सत्यमेव जयते

तेल उद्योग सुरक्षा निदेशालय
Oil Industry Safety Directorate

REVISED STANDARD OISD-STD-116 (JUNE-2025)

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FLOW OF PRESENTATION

CHANGES IN OISD-STD-116

- SCOPE
- DEFINITIONS
- DESIGN ASPECT OF FIRE PROTECTION SYSTEM
- FIRE WATER SYSTEM
- FOAM SYSTEM
- BATTERY FIRE
- MODERNIZATION PLAN FOR FIRE FIGHTING EQUIPMENT
- MOBILE FIRE FIGHTING EQUIPMENT
- TOXIC GAS DETECTION

CHANGE IN SCOPE (CLAUSE 2.0)

Addition of Petrochemical complexes

This standard also covers the facilities located within the refineries and oil/ gas processing plants which includes:

- Petrochemical complexes

Definition (CLAUSE 3.0)

Definitions

(Clause 3.0)

- Definition of "Classification of fire" has been revised.
- Definition of Oil and gas processing plants has been revised.
- Some other new definitions like auto ignition temperature, Tank, water spray system, water sprinkler system, control room & petrochemical complexes have been added.

FIRE PROTECTION PHILOSOPHY (CLAUSE 4.0)

4.2.1 FIXED WATER SPRAY SYSTEM ON STORAGE TANKS

Class ‘A’ Petroleum in above ground tanks (floating or fixed roof) shall have fixed water spray system, having capacity larger than 190 m^3 or diameter greater than 6 m.

4.2.2 SEMI-FIXED FOAM SYSTEM FOR STORAGE TANKS

Fixed roof tanks storing Class 'A' and class 'B' petroleum products, of diameter ≥ 9 m.

4.2.4 AUTOMATIC WATER SPRAY FOR STORAGE AND HANDLING OF LPG /C4 AND LIGHTER ENDS/ HYDROGEN

Automatic Water Spray shall be provided for the following areas:

I. LPG/C4 and lighter ends and hydrogen, pressure storage vessels shall be provided with automatic water spray system.

II. LPG bottling stations, C4 & Lighter ends - loading or unloading gantries, pumps, and compressors.

III. Hydrogen compressors associated with storage facilities.

FIRE PROTECTION PHIOLOSOPHY (CLAUSE 4.0)

4.2.5 WATER SPRAY SYSTEM IN PROCESS UNIT

I. Un-insulated vessels having maximum design liquid holdup capacity larger than 50 m^3 containing class A or B flammable liquid in process unit along with offsite area.

II. Automatic water spray system for pumps handling LPG or hydrocarbons above auto-ignition temperature.

III. Process compressors of C_4 or lighter and Hydrogen.

IV. Water spray rings for columns of height more than 45 M (above grade level) shall be provided. As an alternate, remote operated elevated monitors (at least two, positioned diagonally opposite sides) shall be installed at suitable elevation or high-capacity trolley mounted monitors shall be available, such that they should cover topmost potential source of leakage of column.

Note:- In case there is variance with the recommendations of licensor, then more stringent shall be prevailing.

FIRE PROTECTION PHIOLOSOPHY (CLAUSE 4.0)

4.2.7 WATER SPRINKLER SYSTEM

A water sprinkler system should be provided in polymer extruder buildings, pelletizing building, polymer bagging & its warehouse of a petrochemical complex excluding water reactive/sensitive material storage area. Car parking in the basement of any refinery or petrochemical complex should also be protected with a sprinkler system. For application density & other design aspects of any fire sprinkler system, NFPA-13/IS 15105 may be referred.

4.2.8 WATER CURTAIN SYSTEM FOR NAPHTHA & GAS CRACKER FURNACES

The water curtain shall be provided in cases where hydrocarbon gases are being handled in the vicinity of the cracker furnace in the process unit. The water curtain shall be actuated using Hydrocarbon (HC) detectors placed in the vicinity of the cracker furnace. The water curtain shall be designed as per NFPA 15 or equivalent at a design flow rate of 37 lpm/m. The water curtain coverage should extend a minimum of 1 m above the flame box of a furnace.

FIRE PROTECTION PHIOLOSOPHY (CLAUSE 4.0)

4.2.9 CLEAN AGENT FIRE SUPPRESSION SYSTEM FOR CONTROL ROOM, INSTRUMENT PANEL ROOM & SATELLITE RACK ROOM (SRR)

Clean Agent System along with all equipment, software for hydraulic calculations and corresponding design concentration of clean agent shall be listed or approved by national or international standards such as BIS/UL/FM/VdS/LPCB etc. Cylinder along with cylinder valve assembly shall have regulatory approval."

4.2.11 DRY CHEMICAL FIRE SUPPRESSION SYSTEM

Water reactive material (e.g. TEAL) handling areas including pumps shall be protected with an automatic DCP flooding system. Suitable DCP/metal firefighting DCP shall be used in DCP flooding system for TEAL area. DCP flooding system shall be designed as per NFPA-17.

FIRE PROTECTION PHIOLOSOPHY (CLAUSE 4.0)

4.2.12 FIRE PROTECTION FOR COAL HANDLING AND CONVEYOR SYSTEM

Refinery/Petchem facilities where Coal based Captive Power plant available for power and steam generation.-Following Fire protection system shall be installed for the protection of facilities:

Fire Hydrants, wet risers, and Hose reels

Fire water Monitors – For structures having height more than 15 m.

Automatic High Velocity Water spray system for Boiler burner fronts

Manual medium velocity water spray system with proportioner to mix water with suitable UL approved wetting agent for Coal silos.

Water sprinkler system for open type coke/coal conveyor.

Suitable fire detection system.

FIRE PROTECTION PHIOLOSOPHY (CLAUSE 4.0)

4.2.13 FIRE PROTECTION FOR STORAGE / HANDLING OF FLAMMABLE CRYOGENIC LIQUIDS

Cryogenic liquids are liquefied gases that are maintained at very low temperatures (typically less than -150°C). These liquids are gases at ambient temperatures and pressures. Since these liquids are extremely cold and can expand to very large volumes of gases, they are a safety hazard.

Fire measures required for the same are as below.

- Portable Fire Extinguisher as per Section 12.1
- Suitable type of PPEs
- Fire water network / Hydrants & Monitors: as per section 5.6.1 & 5.6.2
- Foam system: Portable / fixed High expansion foam generator shall be provided for protection of :

I. DWST (double walled storage tank) dykes for handling spills.

II. Underground (Pit) liquid transfer pumps.

FIRE WATER SYSTEM (CLAUSE 5.0)

5.0 FIRE WATER SYSTEM

Water is a universal fire extinguishing agent and meets most ideal properties required for fire extinguishment. The ideal fire extinguishing agent should have the following characteristics: -

a. It must be non-flammable

b. It should have a high heat of vaporization

c. It should be mobile liquid at normal ambient temperature.

d. It should be non-toxic and should not decompose to form toxic products.

Thus, water is the best available option and can be used for fire extinguishment, fire control, cooling of equipment and protection of equipment as well as protection of personnel from heat radiation. Water should be used such as straight jet, water fog, water mist, water curtain, water spray, deluge/ sprinkler, for foam making etc.

The firewater system shall comprise fire water storage, fire water pumps and distribution piping network along with hydrants and monitors, as the main components.

FIRE WATER SYSTEM (CLAUSE 5.0)

5.1 FIRE WATER FLOW RATE

Fire Water flow rate for tank farm shall be aggregated of the following:

a. Water flow calculated for all other tanks situated in the same dyke area a rate of 3 lpm/m^2 of tank shell area

5.2 HEADER PRESSURE

The fire water system shall be designed for a minimum pressure of 7.0 kg/cm^2 at the hydraulically remotest point of application at grade level and minimum residual pressure of 5.25 kg/cm^2 at landing valve at elevated structure on designed flow rate at that point.

5.4.3 STANDBY PUMPS

- In case total number working pumps are up to 2, standby pumps shall be at least one.
- In case number of working pumps are 3 to 4, the number of standby pumps shall be at least 2. For more than 4 working pumps, the number of standby pumps shall be at least 3.

FIRE WATER SYSTEM (CLAUSE 5.0)

5.4.4 JOCKEY PUMPS

The capacity of jockey pumps shall be minimum 1% of the design fire water rate. Its head shall be higher than the main fire water pumps. Auto cut-in / cut-off facility should be provided for jockey pumps.

5.4.5 POWER SUPPLY FOR FIRE WATER PUMPS

The power supply to the electric motor driven pumps should be distributed from a switchboard having two separate incomers such that failure of any one incomer source does not disrupt the power supply to all the electric motor driven pumps.

5.5.3 PROTECTION FOR UNDERGROUND PIPELINES

The mains shall be provided with protection against soil corrosion by suitable coating/wrapping. Where pipes are coming out/going in from/into the ground, the underground anticorrosion coating on the pipe will continue for a length of at least 300 mm above ground.

FIRE WATER SYSTEM (CLAUSE 5.0)

5.6.4 FIXED REMOTE / MANUAL OPERATED, MOBILE HIGH-VOLUME LONG-RANGE WATER OR WATER CUM FOAM MONITORS

I. The number and capacity of monitors shall be provided in such a way that cumulative foam application rate from the designated monitors meet the application rate of 9.75 lpm/m2 for total burning surface of the affected tank to extinguish the full surface tank fire. Additional monitors shall be provided in such a way that each tank is in the coverage area of at least two monitors. Due consideration has been given to compensate for the losses (50%) due to wind and other factors.

II. Monitors should be located to achieve the foam discharge preferably close to tank center from upwind direction of tank on fire.

III. A suitable connections for water supply to portable trailer mounted HVLR should be made available.

FIRE WATER SYSTEM (CLAUSE 5.0)

5.6.4 FIXED REMOTE / MANUAL OPERATED, MOBILE HIGH-VOLUME LONG-RANGE WATER OR WATER CUM FOAM MONITORS

The basic water cum foam monitors shall be listed or approved by national or international agencies such as BIS, UL and FM etc. or certified by the approved Third-Party Inspection (TPI) (only in case of high-volume mobile trailer mounted monitors) agency of the entity. The electrical or hydraulic remote-control mechanism shall be conforming to Hazardous Area Classification.

FOAM SYSTEM(CLAUSE 6.0)

6.4 FIXED ROOF TANK PROTECTION USING FOAM

Foam conveying system shall have same features as of floating roof tank excepting that a vapour seal chamber is required before the foam discharge outlet.

Features of the foam system for fixed roof protection for class A &B shall be as follows:

The vapour seal chamber shall be provided with an effective and durable seal, fragile under low pressure (at an inlet pressure of not less than 10 psi (69 kPa) and not greater than 25 psi (172 kPa), to prevent entrance of vapour into the foam conveying piping system.

FOAM SYSTEM(CLAUSE 6.0)

6.4 FIXED ROOF TANK PROTECTION USING FOAM

Tanks should be provided with foam discharge outlets/ vapour seal chambers as indicated below:

Tank Diameter in m.	Minimum number of foam discharge outlet
≥ 9 upto 20	2
>20 upto 25	3
>25 upto 30	4
>30 upto 35	5
>35 upto 40	6
>40 upto 45	8
>45 upto 50	10

Plus 1 outlet for

each additional 465 m^2 of area

FOAM SYSTEM(CLAUSE 6.0)

6.6 FULL SURFACE STORAGE TANK FIREFIGHTING & LOGISTICS

New chapter in details on scenario basis.

FOAM SYSTEM (CLAUSE 6.0)

6.8 FOAM APPLICATION RATE

For cone roof tanks containing liquid hydrocarbons, the foam solution delivery rate shall be at least 5 lpm/m² of liquid surface area of the tank to be protected.

For floating roof tanks containing liquid hydrocarbons, foam solution delivery rate shall be at least 12 lpm/m² of seal area with foam dam height of 600 mm of the tank to be protected. In case of floating roof sinking, the rate considered should be 9.75 lpm/m² of liquid surface areas for 65 minutes.

DURATION OF FOAM DISCHARGE

The equipment shall be capable of providing primary protection at the specified delivery rates for the following minimum period of time.

i) Tanks containing liquid hydrocarbons - Class 'C' Petroleum - 30 minutes.

ii) Tanks containing Class 'A' & 'B' Petroleum or liquids heated - 65 minutes.
above their flash points

iii) Where the system's primary purpose is for spill fire protection - 30 minutes.

Note:- It is advised to keep foam compound stock for extended 30 minutes for full surface tank fire scenario.

FOAM SYSTEM (CLAUSE 6.0)

6.9 FOAM QUANTITY REQUIREMENT

The aggregate quantity of foam solution for a single largest tank fire should be calculated as the sum of foam quantity requirement in clause 6.8 and total indicated below under items (i) & (ii) for a minimum period of 65 minutes. The quantity of foam compound required should be calculated based on 1%, 3% or 6% concentrate. Necessary changes in the equipment shall be made accordingly.

6.10 FOAM COMPOUND STORAGE

Foam compound should be stored in containers of suitable capacity, in case of protein, fluoro protein or AFFF or AR-AFFF or FFFP. Alcohol Resistant Foam (AR-AFFF) shall be used for handling methanol/ ethanol fires. Alcohol Resistant Foam (AR-AFFF) can be used for all type of hydrocarbon fire and polar solvent fire effectively. Foam compound can also be stored in overhead storage tank of suitable capacity for quick filling of foam tender / nurser during emergency.

Cautionary: Alcohol Resistant Foam (AR-AFFF) is preferred for Ethanol Blended Petrol (EBP) fire.

Note: Alcohol Resistant Synthetic Fluorine Free Foam (AR-SFFF) are environmentally friendly foam may be used.

BATTERY FIRE (CLAUSE 8.0)

8.1 FIRE PROTECTION

For fire protection of Li ion battery, Encapsulator Agent (EA) based on spherical micelle technology should be used in line with NFPA 18A & NFPA 855 (latest edition).

MODERNIZATION PLAN FOR FIREFIGHTING EQUIPMENT (CLAUSE 11.0)

Turbine Based Water Mist System

Turbine based water mist system is a compact, high flow water/ fog generator. The entire system is of modular design which includes turbine system, fuel tank and water/ foam supply. By injecting water, in the exhaust stream of the gas turbine a fog is produced. Due to the power of turbine, this fog can travel a large distance and can be controlled and influenced by the turbine speed, water nozzle configuration and water pressure. The fog stream can be pointed to the object (fire, tank, gas cloud) with a joystick which hydraulically controls the angle of the turbine, up or down and left or right.

Fire extinguisher of HDPE / Composite material body

This will ensure less weight and claimed to have longer shelf life. This will be more useful in corrosion prone area like offshore.

MOBILE FIRE FIGHTING EQUIPMENT (CLAUSE 13.0)

13.1 FIRE TENDERS

The exact number of fire tenders shall be higher of the items (a) or (b):

(a) The quantities firmed up in each case based on two simultaneous major fire taking into consideration the size, location of the plant and statutory requirements.

(b) The quantities indicated below.

i) 3 nos. of foam tenders out of which two are for firefighting, one for spill /standby. The foam tender should have a foam tank capacity of at least 3000 Liter and the pump capacity of minimum 4000 lpm at 8.5 kg/cm^2.

ii) DCP tender(s) having aggregate 4000 kg capacity, with Nitrogen as expellant gas. These are required for fighting LPG/Gas fire. A monitor should have a variable throw of 15/25/40 kg/sec. The throw of the monitor shall be 40 to 50 M for the DCP charge.

Minimum 1 number of Foam Nurser with foam compound tank of minimum 8000-liter capacity, with suitable pump for foam transfer. Entity shall ensure the continuous availability of foam nurser.

For Gas Processing Units a minimum of 2 nos. of multipurpose fire tender shall be provided.

Note:- For small petrochemical follow (a) clause of this section.

MOBILE FIRE FIGHTING EQUIPMENT (CLAUSE 13.0)

13.2.2 FIRE TENDERS

For Gas processing plants, in addition to fixed monitors provided in the tank farm, following additional mobile equipment should be provided; namely:-

(i) Minimum 2 nos. of Trolley mounted water cum foam monitors of capacity of minimum 2000 GPM (456 m3/hr) with field adjustable variable flow which are listed or approved by national or international standards such as BIS, UL and FM etc. Foam induction to the monitor shall be possible from a minimum 60 m distance from the monitor.

(ii) 1 to 2 numbers. of portable monitor of capacity ranging from 1800 to 2250 lpm at discharge pressure of 7 kg/cm2.

15.1.4 TOXIC GAS DETECTION:

i) Toxic gas detectors shall be installed if the risk is applicable. Toxic gas detectors shall be mounted considering the prevailing wind direction and wind speed.

ii) Additionally, Toxic gas sensors shall be installed in HVAC air intake duct of buildings that could be affected in the event of flammable or toxic release in the surrounding area.

Thank You