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PART II

Statutory Notifications (S.R.O)

GOVERNMENT OF PAKISTAN

OIL AND GAS REGULATORY AUTHORITY

NOTIFICATION

Islamabad, the 19th October, 2009

S.R.O.900(I)/2009.-In exercise of the powers conferred by Section 42 of Oil and Gas Regulatory Authority Ordinance, 2002 (Ordinance XVII of 2002) the Oil and Gas Regulatory Authority is pleased to make the following regulations namely:-

1 Short title and Commencement- (1) These Regulations may be called the Technical Standards for the Petroleum Industry (Road Transport Vehicles, Containers and Equipment Used for the Transportation of Petroleum Products)

(2) They shall, come into force at once.

2 Applicability:- These regulations shall be applicable to all road transport vehicles, containers and equipment used for the transportation of petroleum products by the Oil Marketing Companies.

Chapter-1

3 Definitions:- (1) In these regulations, unless there is anything repugnant in the subject or context:-

(i) "articulated vehicle" means a truck and trailer attached to each other.

- (ii) “compatible” in the context of semi-trailers and drawbar trailers means such design as would facilitate the attachment of trailer to the prime mover vehicle.
- (iii) “D value” means value of king pin with built in safety factor (shearing value in kilo newton).
- (iv) “DIN” means the German National Standards.
- (v) “drawbar vehicle” means a trailer attached to a rigid vehicle.
- (vi) “EEC” means EEC standards for European communities (Motor vehicles type approval) Regulations.
- (vii) “Fire -screen” means a screen after the drivers cabin for protection.
- (viii) “GCW” means gross combination weight.
- (ix) “GVW” means gross vehicle weight.
- (x) “NEQS” National Environmental Quality Standards prescribed by the Environmental Protection Agency of Pakistan
- (xi) “NHA” means the National Highway Authority.
- (xii) “rigid vehicle” means a tank put on top of a truck chassis.
- (xiii) “vehicle” or “vehicle outfit” or “outfit” means the entire truck/trailer or the prime mover and tanker. This can also be termed as “Complete Combination” instead of “vehicle outfit”.
- (xiv) ADR – Association of Dangerous goods road transportation

(2) In this Standard the following terms of measurements have been used:

- (i) “g” denotes acceleration due to gravity and is measured in m/sec^2 .
- (ii) “hp” means horsepower.
- (iii) “kph” means kilometres per hour.
- (iv) “kw” means kilo watts.
- (v) “mm” means millimetres.
- (vi) “mph” means miles per hour.
- (vii) “ m/sec^2 ” means metre per seconds squared.

(viii) Self-locking differential unit, such as the ZF or No Spin Types: means a differential unit with anti-rollback provision.

(ix) Type A, B & C Class Fire Extinguisher means a unit with the capability to extinguish fires involving Ordinary Combustible materials (Class A) such as Paper, wood etc, Flammable Liquids & Gases (Class B) and electrical fires (Class C).

Chapter-2

Scope

4 Scope of this Standard

- (1) These technical standards for road transport vehicles and containers and equipment used for the transportation of petroleum products. Petroleum products include petrochemicals, aviation fuels, petroleum spirits including petrol and motor gasoline, kerosene oil including paraffin and gas oil including distillate and diesel.
- (2) These standards do not apply to vehicles or containers used for the road transport of petroleum products where the container's volumetric capacity is less than 5,000 litres.
- (3) These standards do not apply to vehicles or containers carrying petroleum for generating its own motive power.
- (4) These standards do not apply to any receptacles or containers of petroleum products which are immovable.
- (5) These RT standards also apply to transport tankers & equipment used for the transportation of furnace oil (fuel oil). Complete Bottom Loading system for fuel oil tankers is not a requirement & can be omitted for Fuel Oil tankers. The tank shell design must be such that the vehicle may be converted to meet all the requirements of the Bottom Loading System at a later date without welding or applying heat to the tank.
- (6) These do not apply to finished lubricants, asphalt/ bitumen, acids, synthetic chemicals that are highly corrosive or radioactive, or gases.
- (7) All existing road transport vehicles, containers and equipment used for the transportation of petroleum products shall be up-graded to conform with the requirements of these standards within 05years from the date on which these standards are made effective.

5 Removal of Difficulty:-

- (1) The industry may refer any problem faced by them in implementing these technical standards to the Authority for its consideration. The Authority's decision on the referred issues would be final.

Chapter-3

Chassis Cab and Trailer Running Gear

6 Overall Configuration

- (1) The Configuration of the vehicle (e.g. 4x2 articulated, 6x2 rigid, 8x4 drawbar) is not covered under this standard.
- (2) At least 25% of the total outfit (complete combination) weight will be carried on the drive axles.
- (3) For the semi-trailers (articulated vehicle), the complete vehicle must be compatible with the tractor unit to which it is to be mounted, in particular in the areas of:
 - (i) Fifth wheel coupling imposed load, D Value.
 - (ii) Fifth wheel size and type (ISO 2", ISO 3.5").
 - (iii) Fifth Wheel height (the semi-trailer tank should be level to 20 tail down in the laden condition).
 - (iv) Swing clearance, front of trailer/tank to back of cab, cab gantry etc., at least 50 mm swing clearance is required in the worst condition of corner swing and ± 70 vertical articulation.
 - (v) Swing clearance, trailer-landing legs to rear of chassis and tractor mounted equipment.
 - (vi) Vertical Prime Mover/trailer clearance. The Prime Mover and trailer must be able to articulate ± 70 in a vertical plane without any foul occurring.
 - (vii) In the case of the drawbar vehicle, the completed vehicle must be compatible with the drawbar tractor unit. In particular in the areas of:
- (4) Drawbar vehicle to trailer swing clearance. A clearance of 50 mm must be maintained in the worst condition of corner-to-corner positioning and $\pm 7^\circ$ vertical articulation.
- (5) Drawbar vehicle and trailer vertical clearance. The drawbar vehicle and trailer must be able to articulate $\pm 7^\circ$ in a vertical plane without any foul occurring.
- (6) Trailer coupling D Value.

7 Legislation

- (1) The vehicle will comply with all vehicle legislation and regulations applicable in Pakistan, including the National Highway Authorities Axle Load Limits.

8 Weights and Dimensions

- (1) The total vehicle will have a maximum length of 18.3 metres (60.0 feet).
- (2) The vehicle will have a maximum width of 2.5 metres (6.5 feet), excluding tyre bulge and wing mirrors.
- (3) The vehicle will have a maximum height of 4.0 metres (13.0 feet).
- (4) The distance between the outer road contact points of the tyre tread on the rear axles will be greater than 90% of the height of the centre of gravity of the fully laden vehicle, with all payloads that may be carried.
- (5) The total vehicle weight shall be calculated from a certified weighbridge measurement of the un-laden vehicle complete with full fuel tank, water, batteries, spare wheel, tools, and all other equipment normally carried, plus an allowance of 130 Kg for the vehicle crew, plus the payload weight.
- (6) The total weight of the vehicle, calculated as above (Regulation 8(5)), shall be less than or equal to the maximum allowable GVW and GCW as defined by the chassis or trailer manufacturer. The loading on any axle shall be less than or equal to the maximum allowable axle loading for that axle as defined by the chassis or trailer manufacturer or as prescribed by NHA, whichever is less.
- (7) The total loading on any axle shall not exceed the maximum allowable loading on that axle as defined by the tyre manufacturer, for the maximum nominal speed rating of the tyre, the calculated loading, and the inflation pressures as defined by the Axle Loadings prescribed by NHA.

9 Vehicle Modifications

- (1) The only modifications allowed to the vehicle, are those required to mount the tank body, and to comply with the requirements of this standard. Modifications to increase the carrying capacity of the vehicle are specifically not allowed. All modifications must be carried out in line with the chassis or trailer manufacturer's recommendations. (Not exceeding the limits as defined by the Body Building Manual, Body Builder's drawing or through an authorized inspection agency.)

10 Performance

- (1) The vehicle shall have a power to weight ratio of at least 6 hp/tonne (4.48 kw/tonne). Power shall be DIN 70 020 Net, and weight shall be the total vehicle weight as per Regulation 8(5),

- (2) The vehicle shall have a calculated rolling gradeability of at least 20% (See Appendix A for calculation methodology); the minimum rolling gradeability shall not be not less than 12%.
- (3) The vehicle shall have a geared top speed of at least 80 kph (48 mph). (See Appendix A for calculation methodology).

11 Engines, Engine Services, Retarders

- (1) The vehicle shall be powered by a compression ignition (diesel) engine running on high-speed diesel fuel. The engine may be turbocharged and after cooled if required. Gasoline and CNG engines may also be used.
- (2) National Environmental Quality Standards (NEQS) shall be complied by its following maximum permissible limit.
 - (i) Smoke: 40% or 2 on the Ringlemann Scale or equivalent smoke number at end of exhaust pipe during engine acceleration mode.
 - (ii) Carbon Monoxide: Emission standard for:
 - New vehicle 4.5%
 - Used vehicle 6%
 - (10 year or older model)
 - (iii) Noise: 85 dB (A)

(The above values are subjected to change as per revision in NEQS.)

- (3) The vehicle shall be fitted with an engine exhaust brake, or a separate retarder, under driver control. Any retarder fitted aft of the (firescreen if any, or under the haulage compartment shall be adequately shielded if any exposed part reaches a temperature sufficient to cause auto-ignition of the products being carried.
- (4) The vehicle is to be fitted with a fuel tank of capacity of 200 litres or more. The fuel line is to incorporate a fuel filter, water separator and a fuel line heater. The cap is to be lockable and retained by a chain.
- (5) A paper element air cleaner is to be fitted.
- (6) Vehicles having a geared speed above 100 kph (60 mph) are to be fitted with a speed limiting device set to 100 kph (60 mph) or less.
- (7) The engine cooling system shall be such that at full engine power the top tank temperature does not exceed 100°C, at an ambient temperature of 45°C, and with a vehicle air-on velocity of 15 kph or less.
- (8) The overflow vent from the radiator pressure cap shall be led downwards by a pipe, discharging within 350 mm of the road surface, forward of the fire-screen. The pipe shall be situated so that any escaping liquid cannot contact the exhaust system, brake drum or other hot part of the vehicle.

- (9) Vehicles shall be fitted with a cold start system capable of giving reliable engine starts after an 8-hour soak at a temperature of -20°C . If the cold starting system uses volatile fluid injection (such as the start pilot system), all components of this system shall be situated forward of the fire-screen if any.
- (10) Exhaust System. The exhaust system shall be so situated so that any spilt or leaking product cannot contact the hot parts of the exhaust system. This condition shall be as taken as complied with, if any of the following conditions are met:
- (i) The exhaust system and outlet are fully forward of the fire-screen if any.
 - (ii) The exhaust system and outlet are forward of the piping or tank.
 - (iii) The exhaust system is fully protected by a metallic shield in all areas aft of the fire-screen, and that the surface temperature of this shield is at a safe level to prevent auto ignition of the products to be carried. In addition, the exhaust outlet shall be within 100 mm of the outside edge of the vehicle, measured in plan view. The exhaust outlet shall be directed outwards and downwards towards the road surface, with the last 150mm of the tailpipe inclined downwards by at least 150mm.
 - (iv) Vertical stack exhausts are to be forward of the fire-screen if any and the exhaust outlet is directed to the side of the vehicle.

12 Gearbox and Clutch

- (1) The vehicle shall be fitted with a multi-speed all synchromesh gearbox, or with an automatic gearbox. If the gearbox is of the range change type, an inhibitor shall be fitted to protect against low range selection at an excessive road speed.
- (2) In the case of a manual gearbox vehicle the clutch lining is to be non-asbestos.

13 Drive Axles

- (1) The drive axle(s) will be fitted with a cross lock device. A dashboard light will be fitted to indicate that the cross lock is engaged. An alternative to this is a self-locking differential unit, such as the ZF or no-spin types.
- (2) In the case of a vehicle fitted with multiple drive axles (such as a 6x4) the inter-axle drive will incorporate a differential unit, which will also be capable of being locked. A dashboard light will be fitted to indicate that the differential is locked.
- (3) In the case of a vehicle fitted with a drive-steer axle (such as a 4x4), no cross lock shall be fitted to the steered axle.

14 Suspension

- (1) Vehicle roll stiffness shall be such that at a lateral acceleration of 0.25g, the vehicle roll will be less than or equal to 50mm. Product sidewayslop may be ignored for calculation purposes. In the case of an articulated or drawbar outfit, all parts of the vehicle will meet the above criteria.

15 Steering

- (1) All vehicles having a load on the steered axles of more than 4.5 tonnes shall be fitted with a hydraulic power assisted steering system.

16 Wheels and Tyres

- (1) All vehicles having an axle load above 6.0 tonnes shall be fitted with ISO standard wheel fitting of 10 studs 22 mm diameter or as specified by NHA.
- (2) All vehicles will carry at least one spare wheel and tyre, and the tools necessary to change it. On articulated vehicles, the spare wheel may be carried on the semi-trailer.
- (3) Tyre valves to be easily accessible for pressure checking.
- (4) All tyre valves to be fitted with metal hexagon caps.
- (5) In service remoulded tyres may not be used on any steered axle.
- (6) Bias ply and radial ply shall not be mixed on the same vehicle. The entire vehicle must be either fitted with bias ply tyres, or with radial ply tyres, and the spare wheel(s) shall also be of the same type. This applies also to articulated and drawbar vehicles.

17 Brake System

- (1) All vehicles above 12 tonnes total weight are to be fitted with a full air brake system, dual circuit.
- (2) The park brake is to be a spring brake type acting on the rear axles.
- (3) All linings fitted in brake systems shall be non- Asbestos linings.
- (4) Brake system to include an air drier unit.
- (5) All piping is to be nylon type suitable for brake systems, except the pipe immediately out of the compressor, which shall be steel with a high temperature hose.
- (6) On a dry road the service brake system should have the capability of stopping the vehicle from 30 to 35 kph in a distance of 15.5 metres from the point of application of the brake.

- (7) The vehicle must meet the wheel lockup/tyre-ground coefficient of friction requirements of EEC 71/320.
- (8) The requirements of Regulation 17(7) shall not be required for a vehicle fitted with antilock braking systems (ABS) on all axles.
- (9) The vehicle park brake must be capable of holding the fully laden vehicle on a 10% slope.
- (10) The vehicle will be fitted with air system connections in the area of the front towing pintle, allowing the vehicle brakes to be operated by the air system of a recovery vehicle in the event of recovery towing.
- (11) The vehicle shall be fitted with a low air pressure warning buzzer, set to operate at 50% of normal air system maximum pressure or less.
- (12) With the engine on low idle, the system shall have sufficient air capacity to allow for seven service brake applications with a 5 second spacing, without the air buzzer operating.
- (13) In the case of articulated and drawbar outfits the tractor unit shall be fitted with a dual circuit trailer control valve. A single relay valve is not acceptable. All trailers and semi-trailers to be fitted with a Relay Emergency Valve, operating the trailer or semi-trailer service brakes if the air pressure falls below a pre-set level. This pre-set level shall be at a pressure lower than the warning buzzer operating pressure.

18 Electrical System

- (1) The system voltage shall be a nominal 24 volts.
- (2) Only chassis earth points as defined by the vehicle manufacturer shall be used for the connection of any electrical components earth aft of the cab or fire-screen if any. If additional earthing points on the chassis are required, these shall be of a minimum 6 mm diameter, and shall use a stainless steel bolt. The chassis will have the paint removed locally, and the chassis shall be locally "tinned" with solder. All earthing terminals shall be ring type (not U type). The earthing bolt shall be secured either by tapping the chassis and adding a lock nut, or by using a nut and lock nut.
- (3) Batteries situated aft of the fire-screen if any shall be fitted in a box, suitably vented for the escape of any gas. If the box cover is metallic, it shall be rigid enough to withstand the weight of a standing man, without deflecting enough to touch the battery terminals. Battery terminals shall be insulated.
- (4) The vehicle shall be fitted with a dual pole master switch, fitted in the rear of cab area, forward of the fire-screen if any, provided that until 31 December 2012 single pole master switch may be used. The master switch shall be operable from the drivers cab, and from a position at the rear of the cab on

the vehicle opposite side, by means of remote operation buttons. If the master switch is fitted inside a box then easy access must be provided so that the switch may be accessed quickly in an emergency. The switch must be operable:

- (i) From inside the cab;
- (ii) Externally in the area of the back of cab, on the RHS;
- (iii) Externally in the area of the back of cab, on the LHS.

The in-cab master switch remote control shall be placed in a position easily accessed by a driver wearing a seat belt, and recessed in a shroud to prevent inadvertent operation. The master switch must disconnect all electrical circuits from the batteries except GPS monitoring system.

- (5) The wiring shall be single pole (earth return type). All wiring is to be PVC insulated and of suitable gauge for the current carried as specified by manufacturers' wiring diagrams. All wiring aft of the fire-screen if any is to be additionally enclosed in rigid non-conducting polyamide conduit of approved make, including all junctions.
- (6) The vehicle shall be fitted with a jump-start plug situated forward of the fire-screen if any, and must carry jump-start cables at least 5 metres long. These shall be fitted with insulated battery connections at the other end, so that they may be directly attached to the batteries of another vehicle. Jump-start cables with spring loaded clamp connectors must not be carried.
- (7) Where wiring passes through any chassis member, or through any sheet metal components, it must use bulkhead connectors. Cable end connectors must be crimped and/or soldered to the cables. End terminals using clamping screws must not be used.
- (8) All electrical circuits, with the exception of those listed below, must be protected by circuit breakers or fuses of suitable load capacity as specified by manufacturer, and these shall be placed in an easily accessible box placed forward of the fire-screen if any or in the cab. All circuit breakers or fuses shall be suitably marked. Circuits that do not require fuses or circuit breakers are:
 - (i) Battery to cold start and engine stop.
 - (ii) Battery to alternator.
 - (iii) Alternator to fuse box or circuit breakers.
 - (iv) Battery to starter motor.
 - (v) Battery to power control of electrical endurance braking system (if fitted).

- (9) The following items of additional electrical equipment are to be fitted, unless already included in the standard vehicle build:
- (i) Two high intensity rear fog lamps, with an indicator lamp in the cab to show that they are switched on.
 - (ii) Reverse audible warning, actuated when reverse gear is selected.
 - (iii) Two front fog lamps.
 - (iv) In the case of an articulated vehicle a rear of cab light.

19 Chassis Equipment

- (1) The fuel tank and battery carrier shall be protected from side impacts by a side shield with sufficient strength to ensure that the fuel tank and battery carrier is not damaged in case of a collision. Vehicles shall also be fitted with side guards to give as much protection as possible to cyclists and pedestrians, so that they cannot go under the vehicle in the event of an accident.
- (2) All vehicles shall be fitted with robust metallic front bumpers and rear under-ride protection. If front bumpers are extended forward this shall be by less than 500 mm from the original design condition, and this must be done in a manner, which avoids any sharp edges, or protrusions that can cause increased damage to other vehicles or pedestrians in accidents. The rear bumper and under-ride protection must be of robust construction to protect the tank and contents in a rear collision. The bumper/under-ride protection system must be positioned at least 150 mm behind the rearmost part of the tank, or of any piping or valve that may be filled with product in normal road transportation.
- (3) All vehicles will be fitted with a front towing pintle, which is strong enough for vehicle recovery towing. If the vehicle or front pintle is not suitable for suspended towing this must be clearly marked adjacent to the pintle.
- (4) The vehicle must carry two wheel chocks, in an accessible place.
- (5) The vehicle must be fitted with mud wings on all axles.
- (6) The vehicle must be fitted with a metallic fire-screen if any, which is the full width of tank or cab, whichever is the greater. The material shall be a minimum of 1.2 mm thick sheet steel or 2 mm thick aluminium. In height, the fire-screen shall extend from the highest point in the cab, to the top of the chassis frame. The fire-screen may be made in several parts to allow removal for service access, but these must be connected overlapping at least 25 mm (1.0 inch) to avoid gaps. In the case of a vehicle fitted with a metallic cab, the cab itself may comprise the upper portion of the fire-screen, but additional lower portions will be required. Any cab rear screen will be replaced either by a metallic panel or by wired glass at least 6 mm in

thickness. If wired glass is used it must be retained in place by a fire resisting mounting (i.e. not solely by the rubber glazing gasket).

- (7) In the case of an articulated vehicle the tractor unit will be fitted with a 2" or 3.5" Fifth Wheel unit having suitable D value for the outfit. Tractor/semi-trailer brake connections will be by flexible pneumatic hoses (two or three line systems) fitted with quick release couplings at both ends. Electrical connections will be by SAE 7 pin plug and sockets, either one or two. If two are fitted these shall be clearly differentiated. Tractor-trailer connection cables will be 7 core double insulated cables. Loose wires taped together are not acceptable.
- (8) In the case of a drawbar vehicle the tractor unit shall be fitted with a drawbar towing coupling of suitable strength for the outfit. Tractor-trailer brake connections will be by flexible pneumatic hoses (two or three line systems) fitted with quick release couplings at both ends. Electrical connections will be by SAE 7 pin plug and sockets, either one or two. If two are fitted these shall be clearly differentiated. Tractor-trailer connection cables will be 7 core double insulated cables. Loose wires taped together are not acceptable.
- (9) Articulated semi-trailers will be fitted with two speed-landing legs of suitable capacity (laden), and with side-to-side and fore and aft bracing.

20 Driver's Cab

- (1) The cab may be forward control (cab over engine) type or bonneted.
- (2) The cab is to be sleeper type, having at least one bunk, 1.8 metres long, 0.5 metres wide at the head end, and 0.3 metres wide at the feet end. The bunk must be useable when the vehicle is being driven, without restricting the fore-aft adjustment of the driver's seat.
- (3) The cab may be air-conditioned.
- (4) The cab must have seating for at least the driver and one passenger.
- (5) All seats must be fitted with inertia reel three points safety belts.
- (6) The vehicle shall be fitted with a GPS positioning system, which transmits data on the vehicles speed and position to a base station. If a GPS positioning system is fitted, the data shall be recorded and stored for at least 6 months. If a tachograph is fitted, this shall be lockable by key, which is not accessible to the driver, and the card will be of sufficient duration to cover the proposed journeys. Cards will be fitted for each trip, and stored by the operator for 6 months.
- (7) The vehicle will not be fitted with a hand accelerator control, cigarette lighter or any additional electrical point.

- (8) Radio/cassette player or any other communication device, if fitted, shall be of minimum 12V rating. Power supply shall be through fused wiring directly from the fuse box.
- (9) The front screen will be of laminated glass. The side screens will be either laminated or toughened glass.
- (10) The cab will be fitted with external rear view mirrors and a kerb view mirror.
- (11) The cab will carry a first aid kit comprising of the following minimum:
 - (i) Eye Wash Bottle, small bundle of cotton, Band Aid, Splint.
 - (ii) Bandages 2",4"&6", crape bandage, Gauze, A Pair of Scissors, Anti Septic Application e.g. Dettol, Tincture Benzoin, Mercurochrome Lotion.
 - (iii) First Aid Medicines for burns, anti bacterial ointment, pain relievers.
- (12) The cab shall carry at minimum 01 fire extinguisher of 1 to 2 KG DCP (dry chemical powder) or CO₂ fire extinguisher(s) in working condition of type ABC (different classes of fire).

Chapter- 4

Cargo Tank and Equipment (Bottom / Top Loading Vehicles)

21 Legislation and Standards

- (1) The tank and equipment will meet all the applicable legislation and regulations on petroleum product carriage in Pakistan. e.g. Department of Explosives, Excise & Taxation Rules, Weights & Measures Rules, NHA Regulations.
- (2) The tank and equipment will meet the standards of European ADR (ADR - transportation of dangerous goods by road), except as modified by this standard.

22 Overall Design

- (1) Any tank compartment in excess of a total volume of 8,000 litres shall have internal baffles or stiffeners sub-dividing the compartment into volumes of 8,000 litres or less.
- (2) An additional allowance of at least 5% of individual compartment capacities shall be allowed to obtain the "gross water capacity" of each compartment.
- (3) The overall width of the tank must not exceed the width of the rear axle(s) measured over the tyre sidewalls.
- (4) In the case of a trailer or semi-trailer tank, the design may be either:
 - (i) Chassis type, where the tank is mounted to a robust chassis.

- (ii) Integral type, where the tank itself acts as a stressed member.

In either case the structural strength should be designed in such a manner as to withstand all normal running loads experienced by the vehicle in service.

- (5) No specific tank maximum size is defined, apart from those resulting from axle loading, overall vehicle size constraints, and stability considerations.
- (6) Thru GPRS Trackers system this can be locked upon all manlids, outlet valves and other points where entry may be gained to the tank must either be fitted with a tamper-proof evident sealing system giving a clear visual indication if the tank has been opened outside the loading or unloading depots. Fittings where access can be gained to the tank contents only by removal of threaded fasteners are not considered providing adequate security.

23 Tank Construction Materials

- (1) The tank is to be made of mild steel plates or aluminium plates.
- (2) Steel to be of classification Paksteel HR 275 (PS 1020) or equivalent, which corresponds to ISO 4995. The entire tank shell, bulkheads, baffles, dish ends, saddles, cradles, etc. to be a minimum of 4 mm thickness. Tanks that have had their capacity increased by cutting and addition of a spacing steel strip are not acceptable.
- (3) Steel tanks to be free of any significant corrosion internally and externally. Maximum allowable depth of any corrosion pitting is 0.5 mm.
- (4) Aluminium tanks to be made of aluminium plate to classification 5083. The entire tank shell, bulkheads, baffles, dish ends, saddles, cradles etc. to be a minimum of 6 mm thickness.
- (5) The tank, including all valves and fittings, to be suitable for handling all white oil products in the range petroleum spirit (petrol/motor gasoline) kerosene (paraffin) and gas oil (distillate/ diesel).
- (6) In the case of a tank carrying Jet fuel (aviation kerosene), no component of the tank which may come into contact with the product may contain copper, or any alloy containing more than 35% copper. Internal painting for aviation fuel tankers must be carried out by reputable workshops.
- (7) All seals and gasket materials are to be resistant to petroleum products.

24 Tank Design and Construction

- (1) The tank cross-sectional shape shall have maximum radius of curvature of the side panels 2.0 metres, and a maximum radius of curvature of 3.0 metres for the top and bottom panels.

- (2) The tank may vary in depth along its length. The maximum rate of change of section shall be 300 in side elevation. Localised recesses allowing wheel intrusions are permitted in the tank shell, but they must be sufficiently reinforced, and a maximum of 250 mm deep from the normal tank profile.
- (3) All welds to be left in the as welded condition, and must not be filled, so that the welding may be visually inspected both internally and externally.
- (4) Tank to chassis mountings may be either bracket or fishplate. U Bolt mounting is not acceptable.
- (5) All tank mounting must comply with the chassis or trailer manufacturer's instructions as laid down in the Bodybuilder's Manual Bodybuilder's Drawing or otherwise. It is the tank manufacturer's responsibility to ensure that approval is obtained from the chassis manufacturer or his agent.
- (6) Cradles or bearers must be of generous dimensions to avoid high stress concentrations on the tank shell.
- (7) Cradles and bearers should wherever possible be located at the longitudinal positions of the tank baffles or bulkheads, otherwise the tank should be strengthened by providing internal or external gussets or stiffeners.
- (8) All bolts used for tank attachment shall be of Carbon Steel Grade 8.8.
- (9) Bracket mountings should have lips, which contact the top flange of the frame so that the fixing bolts are relieved of high shear stress.
- (10) All divisions between compartments must be single thickness.
- (11) Baffles are to be provided with cut outs at 6 and 12 o'clock position of 300 mm diameter, and at 3 and 9 o'clock of 75 mm diameter, to allow complete drainage of the tank/compartments in any situation, including overturned. Each baffle is also to be provided with a centre hole of 500 mm diameter in order to permit access from chamber to chamber within the tank. Reinforcement can be provided if required.
- (12) Baffles and partitions may be either singly curved (in plan view) or doubly curved (in both plan and side elevations - "dished"). Baffles must have a maximum radius of curvature of 3 m in plan view. All baffles and partitions (divisions) to be flanged with at least 20 mm flat portions of the flange. Welding between the baffle or partition and the tank skin should be at the flange end only.
- (13) Ends may similarly be either singly or doubly curved, with the same radius limitation as above. Ends must also be flanged with a 20 mm flat portion. Welding on the ends should be carried out on both the flange edge and the end edge of the skin section

- (14) Coamings / valances are to be fitted to the tank top to provide protection to the tank top fittings in the event of a rollover. They are to be made of flanged profiles in 2 mm thick steel sheets, or 4 mm thick aluminium sheets, and will be at least 50 mm high above the highest fitting. Closing plates are to be welded transversely between the coamings front and rear. One of the coamings is to be used as a vapour collection manifold for Bottom Loading System.
- (15) Drain tubes of a minimum internal diameter of 25 mm (1.0 inch) are to be provided either internally, or preferably, externally. These are to drain and water collected in the tank top area. The outlets from such drain tubes are to be directed away from any sensitive equipment, electrical equipment or hot area of the vehicle.
- (16) Drain tubes are not to be used for any other function.
- (17) Service tubes are to be provided (air, electrical and overspill protection system). These can be internal or external. The design must be such that neither water, nor product spilt in a top loading operation can enter the tube; this can be done by raising the service tube inlet above the immediate level of the tank top, and incorporating an 180 degree bend. The service tube must have at least 5 mm wall thickness if installed through the tank. Care must be taken that no chafing can occur between the services running through the tube and the edge of the tube. This can be done by rubber grommets, clamping, or preferably by both methods. (Basically service tubes are required for Bottom Loading Systems and must not be allowed through the tank.)
- (18) Any attachments to the tank shell are to be with doubler plates or L shaped brackets.
- (19) Pipe-work (product or vapour) supports are not to be used for any other purpose, or for attaching any other component.
- (20) A sump is to be provided in each compartment with a minimum slope of 1 in 20.
- (21) Vapour collection vent valve and pipe-work will be fitted to each compartment. All pipes and manifolds should have a minimum cross-sectional area of 7,800 sq. mm (equivalent to a 100 mm pipe). At the rear of the coaming a pneumatically operated central vent valve (dump valve) will be fitted. The dump valve shall be capable of being connected to the vapour recovery system of the filling equipment. If no vapour recovery system is fitted at the filling station the dump valve shall exhaust to the open atmosphere.
- (22) Run off pipes, from each foot valve to its associated outlet valve, are to have a continuous minimum slope of 1 in 20.
- (23) A deflector plate will be fitted above the foot valve in each compartment to prevent jetting of the product being loaded inside the compartment. If a

suitable deflector plate is incorporated into the foot valve an additional plate is not required.

- (24) The tank shell design must be such that the vehicle may be converted to meet all the requirements of the Bottom Loading System at a later date without welding or applying heat to the tank.

25 Tank Equipment General

- (1) Each item of tank equipment must be installed to ensure electrical continuity of 10 ohms or less (for metallic components) exists between it and the tank shell, and any earthing pin or bar fitted.
- (2) A pressure switch shall be included and connected into the overload protection system so that a non-permissive signal is given when the system pressure is insufficient/ excessive to operate the valves. This Regulation applies only to Bottom Loading Systems.

26 Manlids and Fill Covers

- (1) Each separate compartment isolated by partitions shall be equipped with a manlid of diameter ranging more than 450 - 500 mm (18 – 20 inches) minimum.
- (2) Manlids are to be positioned on the tank top to take into account the requirements of other equipment such as foot valve access, dip tube location, and attachment of other equipment, such as vapour venting and high level probes.
- (3) A suitable dip tube mandrel shall be fitted to each compartment made of 1.5 inch (38 mm) diameter schedule 40 pipes with a perforation of 24 holes of 12 mm diameter of pitch of 130 mm. One hole must be above the product level in the full condition. At the top of the mandrel a screwed cap with proper sealing arrangement to be provided. A corrosion resistant dipstick, graduated in millimetres to be provided in each mandrel.
- (4) A fire engulfment relief valve is to be included in the man lid. Opening pressure set to 210 mbar. At least one manlid incorporating a fire engulfment valve shall be fitted to each compartment, not exceeding 16 KL capacity.
- (5) A pressure/vacuum vapour vent valve, with settings of +70 mbar pressure, and -20 mbar vacuum is to be fitted in each manlid.

27 Foot Valves

- (1) The foot-valves shall be pneumatic pressure operated, with interlocks as described in Regulation 29. They shall be non-pressure balanced.
- (2) Foot-valves are to be a minimum of 100 mm nominal size.

- (3) Foot-valves with wire mesh strainers to handle different petroleum products as specified by manufacturer to be fitted.

28 Outlet Valves / Loading Adapters

- (1) Outlet valves are to be open-and-shut adapters conforming to the API, 4 inch standard or 2 ½ inch threaded NPT to 4 inch flange. They are to be provided with a suitable cap to be secured over the outlet, attached by a chain or wire.
- (2) The outlet valves are to be situated together in a steel or aluminium cabinet with a lockable door. The door shall be guarded by a pneumatic switch with interlocking (see Regulation 29).
- (3) The operation of the discharge valves shall be mechanical. An external indication of the position of the internal poppet valve must be provided when this is not evident from the valve operation.
- (4) Outlet valves are to be mounted with the coupling face substantially vertical.
- (5) Outlet valves are to be mounted on the vehicle left hand side. They are to be positioned at least 300 mm apart horizontally, and at a convenient working height above the ground (0.6 to 1.2 metres).

29 Outlet and Loading Valve protection, anti-drive away interlock

- (1) The discharge cover must provide protection for the valves, ensure that unauthorised removal of the valve caps cannot occur, and provide an interlock to stop the vehicle being driven away with any hose or cable still connected. Alternatives to an interlocked cover may be considered if they achieve the same functionality.
- (2) The system must be interlocked with the vehicle's braking system in a manner approved by the chassis manufacturer, such that, the vehicle cannot be driven with the discharge cabinet cover not in the safe position.
- (3) If this system uses pressure applied service brakes to achieve this function, the system must also incorporate a clear visual or audible warning, external to the cab, that shall function if the service brake pressure drops to 50% of its normal operating pressure and if the cabinet door is open.
- (4) The visual or audible warning shall not be electrically operated so that it remains effective even if the vehicle master switch is open.

30 Vapour Vent Valves for Bottom Loading Systems

- (1) In the case of Bottom Loading Systems:

- (i) Vapour vent valves shall be fitted to the tank top, for each compartment, in such a way that they are protected in a vehicle rollover.
- (ii) The tank equipment control system shall ensure that the vapour vent valves are all open before loading can commence so as to ensure that vapour is directed to the vapour collection manifold and from there to the central vent (dump) valve. This is to be achieved by a sequential pneumatic control system which requires each vapour vent valve to be opened before a permissive signal can be given by the overfill protection signal.

31 Overfill Protection System for Bottom Loading Systems

(1) In the case of Bottom Loading Systems:

- (i) A self-checking fail-safe overfill protection system is to be fitted in accordance with the manufacturer's recommendations. The system type is to be five wires with optic sensors, and pneumatic pressure switch.
- (ii) The probes are to be set 25 mm above the nominal compartment full level, to avoid false non-permissive signals. Sensor protection shrouds are to be fitted and they are to be perforated to the top of the shroud to allow full entry of overflowing product through the shroud.
- (iii) A socket is to be provided in the discharge cabinet and adjacent to, and rearwards, of the outlet valves for connection of the plug and cable of the gantry based overfill protection system.

32 Pneumatic System

- (1) The vehicle is to be provided with a pneumatic system that controls and monitors the various pneumatic components, such as foot valves, vent valves, emergency push buttons etc. This system is to be mounted in a "Control Cabinet API Box" on the left side of the vehicle, and shall consist of:
- (i) A system protection valve so that any failure of the system does not impact the vehicle's braking ability.
 - (ii) A pressure protection valve to protect the tank pneumatic system from excessive pressure from the vehicle's air reservoir.
 - (iii) A 40-micron filter with automatic drain, capable of removing solid and liquid contaminants. A regulator and pressure gauge so that the tank system pressure may be set to the optimum pressure of 5 bar.

- (iv) Parking brakes interlock allowing operation only when the vehicles parking brakes are applied. This should also become effective if the park brake is released during the loading or unloading process.
 - (v) Cabinet door interlock, closing all the foot valves and shutting off the air supply when the cabinet door is closed.
 - (vi) Control switches/valves, one for each compartment foot valve.
 - (vii) 4 inch Bottom Loading API adapter. This is a dry break connection to connect the gantry loading arm to the vehicle. It is fitted with a product indicator giving a visual check of the presence of product in the pipework. It is fitted with a quick release dust cap.
 - (viii) Pressure switch and optic multipoint receptacle. This is connected to the overfill sensor by a pneumatic nylon tube, and further connected to the "Optic Multi-pin Receptacles" on either side with the electrical wires.
 - (ix) Emergency push buttons will be fitted, one inside the cabinet and one placed on the tank right hand side near the front of the tank.
- (2) Provided that Regulations 32(1)(iv), 32(1)(vii) and 32(1)(viii) above shall not apply to top loading vehicles.

33 Electrical System

- (1) Any additional wiring shall be PVC insulated and of suitable gauge for the current carried. It shall be enclosed in non-conducting polyamide conduit including all junctions.

34 Other Equipment

- (1) Suitable discharge hoses are shall be carried in containers with a lid and locking arrangement.
- (2) One Fire extinguisher Min Capacity 9 Kg DCP of type ABC in working condition shall be mounted on each side of the tanker. Access and operation of the extinguisher shall be unimpeded.
- (3) Kemlar or HAZCHEM plates with product code shall be fitted, one each side. Orange plates shall be fitted at front and rear of the vehicle as per requirement of the organization it is representing.
- (4) Compartment number and capacity plates shall be permanently marked on the left hand side of the tank coaming and on a steel plate above each outlet valve. These plates shall show the product identification tags.

35 Tank top access

- (1) A tank top walkway shall be fitted between the tank top coamings. Non-slip material shall be attached to the tank top in all areas where an operator may require access.
- (2) A ladder shall be provided as per design of the tanker from an approved workshop giving easy access to the tank top area.

36 Painting and Livery

- (1) The vehicle shall be painted with paints of quality & scheme as specified by individual organization it is representing and shall be fitted with appropriate decals as defined by individual organization it is representing.

37 Calibration and Testing

- (1) Each compartment shall be calibrated to the liquid full condition, and to the ullage marker, dipstick or other contents measurement. The Manual of Petroleum Measurement Standard API-2554 Calibration for Tank Cars shall be applicable.
- (2) In the case of Bottom Loading Systems, the ullage space between the point at which the overfill protection probe is triggered by overfilled product, and the mounting pad for the conventional vapour vent valve shall also be calibrated and shall be a minimum of 150 litres .
- (3) Complete tank and individual compartments thereof shall be pressure tested to 350 mbar at new build, and shall be periodically retested at regular intervals (not exceeding 12 months) to 200 mbar. Tank must be visually inspected for leakage during testing, and deflections of compartment dividers must be measured during testing.

Appendix A- Rolling Gradeability Requirements

The requirement for a rolling gradeability shall be taken as met provided that the following relationship is demonstrated by calculation:

$$\frac{T \times A \times G}{(RC) \times (GW)} > K1$$

Where:

T is the maximum engine torque in Kgf. Metres to DIN Standard 70 020 Net.

A is the axle numerical ratio. G is the lowest gear ratio.

RC is the tyre rolling circumference in millimetres, and may be taken from:

9.00 R 20	3105	10.00 R 20	3209
11.00 R 20	3300	12.00 R 20	3422

(For other tyres, the published rolling circumference from the tyre makers' technical data shall be used).

GW is the total vehicle weight in tonnes (GVW, GCW or GTW as applicable).

For a 20% grade K1 = 0.0372. For a 15% grade K1 = 0.0286. For a 12% grade K1 = 0.0215

The requirement for a certain vehicle-gear speed shall be taken as met if the following relationship is demonstrated by calculation.

$$\frac{(\text{Max. RPM}) \times (RC) \times 60}{A \times G1 \times 1,000,000} \geq K2$$

Where:

Max. RPM is the Engine Rated Speed.

RC is the tyre-rolling circumference as above.

A is the axle numerical ratio.

G1 is the top gear ratio.

K2 is the geared speed in kph.

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