of more than 76 kpa should have Fixed Root Tank with vapour control system.
5. Requirement for seals in Floating Roof Tanks :
 - (i) a. IFRT and EFRT shall be provided with double seals with minimum vapour recovery of 96%.
 - b. Primary seal shall be liquid or shoe mounted for EFRT and vapour mounted for IFRT. Maximum seal gap width will be 4 cm and maximum gap area will be 200 cm²/m of tank diameter.
 - c. Secondary seal shall be rim mounted. Maximum seal gap width will be 1.3 cm and maximum gap area will be 20 cm²/m of tank diameter.
 - d. Material of seal and construction shall ensure high performance and durability.
 - (ii) Fixed Roof Tanks shall have vapour control efficiency of 95% and vapour balancing efficiency of 90%.
 - (iii) Inspection and maintenance of storage tanks shall be carried out under strict control. For the inspection, API RP 575 may be adopted. In-service inspection with regard seal gap should be carried out once in every six months and repair to be implemented in short time. In future, possibility of on-stream repair of both seals shall be examined.

Storage of Volatile Liquids: Benzene Storage

1. FRT with vapour to incineration with 99.9% of removal efficiency for volatile organic compounds (VOC) shall be provided.
2. IFRT/EFRT with double seals, emission-reducing roof fitting and fitted with fixed roof with vapour removal efficiency of at least 99% shall be provided.

Solvents for Lube-Base Oil production (Furfural, NMP, MEK, Toluene and MIBK)

IFRT with double seals and inert gas blanketing with vapour removal efficiency of at least 97% shall be provided.

Emission control for Road tank truck/Rail Tank wagon loading			
	Loading of Volatile Products	Gasoline and Naphtha :	
		i. VOC reduction, %	i. 99.5
		ii. Emission, gm/ m ³	ii. 5
		Benzene :	
		i. VOC reduction, %	i. 99.99
		ii. Emission, mg/ m ³	ii. 20
		Toluene/Xylene :	
		i. VOC reduction, %	i. 99.98
		ii. Emission, mg/ m ³	ii. 150
		Note : i. It shall be applicable for Gasoline, Naphtha, Benzene, Toluene and Xylene loading ii. Road tank Truck shall have Bottom loading and Rail tank wagon shall have Top submerged loading. iii. Annual leak testing for vapour collection shall be done.	

Standards for Equipment Leaks

1. Approach: Approach for controlling fugitive emissions from equipment leaks shall have proper selection, installation and maintenance of non-leaking or leak-tight equipment. Following initial testing after commissioning, the monitoring for leak detection is to be carried out as a permanent on-going Leak Detection and Repair (LDAR) programme. Finally detected leaks are to be repaired within allowable time frame.
2. Components to be Covered: Components that shall be covered under LDAR programme include (i) Block Valves; (ii) Control Valves; (iii) Pump seals; (iv) Compressor seals; (v) Pressure relief valves; (vi) Flanges - Heat Exchangers; (vii) Flanges - Piping; (viii) Connectors - Piping; (ix) Open ended lines; and (x) Sampling connections. Equipment and line sizes more than 1.875 cm or 3/4 inch are to be covered.
3. Applicability: LDAR programme would be applicable to components (given at 2 above) for following products/compounds: (i) hydrocarbon gases; (ii) Light liquid with vapour pressure @ 20 °C > 1.0 kPa; and (iii) Heavy liquid with vapour pressure @ 20 °C between 0.3 to 1.0 kPa.
4. While LDAR will not be applicable for heavy liquids with vapour pressure < 0.3 kPa, it will be desirable to check for liquid dripping as indication of leak.
5. Definition of Leak: A leak is defined as the detection of VOC concentration more than the values (in ppm) specified below at the emission source using a hydrocarbon analyser according to measurement protocol (US EPA-453/R-95-017, 1995 Protocol for equipment leak emission estimates may be referred to:

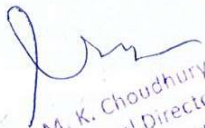
Component	General Hydrocarbon (ppm)		Benzene (ppm)	
	Till 31 st Dec. 2008	w.e.f. January 01, 2009	Till 31 st Dec., 2008	w.e.f. January 01, 2009
Pump/Compressor	10000	5000	3000	2000
Valves/Flanges	10000	3000	2000	1000
Other Components	10000	3000	2000	1000

6. In addition, any component observed to be leaking by sight, sound or smell, regardless of concentration (liquid dripping, visible vapour leak) or presence of bubbles using soap solution should be considered as leak.
7. Monitoring Requirements and Repair Schedule: Following frequency of monitoring of leaks and schedule for repair of leaks shall be followed:

Component	Frequency of monitoring	Repair schedule
	Quarterly (semi-annual after two consecutive periods with < 2% leaks and annual after 5 periods with < 2% leaks)	Repair will be started within 5 working days and shall be completed within 15 working days after detection of leak for general hydrocarbons. In case of benzene, the leak shall be attended immediately for repair.
Pump seals	Quarterly	
Compressor seals	Quarterly	
Pressure relief devices	Quarterly	
Pressure relief devices (after venting)	Within 24 hours	
Heat Exchangers	Quarterly	
Process drains	Annually	
Components that are difficult to monitor	Annually	
Pump seals with visible liquid dripping	Immediately	Immediately
Any component with visible leaks	Immediately	Immediately
Any component after repair/replacement		-

8. The percentage leaking components should not be more than 2% for any group of components, monitored excluding pumps/compressor. In case of pumps/compressors, it should be less than 10% of the total number of pumps/compressors or three pumps and compressor, whichever is greater.
9. Emission Inventory : Refinery shall prepare on inventory of equipment components in the plant. After the instrumental measurement of leaks, emission from the components will be calculated using stratified emission factors (USEPA) or any other superior factors. The total fugitive emission will be established.
10. Monitoring following types of monitoring methods may be judiciously employed for detection of leaks: (i) instrumental method of measurement of leaks; (ii) Audio, visual and olfactory (AVO) leak detection; and (iii) Soap bubble method.
11. Data on time of measurement and concentration value for leak detection; time of repair of leak; and time of measurement & concentration value after repair of leak should be documented for all the components.
12. Pressure relief and blow down systems should discharge to a vapour collection and recovery system or to flare.
13. Open-ended lines should be closed by a blind flange or plugged.
14. Totally closed-loop should be used in all routine samples.
15. Low emission packing should be used for valves.
16. High integrity sealing materials should be used for flanges.

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 M. K. Choudhury
 Regional Director
 Regional Directorate (NE)
 CPCB, Shillong-793001