RECOMMENDED PRACTICES
ON
OIL STORAGE AND HANDLING

Prepared by
FUNCTIONAL COMMITTEE
ON
OIL STORAGE AND HANDLING

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Preamble

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

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

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

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

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

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

Jai Hind!!!

Executive Director

Oil Industry Safety Directorate
FOREWORD

The Oil Industry in India is over 100 years old. As such, various practices have been in vogue because of collaboration/association with different foreign companies and governments. Standardisation in design philosophies and operating and maintenance practices at a national level was hardly in existence. This, coupled with feedback from some serious accidents that occurred in the recent past in India and abroad, emphasised the need for the industry to review the existing state-of-the-art in designing, operating and maintaining 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, for formulating and implementing a series of self-regulatory measures aimed at removing obsolescence, standardising and upgrading the existing standards to ensure safer operations. Accordingly, OISD constituted a number of functional committees comprising of experts nominated from the industry to draw up standards and guidelines on various subjects.

The present document "Recommended Practices on Oil Storage and Handling" has been prepared by the Functional Committee on "Oil Storage and Handling" based on the accumulated experience and knowledge of industry members and various national and international codes and practices.

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

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These documents are intended only to supplement and not to replace the prevailing statutory requirements.
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# RECOMMENDED PRACTICES ON OIL STORAGE AND HANDLING

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RECOMMENDED PRACTICES
ON
OIL STORAGE AND HANDLING

1.0 INTRODUCTION

Crude oil, the feed to all petroleum refineries, is received and stored in tanks to build up enough inventory prior to processing. This takes care of contingencies like delays in crude receipt and avoids interruptions in crude oil processing. Tanks are also provided to store intermediate products/finished products prior to transfer to terminals for further distribution. Ultimately, distribution of petroleum products is done by wagons/trucks/pipeline/tankers/barges etc.

2.0 SCOPE

The present document is applicable to safety in the design philosophies and operating procedures pertaining to the storage and handling of crude oil and petroleum products at crude oil exploration & production, refineries and pipelines installations which are normally stored in above ground atmospheric pressure or low pressure storage tanks and underground tanks. This does not cover the storage and handling of propane, LPG, butane etc. which requires pressurised/cryogenic storage.

3.0 DEFINITIONS

For the purpose of this document, relevant terms are defined as below:

3.1 TERMINALS

Terminals consist of tanks which receive crude/products from oil tankers, rail wagons/truck tankers, pipelines as well as loading or unloading facilities for despatch or receipt of products. A terminal could be part of a refinery/production unit or a separate marketing facility or a cross country pipeline installation.

3.2 SLOP

Off-specification products obtained during plant start-up, shutdown or upset conditions and draining etc. from various equipments/tanks/pumps containing oil-water mixture from process plants/marketing/pipeline installations are called slops.

Slops containing large quantity of free water are known as wet slop. When free water content is low enough to process the slop in plant, in a controlled manner, it is known as dry slop.

3.3 GANTRY

In order to handle large number of wagons/trucks for loading or unloading, facilities called gantries are provided. These consist of loading/unloading headers with loading/unloading points with hoses/arms, walkways, railings, set stop ramping/upramping down (opening in steps and closing in steps) automatic cut-off valves, approach platforms, metering station, rail tracks etc.

3.4 TANKS

Storage tanks are defined as "ATMOSPHERIC STORAGE TANK" and "LOW PRESSURE STORAGE TANK".
ATMOSPHERIC STORAGE TANK

Tanks designed as per API Code 650 or equivalent are called ATMOSPHERIC STORAGE TANKS. These tanks can also be sub-divided into two categories:

- Atmospheric storage tanks with open vent to atmosphere i.e. goose neck type vent
- Atmospheric storage tanks with blanketing facilities

LOW PRESSURE STORAGE TANK

Tanks designed as per API Code 620 or equivalent are called LOW PRESSURE STORAGE TANK. Products having slightly higher vapour pressure are stored in these type of tanks.

TANK CAPACITY

3.4.1 Nominal Capacity of a Tank

Nominal capacity shall mean the geometric volume of the tank from bottom up to curb angle in case of fixed roof tanks and the underside of roof deck up to the maximum floating position of floating roof in case of floating roof tanks.

3.4.2 Gross Capacity of a Tank

Gross capacity (stored volume) is the capacity of the tank up to the maximum safe filling height of the tank.

3.4.3 Net Capacity

Net capacity is the net pumpable capacity of the tank during operation after subtracting the volume of tank bottom contents up to the top of normal pumpout nozzle from safe filling capacity of the tank.

3.5 SICK WAGON

Sick wagons are those which are declared defective because of leaky bottom valve, missing safety valve, leaking body or any other mechanical failure.

3.6 CLASSIFICATION OF PETROLEUM

Petroleum products are divided into three classes based on their flash points as follows:

Class A - Flammable liquids having flash point below 23°C.
Class B - Flammable liquids having flash point of 23°C and above but below 65°C.
Class C - Flammable liquids having flash point of 65°C and above but below 93°C.

Excluded - Liquids having flash point of 93 degree C Petroleum and above

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4.0 DESIGN CONSIDERATIONS FOR STORAGE TANKS

4.1 ROOFS

Tanks are classified based on their roof design. Normally, atmospheric tanks are of fixed roof or cone roof or floating roof or fixed cum floating roof (with or without Nitrogen blanketing) type tanks and low pressure Nitrogen blanketed tanks.

Floating Roof

Floating roof may be single deck pontoon roof, double deck or pan roof. Pan roof shall not be used as these are unsafe. For designing these tanks, API 650 guidelines may be followed.

Fixed Roof

Fixed roof may be of cone type or dome shaped. The tank may be pressurised (to a few inches of water) type with breather valves. Alternatively, tanks may be provided with fuel gas or inert gas blanketing to prevent oxygen/moisture ingress. Fixed roof tanks for light products (e.g. Motor Spirit) breathing into a neoprene balloon is not acceptable. For designing atmospheric/low pressure tanks, API 650 or API 620 may be followed based on the type of the tank.

Fixed cum Floating Roof

These tanks have a fixed roof over a floating roof. They are used for products having very stringent water content specifications like Aviation Turbine Fuel and products sensitive to oxygen like light intermediate feed tanks. Where oxygen ingress is to be avoided, it is preferable to provide Nitrogen blanketing.

4.1.1 Selection of Roof

Selection of type of roof generally depends on ambient conditions and the product handled.

4.1.2 Ambient Temperature

Ambient temperature statistics shall be taken for the past atleast 15 years. Maximum average daily temperature for four (4) summer months for each year shall be considered.

4.1.3 Product Handled

Following guidelines should be used for specific cases:
(a) Tanks used to store finished Aviation Gasoline/ Turbine Fuel shall be floating cum fixed roof to avoid entry of water into product.
(b) Where product degradation due to air/moisture ingress is a problem and fixed roof tanks are used, such tanks should be provided with inert gas blanketing.
(c) Nitrogen blanketing for internal floating roof tanks/fixed roof tanks should be considered for storing hazardous petroleum products like benzene etc.

4.2 TANK BOTTOM

Tank bottoms may have conical shape or inverted cone shape, also known as "Apexdown". Tanks used to store finished Aviation Turbine Fuel shall have bottoms coned downwards towards the centre with a sump of adequate size at the centre of the tank bottom and a siphon drain. The outside of pipe shall be epoxy coated.

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4.3 LOCATION

Tanks may be above ground, on elevated ground or underground. In case of underground storage tanks, protection to the external surfaces of fixed tanks/pipes shall be provided by a glass or synthetic fibre reinforced hot applied bitumen and by surrounding the heated tank with a backfill of selected sand. This is preferred over solid skin of fine concrete through contraction or subsidence. Cathodic protection should be provided where very high standard of protection is required due to soil condition/geographic location.

4.4 CAPACITY

Tank capacities are defined based on item 3.4. Risk analysis for the surrounding area should preferably be undertaken while constructing large capacity tanks beyond 20,000 Cu.M. (Refer OISD Standard-118 on Layouts for Oil and Gas Installations).

4.5 CORROSION ALLOWANCE

Corrosion allowance should be specified depending on the nature of petroleum products to be stored, its impurities level, atmospheric conditions etc.

4.6 TANK APPURTENANCES

4.6.1 Ladders and Handrails

Individual tank shall be provided with access to the roof. A platform with railing should be provided from the top of the stairway to gaugewell and roof ladder. On floating roof tanks, non-sparking self levelling tread type rolling ladder with suitable earthing connection are to be provided.

Stairs

Stairs should be made of grating. All staircases shall have resting/landing platform preferably for every 5m height.

4.6.2 Manholes

Number of manholes shall depend on diameter of the tank (Refer API 650 for details). Minimum of one flush type clean out manhole should be provided for tanks under dirty services.

4.6.3 DRAINS

(i) 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 hydrotest or initial flushing during a start up operation. Refer API 650 for number and details of such drains. Apex down tank bottom shall have one drain connection located at the lowest point near the centre of the tank in addition to normal circumferential drains.

(ii) Floating Roof Drains

Maximum rainfall rate on hourly basis for the past 15 years should be considered for designing the number and size of drains for open floating roof tank. Also drains shall pass the design rainfall when roof is resting at the lowest position. Primary roof drain system shall be closed type using pipe and swing joints and shall include a suitable outlet valve. The inlet for these

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drains shall have a swing type check valve to prevent product from flowing into roof if pipe drain leaks/fails.

(iii) Emergency Roof Drain

Emergency drain for floating roof tank shall be provided on the roof to take care of drainage problem and drainage of total water in case of plugging of normal roof drain.

4.6.4 Dip Hatch

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. Gauge hatch shall be non-sparking (or lined with non-sparking material) and self-closing type. Storage tank having pressure while in normal operation may pose problem in sampling or taking manual dip. For such tanks, it is suggested to resort to slot dipping device. This accessory permits sampling/dipping in tanks having pressure up to 300 mm WG. For operating pressure beyond this, it may be necessary to provide appropriate instrumentation with redundancy.

Gauge well pipe (with slots) should be provided for all types of tanks. This should have continuous contact by means of strips with bottom plate of the tank. Continuous contact makes the tank safer with respect to static charge accumulation and acts as a support for the gauge well pipe.

4.6.5 Walkway on the Roof

Walkway with handrail on the roof of the tank should be provided to facilitate inspection/checking of vents/ flame arrester etc. so that movement of personnel on roof is safer.

4.6.6 VENTS

(i) Open Vents

Open vents shall be of goose neck type, covered with a 4 to 8 mesh screen. For sizing the vents API 2000 is to be referred. However, following are the basic guidelines need to be considered:

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

(ii) Breather Valve

Breather valves shall be provided in the blanketed tanks designed as per API 650. For low pressure tanks breather valve required shall be provided as per API 620. The tank breathes - in air when the tank pressure is lower than the atmospheric pressure and breathes - out when tank pressure is greater than the set pressure. Pressure and Vacuum Relieving Valves (PVRVs) provided on cone roof tanks usually have 20% accumulation. While designing, it is necessary to ensure that under full relieving conditions, the design pressure/vacuum in the tank is not exceeded. Set pressure of PVRV must be decided according to API 520 guidelines.

Breather vents/flame arrestors are known to fail through the formation of crystalline waxy / heavy hydrocarbon deposits or ice on the seats of valve diaphragms or inside the nozzle connection upon which the valve is mounted. Breather vents/flame arrestors are not recommended on these services, instead only open vents should be provided.
Where tanks are blanketed, breathing-in will be from the blanketing gas system. 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/diaphragm or any other suitable device. Gauge hatch and other manholes shall be of gas tight construction.

4.6.7 INSTRUMENTATION

(i) Level

Tanks shall be provided with at least two numbers of level instruments of which one may be local and the other remote, located in control room or office. In addition, high/low level alarms with independent primary sensing device are recommended.

Automatic isolation of tank receipt line based on High Level sensing device should be considered for tanks receiving at high flow rates (unloading from ship/pipeline receipt etc.).

(ii) Temperature

When rundown temperatures are likely to be higher than 100 degree C, a remote temperature indicator with alarm should be provided in addition to local indicators. For tank capacity higher than 5000 cu.m., a minimum of two numbers of local temperature indicators should be so located (within 500 mm above the inlet/outlet nozzle) as not to sense the direct heat of the coil.

4.7 TANK PROTECTION

4.7.1 Earthing

Every storage tank, including its roof and all metal connections, should be electrically continuous and be effectively earthed. In case of floating roof tanks, stainless steel shunts may be provided across the peripheral seals to ensure earthing of floating roof. Alternatively, the pontoon, ladder and shell of the floating roof tank shall be continuously bonded (electrically continuous) with copper cable and the shell shall be independently earthed. Refer OISD-RP-110 on Recommended Practices on Static Electricity.

4.7.2 Painting and Numbering

Painting is essential for tank protection. Besides tank number, safe filling height, reference height etc. should be painted on the tank to avoid operating errors.

(a) For all white oil products a heat reflecting and self cleaning paint is recommended e.g. white "EPIKOTE" ester paint and self cleaning enamel paint.

(b) Numbers should be painted at three positions, 120 degrees apart, below roof level and should be clearly visible from outside the dyke/roadside. Recommended size of letters is half metre high and 50 mm thick. Additionally, at the foot of the staircase of each tank, tank number, safe filling height, reference height and name of the product being handled should be painted clearly.

Recommended size of letters is 150 mm and 12 mm thick. Luminous paint shall be preferred.

4.7.3 INSULATION

Necessary insulation will normally be provided for heat conservation. It is advisable to provide a two meters high insulation around the tanks having higher surface temperature for personal protection. Also, patch insulation may be provided on the shell along with spiral stairway.

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5.0 DESIGN CONSIDERATION FOR TANK FARMS/MANIFOLDS

5.1 GENERAL
The dyke wall may be of earth, masonry or stone. The purpose of a tank dyke is to contain the petroleum product, in the event of the tank rupture. For details of tank farms, refer OISD-STD-118 on "Layout for Oil and Gas Installations".

5.1.1 Tank Farm Drains
Tank farm drainage / spillages / rain water shall be routed either to oily water sewerage or storm water channel. Provision should exist for diversion valves located outside the dyke. In case of clear rain water, the same shall be diverted to open channel. Should a tank rupture, the contents shall remain within the bundwall and gradually be diverted to oily water sewer.

In case of high wax content product or high pour crude, the tank oil drains could be separated and pumped to crude/slop tanks. Depending on capacity, a group of tanks can be considered. The separator shall have steam heating arrangement and auto start/stop for pump can be provided for. In this regard refer OISD Standard 109 on "Blowdown & Sewer System".

5.1.2 Fire Protection
The details of the fire protection are covered under OISD Standard - 116 on "Fire Protection Facilities for Petroleum Refineries & Oil/Gas Processing Plants" and OISD Standard - 117 on "Fire Protection Facilities for Petroleum Depots and Terminals". Where large tank farms are involved (especially in refineries/crude terminals or marketing installations in thickly populated areas) hydrocarbon detectors may be located in selected tank farms with remote alarms in control stations.

5.2 MANIFOLDS
For safety considerations, it is desirable to keep the number of inlet/outlet connections to the tank shell to minimum. This reduces the number of flanges/valves close to the tank. In case of more number of lines, it is desirable to take a single header and form as manifold away from the tank. Tank manifolds shall be located outside the dyke area. The floor underneath should be paved, have curb walls and connected to drainage system.

Crude and other tanks, where water contamination can lead to unit upsets, additional suction at two elevations may be considered so that top outlet can be lined up initially. Alternatively, floating suction shall be installed. After tank settlement, a depression is normally formed on tank pad along the circumference. The same should be effectively made up with proper slope to avoid rain water accumulation and subsequent corrosion. Where large settlement is anticipated, it is desirable to use flexible joints/spring supports for piping to nozzles.

6.0 TANK HEATERS/MIXERS

6.1 HEATERS
Tank heating can be accomplished either by steam heating or electric tracing or hot oil circulation. Heating flues using fired burners are not recommended as these are not safe.
6.1.1 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. For design calculations, it is necessary to specify average wind velocity and minimum ambient temperature over extended period of time.

6.1.2 Steam Heating

Manway heaters consist of a tube bundle, usually of hairpin type, fixed through a manhole of the tank. Manway heater 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. 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.

6.1.3 Electric Heating

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

6.1.4 Hot Oil System

In case of fuel oil, LSHS, Bitumen etc. steam leak in the tank could lead to boil over. For this reason, hot oil heating can also be considered for such cases. This would consist of a fired heater located in remote area. A pump takes suction from a tank containing heating oil (e.g. Dowtherm) and circulates through heater to the tank. Necessary remote temperature indicators and control valves are required for the system. Again, isolation and sampling facilities are to be provided at each tank to check leaks. Heating oil tank level should be monitored with indicators and alarm.

6.2 MIXERS

Though line blending is a preferred practice in refineries, final corrections may have to be done in tanks. Mixing is also required to avoid stratification of heavy oil products and also to accommodate downgraded products, seasonal quality changes as well as for pipeline interphases during cross country transfer. However, blending of Class 'A' product into Class 'C' product by transfers should not be resorted to. Otherwise, the tank should be re-classified.

Types of Mixers

Blending may be carried out by side entry propeller mixers, jet mixers or eductor mixers. In general, eductor mixers shall be preferred for blending. The outlet of eductor shall be located away from tank shell to avoid direct impingement.

Jet mixing shall not be considered for high viscous products and products with high water content. Selection of type of mixer should be based on economics, effectiveness and safety of operation. The mixing stream in operation should never break the surface of the liquid.

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7.0 TANK OPERATION

(i) Entry on floating roof is permitted only if all the following conditions are fulfilled:

(1) The roof is at least half way to the top.
(2) Gas test shows no presence of H2S and gas concentration is below 10% of the lower explosive limit.
(3) Floating roof is levelled and free of oil and excessive water.
(4) One man is standby at the top of platform with a cannister mask / breathing apparatus readily available.
(5) A life line with safety belt is used for the man going on the roof. The other end of the line held by the standby at the top platform.
(6) The tank is not under receipt or delivery.

(ii) No gauging or sampling of tanks should be undertaken during thunder or hail storms.

(iii) Flow velocity at tank inlet should not exceed 1 m/s until the inlet is completely submerged. For easy reference, permissible flow rates for initial filling are given below:

<table>
<thead>
<tr>
<th>Size (in mm) of Inlet Pipe</th>
<th>Max. Flow (cu.m./hr)</th>
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<td>300</td>
<td>246</td>
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<tr>
<td>250</td>
<td>168</td>
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(iv) Conductive footwear e.g. leather soles or electrically conducting rubber soles, should be worn while gauging, sampling or taking temperatures. Nylon rope shall not be used for lowering sample bottles in the tank.

(v) One of the most common sources of leaks and spills is mobile storage tanks, such as diesel fuel tanks used for construction machinery. It is desirable to dig a small pit or construct temporary dyke around the tank.

(vi) If the tank has internal heating coils, steam to the coils should not be charged until the coil is fully submerged and the condensate from these coils must be monitored for oil content.

(vii) In case of large tank farms effective communication is essential. Telephone with loud hooters may be provided on roadside at various locations. This can also be utilised for communication during emergency like fire.

(viii) Side entry mixers may be operated only when liquid level is above the blades. The side entry mixers should be of such a design as to facilitate add-packing while the tank is in operation.

(ix) Whenever saline water is used for testing of tank, an oxygen scavenger and a corrosion inhibitor or other mixture of chemicals can be used.

(x) While cleaning the tanks, care should be taken to avoid generation of static electricity. For this reason, steam of gassy tanks and cleaning of tanks by means of gas oil spray should be avoided. Water washing is preferred.
8.0 LOADING/UNLOADING FACILITIES

8.1 LOADING PUMPS

(i) Pumps shall be located in an exclusive paved area with drainage facilities. 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.

(ii) Loading pumps shall also be provided with additional explosion proof switches located at the gantry to switch off the pump in case of emergency.

(iii) It is preferred to have a dedicated pump for each product. Common standby pump may be used for MS/Naphtha or Kero/HSD or LDO/FO etc. However, positive blinding facility shall be available. Common standby pump shall not be used between Class ‘A’ and Class B/C or Class ‘B’ and Class ‘C’ products.

(iv) It is desirable to have separate pumps for truck loading and not combined with wagon loading as the latter are normally of much higher capacity.

(v) Receiving lines as well as discharge lines shall be provided with thermal safety relief valves to relieve pressure due to ambient temperature rise. Whenever isolation valves are used to isolate TSV, isolation valve with lock open provision should be considered.

(vi) Safety relief valves may vent into a tank or may be piped to a collector drum having level indicator/alarms or to OWS located in safe area. When connected to tank, it should be provided with isolation valve on either side and break flange/union on tank side. Also, location shall be close to drain sump. SRV discharge for congregating service should not be routed to OWS but to a paved area.

(vii) No cast iron valve shall be used in oil service. Only cast steel valves shall be considered.

(viii) Provision shall exist for emptying out the loading headers back to tank by means of loading pumps or through a drain vessel. Use of loading pump is feasible by connecting discharge pipe to pump suction, downstream of suction valve and giving a similar connection from upstream of discharge valve to upstream of suction valve. This ensures safe maintenance.

(ix) In case of large capacity wagon loading gantries where loading could vary from a rake to few wagons, it is desirable to provide a minimum flow controller on discharge line to take care of pressure fluctuations. When more than one loading pump is required to be run to meet higher loading rates, minimum continuous flow requirement of each pump shall be considered.

(x) Where flow indicators/totalisers are provided for gantries, vapour eliminators shall be incorporated.

(xi) For tank truck, loading should preferably be done with set flow indicators rather than manual.

(xii) It is desirable to consider fire proof remote operated switch off valves for loading headers so that gantry headers can be isolated in case of emergency.

8.2 WAGON & TRUCK LOADING GANTRIES

(i) Loading points shall have quick shut-off valves viz. Plug or Ball Valves.

(ii) Vacuum release valves shall be provided with chain lever arrangement for release in case of stuck up vacuum release valves.

(iii) As there would be variations in number of trucks/wagons being loaded at a time, the flow rate through each point would also vary. Hence, restriction orifices or flow control valves must be provided to restrict velocity up to 6 m/sec, particularly for motor spirit, kerosene, ATF and diesel.

(iv) Kero and diesel can form a multipoint. Similarly, LDO and FO may be combined. Two types of Naphtha viz. HAN & LAN can be put together. However, ATF or MS shall be exclusive.

(v) All flanged points, in loading header and loading points shall be provided with jumper wires.

(vi) Earthing of loading gantry shall be provided at structure pillars. Railway gantry should be grounded at every 25m. Loading header in the loading gantry shall be bonded to the Railway track at every 25m. Earthing of truck tankers to be ensured before commencing loading / unloading operation.

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(vii) In case of loading hoses, only neoprene impregnated hoses, supplemented with external wire connecting nozzle to pipe should be used.

(viii) All tank wagons and tank trucks should have a fill pipe leading to the bottom. In the absence of the same, portable fill pipe shall be used. However, splash filling is permissible for asphalt loading in tank truck or tank wagons.

(ix) Where bottom loading is done, deflector plates in the trucks / wagons to be ensured.

(x) Bottom flameproof lighting should be provided for night time checking of wagon bottom leaks and also for proper sealing and inspection wherever loading/unloading during night is required to be done.

(xi) Loading gantry platform should have at least one explosion-proof telephone for communication with pump house as well as in emergencies.

(xii) Gantry shall be protected with well designed fire fighting system. For details refer OISD-STD-116 and 117.

(xiii) Tank wagon and truck loading gantries shall be suitable for all weather conditions.

(xiv) Loading platforms (swing type) shall be light in construction and bottom rest shall be neoprene packed to avoid spark generation due to impact.

(xv) Proper handrail arrangement shall be provided on opposite side of loading point for safe movement of personnel over truck/wagon.

(xvi) Well maintained earthing clamps should be available for earthing of trucks.

(xvii) Protection against pressure surge in the loading header due to sudden change in loading rate need to be considered. Provision of shock absorber as one of the surge protection method at suitable location on the rail/road loading header may be considered.

(xviii) Wagon/truck loading gantries shall be on concrete supports. Alternatively, fire-proofing shall be done up to the platform if made of steel structure.

(xix) Entire loading gantry, including areas below railway lines/truck bays, shall be paved for smooth draining and collection of spillages into drains. Also, underground drain shall be provided with riser and funnel for each loading point so that the hose after loading can be inserted into the same to avoid spillages.

(xx) Open drains along the railway line/gantry shall be covered with gratings so as not to endanger movement of personnel.

(xxi) All trucks entering truck loading gantry shall be provided with flame arrestors at the exhaust.

(xxii) Oil and water collected from loading areas should be routed to central waste water treatment facilities. Where such central facility does not exist, as in the case of terminals/bulk plant depots, local oil water collection and separation system should be provided. Depending on size, this could be a catch basin or trap, API separator or similar facility. A slop tank may be earmarked for storing separated oil.

8.3 HANDLING OF SICK WAGON/TRUCK

When a wagon is found leaking during loading, provision should be kept for unloading the content safely. A drain header should be provided to drain out the content to a underground tank/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 wagon, explosion proof motor and power connection should be provided. Similar facility should be provided for unloading sick truck tanker also.

9.0 HANDLING OF SLOP

9.1 COLLECTION

9.1.1 Underground Drainage

A network of underground drainage system should be provided to collect oil drains from various equipments, gantry areas, pump houses etc. They should also collect surface drains from

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places where oil spillages are likely to occur. The underground drainage should lead to central waste water treatment plant/oil catcher as the case may be.

9.1.2 Receiving Sump

The receiving sump of the central oily water treatment facilities shall have inverted weir arrangement to skim off upper layer of accumulated oil. Skimmed oil shall be pumped directly to wet slop tanks. Left over oil water mixture shall be routed to waste water treatment.

9.1.3 Slop Oil Collection Sump

Separated oil from waste water treatment plant should be routed to an underground sump called slop oil sump. It is also desirable to provide a standby sump which would facilitate proper cleaning and maintenance.

9.2 PROCESSING AND DISPOSAL

9.2.1 Unit Slops

Off-spec products during start up or shutdown of process units are routed to dry slop tank. However, hot and heavy products shall be routed separately to a tank and high RVP products to another tank. The tanks shall be designed to suit the pumping rate, RVP etc. and should be floating roof type. These dry slops are either routed to crude tank or directly processed as a slop stream in processing units.

9.2.2 Wet Slops

Wet slops carry water and hence these tanks should be designed with liberal corrosion allowance (Refer item 4.5). Wet slops are allowed to settle in wet slop tanks for further water separation and subsequent draining. The draining shall be supervised and the oil may be transferred to dry slop tanks.

10.0 REFERENCES

(i) API Stds - 650,2000,2550, RR 2003 etc.
(ii) Petroleum Rules
(iii) UOP Project Specs.
(iv) CALTEX Basic Practices
(v) Storage & Handling of Petroleum Liquids by John R. Hughes
(vi) OISD Standard-118:“Layouts for Oil & Gas Installations”
(vii) OISD Standard-116:“Fire Protection Facilities for Petroleum Refineries and Oil/Gas Processing Plants”
(viii) OISD Standard-117:“Fire Protection Facilities For Petroleum Depots and Terminals”

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