



**Ministry of Energy & Energy Industries**

# **GUIDELINES FOR THE TRANSPORTATION OF PETROLEUM BY ROAD TANK WAGONS**

## **DRAFT**

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## **Guidelines for the Transportation of Petroleum by Road Tank Wagons<sup>1</sup>**

This document has been prepared to offer guidance to users of tank wagons in Trinidad and Tobago.

The development committee was requested to prepare a document reflective of the regulations and safety requirements associated with the transportation of petroleum and its derivatives by road.

References and requirements to local standards and their contents take precedence over any other mentioned.

It must be noted that this document is not all encompassing and is subject to change. Where local legislation may be silent, appropriate international codes and standards should be referenced. The Ministry of Energy and Energy Industries, together with other authorities having jurisdiction, would pronounce as to the fitness for use of all tank wagons to be used in the bulk transportation of petroleum.

It is anticipated that users of this document, and the materials referenced, would form the base for a safe, health conscious and environmentally responsible operation in the transportation of petroleum and petroleum derivatives by road and act as the primary and minimum requirements in this industry.

THE STORAGE AND HANDLING OF PETROLEUM IS PROVIDED FOR THROUGH THE PETROELUM ACT CHAP. 62:01 WITH REFERENCE TO PART II AND III OF THE ACT.

### **Development Committee**

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<sup>1</sup> The term "Road Tank Wagon" shall include both the articulated and rigid designed conveyance, used for the transportation of bulk petroleum by road unless otherwise specified.

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## **1. General**

### **1.1. Purpose**

The Guidelines for the Transportation of Petroleum by Road Tank Wagons is intended to, when observed, offer greater degrees in safety in the use of tank wagons for the transportation of petroleum in Trinidad and Tobago.

The intent of the Ministry's Guidelines for the Transportation of Petroleum by road tank wagons is to promote and standardize the safety, health and environmental practices with road tank wagons that are used for the transportation of hazardous substances in Trinidad and Tobago.

### **1.2. Scope**

The guideline is intended to cover the transportation of the following commodities in tank wagons:

- a. Crude Petroleum
- b. Derivative of petroleum e.g. diesel, LPG, gasoline
- c. Liquefied natural gas
- d. Natural gas liquids e.g. butane, propane and its derivatives

## **2. Road Tank Wagon**

### **2.1. Definition**

A Road Tank Wagon or RTW is a composite unit consisting of a propelling motor and cab together with one or more tanks fixed to a chassis such that bulk transportation of petroleum can be done.

Such vehicle would satisfy the minimum requirements listed by the authorities having jurisdiction and, in any case, meet or exceed the nominal standards of CFR 49, IP (Model Code of Safe Practice) or any code that the Government of Trinidad and Tobago elects to recognize.

### **2.2. Documentation**

#### **2.2.1. Registration**

Tank wagons satisfying the description as a road tanker wagon should be registered, prior to deployment into service in the petroleum industry, and permitted by the authorities having jurisdiction. A tank wagon may therefore need to satisfy, one or more authority in order to be registered.

#### **2.2.2. Insurance**

Insurance for the use of tank wagon should be obtained and kept aboard the cab of the propelling unit.

### 2.2.3. Certification

A manufacturer's certificate should be provided for every tank used in the transport of petroleum. (No tank should be used in the transport of petroleum unless it is constructed and certified for the intended purpose)

### 2.2.4. Additional documentation

Additional documentation that should be carried on board the vehicle should include:

- a. Cargo inventory
- b. Material Safety Data Sheet (MSDS)
- c. Cargo destination
- d. A clear indication of the route (and alternative route) to be followed by the vehicle. (All the routes must be approved by the Trinidad Transport Board for all Road Tank Wagons classified as Special Vehicles, i.e. vehicles with a maximum gross weight in excess of 15000 kg)

## 2.3. Chassis

- a. The chassis and or its relationship with other parts of the tank wagon should not be modified or adjusted other than as designed.
- b. Load bearing members of the chassis should show no signs of corrosion, deformation, or any effects that are associated with excessive stress.
- c. The chassis should be of sufficient and adequately designed to support and protect the tank inclusive of the environment.
- d. All constructions should be protected from corrosion or damage, which may possibly arise from its exposure to the cargo or environment.

## 2.4. Braking

Road tank wagons should be provided with means to prevent accidental motion.

## 2.5. Fifth Wheel Assembly

Road tank wagons fitted with the "5<sup>th</sup> wheel" mechanism should only be used when the "5<sup>th</sup> wheel" assembly satisfies the minimum requirements of the authority having jurisdiction.

## 2.6. Cargo tank

Cargo tanks should be adequately designed for the intended application. Such tanks should be capable of containing cargoes having regard to temperature, pressure, chemical characteristics and the flammable and/or combustible nature being transported.

#### 2.6.1. Material

Any material used in the construction of the tank should be in accordance with, and acceptable in nature by, observed standards of TTBS or authorities having jurisdiction.

#### 2.6.2. Design

Tanks should be designed in accordance with acceptable standards. The tank should not be modified from its original design without approval from the authority having jurisdiction.

#### 2.6.3. Structural Integrity

The structural integrity should at all times be maintained. The maximum calculated stress value should not exceed 20% of the minimum ultimate strength of the material or authorized except when ASME pressure vessel design requirements apply.

#### 2.6.4. Loadings/ Stresses

- a. Cargo tanks should be designed with adequate and sufficient structural elements to prevent resulting stress in excess of those permitted by design. Cargo tanks should, therefore, be structurally designed to exceed and be protected against:
  - i. Dynamic loading under product load configuration.
  - ii. Internal Pressure
  - iii. Superimposed loads.
  - iv. Reaction of supporting lugs and saddles or other supports.

#### 2.6.5. Joints

All joints should satisfy or exceed the recognized standards by the authority having jurisdiction.

#### 2.6.6. Supports and Anchoring

- a. Cargo tanks with frames not made integral with the tank as by welding should be provided with restraining devices to eliminate any motion between the tank and the frame.
- b. Restraining devices should be made accessible for maintenance, insulation and jacketing permitting.

### **2.7. Accident Damage Protection**

- a. The design of the tank wagon should provide the cargo tank with adequate and sufficient protection from accidental damage.
- b. All outlets, valves, closures, piping and other devices in contact with lading should have accident damage protection.

- c. For piping extending past the accident damage protection, there should be a stop-valve and a sacrificial device located outboard of the stop-valve and within the accident damage protection.
- d. Lading discharge openings equipped with internal self-closing stop-valves should either have a sacrificial device located outboard of valve or bottom damage protection.

#### 2.7.1. Appurtenances

- a. Appurtenances should not project external to the road tank wagon and should benefit from being sited in protective relation to frame, chassis, overturn protection and other external fixture.
- b. Appurtenances should not be welded directly onto the shell unless an approved method such as use of a mounting pad is employed.
- c. Metal fittings such as conduit clips, brake line chips etc. should be of construction of material appreciably less strong but not more than 72% of the thickness of the tank shell or head. Such may be secured directly to the tank providing that there is no corrosion arising from its attachment or comprising of the tank structure.

#### 2.7.2. Road Clearance

Sufficient and adequate clearance should be afforded the tank from the road.

#### 2.7.3. Rear-end Protection

Every road tank wagon should have rear-end protection.

- a. The device should be able to protect the tank and the piping in the event of a rear-end collision and minimize the possibility of any part of the colliding vehicle striking the tank.
- b. The bottom surface of the device should be at least 10 cm (4") below the lowest component, containing lading whilst in transit and at most, 150 cm (60") from the ground when the tank is empty.
- c. The rear-end protection, such as the bumper, should be located at least 15 cm (6") to the rear of any vehicle component or tank fitting etc.
- d. The following conditions apply to rear-end protection consisting of separate sections:
  - i. Any piping located at the rear of the vehicle should be equipped with a sacrificial device outboard of a shut-off valve.
  - ii. The separation between sections should be limited to 60 cm (24") at most.

#### 2.7.4. Overturn Protection

All closures for fittings, manholes, or inspection openings should be protected from damage that may arise from accidents.



## **2.8. Piping**

- a. All piping used for the loading and/or unloading or supplying of petroleum road tank wagon should be
  - i. Designed for the product, type, pressures and temperatures
  - ii. Provided with fittings and seals
  - iii. Protected from damage
  - iv. Colour coded where applicable
  - v. Fitted with adequate valves, plugs and bungs
  - vi. Provided with safety type fittings such as shear and couplings/sections
- b. Strength of piping, fittings, hose, coupling should be such that any cargo being transferred is safely contained.
- c. Such items should be resistive to the cargo, its temperature, environment and other impacting considerations that may compromise the safety of the handling of petroleum.
- d. It is recommended that only approved piping, fitting, couplings etc. should be used in the transfer of products.
- e. Where necessary, certification through retesting should be done to ensure compliance.

### **2.8.1. Provision for Expansion and Vibration**

Suitable provisions should be made to allow for and prevent damage due to expansion, jarring and vibration of all piping.

### **2.8.2. Heater coils**

Heater coils, when installed, should be constructed such that the breaking-off of their external connections will not cause leakage of contents of tanks.

## **2.9. Hoses and Couplings**

- a. Hoses and couplings should be maintained leak free.
- b. Hoses and couplings should only be used in the services for which they are designed.
- c. Maintenance and inspection of hoses and couplings should be carried out to prevent compromising the safety inherent in their design. Records of such tests should be kept.
- d. Hose clamps, clips and other fixing means should satisfy the manufacturer's design and be of type approved by the authority having jurisdiction.

## **2.10. Tank Outlets & Openings**

- a. Each opening should be closed with a plug, cap or bolted flange.
- b. Each loading/unloading outlet should have at least one stop-valve.
- c. Tanks in low-pressure service should have either an internal self-closing stop-valve or a remotely operated external stop valve near to tank wall.
- d. Tanks in high-pressure service should have a manual stop valve prior to the hose connection in addition to an internal self-closing stop-valve on the discharge lines. (Older tanks with excess flow valves on the discharge lines may be permitted).
- e. Each loading/unloading outlet should have a self-closing system capable of both remote activation and thermal activation (at not more than 121°C) if the cargo is of a flammable or combustible nature.
- f. Every outlet should terminate with a stop-valve or other such leak-tight closure.

## **2.11. Valves**

All valves used on road tank wagons should satisfy the approved standards associated with the intended application. Valves should be tagged or colour coded to differentiate service.

## **2.12. Gauging**

- a. Unless the cargo tank is to be filled by weight, there should be a gauging device that indicates the maximum permitted liquid level. (Gauge glasses are not permitted).
- b. Tanks in LPG service should have one of the following gauging devices or any other device deemed acceptable by the authority having jurisdiction:
  - i. Rotary tube
  - ii. Adjustable slip tube
  - iii. Fixed length dip tube
- c. All tanks/containers should carry accepted means of determining size of the cargo.
- d. Such indicators/tools should be calibrated, maintained, stored and protected from damage.

## **2.13. Calibration**

- a. All road tank wagons should be calibrated by the manufacturer or an approved authority.
- b. All tanks should be calibrated such that the minimum and maximum volumes are established and, where required, provided with a calibrated measurement tool and documented tank table.

- c. Where invasive means of gauging/measurement are used, ports and openings should be provided with means of isolation.
- d. Certification of the calibrated tank tables should be maintained as required by the authorities having jurisdiction.

## **2.14. Pressure Relief**

- a. The road tank wagon should have equipment to relieve pressure or vacuum conditions (for non-vacuum loaded tanks). Where such vents are for a pressured vessel the venting via relief valves is required. All pressure relief valves/vents should be designed to be in communication with the vapour/gas space of the tank.
- b. Shut off valves should not be provided as means of isolation of pressure relief valve/vents from the tank and its contents.
- c. The vents/pressure relief valves should be sited such that they are protected from impact and damage from exposure to the environment.
- d. Pressure relief valves/vents should be of adequate design to:
  - i. Withstand the physical requirements of siting.
  - ii. Offer sufficient capacity to relieve pressure thereby protecting tank and contents
  - iii. Resist exposure to the environment and/or any nature of the cargo
- e. The following provisions apply for the relief system where venting via pressure relief valves is required:
  - i. There should be a primary relief system with at least one reclosing pressure relief valve (Spring loaded safety relief valves should be used for tanks in LPG service).
  - ii. Gravity actuated reclosing valves are not permitted.
  - iii. The set pressure of the relief system should be between 120% and 132% of the MAWP and should reclose before 108%.
  - iv. Each pressure relief device should be permanently marked with the following:
    - Manufacturer's name;
    - Model number;
    - Set pressure, in psig; and
    - Rated flow capacity, in SCFH at the rating pressure, in psig.
- f. Normal venting - Tanks operating at or around atmospheric pressure and where the tank may experience vacuum and slight pressures above atmosphere should be fitted with adequate vents. These tanks should be fitted with the prescribed relief valves and such fittings should prevent cargo spillage in case of overturn.

### **2.14.1. Marking of Venting Valves**

Pressure/Vacuum relief valves should be marked as to capacity, type, last date of inspection.

#### 2.14.2. Additional Venting

Where additional venting may become necessary (as may be during operation abnormalities or accidents) other fixtures allowing relief of pressure may be necessary:

- Pressure actuated venting
- Fusible venting
- Rupture disc venting

These fittings should be maintained in conditions that would allow the maximum operability as per design.

#### 2.14.3. Vent Maintenance

All vents should be maintained in satisfactory operable condition. Testing, labeling and certification of vents should be done in accordance with approved practices, standards and legislation.

### **2.15. Vapour Recovery**

Any tank wagon receiving and dispensing gasoline should be equipped with a certified Stage I vapour recovery system. The following conditions should also be followed:

- a. Stage I systems should be able to recover at least 95% of all gasoline vapours at the facility or be at least as efficient as the manufacturer's design efficiency, whichever is higher.
- b. All hoses and equipment on the tank wagon shall be compatible with and properly connected to the equipment on the storage tank at the dispensing facility
- c. Stage II manifolds at a gasoline dispensing facility should not be utilized for the purpose of stage I vapour recovery unless the manifold meets the definition of stage I pursuant to this part.
- d. Coaxial systems shall use a separate coaxial coupling with a stage I vapour recovery hose for each tank.
- e. Dual-point systems shall use separate stage I vapour recovery connections at each tank. When dual-point connections are available on a stage I manifold, the same vapour recovery connection may be used to service all tanks on the manifold, provided there is at least one vapour recovery hose for each product hose.
- f. Stage I adapters or couplers that attach to the storage tank shall be equipped with closures that seal upon disconnect.
- g. During loading and unloading, cargo tanks shall have a back pressure that does not exceed 4.48 kPa (10.4 oz/in<sup>2</sup>) or 18 inches water column pressure

or 1.47 kPa (3.4 oz/in<sup>2</sup>) or 5.9 inches water column vacuum. A tank wagon not meeting this criteria should undergo repairs and be retested within 15 days.

### **3. Maintenance, Periodic Inspection, Testing and Re-certification**

#### **3.1. General**

All cargo tank appurtenances, associated piping, hoses, ancillaries and tank vehicles proper should be periodically inspected and maintained in good condition while in service. Key to this process is the maintenance of or accurate records on commissioning and subsequent periodic inspections.

#### **3.2. Garaging**

Adequate and sufficient garaging space should be afforded for the storage of all road tank wagons.

#### **3.3. Workshop**

Adequate and sufficient workshop area should be provided for the repair and maintenance of road tank wagon units. The workshop and all fixtures contained therein should be adequately designed for the purpose of repair of road tank wagon units transporting petroleum.

#### **3.4. Repair of Road Tank Wagons**

Adequate care should be taken to prevent any ignition source that may arise whilst maintenance/ repair is being carried out on a tank that may contain petroleum or its vapours.

- a. The owner of a vehicle used to transport liquid or gaseous petroleum in bulk should ensure that if the vehicle is to be brought into a building to carry out service or repair work on its cabin, chassis or engine the following requirements are observed before the vehicle is brought into the building:
  - i. Every transport tank and all piping and hoses on the vehicle should be emptied of liquid contents.
  - ii. All primary shut-off valves should be closed and all outlet or inlet connections should be capped.
  - iii. The person in charge of the workshop should be told of the nature of any residue in the transport tanks and bulk containers and that valves and fittings are not to be tampered with.
  - iv. No repair work should be performed on a transport tank or on any primary tank shut-off valve unless the tank and every compartment of it has been:
    - purged free of dangerous goods; and
    - inspected and tested in a manner sufficient to ensure that the tank is free of dangerous goods.

The above procedures should be documented and distributed to all persons involved in the maintenance and repair of road tank wagons.

### 3.5. Inspection and Retesting

#### 3.5.1. General

Each cargo tank in operation should be periodically inspected and retested according to the manufacturer's specification or legislation applicable to such an issue. Inspection should be done by an independent authorized testing agency recognized by the authority having jurisdiction.

#### 3.5.2. Conditions requiring testing and inspection

A cargo tank should be tested and inspected in accordance with this section prior to further use if:

- a. The cargo tank inspection or test has become due according to guidelines specified herein.
- b. The cargo tank shows evidence of bad dents, corroded or abraded areas, leakage, or any other condition that might render it unsafe for transportation service.
- c. The cargo tank has been in an accident and has been damaged to an extent that may adversely affect its lading retention capability.
- d. The cargo tank has been out of hazardous materials transportation service for a period of one year or more. Each cargo tank that has been out of hazardous materials transportation service for a period of one year or more should be pressure tested.
- e. The cargo tank has been modified from its original design specification.
- f. The authorities having jurisdiction as to the use of such tanks are not satisfied with the degree of safety displayed in its use.

### 3.6. Periodic Testing

Inspections and tests should be carried out with frequency specified by the following table.

Compliance Dates

Test or inspection	Cargo Tank specification/ configuration	Interval Period after first test
External Visual Inspection	All cargo tanks designed to be loaded by vacuum with full opening rear heads	6 months
	All other cargo tanks	1 year
Internal Visual Inspection	All insulated cargo tanks except those in high pressure or cryogenic	1 year

	temperature service	
	All other cargo tanks	5 years
Leakage Test	All cargo tanks	1 year
Pressure test (Hydrostatic or pneumatic) (See Note 1)	All cargo tanks which are insulated with no manhole or insulated and lined	1 year
	All cargo tanks designed to be loaded by vacuum with full opening rear heads.	2 years
	All other cargo tanks	5 years

Note 1: Pressure testing is not required for un-insulated lined cargo tanks, with a design pressure of MAWP 15 psig or less; which receive an external visual inspection and lining inspection at least once each year.

### 3.6.1. External Visual Inspection and Testing

Where insulation precludes external visual inspection, the cargo tank, other than tanks in high-pressure service, should be given a visual internal inspection. The tank should be hydrostatically or pneumatically tested where:

- Visual inspection is precluded by internal lining or coating, or
- The cargo tank is not equipped with a manhole or inspection opening.

External visual inspection and testing should include as a minimum the following:

- a. The tank shell and heads should be inspected for corroded or abraded areas, dents, distortions, defects in welds and any other conditions, including leakage, that might render the tank unsafe for transportation service. Corroded or abraded areas of the cargo tank wall should be thickness tested.
- b. The piping, valves, and gaskets should be carefully inspected for corroded areas, defects in welds, and other conditions, including leakage, that might render the tank unsafe for transportation service.
- c. All devices for fastening manhole covers should be operative and there should be no evidence of leakage at manhole covers or gaskets.
- d. All emergency devices and valves including self-closing stop valves, excess flow valves and remote closure devices should be free from corrosion, distortion, erosion and any external damage that will prevent safe operation. Remote closure devices and self-closing stop valves should be functioned to demonstrate proper operation.
- e. Missing bolts, nuts and fusible links or elements should be replaced, and loose bolts and nuts should be tightened.
- f. All markings on the cargo tank required of this guideline should be legible.

- g. All major appurtenances and structural attachments on the cargo tank including, but not limited to, suspension system attachments, connecting structures, and those elements of the upper coupler (fifth wheel) assembly that can be inspected without dismantling the upper coupler (fifth wheel) assembly should be inspected for any corrosion or damage which might prevent safe operation.
- h. The gaskets on any full opening rear head should be visually inspected for cracks or splits caused by weather or wear.

The results of the external visual examination should be recorded. A written report of each inspection should be retained in the files of the owner or operator until the next test or inspection of the same type is successfully completed.

#### 3.6.2. Internal Visual Inspection

When the cargo tank is not equipped with a manhole or inspection opening, or the cargo tank design precludes an internal inspection, the tank should be hydrostatically or pneumatically tested.

The internal visual inspection should include as a minimum the following:

- a. The tank shell and heads should be inspected for corroded and abraded areas, dents, distortions, defects in welds, and any other condition that might render the tank unsafe for transportation service.
- b. Tank liners should be inspected.

Corroded or abraded areas of the cargo tank wall should be thickness tested.

The results of the internal visual inspection should be recorded.

#### 3.6.3. Lining Inspection

The integrity of the lining on all lined cargo tanks, when lining is required, should be verified at least once each year.

Lining Inspection Method: Ref. CFR Title 49 Sec 180.407 (f) or any other internationally recognized standard.

#### 3.6.4. Pressure Test

Cargo tanks operating at 3 psig or less should be tested at 3 psig (20.7kPa) or design pressure, whichever is greater.

Note: Pressure testing is not required for uninsulated lined cargo tanks, with a design pressure of MAWP of 15 psig or less, which receive an external visual inspection and a lining inspection at least once each year.



Cargo tanks, which operate at high pressures and are used for the transportation of liquefied petroleum gas, should be internally inspected by the wet fluorescent particle method immediately prior to and in conjunction with the performance of the pressure test.

Pressure Test Method: Ref. CFR Title 49 Sec 180.407 (g); ASME BPV Code

#### 3.6.5. Leakage Test

The leakage test should include product piping with all valves and accessories in place and operative, except that any venting devices set to discharge at less than the leakage test pressure should be removed or rendered inoperative during the test.

Leakage Test Method: Ref. CFR Title 49 Sec 180.407 (h) or any other internationally recognized standard.

#### 3.6.6. Thickness Test

Thickness testing should be performed in the following areas of the cargo tank wall, as a minimum:

- i. Areas of the tank shell and heads and shell and head area around any piping that retains lading;
- ii. Areas of high shell stress such as the bottom center of the tank;
- iii. Areas near openings;
- iv. Areas around weld joints;
- v. Areas around shell reinforcements;
- vi. Areas around appurtenance attachments;
- vii. Areas near upper coupler (fifth wheel) assembly attachments;
- viii. Known thin areas in the tank shell and nominal liquid level lines;
- ix. Areas near suspension system attachments and connecting structures;
- x. Connecting structures joining multiple cargo tanks of carbon steel in a self-supporting cargo tank motor vehicle.

The in-service minimum thickness of any area should be no less than 90 percent of the specified manufactured thickness.

Thickness Test Method: Ref. CFR Title 49 Sec 180.407 (i) or any other internationally recognized standard.

#### 3.6.7. Test or inspection reporting

Each cargo tank, which is tested or reinspected as specified, should have a written report, in English, prepared in accordance with this paragraph.

The test or inspection report should include the following:

- i. Type of test or inspection performed and a listing of all items either tested or inspected (a checklist is acceptable);
- ii. Owner's and manufacturer's serial numbers;
- iii. Test Date (Month and year);
- iv. Location of defects found and method used to repair each defect;
- v. Name and address of person performing the test;
- vi. Disposition statement, such as "Cargo tank returned to service" or "Cargo tank withdrawn from service"; and
- vii. Dated signature of inspector and owner.

The owner and the motor carrier, if not the owner, should each retain a copy of the test and inspection reports until the next test or inspection of the same type is successfully completed.

Additional test or inspection report requirements for LPG cargo tanks:

- i. A statement indicating the methods employed to make repairs, the agent making the repairs, and the date they were completed. Also, a statement of whether or not the tank was stress relieved after repairs and, if so, whether full or local stress relieving was performed;
- ii. A statement of the nature and severity of any defects found. In particular, information should be furnished to indicate the location of defects detected, such as in weld, heat-affected zone, the liquid phase, the vapor phase, or the head-to-shell seam. If no defect or damage was discovered, that fact should be reported.
- iii. A copy of the report should be retained by the carrier at its principal place of business during the period the cargo tank is in the carrier's service and for one year thereafter.

## **4. Marking**

Every road tank wagon used for the transportation of any flammable or combustible liquids, regardless of quantity, or whether loaded or empty, should be conspicuously and legibly marked in accordance with the following, unless the TTBS and/ or other authorities having jurisdiction take precedence.

### **4.1. Markings**

- a. The cargo tanks of all road tank wagons should carry markings. Such markings should display the following:

Vehicle manufacturer:

Manufacturer's serial no.:

Date of Manufacture:

Original test date:

Certificate date:

Design Pressure:

Test Pressure:

Head material:

Shell material:  
Weld material:  
Lining material:  
Nominal tank capacity:  
Maximum product load:  
Loading limits:  
Unloading limits:

- b. These markings should not be modified, obstructed, made inaccessible or unreadable by paints or any fixtures.
- c. The installation of any plate with these markings onto the tank body should not compromise the safety of the tank.
- d. Means of attachment or display by such markings should not compromise the integrity of the tank.

#### 4.2. Placards

Placards/ warning signs/ internationally accepted signage, should measure at least 273mm (10.8 inches) on both sides and have a 12.7mm (0.5 inches) solid line inner border and be conspicuously sited. The text indicating the hazard and the hazard class should be at least 41mm(1.6 inches) in height for both. Descriptions of the appropriate placards can be found in

- USDOT CFR Title 49 Parts 172.519-172.560.
- IMO (International Maritime Organisation) IMDG (International Maritime Dangerous Goods Code)

Placards for flammable gas and liquid are shown below



## 5. Engines, Pumps and Compressors

### 5.1. Internal Combustion Engines

- a. Internal combustion engines installed or carried on a road tank wagon transporting Class I liquids for the purpose of providing power for the operation of pumps or other devices should be made safe.

- b. A spark ignition engine should not be used for powering a pump for flammable and/or combustible products.
- c. The engine air intake should be equipped with an effective flame arrester or an air cleaner having effective flame arrester characteristics. Such fitting should be designed so that any backfire is contained within.
- d. Exhaust system of internal combustion engines should be fitted with means of spark suppression. The routing of the exhaust should not compromise the safety of the cargo or persons.
- e. The fuel supply for auxiliary equipment should be constructed such that no impediment to access to cargo operations, safety, or fire hazard is introduced. Suitable shielding against physical impact or heat should be provided.

## **5.2. Pumps and Compressors**

- a. All positive displacement pumps/ compressors should be provided with a pressure relief system capable of preventing over-pressuring of the system.
- b. All rotating and reciprocating parts of pumps and other appurtenances should be adequately guarded.
- c. When a pump is used to deliver products, automatic means shall be provided to prevent pressure in excess of the design working pressures of the accessories, piping and hose.
- d. An electric motor should not be used to power a pump unless the motor and all electrical fittings and equipment are suitable for that use.

# **6. Driver Selection and Training**

## **6.1. Driver Selection**

- a. Personnel selected as drivers for transport of hazardous and flammable material should possess a valid driving license in a relevant classification from the local license authority.
- b. It is recommended that prospective drivers also possess the following:
  - Certificate of health from a recognized physician or general hospital.(This should include a drug test.)
  - Experience in driving the relevant class of vehicle.
  - Defensive Driving Certification

## **6.2. Training**

Recommended components of a training program are as follows:

- a. Theoretical and practical training relevant to
  - i. the type of vehicle, and
  - ii. class of hazardous petroleum product to be assigned to the driver concerned.

- b. Detailed theoretical and practical training on emergency response action to be taken in the event of an incident.
- c. Procedure to be followed by the driver on reaching his/her destination.
- d. Drivers/operators should be trained in the proper method of operating road tank wagons and in the procedures for loading and unloading road tank wagons.

## **7. Safety and Contingency Planning**

Main features of a Contingency plan should be (minimum requirements):

- a. Emergency response Plan.
- b. Systematic response plan in the event of spillage or accidental damage to tank.
- c. Driver and/ or attendant training in emergency operating response procedures.
- d. Functional communication devices (e.g. radio, cell phone) on the vehicle.
- e. Designation of an Emergency Control Coordinator to manage any accidents that may occur during operation of the transport vehicle.

## **8. Operation of Road Tank Wagon**

### **8.1. General**

- a. Road tank wagons should not be operated unless they are in acceptable state of repair.
- b. All covers excepting those being used for pressure control should be kept closed in transit.
- c. Cargo tanks, lines and hoses should be compatible with intended cargo.
- d. Class II or Class III liquids should not be loaded into adjacent compartments to Class I liquids unless double bulkheads are provided, nor should chemically non-compatible chemicals be loaded into adjacent compartments unless separated by double bulkheads.
- e. No road tank wagon should be:
  - i. Operated with cargo at a temperature in excess of the maximum allowable cargo temperature specified on the warning sign required.
  - ii. Loaded or transported at a temperature above its ignition temperature.

### **8.2. Loading and Unloading**

Loading and unloading of road tank wagons should only be done at approved locations.

### **8.3. Separation of trailer from prime mover**

If the composite units of an articulated road tank wagon are separated, the cargo tank must be so restrained and so supported on a surface of sufficient bearing capacity as to avoid the risk of moving or falling.

#### **8.4. Precautions Against Ignition by Static Charges**

Electrical bonding is essential when handling petroleum products that can form ignitable mixtures.

Some exceptions where bonding is not required are:

- i. When filling underground tanks
- ii. When loading and unloading through tight connections
- iii. When loading or unloading asphalt, crude oil, or a product containing substantial proportions of crude residuum or other liquids with low resistivities.

Ref.: NFPA 385 - Tank Vehicles for Flammable and Combustible Liquids 1990 edition; API RP 2003 5<sup>th</sup> Ed. – Protection Against Lightning, and Stray Currents.

#### **8.5. Extinguishers**

- a. Each road tank wagon should be provided with at least one fire extinguisher having a rating of at least 20-BC. When more than one fire extinguisher is provided, each extinguisher should have at least 10-B rating.
- b. Fire extinguishers should be kept in good operating conditions satisfying the authority having jurisdiction.
- c. Fire extinguishers should be accessible and be protected from the environment and impact.

### **9. Appendix A – Referenced Publications**

Petroleum Act, Chap. 62.01

New Hampshire Department of Environmental Services rules regarding vapor recovery: Part ENV-A 1205 Volatile organic compounds (voc): Gasoline dispensing facilities and cargo trucks

NFPA 385 – 1994, Tank Vehicles for Flammable and Combustible Liquids

NFPA 58 – 1998, Liquefied Petroleum Gas Code

API RP 2003 – 5<sup>th</sup> Ed. 1991, Protection Arising out of Static, Lightning and Stray Currents

API 2013 – Recommended Practice for Cleaning Mobile Tanks in Flammable or Combustible Liquid Service

CFR Title 49 – 1997, Parts 171 to 180

IP Model Code of Safe Practice – Marketing Safety Code

### **10. Appendix B – Definitions**

## 10.1. Acronyms

<b>API</b>	– American Petroleum Institute
<b>ASME</b>	– American Society of Mechanical Engineers
<b>ASME BPV</b>	– American Society of Mechanical Engineers Boiler and Pressure Vessel Code
<b>CFR</b>	– Code of Federal Regulations (U.S.A)
<b>IMO</b>	– International Maritime Organisation
<b>IMDG Code</b>	– International Maritime Dangerous Goods Code
<b>IP</b>	– Institute of Petroleum
<b>LPG</b>	– Liquefied Petroleum Gas
<b>MAWP</b>	– Maximum Allowable Working Pressure
<b>NFPA</b>	– National Fire Protection Association (U.S.A.)
<b>SCFH</b>	– Standard Cubic Feet per Hour
<b>TTBS</b>	– Trinidad and Tobago Bureau of Standards
<b>USDOT</b>	– United States Department of Transportation

## 10.2. Definition of Terms

**Appurtenance** means any cargo tank accessory attachment that has no lading retention or containment function and provides no structural support to the cargo tank.[CFR 49]

**Authority Having Jurisdiction** – The organisation, office or individual responsible for approving equipment, an installation, or a procedure.[NFPA]

**Bonding** means an electrical connection between an electrically conductive object and a component of a lightning protection system that is intended to significantly reduce potential difference created by lightning currents. [NFPA]

**Bulkhead** means a liquid-tight transverse closure at the ends of or between cargo tanks. [CFR 49]

**Cargo tank** means a bulk packaging which:

- (1) Is a tank intended primarily for the carriage of liquids or gases (including appurtenances, reinforcements, fittings, and closures).
- (2) Is permanently attached to or forms a part of a motor vehicle but which, by reason of its size, construction or attachment to a motor vehicle is loaded or unloaded without being removed from the motor vehicle; and
- (3) Is not fabricated under a specification for cylinders, portable tanks, tank cars, or multi-unit tank car tanks. [CFR 49]

**Cargo tank wall** means those parts of the cargo tank which make up the primary lading retention structure including shell, bulkheads, and fittings which, when closed during transportation of lading, yields the minimum volume of the cargo tank assembly. [CFR 49]

**Coaxial system** means a type of stage I system which consists of a tube within a tube. The fill tube, which is submerged in the gasoline storage tank, delivers the product through the inner tube. The vapors from the storage tank are returned via the outside space surrounding the fill tube. The single coupling services both the product and vapor recovery hoses.

**Combustible Liquid** – A liquid having a flash point at or above 37.8°C(100°F).[NFPA]

Combustible liquids shall be subdivided as follows:

Class II liquids shall include those having flash points at or above 37.8°C(100°F) and below 60°C(140°F).

Class IIIA Liquids shall include those having flash points at or above 60°C(140°F) and below 93.4°C(200°F).

Class IIIB Liquids shall include those having flash points at or above 93.4°C(200°F).

**Connecting structure** means the structure joining two cargo tanks. [CFR 49]

**Constructed and certified in conformance with the ASME Code** means the cargo tank is constructed and stamped in accordance with the ASME Code, and is inspected and certified by an authorized inspector. [CFR 49]

**Constructed in accordance with the ASME Code** means the cargo tank is constructed in accordance with the ASME Code with the authorized exceptions. [CFR 49]

**Dual-point system** means a type of stage I system which uses a vapor return connection at the tank which is independent of the fill port. Separate connections are made for both the product and vapor recovery hoses. This is also known as a "two-point system".

**External self-closing stop-valve** means a self-closing stop-valve designed so that the self-stored energy source is located outside the cargo tank and the welded flange. [CFR 49]

**Extreme dynamic loading** means the maximum single-acting loading a cargo tank motor vehicle may experience during its expected life, excluding accident loadings. [CFR 49]

**Flammable Liquid** – A liquid having a flash point below 37.8°C (100°F) and having a vapour pressure not exceeding 2068 mm Hg (40 psia) at 37.8°C (100°F) shall be known as a Class I liquid. [NFPA]

**Flange** means the structural ring for guiding or attachment of a pipe or fitting with another flange (companion flange), pipe, fitting or other attachment. [CFR 49]

**Internal Excess Flow Valve** means an excess- flow valve constructed and installed so that the seat remains in the container so that damage to valve parts exterior to the container will not prevent effective seating of the valve.[NFPA]

**Internal self-closing stop-valve** means a self-closing stop-valve designed so that the self-stored energy source is located inside the cargo tank or cargo tank sump, or within the welded flange, and the valve seat is located within the cargo tank or within one inch of the external face of the welded flange or sump of the cargo tank. [CFR 49]

**Lading** means the hazardous material contained in a cargo tank. [CFR 49]

**Loading/unloading outlet** means the cargo tank outlet used for normal loading/unloading operations. [CFR 49]

**LPG** means any material having a vapor pressure not exceeding that allowed for commercial propane composed predominantly of the following hydrocarbons, either by themselves or as mixtures; propane, propylene, butane (normal butane or isobutene), and butylenes. [NFPA]

**Manufacturer** means any person engaged in the manufacture of a specification cargo tank, road tank wagon or cargo tank equipment which forms part of the cargo tank wall. This term includes attaching a cargo tank to a motor vehicle or to a motor vehicle suspension component which involves welding on the cargo tank wall. [CFR 49]



**Outlet** means any opening in the shell or head of a cargo tank, (including the means for attaching a closure), except that the following are not outlets: A threaded opening securely closed during transportation with a threaded plug or a threaded cap, a flanged opening securely closed during transportation with a bolted or welded blank flange, a manhole, or gauging devices, thermometer wells, and safety relief devices. [CFR 49]

**Placard** – Printed sign indicating the class and nature of the hazardous cargo.

**Pressure Relief Device** means a device designed to open to prevent a rise of internal fluid pressure in excess of a specified value due to emergency or abnormal conditions. [NFPA]

**Pressure Relief Valve** means a type of pressure relief device designed to both open and close to maintain internal fluid pressure. [NFPA]

**Rear bumper** means the structure designed to prevent a vehicle or object from under-riding the rear of a motor vehicle. [CFR 49]

**Rear-end tank protection device** means the structure designed to protect a cargo tank and any lading retention piping or devices in case of a rear end collision. [CFR 49]

**Road Tank Wagon** is a composite unit consisting of a propelling motor and cab together with one or more tanks fixed to a chassis such that bulk transportation of petroleum can be done.

**Rotary Gauge** – A variable liquid level gauge consisting of a small positive shutoff valve located at the outer end of a tube, the bent inner end of which communicates with the container interior. The tube is installed in a fitting designed so that the tube can be rotated with a pointer on the outside to indicate the relative position of the bent inner end. The length of the tube and the configuration to which it is bent are suitable for the range of liquid levels to be gauged. By means of a suitable outside scale, the level in the container at which the inner end begins to receive liquid can be determined by the pointer position on the scale at which a liquid-vapor mixture is observed to be discharged from the valve. [NFPA]

**Sacrificial Device** means an element, such as a shear section, designed to fail under load in order to prevent damage to any lading retention part or device. The device must break under strain at no more than 70 percent of the strength of the weakest piping element between the cargo tank and the sacrificial device. Operation of the sacrificial device must leave the remaining piping and its attachment to the cargo tank intact and capable of retaining lading. [CFR 49]

**Self-closing stop-valve** means a stop-valve held in the closed position by means of self-stored energy, which opens only by application of an external force and which closes when the external force is removed. [CFR 49]

**Shear section** means a sacrificial device fabricated in such a manner as to abruptly reduce the wall thickness of the adjacent piping or valve material by at least 30 percent. [CFR 49]

**Shell** means the circumferential portion of a cargo tank defined by the basic design radius or radii excluding the closing heads. [CFR 49]

**Slip Tube Gauge** – A variable liquid level gauge in which a relatively small positive shut off valve is located at the outside end of a straight tube, normally installed vertically, that communicates with the container interior. The installation fitting for the tube is designed so that the tube can be slipped in and out of the container and so that the liquid level at

the inner end can be determined by observing when the shutoff valve vents a liquid-vapour mixture.[NFPA]

**Stage I** means the reference and description of the regulatory requirements with which owners of certain storage tanks at gasoline dispensing facilities and owners of certain cargo trucks are required to comply. These requirements involve the installation of vapor recovery equipment to certain cargo trucks such that gasoline vapors from such cargo trucks can be recovered from stationary storage tanks at such facilities during product delivery.

**Stage I system** means the gasoline vapor recovery system used during the transfer of gasoline between a stationary tank and a cargo truck. The term includes "coaxial system", and "dual-point system".

**Stop-valve** means a valve that stops the flow of lading. [CFR 49]

**Tank** means a container, consisting of a shell and heads, that forms a pressure tight vessel having openings designed to accept pressure tight fittings or closures, but excludes any appurtenances, reinforcements, fittings, or closures. [CFR 49]

**Test pressure** means the pressure to which a tank is subjected to determine pressure integrity. [CFR 49]

**Vacuum cargo tank** means a cargo tank that is loaded by reducing the pressure in the cargo tank to below atmospheric pressure. [CFR 49]