Comments / views on PNGRB (Technical Standards and Specifications including Safety Standards for Refineries and Gas Processing Plants) Regulations, 2020.

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Section 2. Definitions (gg): 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 (>= 15 psi) and whose water capacity exceeds one thousand liters and includes inter connecting parts and components thereof upto the first point of connection to the connected piping and fittings	Contradictions between definitions of pressure vessels in this regulations with various statutory rules like SMPV, Factories Rules are observed. This need to be reconciled before finalizing the definition.
Section 4 Scope. (1) Requirements of these regulations shall apply to all Refineries and Gas Processing Plants, (2) These regulations lay down minimum requirements of layout within the plant boundary for unloading or loading, storage, processing, transfer and handling of hydrocarbons/ other hazardous substances / chemicals in Refineries and Gas Processing Plants. (3) These regulations also cover engineering considerations in design, installation, operation, maintenance, inspection including fire protection and safety systems. (4) The Liquefied Natural Gas facilities are covered in PNGRB (Technical Standards and Specifications including Safety Standards for LNG facilities) Regulations, 2018. (5) These regulations shall not be applied to onshore/ offshore upstream facilities.	**Specify exemptions to this regulations as:** Nothing in this technical standard shall apply to (a) Vessels having internal diameter nor exceeding 150 mm (6") and capacity not exceeding 141.585 liters (5 cu.ft.) (b) Vessels made of ferrous materials having an internal operating pressure not exceeding 1 Kg/sq.cm (15 lbs/ square inch) (c) steam boilers steam and feed pipes and their fitting coming under the purview of Indian Boilers Act, 1923, (V of 1923) (d) Metal bottles or cylinders used for storage or transport of compressed gases or liquified or dissolved gases under pressure covered by the Gas Cylinder Rules, 1940 framed under the Indian Explosives Act, 1884 (IV of 1884) (e) Vessels in which internal pressure is due solely to the static head of liquid; (f) Vessels with a nominal water, capacity not exceeding 500 litres connected in a water pumping system containing air that is compressed to serve as a cushion (g) Vessels for nuclear energy application (h) Refrigeration plant having a capacity of 3 tons or less of refrigeration in 24 hours and, (i) Working cylinders of steam engines or prime mover; feed pumps and steam traps turbine casings; compressor cylinders; steam separators or dryers; steam strainers; steam device super-heaters; oil separators, air receivers for fire sprinkles installations; air receivers of monotype machines provided the maximum working pressure of the air receiver does not exceed 1.33 Kg.f /sq.cm. (20 cu.ft.); and the capacity 84.95 litres (3 cu.ft.) air receivers of electrical circuit breakers; air receivers of electrical relays; air vessels on pumps pipe coils, accessories of instruments and appliances; such as cylinders and piston assemblies used for operating relays

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	and interlocking, type of guards; vessels with liquids subjected to static head only, and hydraulically operating cylinders other than any cylinder communicating with an air loaded accumu lator.
Schedule 1:- Site Selection and layout	
1.2 Plant Layout Philosophy (e) Alternative access shall be provided for each facility so that it can be approached by emergency responders. **at road junctions shall be designed to facilitate movement of the largest fire-fighting vehicle in the event of emergency.**	"**~~at~~ All road junctions shall be designed to facilitate movement of the largest fire-fighting vehicle in the event of emergency."**
1.2 (h). 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.	1.2 (h) Two road approaches from the highway / major road should be provided. Preferably, one for employees and other for product / material movement. Both these approaches should be available for receipt of assistance in emergency.
1.3.1 (f) 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	1.3.1 (f) While designing layout, overhead power transmission lines shall not pass over the installation including the parking areas during. Horizontal clearance shall be in line with the Indian Electricity Rules
1.3.1(k)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.	1.3.1(k) While designing layout, the truck loading / unloading facilities should be located close to product movement gate and should be oriented to provide one-way traffic pattern for segregated entrance and exit.
1.3.2. Location of firewater pumps shall not be less than 60 meters from other hazardous facilities	It shall be renumbered as 1.3.1 (t).
1.3.3 Separation distances - Table 1	Petroleum Rule and this regulations specifies different Tables for separation distances. Currently there is no contradiction between these two tables. The possible contradiction arising out of updation of norms for layouts based on Petroleum Rules amendment and the provisions of this regulations need to be addressed.
1.4.1 (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.	1.4.1 (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~~ 1.5.1.1 of this standard. (Typographical error to be corrected)
1.5.1.3 Fire walls: **(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	1.5.1.3 (d,e,f,g) shall be renumbered as 1.5.1.1 h,I, j and k.

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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. **(d)** 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 **(e)** 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. **(f)** 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. **(g)** 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.	
Schedule 2	The design of equipment not covered under the Schedule 2 of this regulation (pressure vessel, heater, piping etc.) shall be govern by the requirement as per Factories Act / Rules.
2.1.1.2(d) Individual vents shall have a drain hole of 1/2" at the low point in the vent line. The drain connection shall be piped to a safe location.	2.1.1.2 (d) - Individual vents shall have a drain hole of 1/2" at the low point in the vent line. The drain connection shall be piped to a safe location for hydrocarbon and steam
2.1.3.2. Vents and drains shall be routed to safe location, and double block valves shall be provided for compressors in Hydrocarbon service.	2.1.3.2 - Vents and drains shall be routed to safe location, and double block valves shall be provided for compressors in Hydrocarbon service where it is not connected to flare
2.1.3.4. Guidelines for Compressor Design and Manufacture: should we go into such details? The equipment are designed referring to API standards, why should we repeat he requirements and make the document bulky?	**2.1.3.4. Guidelines for Compressor Design and Manufacture: ~~should we go into such details? The equipment are designed referring to API standards, why should we repeat he requirements and make the document bulky?~~ (Deleted being not relevant)**
2.1.4.2 – Steam Purity	Manufactures design specification shall govern
2.1.1.1 Level: Tanks shall be provided with at least two numbers of level instruments of which one may be local and	All Class A and Class B storage 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~~

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the other remote, located in control room or office. In addition, high/low level alarms with independent primary sensing device are recommended.	~~with independent primary sensing device are recommended.~~
Schedule 3	
3.5.1 xiii : Relief valves shall be removed or blinded prior to hydrostatic testing.	3.5.1 xiii : The following condition shall be added to the existing clause. "All spring support shall be in locked condition during hydro test. (Spring support to be designed for hydrotest load. If not designed, temporary support to be provided during hydrotest)"
3.5.1(xix). Provided manufacturers test certificates are available, only the following pressure tests should be carried out on heat exchangers except as required below: (a) On floating head shell and tube type exchangers, on tube side with bolted bonnets removed. (b) On tube-in-tube types, on both sides in conjunction with associated pipework. On air-cooled types, the bundles are to be isolated and tested separately from associated pipework	3.5.1 (xix) Provided manufacturers test certificates are available, only hold test for both shell and tube side should be done for new exchangers.
3.5.6.Records: The records for flushing and blowing to approved standards of cleanliness and restoration of plant condition to P7ID requirement shall be retained in each Systems Completion Manual.	3.5.6 Instead of P7ID, mention as P&ID (Typographical error to be corrected)
3.6.1. Activities in commissioning: First three activities below falls under pre-commissioning	3.6.1 In table, Mention Sl No: 2 & 3 as perform by Construction and Witness by Operations
3.6.2. General commissioning activities before commissioning of main process systems	3.6.2 Add (n) Gas monitor / PA system
Schedule 4	
4.4.2 Process Design	The equipment identified as safety critical equipment shall prevent or mitigate a major incident and also shall survive an initial fire or explosion and still perform its critical function.
4.4.2.1 (i) Manufacturer's recommendations for periodic inspection/ testing/ maintenance of equipment supplied by them.	4.4.2.1 SL No: I , Manufacturers recommendation for periodic inspection/ testing/ maintenance of equipment supplied by them, wherever supplied.
Schedule 5 Electrical Systems	
5.1 Design Philosophy	
vi. VFD & UPS Room shall be air-conditioned to increase reliability of heat sensitive electronic component like semi-conductor devices, Transducers, Cards for inter electronic equipment communication etc. Switchgear Room shall be force ventilated or air-conditioned.	vi. VFD & UPS Room shall be air-conditioned to increase reliability of heat sensitive electronic component like semi-conductor devices, Transducers, Cards for inter electronic equipment communication etc. Switchgear Room shall be preferably force ventilated or air-conditioned.

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viii. VRLA battery room shall be air conditioned to maintain specified temperature.	viii. VRLA battery room shall be force ventilated/air conditioned to maintain specified temperature.
ix.There shall be classified for the degree extent of hazard from flammable materials. Classification of hazardous areas for all areas shall be done as per guidelines indicated in latest IS 5572 and equipment selection for hazardous area shall be as per IS 16724/IEC 60079-14. All electrical equipment in hazardous area shall be minimum suitable for Zone-2 Gas Group IIA/IIB, Temperature class T3.	ix. There shall be classified hazardous areas based on ~~for~~ the degree / extent of hazard from flammable materials. Classification of hazardous areas for all areas shall be done as per guidelines indicated in latest IS 5572 and equipment selection for hazardous area shall be as per IS 16724/IEC 60079-14. All electrical equipment in hazardous area shall be minimum suitable/at least comply for Zone-2 Gas Group IIA/IIB, Temperature class T3.
5.8.8 Alarm Annuciations	**5.8.8 Alarm Annunciations**
5.10 Where necessary, electrical trace heating shall be provided for process pipelines. Electrical heat tracing shall be designed and procured in accordance with project specification. As far as practical suitably certified self-regulating heating tapes shall be employed. Special types of heating (e.g. skin effect, impedance or induction heating) may be employed in particular application.	Where necessary, electrical heat tracing shall be provided for process pipelines. Electrical heat tracing shall be designed and procured in accordance with project specification. As far as practical suitably certified self-regulating heating tapes shall be employed. Special types of heating (e.g. skin effect, impedance or induction heating) may be employed in particular application.
Schedule 7	
7.5.4 (iii) Protection for above ground pipelines The system for above ground portion shall be analysed for flexibility against thermal expansion and necessary expansion loops shall be provided wherever called for.	7.5.4 iii, The system for above ground portion should be analysed for flexibility against thermal expansion and necessary expansion loops shall be provided as per good engineering practice.
7.16 Table (iii) foam compound: The minimum foam compound storage shall be the quantity as calculated by Clause 7.11.9.	The typographical error to be corrected as Clause 7.10.9
7.23.3. Gas Detection Systems: Furl Gas knockout drum	7.23.3 – Typographical error to be corrected as 'Fuel gas knockout drum'.
7.3.2 (i): Water flow required for applying foam into a single largest cone roof or floating roof tank (after the roof has sunk) burning surface area of oil, by way of fixed foam system, where provided or by use of water/foam monitors. (Refer section **7.8** for foam rates).	Typographical error to be corrected as Section 7.10
7.3.2 (i): Fire water flow rate for supplementary stream, shall be based on using 4 single hydrant outlets and 1 HVLR (1000GPM) simultaneously. Capacity of each hydrant outlet as 36 m_3/hr and of each monitor as 228 m_3/hr shall be considered at a pressure of 7 kg/cm_2g.	Typographical error to be corrected as HVLRM.
7.3.2 (iil): Water flow required for applying foam into a single largest cone roof or floating roof tank (after the roof has sunk) burning surface area of oil, by way of fixed foam system, where provided or by use of water/foam monitors. (Refer section 7.8 for foam rates).	Typographical error to be corrected as Section 7.10
7.4.2: **Capacity of main Pumps**	Typographical error to be corrected as section 7.3.2

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The capacity and number of main fire water pumps shall be fixed based on design fire water rate, worked out on the basis of design criteria as per section 5.2. The capacity of each pump shall not be less than 400 m3/hr or more than 1000 m3/hr. All pumps should be identical with respect to capacity and head characteristics.	
7.6.1.ii: Provision of hydrants within buildings shall be in accordance with Standard IS Standard- 3844	Typographical error to be corrected as IS standard 3844.
7.6.1.iv: Double headed hydrants with two separate landing valves on 4" stand post shall be used. All hydrant outlets shall be situated at a workable height of about 1.2 metre above ground level.	Typographical error to be corrected as 4" dia.
7.8.2: Atmospheric storage : 3 lpm/m2 of tank shell area for tank on fire Tanks 3 lpm/m2 of tank shell area for exposure protection for tanks located within (R+30) M from centre of tank-onfire within the same dyke area. 1 lpm/m2 of tank shell area for exposure protection for tanks located outside (R+30) metre from centre of tankon-fire within the same dyke area.	Typographical errors to be corrected as Atmospheric Storage Tanks : 3lpm/m_2 of tank shell area for tank on fire. 3 lpm/m_2 of tank shell area for exposure protection for tanks located within (R+30) M from centre of tank-on-fire within the same dyke area. 1 lpm/m_2 of tank shell area for exposure protection for tanks located outside (R+30) metre from centre of tank-on-fire within the same dyke area.
7.10.2	Schedule 7.10.2 to be renumbered as 7.10.1.2
7.10.3	Schedule 7.10.3 to be renumbered as 7.10.1.3
7.10.2: Provision of an automatic rim-seal protection system of foam flooding type shall be in line with the details mentioned at 4.2.3 and at Annexure-VII.	Typographical error to be corrected as 7.2.3 in place of 4.2.3
7.10.4	Schedule 7.10.4 to be renumbered as 7.10.2
7.10.4 (iii): The estimation of number of foam discharge outlet is based on pourer capacity of 1000 lpm at a pressure of 7 kg/cm2g upstream of eductor. This can be suitably adjusted for different vapour seal chamber capacity in accordance with para 6.4 (iii).	It is 7.2.3 to be renumbered as 6.4 (iii)
7.10.5	Schedule 7.10.5 to be renumbered as 7.10.3
7.10.6	Schedule 7.10.6 to be renumbered as 7.10.4
7.10.7	Schedule 7.10.7 to be renumbered as 7.10.5
7.10.8	Schedule 7.10.8 to be renumbered as 7.10.6
7.10.9	Schedule 7.10.9 to be renumbered as 7.10.7
7.10.9 (i): Foam solution application at the rate of 5 lpm/m2 for the liquid surface of the single largest cone roof tank or at the rate of 12 lpm/m2 of rim seal area of the single largest floating roof tank or at the rate of 8.1 lpm/m2 of the liquid surface of the largest floating roof tank for a *roof* sinking case, whichever is higher. (Refer Annexure- for sample calculation)	Typographical error to be corrected as Annexure VI
7.10.10	Schedule 7.10.10 to be renumbered as 7.10.8
7.15.1: (a) The quantities indicated below.	Typographical error to be corrected as 3 nos.

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(i) nos. of foam tenders out of which two are for fire fighting and one for spill/ standby. The foam tender should have foam tank capacity of minimum 3000 litre and the pump capacity of minimum 4000 lpm at 10 kg/cm2.	
7.15.3 (ii) Fire Hoses: IS 636: Type A or Synthetic hose of Type B.	Hose classification has been changed Type 1 and Type 3 as per latest revision of IS 636.
7.16 (iii): The minimum foam compound storage shall be the quantity as calculated by Clause 7.11.9.	The minimum foam compound storage shall be as per Clause 7.10.10
7.18 (iv) 2.: **Major Fire:** A wailing siren for two minutes.	Major sire code to be change as per ERDMP regulation of PNGRB.
7.7 (v) Reinforced Rubber Lined Hose as per IS 636 (Type A)/Non-percolating Synthetic Hose (Type B).	Hose classification has been changed Type 1 and Type 3 as per the latest IS 636.
Schedule-7 Annexure-1 Point 2.1 ; c **Foam water requirement for rim seal area:** Water flow required for applying foam on a largest tank burning surface area. For floating roof tank of 79 m diameter, Diameter of the tank (D1) = 79 m Distance of foam dam from shell = 0.8 m Diameter of roof up to foam dam (D2) = 79- (2 x 0.8) = 77.4 m the rim seal area = ((π /4) x (792 - 77.42)) m2 = 197 m2 Foam solution rate @ 12 lpm/ m2 = 2,364 lpm (For 3% foam concentrate) = (0.97 x 2364) lpm = 2293 lpm. = 2293 x 60 m³/hr 1000 = 138 m³/hr. ***Note-1**: These are sample calculations only. Calculations on the basis of actual site conditions and dimensions need to be carried out for each installation as per guidelines provided in clause 5.2.*	**Typographical error to be corrected as :** rim seal area = **((**π /4) x (79^2 - 77.4^2)) sqm **= 2293 lpm (138 cum/hr)** In note 1, typographical error to be corrected as Clause 7.3.2 in place of clause 5.2
Schedule-7, Annexure-1 ,Point 2.2 ; c c) **Foam water requirement** (for 1 tank only) @ 5 lpm/ m2, Foam solution rate = (π x (37.5)2 x 5) lpm	**Typographical error to be corrected as** Foam solution rate = $\frac{(\pi \times (37.5)^2 \times \mathbf{5})}{4}$ **lpm**

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4 = 5525 lpm For 3% foam concentration = (5525 x 0.97) lpm = 5359 lpm = 322 m3/hr d) Fire water for **supplementary hose** stream = 372 m3/hr	**Change all m3 to m^3** **Change all m2 to m^2**
Schedule-7,Annexure-1, Point 3 **3.0 TOTAL DESIGN FIRE WATER RATE** For two major fire fought simultaneously Fire water rates for 5 cases are given below: i) Floating roof tank protection = 1369 m3/hr ii) Cone roof tank protection = 1714 m3/hr iii) LPG sphere protection = 2040 m3/hr iv) LPG rail wagon loading gantry = 702 m3/hr Protection v) Process unit protection = 984 m3/hr ***Note-2**: Potential foam losses from wind and other sources to be added to this value as per design requirements. These losses are not considered in this typical calculation sheet.*	**Note 2 to be corrected as** *: Potential foam losses from wind and other sources to be added to this value as per design requirements. (These losses are not considered in this typical calculation sheet)*
Schedule-7, Annexure-II, Point 1 **ii) The quantity of foam compound shall be calculated as follows:** Consider foam solution application @ 5 lpm/ m2 for the liquid surface of the single largest cone roof tank in the dyke area. Foam solution rate $\frac{\pi \times (37.5)2}{4} \times 5$ = 5525 lpm Foam compound required (3%) = (5525 x 3 / 100) lpm = 166 lpm Foam compound quantity for 65 minutes = 166 x 65 = **10,790 litre**	**Change m2 to m^2** **The typographical error to be corrected as:** Foam solution rate = $\frac{\pi \times (37.5)^2}{4} \times 5$
Schedule-7, Annexure-II, Point 2 iii) Consider foam solution application rate of 12 lpm/ m2 of seal area of the single largest floating roof tank in the dyke area : For floating roof tank of 79 m diameter, Diameter of the tank (D1) = 79 m Distance of foam dam from shell = 0.8 m Diameter of roof up to foam dam (D2) = (79-(2X0.8)) m = 77.4 m Rim seal area = ((π /4) x (792-77.42)) m2 = 197 m2 Foam solution rate @ 12 lpm/ m2 = 2364 lpm 3% Foam Compound required = 70.9 lpm **Foam Compound required for 65 mins. = 4,609 liter**	The sub clause numbering to be corrected. **The typographical error to be corrected as:** **Rim seal area = ((**π /4) x (79^2 - 77.4^2)) m2

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Schedule-7, Annexure	Annexure numbering corrections to be done to ensure continuity.
Schedule-7, Annexure-VI **DATA:** 1. Diameter of Tank = 79 m 2. Type of Roof = Floating Roof 3. Foam Application Rate = 8.1 lpm Foam Solution Requirement = π x 79 x 79 ---------- x 8.1 4 = 39,720 lpm = 2,383 m3/hr Say, = **2,400 m3/hr**	Typographical error to be corrected as Foam solution requirement = $\frac{\pi \times (79)^2}{4} \times 8.1$
Schedule 8: 8.2. The Refresher programs for training of all personnel shall be conducted at an interval not exceeding 3 years to keep personnel current on the knowledge and skills.	8.2 The refresher programs for training of all operating personnel in field shall be conducted at an interval not exceeding 3 years to keep personnel current on the knowledge and skills
Schedule 9 **9.2.1.** Types of Safety Audits:	Under types of safety audits, only internal safety audit is mentioned. Add external safety audits also.
Schedule 10 **Driver and Helper:** Each driver should undergo periodic medical examination at regular interval with special reference to vision, night and colour blindness.	The requirement may be limited to Heavy Vehicle drivers only. For others, requirements of State Licensing Authorities in this regard shall govern.
12.4.2 Type of Work Permits Based on the nature of work to be performed, the following minimum type of work permits shall be used. (a) Cold Work (b) Hot Work (c) Confined Space Entry (d) Electrical isolation and Energization (e) Work at height (f) Critical lifts (To be defined) (g) Composite permit as applicable (h) Radiography (i) Excavation	Work permit shall be specific based on the nature of hazards and the precautions to be taken. Therefore there shall not be a composite permit Work at height: Definition of working at height shall be included for temporary platforms, permanent platform and conditions requiring special health check-ups. For better control and monitoring, electronic permit system shall be encouraged.
Schedule 13 (xiv). The entity shall conduct a comprehensive internal audit at least once every year. Internal audits shall be performed by the multidisciplinary team who are not reporting into the function / department being audited. Examples may include personnel of a separate operating unit, an organization's compliance unit, an organization's internal audit group.	(xiv) The internal safety audit shall be including PSM aspects also.
Schedule 13 **Vii. Contractor Safety -**When selecting contractors, operators should obtain and evaluate	The clause may be revised as:

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information regarding a contractor's safety and environmental management policies and practices, and performance, and the contractor's procedures for selecting subcontractors. The entity shall communicate their safety and environmental management system expectations to contractors and identify any specific safety or environmental management requirements they have for contractors. Interfacing of SMS of various entities (operator, contractor / 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.	When selecting contractors, operators should obtain and evaluate information regarding contractor's HSE policies & practices, contractor's performance and contractor's procedures/criteria for selecting subcontractors. The operator shall communicate their safety and environmental management system expectations to contractors and identify any specific safety or environmental management requirements they have for contractors. Interfacing of SMS of various entities (operator, contractor / service provider, subcontractor and third-party) should be ensured through a well written bridging document. Clear roles and responsibilities of the operator, contractor / service provider, subcontractor and third-party shall be documented by the operator.
Reference	Include IS 5572 also in the references list.