The Environmental Risk Management Authority
P O Box 131
WELLINGTON

Code of Practice for

Flammable Liquids Tank Wagons

A Code of Practice for the design and construction of vehicles for the bulk transportation of flammable liquids by road

Approved Code of Practice
Under the HSNO Act 1996

Code Reference: **HSNOCOP 6-1**
Date of Approval: **July 2008**

Preface

This Code of Practice (No. HSNO COP 6-1 December 2007) is approved pursuant to Sections 78 and 79 of the Hazardous Substances and New Organisms Act (HSNO Act). The Environmental Risk Management Authority has delegated the power to approve Codes of Practice to the Chief Executive of the Authority, and this code is approved in accordance with that delegation. It is confirmed that the requirements of Sections 78 and 79 have been met.

Approval of the code is limited to those matters in the document that relate to the HSNO Act and the regulations made under this act.

This code has been developed by the Environmental Risk Management Authority in association with the oil industry and sets out a means of compliance with the requirements of the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004 in respect of tank wagons that are used for the bulk transport of liquids with a 3.1 hazard classification.

The publication date in the Gazette for the Notice of Approval of this Code of Practice is 20 Dec 2007.

Pursuant to Section 80 (1) (a) of the Act, a copy of the code may be inspected at the Wellington office of ERMA New Zealand.

Pursuant to Section 80 (1) (b) of the Act, a copy of the code is available to download from the ERMA New Zealand website (www.ermanz.govt.nz).

Approved this 13th day of December 2007.

Rob Forlong
Chief executive

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1 Purpose, Scope and General

1.1 Purpose

1.1.1 The purpose of this Approved Code of Practice is to provide an acceptable solution for the design and construction of tank wagons for the conveyance of bulk flammable liquids by road.

This Code of Practice for Flammable Liquids Tank Wagons (the Code) is approved by ERMA New Zealand under the Hazardous Substances and New Organisms (HSNO) Act 1996 as a means of compliance with the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004 (as amended), Regulations 6-29, 32-37 and 42, in respect of tank wagons that are used for the bulk transport of flammable liquids.

1.2 Scope of This Code

1.2.1 Improper handling of hazardous substances may cause injury, death or ill health to a person and cause damage to property or the environment. Hazardous substances may pose a risk to drivers, cargo handlers, emergency services and the general public during their transportation. These risks are compounded when hazardous substances are transported in bulk.

1.2.2 The aim of this Code is to ensure that bulk flammable liquids are securely contained and safely transported, thereby reducing the risks and helping to prevent accidental damage or injury to people, property and the environment.

1.2.3 The tanks, tank fittings and attachments shall be designed and constructed in accordance with this Code, which also includes requirements for the design, construction and operation of the vehicle carrying such tanks, tank fittings and attachments.

1.2.4 This Code applies to all substances with hazard classifications 3.1A, 3.1B, 3.1C or 3.1D, as determined by the HSNO Act.

1.2.5 This Code does not detail the requirements of other legislation. Compliance with this Code does not obviate the requirement to comply with other sections of the HSNO act or regulations made under that act, or other legislation such as the Health and Safety in Employment Act 1992, the Heavy Motor Vehicle Regulations 1974 and the Land Transport Dangerous Goods Rule 45001/1.

1.3 The HSNO Act and the Place of Codes of Practice

1.3.1 The HSNO Act and regulations made under that act are largely performance based, that is they specify a desired outcome without prescribing how to achieve it. They do not require that a single specific means be used to comply with any regulation and this allows for variations in method.

1.3.2 The HSNO Act, as well as the regulations and transfer notices made under that act provide for Codes of Practice approved by ERMA New Zealand to identify acceptable solutions to comply with the specified regulatory requirements. An Approved Code of Practice provides users with a method of meeting the control requirements with a degree of prescription and assistance.

1.3.3 The Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004 (as amended) specifies standards for the design and construction of tank wagons. This Code provides a practical means to meet these requirements.

1.4 Limits of this Code

1.4.1 This Code applies to the design, construction and operation of vehicles which:

- have commenced construction after 1st January 2008, and
- are used for the transportation of flammable liquids (hazard classification 3.1A, 3.1B, 3.1C or 3.1D), and
- are used to convey these substances in bulk by road

1.4.2 It also applies to the design, construction and operation of vehicles used for refuelling of aircraft as well as those used for the transportation of flammable liquid waste.

1.5 Definitions

Where any term used is not defined in this section, the meaning of that term shall be as defined by the Hazardous Substances (Tank Wagon and Transportable Container) Regulations 2004 (as amended). Where there is a conflict in a term, the definition in the Hazardous Substances (Tank Wagon and Transportable Container) Regulations 2004 (as amended) shall prevail.

1.5.1 ERMA
The Environmental Risk Management Authority of New Zealand

1.5.2 Head
A closure at the end of a tank and which is liquid tight

1.5.3 HSNO
The Hazardous Substances and New Organisms Act 1996

1.5.4 Liquids with Class 3.1 A, 3.1B, 3.1C or 3.1D Hazard Classification
Liquids, mixtures of liquids, and liquids containing solids in solution and suspension as defined in the Hazardous Substances (Classification) Regulations 2001. In each case the flash point is less than or equal to 93^0C. A few examples of such liquids are petrol, acetone, methanol, and ethanol.

1.5.5 Maximum capacities
For maximum capacities refer to Section 3.1.1. All capacities quoted are water capacity (tank full) at standard temperature and pressure.

1.5.6 Tank
An enclosed vessel exceeding permanently fixed to the chassis of a tank wagon used for the transport or storage of Liquids with Class 3.1A, 3.1B, 3.1C or 3.1D Hazard Classification, and includes:-

- any compartments and all components or materials (including coatings) necessary for the tank to perform its containment function, and
- all parts affecting the structural integrity of the tank and the means of closing the tank.

A tank for liquid transport may be either of the following:

(a) A small compartment tank – a tank having one or more compartments, none of which exceed 8600 litre water capacity, or
(b) A large compartment tank – a tank having one or more compartments, which would not qualify as a small compartment tank.

1.5.7 Tank wagon
Any vehicle constructed for the primary purpose of the bulk carriage of Liquids with Class 3.1A, 3.1B, 3.1C or 3.1D Hazard Classification in a tank or tanks. Tank wagons may be of one of the following types.
(a) Tank Truck (rigid) — A single vehicle having its own means of propulsion, or
(b) Tank Semi-trailer — A vehicle, including a prime mover, constructed so that, when drawn through a fifth wheel or turntable connection, part of the load rests on the towing vehicle (includes B trains) or
(c) Tank Trailer — A vehicle which does not have its own means of propulsion, but does not include a tank semi-trailer, or
(d) Prime Mover – A vehicle used to pull Tank Semi-Trailers carrying Liquids with Class 3.1A, 3.1B, 3.1C or 3.1D Hazard Classification or
(e) Airport Only Refueller – A vehicle that is used primarily for refuelling aircraft at airports and which has nil (or limited) travel on public roads.

1.5.8 Ullage
The ullage of a container is the air space left when the container is filled to its liquid carrying capacity so that any expansion of the liquid will not cause

overflow or excessive hydraulic pressure. The ullage space is to be measured at 15 degrees Celsius.

1.6 References

AS 1163 Structural steel hollow sections
AS 1449 Wrought alloy steels –Stainless and heat-resisting steel plate, sheet and strip
AS/NZS 1554 Structural Steel Welding parts 1, 4 and 5
AS 1594 Hot-rolled steel flat products
AS 1664.1 Aluminium structures - Limit state design
AS 1664.2 Aluminium structures - Allowable stress design
AS/NZ 1665 Welding of aluminium structures
AS/NZS 1734 Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate
AS/NZS 1866 Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes
AS 1874 Aluminium and aluminium alloys – Ingots and castings
NZ3404.1 and 2 Steel Structures Standard
AS 3678 Structural steel – Hot-rolled plates, floor plates and slabs
AS 3679 Structural steel
Part 1: Hot rolled bars and sections
Part 2: Welded sections
AS 3990 Mechanical equipment – Steelwork
AS/NZS 2430.3.3 Classification of hazardous areas Part 3.3 Examples of area classification – Flammable liquids.
Hazardous Substances and New Organisms Act 1996
Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004 (as amended)
Land Transport Rule 41001 Vehicle Dimensions and Mass 2002 (as amended)
Land Transport Rule 45001/1 Dangerous Goods 2005 (as amended)

1.7 Tank Wagons Limited to Carrying Substances with 3.1D Flammable Classification

1.7.1 Tank wagons that are limited to carrying substances with 3.1D flammable classification e.g. diesel, may be constructed in accordance with the requirements of Appendix C to this Code.

2 VEHICLE DESIGN AND EQUIPMENT REQUIREMENTS

2.1 General

2.1.1 The vehicle shall be strongly constructed, as far as practicable, of fire resisting materials. The tank, fittings and any part of the tank wagon that could under normal course of operation come into contact with the substance being carried must be constructed with materials that are compatible with that substance. The design of the vehicle shall provide an integration of the tank supporting members and the vehicle chassis. The means of securing the tank to the chassis, and in the case of tank trailers or tank semi-trailers the means of attaching the prime mover to the trailer or semi-trailer, shall be designed to withstand the design loads of this Code. The vehicle shall, in addition, comply with all current NZ Road Transport Rules and Regulations.

2.2 Road Clearance

2.2.1 Tank components and protection devices located between any two adjacent axles of a vehicle or vehicle combination shall have not less than 40 mm ground clearance for each metre between such axle centres The ground clearance shall be not less than 350 mm when unladen, except for Airport only Refuellers.

2.2.2 Tank filling and discharge connections which are rigidly attached to the tank shall not extend lower than 40 mm below the plane through the centre line of the axles (except for Airport only Refuellers).

2.3 Rear Bumper Requirements

2.3.1 Every tank wagon shall be provided with a collision bumper to protect the tank from rear impact in accordance with the following requirements:

2.3.1.1 The impact surface of the collision bumper shall be not less than 150 mm behind the vertical plane of the rearmost bulkhead and not be less than 50 mm behind any other item located behind the tank rear elevation.

2.3.1.2 The inner face of the collision bumper shall allow at least 150 mm clearance from any component or fitting below the bottom surface of the tank subframe which may contain liquid during loading, discharge or conveyance. The collision bumper shall be attached to the sub frame of the tank wagon or the chassis of the vehicle. It shall not be attached directly to the tank.

2.3.1.3 In circumstances whereby the width of the tank is less than 1500 mm, the width of the bumper must be not less than the maximum width of the tank, with the full width of the bumper being the collision bumper.

2.3.1.4 The collision bumper shall be a minimum of 1500 mm wide, 750 mm either side of the centre of the tank The full width of the bumper shall not be less than:

- 1500 mm, or
- 95% of the maximum width of the tank, or
- 95% of the maximum width of the vehicle,

whichever is the greater. Additional sections beyond the collision bumper may extend to the full width of the tank and carry lights or other equipment.

2.3.1.5 The height of the collision bumper measured from the ground to the lowest surface of the bumper shall be not less than 600 mm and not more than 1000 mm.

2.3.1.6 The collision bumper shall be designed to withstand a load equal to 40 tonne or twice the weight of the fully loaded tank wagon, whichever is the lesser, and uniformly distributed over the central 1500 mm section of the collision bumper. A limit state or alternative method of design can be used in accordance with NZS 3404:1997 Steel Structures Standard.

2.3.1.7 The outer section of the bumper i.e. that which extends outside the 1500 mm collision bumper, and which may be used to carry lights, does not have to comply with the strength requirements in 2.3.1.4.

2.3.1.8 Airport Only Refuellers are exempt from clause 2.3.1.6.

2.3.2 Rear under run protection shall be fitted in accordance with the following requirements:

2.3.2.1 In circumstances whereby the width of the tank is less than 1500 mm, the width of the bumper must be not less than the maximum width of the tank, or in circumstances whereby the width of the tank is 1500 mm or greater, the width of the under-run bumper shall not be less than 1500 mm.

2.3.2.2 The rear under run protection shall have an elevation, measured from the ground to the lowest surface of the bumper, of not less than 300 mm and not greater than 500 mm.

2.3.2.3 The impact surface of the under-run bumper shall be vertically in line (i.e. within 100 mm forward or backward) with the impact surface of the collision bumper.

2.3.2.4 The under-run bumper shall be designed to withstand a load equal to 10 tonnes uniformly distributed over the central 1500 mm section of the bumper. A limit state or alternative method of design shall be used in accordance with NZS 3404:1997 Steel Structures Standard.

2.3.2.5 Airport Only Refuellers are exempt from this clause 2.3.2.2 and 2.3.2.4.

2.3.3 An energy absorbing bumper may be used providing it is suitable for the vehicle involved and provided that its deformation under full deflection would not result in any damage to the tank or its fittings.

2.3.4 Where it is practical, one bumper may serve as both a collision bumper and an under-run bumper, in which case it must at least meet the requirements of 2.3.1 and 2.3.2 separately.

2.3.5 All bumper dimensions are to be taken in the unladen state.

2.4 Electrical Wiring

The electrical wiring of tank wagons that convey substances with 3.1A, 3.1B or 3.1C hazard classifications shall comply with the following requirements and shall be suitable for the electrical loads.

2.4.1 The nominal voltage shall not exceed 48 volts.

2.4.2 The size of conductors shall be large enough to avoid overheating and shall be insulated. All circuits shall be protected by fuses or automatic circuit breakers, except for the following:

- From the battery to the cold start and stopping systems of the engine; and
- From the battery to the alternator; and
- From the alternator to the fuse or circuit breaker box; and
- From the battery to the starter motor; and
- From the battery to the power control housing of the endurance braking system (if fitted), if this system is electrical or electromagnetic; and
- From the battery to the electrical lifting mechanism for lifting the bogie axle.

2.4.3 The electrical installation beyond the rear of the driver's cab shall be designed, constructed and protected such that it cannot provoke any ignition or short-circuit under normal conditions of use of the vehicle and that these risks can be minimised in the event of an impact or deformation.

2.4.4 The battery shall be secured in front of the fire resistant shield. If this is not practicable, it may be carried in a metal box or secured in a metal frame as close to the cab as possible. The battery terminals shall, by means of an effective acid resisting insulation cover, be held securely in place, be

prevented from accidental shorting.

2.4.5 The generator/alternator, switches and fuses shall be carried in front of the fire resistant shield. Other electrical components may be fitted outside the cab provided the components are rated for the hazardous atmosphere zones they may operate in. There may be other equipment necessary for the control/propulsion of the vehicle other than that used for the delivery of the substance and which may not be suitable for the hazardous atmosphere zone they operate in. This equipment is acceptable provided that it is isolated by the battery master switch when the hazardous atmosphere zones are present.

2.4.6 A battery master switch shall be provided to enable a means of isolating the electrical supply e.g. by means of a double pole switch. This shall be provided in a readily accessible position as close to the battery as is practicable, (it should be adjacent to the battery and preferably no further than 600 mm from it) and shall be clearly labelled as to its position. If a single pole switch is used it shall be placed in the supply lead and not in the earth lead.

2.4.6.1 This battery master switch must be able to be manually operated externally and deactivated from inside the vehicle cab in a position readily accessible to the driver. It shall be distinctively marked and protected against inadvertent operation by the driver.

2.4.6.2 The battery master switch shall be suitable for use in the hazardous atmosphere zone which it is required to operate in i.e. it shall;

i. be EEx or suitable equivalent, and
ii. have a temperature rating T4, T5 or T6
iii. be suitable for equipment group II B or II C

2.4.6.3 The battery master switch shall be suitable for the environment that it is required to operate in i.e. it shall have a casing with protection degree IP65. The cable connections to the switch shall also be suitable for the operating environment. It is recommended that they have a protection degree IP54. However if they are contained in a housing (which may be the battery box) or switches with protection degree IP54 are not available, it is sufficient to protect their connections against short circuits (e.g. with a secure rubber cap).

2.4.6.4 The electrical supply may be maintained to certain vehicle accessories (e.g. operation recorder, computer, radios, clocks,) which cannot be shut off, provided the instrumentation is within the cab and each device is protected by a circuit breaker or fuse. Other electrical components may be fitted outside the cab provided the components are rated for the hazardous atmosphere zone they may operate in.

2.4.7 The original equipment manufacture wiring (cab chassis) is to be in sound condition and must prevent the ingress of vapours, thus removing the potential for them to be a source of ignition. This does not obviate the

requirement for the original equipment manufacture wiring that is in a hazardous atmosphere zone classified as Zone 1 to meet the requirements of that zonal classification (as qualified by the Notes in clause 2.4.11).

2.4.8 Electrical wiring added to the original vehicle wiring shall be insulated from the chassis. The wiring shall be supported and protected from mechanical injury, chafing and exposure to contact with oil, grease, or petroleum substances, and shall be so located as to avoid damage to insulation from heat. Wiring outside and to the rear of the cab or on a trailer must carried in conduit or double sheathed cable.

2.4.9 Junction boxes are to be at least IP65 rated.

2.4.10 Any electrical equipment that may be required to be active during hazardous substance transfer and that is located within a hazardous atmosphere zone shall be suitable for such an area. The hazardous atmosphere zones are deemed to exist during hazardous substance transfer and for 5 minutes thereafter.

The hazardous atmosphere zone shall be determined in accordance with the area classifications of AS/NZS 2430.3.3 Classification of hazardous areas Part 3.3 Examples of area classification – Flammable liquids.

In circumstances where tank wagons are to be used for top loading, particular consideration is required to be given to establish the hazardous atmosphere zones.

Note : Isolation of the vehicle in accordance with 2.4.6 above is deemed to meet the hazardous atmosphere zones.

2.5 Fire Extinguishing Equipment

2.5.1 The type and number of fire extinguishers fitted to the vehicle are to be as per Table 2.1 of this Code.

2.5.2 Fire extinguishers shall be installed so they are:
(a) mounted securely by means of a quick-release attachment
(b) located so as to be readily accessible for use but remote from the hose connection points.

Note. The quick release of a fire extinguisher is deemed to be removal and ready for use within 10 seconds of commencing the release of the extinguisher from the vehicle.

2.5.3 Where two fire extinguishers are fitted to any tank wagon, one is to be located on the left hand side of the road tank wagon, with the other on the right hand side of the vehicle towards the front of the vehicle. If it is not

practicable to locate the latter extinguisher towards the front of the vehicle, it is to be located in a position that is still readily accessible by the driver.

Note: For purpose of this clause, an additional towed tank trailer, each additional B-Train tank and similar combination is treated as being an individual vehicle and thus requires an additional complement of extinguishers.

2.5.4 The fire extinguishing medium shall be compatible with the substance being transported.

Table 2.1 – Type and Number of Fire Extinguishers

Application	*Minimum Requirement*
In every vehicle cab	One 30B extinguisher
A road tank vehicle which exceeds 2,000 litres capacity and which carries Class 3.1 A-D Flammable cargo.	2 x 30B or 1 x 60B extinguisher

2.6 Vehicle Inspection

2.6.1 Regular inspections of tank wagons shall be carried out in accordance with clause 2.2 of Appendix A. Records of the inspection and any necessary rectifications shall be kept by the vehicle operator and the owner for inspection. Alternative inspection procedures and frequencies may be used provided they cover the requirements of this Code.

2.7 Tank Truck or Prime Mover Equipment

2.7.1 Mode of power.
The vehicle shall be powered by an internal combustion engine.

2.7.2 Fire Resisting Shields.
The person operating the tank wagon (i.e. the person in the drivers cab) is to be protected for 1 minute from the heat of a fire in the load tank or a fire in the means of propulsion of the tank wagon. In this regard the person operating the tank wagon must not be subject to a level of heat that exceeds 2.56 kw/m2

2.7.2.1 Fibreglass cabs are not considered to provide this level of protection unless it can be demonstrated that the requirement is complied with.

2.7.2.2 In the case of a steel or aluminium cab this is deemed to comply with 2.7.2.

2.7.2.3 Spark Ignition Engines. The engine shall be screened from the load tank by a fire resisting shield (which may be the rear wall of the cab) carried down at least to the level of the bottom of the load tank or chassis (whichever is lower) and up to at least the level of the top of the tank or, if the roof of the cab is of fire-resisting construction and without opening, to the level of the top of the cab.

2.7.2.4 Compression Ignition Engines. Where the engine is not fully covered by the cab, and the cab rear wall is the fire-resisting shield, the engine shall be protected from vertical spillage from the load tank by a fire-resisting shield situated not less than 50 mm from the engine and this must be in place at all times during operation.

2.7.3 Cab Rear Windows

Windows fitted in the rear wall of the cab shall be securely clipped with substantial stainless steel clips and fixings at 300 mm centres or fitted with fire resisting framing. The window clips are to be fixed in such a way that the window remains in place in the event of a fire. The windows, if plain glass, are to be replaced with wired glass or other recognised type of heat resisting material, and shall not be capable of being opened. Curved corner windows in vehicle cabs further than 2 m from the load tank are not considered as being in the rear wall of the cab.

2.7.4 Vents

Roof vents and rear cab air discharge vents, if capable of being opened, are to be fitted with 500 micro-metres nominal aperture gauzes or sealed closed. Where vents are installed in the fire resistant shield that forms part of the rear of the cab and the vents may be compromised by the action of a fire, they shall in addition to having a 500 micro-metres gauze fitted, be shielded against the action of fire or vented to the side of the vehicle.

2.7.5 Fuel Tanks

2.7.5.1 The fuel tank of the vehicle shall be located so as to minimise mechanical damage and the spread of fire. All piping shall enter through the top of the tank. In the case of vehicles fitted with dual fuel tanks, the manufacturer's interconnecting piping will be acceptable.

2.7.5.2 If mounted in a vulnerable position, the fuel tank shall be protected from mechanical damage. If the tank is constructed of aluminium with shell thickness less than 5 mm thick or constructed of steel with shell thickness less than 3 mm thick, then a guard shall be fitted unless the tank has an equivalent level of protection (see Appendix D). The guard shall take the form of a metal plate of above minimum thicknesses covering vulnerable surfaces of the tank. The protection provided to the fuel tank shall be attached securely to the vehicle (and not the fuel tank) unless it is impracticable to do so.

2.7.5.3 The tank shall have its filling hole fitted with a secure closure and shall not leak.

2.7.5.4 For spark ignition engines, a clearly indicated and readily accessible means of cutting off the fuel supply to the engine shall be fitted where the fuel is supplied to the engine by gravity.

2.7.6 Exhaust and Intake

2.7.6.1 For spark ignition engines, the exhaust shall discharge horizontally in front of the front wheels.

2.7.6.2 For compression ignition engines, the exhaust may discharge horizontally in front of the front wheels or vertically behind the cab. If the exhaust is located behind the cab then:

(a) if it is closer than 800 mm horizontally to the load tank, it shall be shielded to prevent spillage onto the exhaust system. The shield shall be at least 50 mm away from any hot part of the exhaust system and at least 75 mm away from the load tank.
(b) Any openings or perforations for ventilation shall be located on the side remote from the load tank;
(c) if it is closer than 2 m to any opening to the load tank, it shall terminate at least 75 mm above the valance.

2.7.6.3 The exhaust system shall be free from leaks and shall be located so as to minimise the accumulation of oil or grease, and shall be so designed as to inhibit the ejection of sparks.

Note: Turbochargers under normal conditions are considered to inhibit sparks.

2.7.6.4 Air intakes behind the cab of compression ignition engines shall terminate above the level of the cab. Air intakes in front of the cab are free as regards position but no part of the opening shall be lower to the ground than 1.5 m. Tilt cab flexible couplings or boots are acceptable but where these are less than 1.5 metres from the ground level they are to be sealed and clipped (or provided with an alternative mechanism that is at least equivalent). These flexible couplings or boots are to be included in the three monthly vehicle inspections. (Refer Appendix A.)

2.7.6.5 In circumstances whereby the air intake is at the front of the cab and it is not possible to get access to the tilt cab flexible coupling or boot, an engine strangler is to be provided.

2.8 Tank Trailer and Tank Semi-trailer Requirements

2.8.1 A tank trailer of more than 2000 litres capacity shall have 2 or more axles, which shall not be in line transversely. Any trailer having fewer than 2 axles shall be equipped with means of stabilising it when detached from the towing vehicle.

2.8.2 Fifth wheel couplings for tank semi-trailers shall be of a type which transmit a portion of the roll motion of the semi-trailer to the prime mover (under normal operations). In particular, tank semi-trailers should not be fitted with unrestricted double oscillating fifth wheels.

2.8.3 The fifth wheel shall have a maximum towed rating of at least 1.25 times the weight of the fully laden semi-trailer, and a vertical rating of at least 1.25 times the vertical load imposed on the coupling.

2.8.4 Brake equipment is to comply with all Land Transport New Zealand requirements. As a minimum it shall be at least a dual system of airline brakes, which under all conditions of use will immediately and automatically operate to stop and hold the trailer on should it become disconnected from the vehicle to which it is attached.

2.8.5 The driver shall not be provided with the means of altering the intrinsic brake system balance.

2.8.6 Tank trailer or semi-trailer brake systems shall be provided with a remote air-operated emergency release system, having an independent air system.

2.8.7 No person shall attach to any tank wagon that is or has been conveying hazardous substances with a 3.1A or 3.1B hazard classification, a trailer that is not used or intended to be used exclusively for conveying substances with a class 3.1 hazard classification.

2.8.8 No person shall attach a tank trailer or semi- trailer with a capacity of more than 10,000 litres and containing a hazardous substance with class 3.1A or 3.1A hazard classification to any vehicle unless that vehicle is a tank wagon, tractor unit or other vehicle that is designed for use in transporting hazardous substances of classes 3.1A and 3.1B hazard classification.

2.9 Tank Wagon Tank Mounting Requirements

2.9.1 A clearance of not less than 100 mm shall be provided between the back of the cabin and the tank. Any fittings carried in this space will not compromise the integrity of the load tank. For articulated vehicles, the clearance shall be achieved at all angular positions.

2.9.2 The electrical resistance between the tank and the tractor chassis, prime mover chassis, or trailer under carriage and between the tank and connection of tank wagon pipe work to the delivery hose shall not exceed 10 ohms. The

resistance between all other conductive parts of the vehicle and the tank shall not exceed 1 Megohm.

2.9.3 At least one means of bonding the load tank or vehicle to any container, to or from which transfer of liquid is made, shall be provided. It shall be located as far from flammable vapour emergence points as practicable, and in a convenient location for the operator. Additional connection points are permissible.

2.9.4 The mountings on the tank wagon chassis shall be designed and constructed in accordance with:

2.9.4.1 Forces able to be resisted by attachment of tank to chassis

Vertically up	1 g x M
Vertically down	2 g x M
Laterally	1 g x M
Longitudinally	2 g x M

Where:

g acceleration constant due to gravity (9.81 m/s^2)

M mass of tank, contents, and fittings (but excluding chassis)

2.9.4.2 The mass of the cargo shall be calculated from its density and volume. The density shall be taken as the density of the cargo or 1000 $kg/m^{3,}$ whichever is the greater.

2.9.4.3 A limit state or allowable stress method of design shall be used.

2.9.5 Fatigue of the tank wagon chassis mountings shall be included in the design of the tank wagon (i.e. by reducing areas of stress concentration) in accordance with the provisions of Section 10 of NZS 3404: Part 1 or similar standard.

2.9.6 If mountings of tanks are provided by twist locks and the twist locks are used to provide vertical restraint, then they shall be selected to meet a vertically up strength requirement that is twice the strength requirement in clause 2.9.4.1. This rating of the twist lock is to be certificated. The twist locks are to be examined at 12 monthly intervals for mechanical defects and replaced if a defect is noted. The design number of twist locks must be in use.

2.10 Stability of Tank Wagons

2.10.1 A road tank wagon must be designed and constructed so that when the tank is full it will not roll over when subjected to any of the following:

2.10.1.1 A static roll threshold of at least 0.45g.
2.10.1.2 A maximum dynamic load transfer ratio of 0.6
2.10.1.3 A high speed transient off-tracking of 0.8 m.

2.10.2 For the purposes of subclause above, a static roll threshold means the maximum level of steady turning lateral acceleration a vehicle can tolerate without rollover, which is calculated as a proportion of g.

2.10.3 The requirements of sub clause 2.10.1 are met if the static roll threshold, calculated in accordance with the Land Transport Rule 41001 "Vehicle Dimensions and Mass 2002" is at least 0.45 g.

2.11 Overseas Designs

2.11.1 If the use of tank wagons designed and built overseas is contemplated, or if the building of overseas designs in New Zealand is contemplated, details of the proposal are to be submitted to an ERMA approved Test Certifier to obtain a Design Test Certificate.

2.12 Illumination

2.12.1 At least one certified flame-proof battery-operated torch shall be carried in the cab.

2.13 Other Requirements

2.13.1 In addition to this Code, tank wagons must conform fully to the regulations made under the Transport Act 1962 and carry a valid Certificate of Fitness.

2.13.2 Tank wagons that transport hazardous substances by sea (e.g. across Cook Strait) are required to comply with the requirements of the any applicable New Zealand Marine Transport Regulations.

3 TANK, ACCESSORIES AND COMPONENTS

3.1 General

3.1.1 All tanks for use on public roads must not have compartments with a liquid carrying capacity greater than 10,000 litres i.e. must not have a total volumetric capacity greater than 10,500 litres when the allowance for ullage is included.

3.1.2 The ullage space of each compartment of the Tank Wagon must have:

3.1.2.1 a minimum ullage of 2%, and
3.1.2.2 a maximum ullage of 5% or 350 litres (whichever is the greater).

Note: the petroleum supply companies in New Zealand have minimum ullage requirements that are required to be met if the vehicle is to have a Safe Load Pass.

3.1.3 The tank shall be made in accordance with best known and available practices in addition to the other applicable tank specification requirements.

3.1.4 All tanks must be design approved by an approved ERMA Test Certifier (refer Appendix A).

3.1.5 Internal bulkheads shall be welded from both sides to minimise fatigue damage as well as increase bending strength in an accident. Sealing rings shall only be accepted where it is impractical to weld the bulkhead to the outer shell.

3.1.6 Internal bulkheads of dished and flanged type may be welded on one side at the toe of the flange. Sealing rings shall only be accepted where it is impractical to weld the bulkhead to the outer shell.

3.2 Materials

3.2.1 Aluminium Alloys — Thicknesses specified of aluminium alloy sheet are based on aluminium alloy 5454 in the H32 temper condition. This has a tensile strength of 248 MPa unwelded, and a welded tensile strength of 213 Mpa. If other alloys with lower welded tensile strength are used, the temper shall be at least H32 or T6 and the shell thickness is to be increased in the ratio 213/welded tensile strength of the alloy used. If the alloys used have a higher welded tensile strength than that of alloy 5454, the thickness may not be decreased, but tempers may be lower than H32, provided that the tensile strength is at least 248 MPa.

Aluminium alloys used in the construction of tanks shall not be less than the

grades specified in the following Australian standards (or equivalent) as appropriate:

- AS/NZS 1734 – Aluminium and aluminium alloys – Flat sheet, coiled sheet and plate
- AS/NZS 1866 – Aluminium and aluminium alloys – Extruded rod, bar, solid and hollow shapes
- AS 1874 – Aluminium and aluminium alloys – Ingots and castings.

3.2.2 Steel – Steel shall be of a quality suitable for the conditions in which it is being used and comply with the requirements of the following Australian Standards (or equivalent), as appropriate:

- AS 1163 – Structural steel hollow sections
- AS 1449 – Wrought alloy steels –Stainless and heat-resisting steel plate, sheet and strip
- AS 1594 – Hot-rolled steel flat products
- AS 3678 – Structural steel – Hot-rolled plates, floor plates and slabs
- AS 3679- Structural steel
  Part 1: Hot rolled bars and sections
  Part 2: Welded sections

3.3 Tank Design and Construction

3.3.1 Design Actions
The tank, its supports and connections shall be designed in accordance with:

(a) AS 3990 Mechanical equipment – Steelwork, or
(b) NZ3404.1 and 2 Steel Structures Standard, or
(c) AS 1664.1 Aluminium structures - Limit state design, or
(d) AS 1664.2 Aluminium structures - Allowable stress design,

taking into account the loadings below. The applicability of each of these standards is limited to the tank wagon parts for which the standard is valid. The parts of the tank wagon that are to be designed by reference to Table 3.1 shall be excluded from the provisions of these standards. Where applicable a vector sum of these loads shall be taken.

(a) The tank and its attachments shall be designed to withstand a minimum design action of twice that due to the tank and maximum cargo. The density of the cargo or a value of 1000 kg/m^3, whichever is the greater, shall be used for calculations.
(b) Stresses due to internal pressures caused by liquid head, plus vapour pressures of 20 kPa, shall be added to the static loading stresses.
(c) Loadings caused by the weight of equipment, the reaction at supports and thermal gradients shall be taken into account.
(d) Unless fatigue resistance has been demonstrated by field experience or supervised tests, fatigue stresses shall be calculated and added to the

stress calculated for the stationary vehicle. The calculation shall be based on the following load ranges at constant amplitude for $5x10^6$ cycles:

(i) vertical 0.6 g M
(ii) longitudinal 0.4 g M
(iii) lateral 0.4 g M

(e) The thickness of the shell, heads, bulkheads and baffles shall be not less than that specified on table 3.1. . Notwithstanding this however, the thicknesses for heads and bulkheads for large compartment tanks may be reduced to not less than the shell thickness provided that there is a calculation undertaken for head thickness in accordance with AS 1210 and this calculation indicates that it is safe to reduce the thickness.

Explanation: Subclauses 3.3.1(a) and 3.3.1(d) combined have the effect of providing an oscillating vertical load case of ±0.3 g M about an all up vertical load case of 2.3 g M.

3.3.2 Stiffening of Heads, Bulkheads and Baffles — Unless a proven equivalent form of stiffening is provided, the heads, bulkheads and baffles shall be dished to a depth, exclusive of any flange, of not less than 80 mm per metre of depth of the minor axis of the tank cross-section, but in any case not less than 100 mm. Dished bulkheads should be placed with the convex facing forwards, to minimise the effect of braking loads.

3.3.3 Large compartment non-circular tanks —

3.3.3.1 Baffles percentage area. Tank baffles shall be fitted to large compartments of non-circular tanks. Where the length of such compartment exceeds 2.5 metres, the distance between a head or bulkhead and a baffle shall not exceed 2.5 metres. The minimum baffle percentage area is to be calculated as 28 times the distance in metres between the baffle and the furthermost head or bulkhead in the compartment.

3.3.4 Circumferential Reinforcement — The tank shall be reinforced circumferentially by stiffeners, bulkheads or baffles (or in any combination) in accordance with the following requirements:

3.3.4.1 Reinforcements shall be located so that the maximum unreinforced length shall not exceed that specified for the particular shell thickness in Table 3.1. The exception is where two or more full-length underframe members of an aggregate section modulus of at least 180 x 10^3 mm3 about a horizontal axis and a shell thickness of at least that for an unreinforced length over 1.4 m and up to and including 1.5 m of table 3.1 are provided. Reinforcements may be up to 2.5 m apart (Or an equivalent design that meets all the design loads of 3.3.1).

The section modulus of underframe members does not include any section of the shell and is calculated using the maximum distance from

the neutral axis. If the tank is fully supported over its entire length (e.g. by a vehicle or trailer chassis) the minimum section modulus does not apply.

3.3.4.2 Reinforcements shall be located within 25 mm of points where the longitudinal alignment of shell sheets changes direction by more than 10 degrees, unless otherwise reinforced sufficiently to keep stresses within the specified limits.

TABLE 3.1 MINIMUM PLATE THICKNESSES

Tank Details		Minimum Nominal Thickness (mm) for non circular tanks												
		Unreinforced length of shell (m) for small compartments									Bulkhead and baffle thickness (mm)		Head thickness (mm)	
Rated capacity per metre of tank length (litres)	Maximum shell radius (m)	0.9 or less			Over 0.9 and up to and including 1.4			Over 1.4 and up to and including 1.5						
		MS	HSLA SS	AL	MS	HSLA SS	AL	MS	HSLA SS	AL	MS HSLA SS	AL	MS HSLA SS	AL
1400 or less l/m	≤1.8	2.0	1.6	2.2	2.0	1.6	2.2	2.0	1.8	2.4	2.0	4.0	2.5	4.4
	>1.8 ≤2.3	2.0	1.6	2.2	2.0	1.8	2.4	2.4	2.0	2.8				
	>2.3 ≤ 3.2	2.0	1.8	2.4	2.4	2.0	2.8	2.8	2.4	3.0				
	>3.2	2.4	2.0	2.8	2.8	2.4	3.0	3.0	2.8	3.8				
Over 1400 up to and including 2100 l/m	≤1.8	2.0	1.6	2.2	2.0	1.8	2.4	2.4	2.0	2.8	2.5	4.4	3.0	5.0
	>1.8 ≤ 2.3	2.0	1.8	2.4	2.4	2.0	2.8	2.8	2.4	3.0				
	>2.3 ≤ 3.2	2.4	2.0	2.8	2.8	2.4	3.0	3.0	2.8	3.8				
	>3.2	2.8	2.4	3.0	3.0	2.8	3.8	3.5	3.0	4.4				
Over 2100 up to and including 2700 l/m	≤1.8	2.0	1.8	2.4	2.4	2.0	2.8	2.8	2.4	3.0	3.0	5.0	3.0	5.5
	>1.8 ≤ 2.3	2.4	2.0	2.8	2.8	2.4	3.0	3.0	2.8	3.8				
	>2.3 ≤ 3.2	2.8	2.4	3.0	3.0	2.8	3.8	3.5	3.2	4.4				
	>3.2	3.0	2.8	3.8	3.5	3.0	4.4	4.0	3.5	5.0				
Over 2700 l/m	≤1.8	2.4	2.0	2.8	2.8	2.4	3.0	3.0	2.8	3.8	3.2	5.5	3.0	6.0
	>1.8 ≤ 2.3	2.8	2.4	3.0	3.0	2.8	3.8	3.5	3.0	4.4				
	>2.3 ≤ 3.2	3.0	2.8	3.8	3.5	3.0	4.4	4.0	3.5	5.0				
	>3.2	3.5	3.0	4.4	4.0	3.5	5.0	4.0	4.0	5.5				

Legend S = Mild Steel HSLA = High Strength Low Alloy Steel SS = Austenitic Stainless steel AL = Aluminium Alloy

3.3.4.3 Ring stiffeners shall be continuous, and shall have a section modulus about the neutral axis of the ring section parallel to the shell not less than that determined from the following formula:

$$I/C = K\ W\ L$$

I/C = K W L where:

I/C =	section modulus, in cubic millimetres
K =	0.0069 for all steels= 0.01186 for all aluminium alloys
W =	Tank width or diameter, in millimetres
L =	Ring spacing, i.e. the maximum distance from the midpoint of the unsupported shell on one side of the ring stiffener to the midpoint of the unsupported shell on the opposite side of the ring stiffener, in millimetres.

Where a ring stiffener is welded to the shell in accordance with Clause 3.3.3 the maximum portion of the shell which may be used as part of the ring for computing the section modulus shall be as described in Table 3.2.

Table 3.2 Parts of Shell in Ring Stiffener

Number of circumferential ring stiffeners to tank shell welds	***Distance between parallel circumferential ring stiffener to shell welds***	***Maximum shell section credit***
1	------	20t
2	Less than 20t	d + 20t
2	20t or more	40t

Legend: t = shell thickness
d = distance between parallel circumferential ring stiffener to shell weld

3.3.4.4 The welding that attaches stiffening members shall not be less than 50% of the total circumference, and no unwelded length of the joint shall exceed 40 times the shell thickness

3.3.4.5 Flat shell sections are allowed between the valences at the top of the tank only under the following conditions:

i. stiffeners of the same material as the shell are welded across the tank for the full width of the flat section. Recommended size is 75 mm deep by 5 mm thick and spaced such that unsupported shell length does not exceed 700 mm. In this case this section of the shell will not be considered in minimum shell thickness determination.

ii. with no stiffeners the shell is considered as having infinite radius at that section for minimum thickness determination (i.e. shell radius > 3.2m).

iii. it is shown that the flat section has stiffness equal to a stiffened plate or curved plate (equivalent radius).

3.3.4.6 Access through Baffles — a baffle shall have a manhole sized opening where no other means exists for gaining access to tank space on both sides of the baffle.

3.3.4.7 Distribution of Loads — The loads from supports should be taken on stiffening members and should be distributed as widely as possible through pads, gussets and the like.

3.3.4.8 Separation of Liquids - Tanks designed to transport different commodities which if combined during transit will cause a dangerous condition or evolution of heat or gas shall be provided with:

i. a double wall bulkhead, and
ii. each compartment of the tank has a separate filling and discharge system.

3.3.4.9 Enclosed Air Spaces - The air spaces between double bulkheads, or internal or external ring stiffeners, shall be provided with screwed openings for venting and draining. Any such openings on the upper surface of the tank shall be plugged.

3.3.4.10 Component Attachment — The attachment of auxiliary components and accessories should be to the sub frame or skirting wherever practicable. Where attachment to the tank shell is unavoidable, the following requirements shall apply:

i. The design of the component and/or its method of attachment shall be such that the component will break away before damage is caused to the shell.
ii. The attachment shall be to a mounting pad welded to the tank.
iii. A mounting pad shall be no thicker than the shell at that point, and shall extend at least 25 mm beyond the perimeter of the component

attachment, and shall be shaped to avoid concentrations at sharp corners.

The means of attachment shall avoid pockets which could initiate corrosion. The welding of the pad to the tank shall be continuous unless a gap for drainage is provided at the bottom. A tell tale, which shall be plugged, must be provided where such a drainage gap is not provided.

Note: For light boxes mounted on the rear tank bulkhead, the break away requirement does not apply.

3.3.5 Roll-over Protection — Every tank shall be provided with roll-over protection which shall comply with the following requirements:

3.3.5.1 A guard in the form of inverted U coamings, the space between which is closed by valances level with the top of the coamings at the front, and at least 50 mm high at the rear.

3.3.5.2 Any guard shall project at least 20 mm above the top of the fittings which it protects.

3.3.5.3 The material of the guard shall be compatible with the tank shell.

3.3.5.4 The thickness of the material of the U coamings and valences shall not be less than 5 mm for aluminium, 3 mm for mild steel, 2.5 mm for high strength low alloy steel or stainless steel.

3.3.5.5 Any air space enclosed inside a coaming or guard shall have openings to permit draining and purging before repair. When the enclosed space is used to transfer vapour, the openings shall be plugged.

3.3.5.6 The tank coaming shall be fitted with drains to prevent liquid from collecting on top of the tank. Drains shall discharge clear of and below the engine and exhaust system.

3.3.6 Welding

3.3.6.1 All welding of components for structural or pressure purposes in building any new or in modifying any existing vehicle for use as a tank wagon shall be carried out in accordance with recognised good practice as determined below:

3.3.6.2 Welding of steel shall be in accordance with AS/NZS 1554 Structural Steel Welding parts 1, 4 and 5 (or equivalent) as appropriate. This includes all requirements for qualification of welding personnel.

3.3.6.3 All welding of aluminium components shall comply with AS/NZ 1665 Welding of aluminium structures (or equivalent).This includes all requirements for qualification of welding personnel.

3.3.6.4 Inspection of the welding shall be carried out in accordance with the welding specification (AS/NZS 1554 or AS/NZS 1665 as relevant) including:

i. verification of material
ii. verification of filler material
iii. qualification of welding procedures
iv. qualification of welders to the above procedures
v. inspection of production welds, including a minimum of 5% x-ray.

3.3.6.5 Review of the x-rays (i.e. the 5% in clause 3.3.6.4 v above) is to be carried out by properly qualified personnel. In particular, testing laboratory registration under the IANZ (or equivalent) with personnel holding currently recognised qualifications in the appropriate material category.

New aluminium tank wagons are to be inspected to weld quality Class B

3.3.6.6 As part of the approval of each unit, certification that this testing has been carried out and passed is to be made available to a Test Certifier approved by ERMA New Zealand.

i. The documents from the above inspections are to be available for inspection at any time.

ii. An independent inspector or inspection agency may be required at the cost of the vehicle owner to check the welding or construction if the Test Certifier considers that some aspects do not conform to the requirements as specified in this Code.

3.4 Manholes, Valves, Vents

3.4.1 Every opening to the liquid space of a tank shall be provided with an effective means of closure in accordance with one of the requirements of this Clause 3.4 as appropriate.

3.4.2 Manholes — Each compartment shall be accessible through a manhole and fitted with a closure capable of passing the tank pressure test.

3.4.3 Valves — Each liquid discharge opening shall be provided with an internal shut-off valve and an external shut-off valve, suitable for service at the piping design pressure.

3.4.3.1 The internal shut off valve shall comply with the following requirements:

i The valve seat shall be located inside the tank or within the tank flange or its companion flange. The remainder of the valve may be either inside or outside the tank shell, provided that in the event of accidental damage to any associated external fittings the safe functioning of the internal valve is not impaired.

ii An internal shut-off valve which is bottom-operated shall incorporate, in addition to the normal means of closure, an automatic heat-actuated closing device which will become effective at a temperature arranged to respond to a fire in the vicinity of the tank outlets i.e. it is to actuate at a temperature not more than 80% of the auto-ignition temperature of the liquid being carried. (Nylon or plastic pneumatic line to the internal shut off valve shall be deemed to meet this requirement.)

iii A tank designed for bottom loading shall incorporate an effective liquid flow deflector above the internal shut-off valve, and a provision to minimise the possibility that foreign objects within the tank might prevent the closure of the valve. Any such protective device shall be designed to avoid the spraying of liquid during filling.

iv. The valve shall be capable of being manually closed from a position remote from the delivery hose connection.

3.4.3.2 The external shut-off valve shall be a quick-shut type suitable for the hazardous substances and pressures involved be fitted in a readily accessible position and fitted with a cap. External delivery pipes and valves shall in all cases be protected from damage.

3.4.4 Vents — Each tank compartment shall be provided with normal venting in accordance with Clause 3.4.5 and emergency venting in accordance with Clause 3.4.6 to relieve vapour in order to avoid building up an excessive pressure. The vents shall be suitable for the substance being carried. The vents and their installation shall comply with the following requirements:

3.4.4.1 Each vent shall be marked with the manufacturer's name, model identification, discharge capacity and related pressure.

3.4.4.2 The discharge capacity of each model and type of vent shall be determined before use.

3.4.4.3 Vents shall be designed and installed to prevent leakage of liquid past the vent in the event of surge or vehicle overturn.

3.4.4.4 The exit of a vent except an emergency vent shall be covered with wire gauze of 500 micro-metres nominal aperture.

3.4.4.5 Each vent shall communicate with the vapour space.

3.4.4.6 Shut-off valves shall not be installed between the tank opening and the vent.

3.4.4.7 Vents shall be mounted, shielded, or drained, so as to prevent the accumulation of water in such a manner that freezing could impair the operation of the vent.

3.4.5 Normal Venting — The normal venting provision shall consist of a pressure vent and a vacuum vent, generally in accordance with the following requirements:

3.4.5.1 The clear area through any pressure or vacuum vent shall be not less than 280 mm2. The pressure opening setting shall not exceed 17 kPa and the vacuum vent opening setting shall not be less than 7 kPa vacuum.

3.4.5.2 When tilted to any angle exceeding 90^0 from the vertical, the pressure vent shall open at a minimum of 30 kPa or shall lock shut.

3.4.6 Emergency Venting — The emergency venting provision for protection against fire exposure which may be incorporated into the vent valve shall comprise a pressure vent which complies with the following requirements:

3.4.6.1 The emergency vent shall start to open at a pressure no higher than 30 kPa and be fully open at 45 kPa.

3.4.6.2 The total emergency venting capacity of each tank compartment shall be not less than that specified in Table 3.3. Flow rating pressure shall be the "vent fully open" value of 45 kPa.

Table 3.3

Exposed area of tank compartment (m2)	Minimum emergency vent capacity (m^3 free air/h)*	Exposed area of tank compartment (m^2)	Minimum emergency vent capacity (m^3 free air/h)*
2	480	30	6650
3	720	35	7260
4	960	40	7830
5	1200	45	8370
6	1440	50	8880
7	1680	55	9370
8	1920	60	9840
9	2160	65	10300
10	2400	70	10700
12	2880	75	11200
14	3360	80	11600
16	3840	85	12000
18	4320	90	12400
20	4800	95	12800
25	6000	100	13200

NOTE: (1) Free air measured under IGU standard conditions.
(2) The requirement for intermediate sizes can be determined by interpolation.

3.4.7 Loading and Unloading Protection — Unless provision is made to fill through the hatch, all tanks shall be loaded or unloaded with the hatch covers closed and shall be provided with sufficient liquid-venting capacity to discharge the whole of the liquid delivery rate of the pump, and with sufficient air inflow capacity to match the liquid withdrawal rate. The pressure and vacuum limits of 45 kPa and 7 kPa (negative) shall not be exceeded.

3.4.8 Filling Provisions. The provisions for filling the tank shall comply with the following requirements:

3.4.8.1 The fill tube of a top-filled tank shall terminate not more than 50 mm or less than 35 mm from the bottom of the tank, and shall be stayed.

3.4.8.2 The fill tube shall be connected to the vapour space of the tank by a pressure equalizing hole not less than 3 mm diameter or the equivalent in area, and which shall be fitted with gauze as required by Clause 3.4.9(a).

3.4.8.3 The vent shall be shrouded to redirect liquid down the fill pipe. The bottom end of the tube shall be cut square and the flow of liquid from the pipe shall be directed away from any objects which might cause the liquid to spray.

3.4.9 Dip Stick — A dip indicating system shall be installed and shall comply with the following requirements:

3.4.9.1 A dip stick which measures by contacting the bottom of the tank shall be provided with a tubular dip tube. A pressure equalizing hole shall connect the upper end of the dip tube with the upper tank space. The hole shall be covered by an anti-flash gauze of 500 micro-metres nominal aperture.

3.4.9.2 A durable striker pad of a thickness not less than that of the tank shell or 5 mm, whichever is the greater, and of the same material as the shell shall be welded to the tank bottom below the dip opening.

3.4.9.3 The dip tube shall terminate not more than 50 mm from the bottom of the tank and shall be stayed.

3.5 Pipework and Pipe Fittings

3.5.1 Strength of Piping — Piping and associated fittings shall be designed for the pressure to which they may be subjected in service, and shall be designed and supported to allow for expansion, contraction and vibration. Unrestrained slip joints shall not be used for this purpose.

3.5.2 Discharge Piping — Discharge piping shall be located so that it is protected from damage that could occur in the normal operation of the tank wagon.

3.5.3 Hoses and Hose Couplings.

3.5.3.1 Hoses shall not be used in that section of piping which is between the tank's internal valve and the first valve outside the tank (unless the tank wagon is an aircraft only refueller or a vehicle that is built to Appendix C).

3.5.3.2 Any hose or coupling used shall be designed for a working pressure not less than 20% in excess of the design pressure of the system and shall be so designed that there will be no leakage when connected.

3.5.3.3 Where unloading by pressure is permitted, hoses shall be designed for a bursting pressure of 690 kPa, or two times the maximum pressure it

could be subject to in use, whichever is the greater. The hoses are to be properly maintained and checked frequently.

3.5.4 Tank Fill Pipework

3.5.4.1 The pipework used for filling the tank must be sized to avoid the generation of static electricity. Where the tank is bottom loaded and the fill rate at maximum flow is 2000 litres per minute, the diameter of the pipework used for filling the tank must not be less than 100 mm diameter.

3.6 Pumps

3.6.1 Suitability — A pump intended for handling the tank wagon's cargo shall be suitable for use with that cargo, and for the required flow rates and pressures.

3.6.2 Pressure Regulation — A pumping system shall be provided with automatic means to ensure that the design pressure of any component is not exceeded.

3.6.3 Electric Pump Motors — An electric motor driving a pump shall be certified suitable for use in Class 1, Zone 1, hazardous areas.

3.6.4 Pump-driving Engines — A spark-ignition engine shall not be used for pumping. Auxiliary engine powered pumps shall not be used unless full compliance with section 2.7.6 can be met. Any such engine shall not be fitted with any electrical equipment. A compression-ignition propulsion engine of the tank wagon may be used to drive a pump.

3.6.5 Location of Controls — Power driven pumps shall be provided with controls which shall comply with the following requirements:

3.6.5.1 Controls shall be clearly marked, easily accessible, and located in a position remote from the pump.

3.6.5.2 An emergency stop for the engine or motor shall be provided with dual controls, operable from inside the cab and at a point remote from the cab. All such devices shall be clearly identified and easily accessible. The emergency stop should shut off the fuel to the engine and be able to stop the engine within 5 seconds. (Electrical master switch is one way of meeting this requirement, provided it shuts off the fuel supply to the engine).

3.6.6 Shielding of Pump Shaft — The pump shaft between the pump and the engine shall be shielded to prevent leakage from the pump seal from dripping or being thrown onto hot parts of the engine. Materials used in the shielding shall be of a type that will not create sparks when struck.

3.7 Testing

3.7.1 A tank or an individual tank compartment shall not leak, distort or suffer any permanent distortion, or show evidence of impending failure after application of 1 of the following tests for 10 minutes:

3.7.1.1 a hydrostatic test: when filled with water, the temperature of which does not exceed 38°C, conducted at 1.5 times the design pressure (note that for a hydrostatic test the water may be pressurised by air over the top of the water); or

3.7.1.2 a pneumatic test; at 1.25 times the design pressure. The adjacent compartments are to be empty and at atmospheric pressure. The air pressure shall be held and the entire surface of all joints that are under pressure are to be coated with a solution of soap and water, heavy oil, or other material that is suitable to detect foaming or bubbling, which indicates the presence of leaks.

In both tests the following is applicable:

- each compartment is to be tested individually and adjacent compartments are to be
  - (i) empty in both instances; and
  - (ii) at atmospheric pressure;
- relief devices which could prevent the test pressure from being reached shall be made inoperative during testing.

A vapour-recovery transfer system and a coaming that is part of a vapour recovery system shall not leak when subjected to a pressure of 35 kPa with the pressure maintained without leaks for 10 minutes.

3.7.2 Piping — Piping systems shall be tested in accordance with the following:

3.7.2.1 A piping system subject to pumping pressure shall be tested to a pressure 1.5 times the maximum working pressure.

3.7.2.2 Piping and in-line valves shall be tested at a pressure of 200 kPa before attachment to the tank.

3.8 Overfill Protection

3.8.1 It is recommended that tank wagons are equipped with over fill protection. For those tank wagons that load at the gantries of the major oil companies, industry compatible over fill protection is required to be fitted.

3.8.2 It is recommended that those vehicles which have over fill protection fitted also have the system interconnected with the vents of the tanks to ensure that the vents are open, thereby preventing the tank from becoming over pressurised during the filling operation.

3.9 Handrails

3.9.1 Where hand rails are fitted to a tank wagon, the attachment to the tank shall comply with 3.3.4.10 and the design shall minimise puncturing of the tank in the event of roll over.

4 REPAIRS

4.1 Major Repairs to Tank Wagons

4.1.1 Major modifications or repairs affecting the structural integrity of any tank used for conveying Liquids with Class 3.1A, 3.1B, 3.1C or 3.1D hazard classification in bulk shall be carried out only after a Design Test Certificate has been issued by an ERMA approved Test Certifier.

4.1.2 A major repair or modification is defined as altering the subframe and or tank, and includes remounting of tanks (where the structural integrity of the tank is changed).

4.1.3 Repairs shall be carried out as above only when the tank has been rendered free of flammable liquid and gas.

4.2 Repairs and Servicing of Tank Wagons

4.2.1 Tank wagons that are gas-freed may be serviced at any location or in any building, subject only to Clause 4.1 above.

4.2.2 Tank wagons that are not gas-freed may be taken into a building for repairs or servicing, including maintenance, but not hot work, provided that:

4.2.2.1 the tank is drained and valves closed or sealed;
4.2.2.2 no hot work is undertaken on the tank wagon;
4.2.2.3 the room is to be well vented to the outside of the building;
4.2.2.4 there is no source of ignition within 8 metres (electrical wiring and fittings to be in accordance with requirements for use in hazardous areas or disconnected);
4.2.2.5 the building is fire resistant or there is a sprinkler system installed.

4.2.3 Tank wagons may be serviced outside a building provided that:

4.2.3.1 the tank is drained and valves closed or sealed;
4.2.3.2 no hot work is undertaken on the tank wagon;
4.2.3.3 there is no source of ignition within 8 metres (electrical wiring and fittings to be in accordance with requirements for use in hazardous areas or disconnected);

4.3 Emergency Repairs

4.3.1 Emergency repairs not involving the load tank may be carried out in a building if:

4.3.1.1 it is impractical to do work otherwise;
4.3.1.2 the vehicle remains in building for minimum period of time
4.3.1.3 the vehicle does not remain in building overnight;
4.3.1.4 the person in charge of the building is given written notice of presence of Liquids with Class 3.1A, 3.1B, 3.1C or 3.1D hazard classification in the building.

4.3.2 Emergency repairs or operations (where the tank wagon cannot be moved) may be carried out at other locations provided no source of ignition is permitted within 8 m.

4.4 Re-testing

See clause 5.4 of Appendix A.

5 MARKINGS

5.1.1 The tank shall be marked on the rear and both sides with labels in accordance with the placarding requirements of the NZ Land Transport DG Rule 2005 and subsequent amendments.

5.1.2 Marking must be permanently attached to each tank or tank sub-frame that specifies:

5.1.2.1 the recommended operating pressure for each part of the tank and fittings that are intended to operate at different pressures, and
5.1.2.2 the maximum gross filling level of each tank compartment, and
5.1.2.3 the maximum density of any liquids to be carried, and
5.1.2.4 the material used to construct the tank, and
5.1.2.5 the date of manufacture, and
5.1.2.6 the manufacturer of the tank, and
5.1.2.7 the serial number of the tank, and
5.1.2.8 any limitations on substances that can be transported e.g. Diesel only trailers

5.1.3 This plate shall be affixed in a place readily accessible for inspection, preferably on the true left hand side near the front of the tank. The information shall be stamped, embossed, or applied by suitable means, into the material of the plate in characters at least 5 mm high. The plate shall not be painted so as to obscure the marking thereon. The tank serial number shall also be stamped on a substantial part of the tank structure.

5.1.4 Separately from the above, the following are also to be permanently attached:

5.1.4.1 the name and contact details of the test certifier who certified the last in service test certificate for the tank wagon is to be permanently attached to each tank or sub-frame. This can be a plate or label, and
5.1.4.2 the design registration number issued by the Authority (or LAB number issued by the Department of Labour if the tank was constructed prior to 1st April 2004), is to be permanently fixed on the tank in letters and numerals 75 mm high, preferably on the front right hand side of the tank, and
5.1.4.3 all tank outlets are to be labelled with the hazardous substance carried in each compartment. This can be achieved by fitting each compartment outlet with a tumbler incorporating the different hazardous substances carried in that compartment, and
5.1.4.4 if different hazardous substances are carried in each tank compartment, markings must be attached to the tank to identify the hazardous substance and the hazardous properties of each tank compartment as well as the tank filling and connection system to be used if more than one option is available.

APPENDIX A - MEANS OF COMPLIANCE WITH THIS CODE

The following are the actions are to be undertaken by a vehicle owner or the owner's agent to comply with this Code.

1 Design and Construction

1.1 The design of any new tank wagon or the assessment of any existing vehicle which is undergoing major modification, for use under this Code is to be carried out by a qualified person with relevant experience in the road transport industry. Completed designs and assessments are to be forwarded to the ERMA approved Test Certifier to obtain a Design Test Certificate. This certificate may be issued with conditions of approval.

1.2 The person seeking the approval of the Test Certifier will be expected to provide the following information:

a) Two copies of the general assembly drawing of the tank wagon for which approval is sought INCLUDING, where appropriate, the anticipated prime mover to be used. This drawing shall show all major dimensions.
b) In the case of new designs, two copies of the working drawings to be used in the construction of the tank wagon. In the case of assessments of existing designs, a copy of the assessment report and two copies of any drawing showing any modifications to be made before the tank wagon enters service.
c) The design calculations for the rear bumper.
d) The design calculations for the tank mounting arrangements.
e) The static roll threshold criteria assessment.
f) If available the registration number and fleet number of the vehicle concerned.
g) The identification of the qualified person responsible for the design or assessments.
h) The identification of the qualified person to be responsible for the supervision of construction of the tank wagon.

1.3 Once the Test Certificate for the design is issued, a copy of this Test Certificate and the design information (including the drawings) is to be forwarded to ERMA New Zealand who will issue a register number of the form "TAN XXX". If this design is to be used for other vehicles that have tanks 2000 litres or larger, these shall be designated by separate numbers.

1.4 Before the tank wagon enters service, it must be inspected by a Test Certifier for compliance with the requirements of this Code.
This inspection will include:

a) The obtaining of a written declaration from the manufacturer responsible for the supervision and construction of the tank wagon stating that the tank wagon has been constructed according to the approved design and drawings and is in accordance with this Code (refer to the Manufacturer's Declaration included with this Appendix).
b) A check for compliance with this Code.

2 Inspection

2.1 The vehicle shall be operated and inspected in accordance with the requirements of this Code, and all records of inspection required by this Code shall be kept by the vehicle owner or owner's agent or inspection as required by the ERMA approved Test Certifier. These inspection requirements include:

2.2 Every 3 months - an inspection carried out by a suitably experienced serviceman. This shall include

- inspection of any flexible hoses used in the transfer system for damage and wear and for electrical conductivity (if applicable), and
- inspection of any earthing straps for continuity and serviceability, and
- inspection of the intake flexible coupling (where applicable).

2.3 Every six months - present the vehicle to the Ministry of Transport Automotive Survey Section for a Certificate of Fitness inspection.

2.4 Every two years - an In Service Test Certificate issued by a Test Certifier approved by ERMA New Zealand is to be obtained. The following items are to be included in the check:

2.4.1 The tank and fittings are compatible with the substances being carried.
2.4.2 The vehicle including the load tank and pumping equipment are to be checked for hazardous substance leaks and if any are found they are to be repaired before entering service.
2.4.3 The tank is to be checked for significant corrosion. Where corrosion is found the tank must still meet the stress, pressure resistance and fatigue resistance that it was originally designed for.
2.4.4 The tank internal shut off valve and external shut off valve (outlet faucet) both operate as originally intended and have no leaks.
2.4.5 The means of shutting off any delivery pump operates as originally intended.
2.4.6 The vehicle fuel tank is free from any leaks and still meets the requirements of this Code.
2.4.7 The vents of each tank compartment are tested to ensure they operate correctly.
2.4.8 The tank compartments are pressure tested without permanent distortion or leaks (not required for tank trailers less than 2000 litres capacity)..
2.4.9 The rear run-under protection requirements are in place.
2.4.10 The rear end collision protection requirements are in place.
2.4.11 The fire resisting shield, the rear window of the cab and the cab vents are as originally designed.

2.4.12 Verification of the height of the overfill probes

2.5 Test method for a tank that is found to be leaking. If there is any reason to suspect a leak or the vehicle is involved in any significant accident or if repairs are carried out to the tank, each affected compartment shall be tested by one of the following methods:

(i) Pressurised to the design pressure with inert gas (unless the tank has been gas-freed in which case air may be used) while the adjacent compartments are empty and at atmospheric pressure. The pressure shall be held for at least ten minutes and the entire surface of all joints that are under pressure are to be coated with a solution of soap and water, heavy oil, or other material that is suitable to detect foaming or bubbling, which indicates the presence of leaks, or:

(ii) Pressurised as specified in Section 3.7.1. Any pressure relief devices which could prevent the test pressure being attained shall be rendered inoperative during testing.

2.6 Tanks failing the above tests shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered before any tank is put in service

2.7 In circumstances whereby these inspection procedures are unable to be used alternative inspection procedures may be used provided that they approved by the Test Certifier issuing the Test Certificate for the Tank Wagon.

MANUFACTURERS DECLARATION – FLAMMABLE LIQUID TANK WAGONS

I . . . . . .certify that I have design checked /inspected the following:

Vehicle:	Reg No:
Owner:	Fleet No:
Type of Vehicle:	Tank No:
Hazardous substances:	Capacity:
	Drawings:

I declare that I have made such detailed examinations and checks as I considered necessary and it is my opinion that:

1. The design is in accordance with the *Code of Practice for Flammable Liquids Tank Wagos, Reference HSNOCOP 6.1 (the Code)* and has been issued the registration number …….

2. The construction is in accordance with good and widely accepted engineering practice and the design as shown on the drawing list attached.

3. An inspection has been carried out and the requirements of the Code have been met.

4. I have witnessed and/or verified non-destructive testing/hydro testing in accordance with the requirements of clause 3.7 of the Code.

5. This tank wagon is subject to additional conditions as follows:

Therefore I recommend that this tank wagon be approved for transport of hazardous substances with Class 3.1A, 3.1C, 3.1B and/or 3.1D (strike out which is not applicable) flammable classifications under the Hazardous Substances (Tank Wagons and Transportable Containers) Regulations 2004

Signed . . . . . .

for and on behalf of . . . . . .

APPENDIX B - TANK WAGONS (INCLUDING TANK TRAILERS LESS THAN 2000 LITRES CAPACITY

This appendix is applicable to tank trailers with a water capacity less than 2000 litres.

1. The tank is to be designed and constructed to sound engineering principles. A horizontal cylindrical tank that is constructed as a Category 2 tank in accordance with AS 1692 Steel tanks for flammable and combustible liquids is deemed to meet this requirement.
2. The tank is to have a minimum shell thickness of
   - not less than 4mm when constructed from aluminium, or
   - 3mm when constructed from low carbon steel, or
   - 2.5 mm shell thickness when constructed of stainless steel.
3. The end plates are to have a minimum thickness of 5mm (without stiffeners) when constructed from aluminium or low carbon steel or 4 mm (without stiffeners) when constructed from stainless steel.
4. Trailer tanks greater than 1200 litre capacity are to be fitted with a baffle.
5. The tank is to be fixed to a chassis such that under foreseeable operating conditions the tank will remain attached to the chassis and comply with section 2.9.4 of this Code.
6. Each compartment of the tank shall be able to contain the substance carried when it is subject to an internal pressure of 35 kPa. The tank meets this requirement if each compartment, when subject to a hydrostatic pressure of at least 35 kPa or the design pressure, whichever is greater, for at least ten minutes, with adjacent compartments empty and at atmospheric pressure: the compartment does not leak, or show any other evidence of failure.
7. Corrosion shall be taken into account when designing a tank. With the corrosion expected from its normal working life, the tank must still meet the stress, pressure and fatigue resistance that it was originally designed for.
8. Tanks are to comply with the venting requirements in section 3.4.6 of this Code. Notwithstanding this, tanks used for substances with a flammable hazard classification of 3.1 D only, are not required to meet the provisions of clause 3.4.8.
9. Trailer tanks are to comply with the stability requirements of 2.10 of this Code.
10. Each trailer tank shall be protected from rear end collisions and is to comply with the provisions of clause 2.3.1 of this code.
11. In circumstances whereby trailer tanks are constructed with the rear bumper greater than 600 mm above ground level, the trailer tank shall have rear end protection fitted in accordance with the following requirements:
    - In circumstances whereby the width of the tank is less than 1500 mm, the width of the under-run bumper shall be not less than the width of the tank, or in circumstances whereby the tank is 1500 mm or greater, the width of the under-run bumper shall not be less than 1500 mm.

- The under-run bumper shall have an elevation, measured from the ground to the lowest surface of the bumper, of not less than 500 mm and not more than 600 mm.
- The under-run bumper shall withstand a static load not less than the laden weight of the road tank trailer.

[11A. As an alternative to 11 above, trailer tanks may be constructed with rear bumper protection fitted in accordance with the following requirements:

- If the width of the tank is less than 1500 mm, the width of the bumper shall be not less than the width of the tank, or if the tank is 1500 mm or greater, the width of the bumper shall not be less than 1500 mm.
- The bumper shall withstand a static load applied at not less than 500 mm and not more than 600 mm from ground level.
- The bumper shall withstand a static load of twice the laden weight of the road tank trailer.]

12. All tank fittings are to be protected from damage in an accident, i.e. by coamings or shields.
13. All connections to the tank shall be above the safe fill level.
14. The tank outlet pipes are to have shut-off valves fitted as close as practical to the tank. The valve(s) are to be readily operable in an emergency.
    - In the case of a trailer tank with a lockable shield, the valves must be shut unless liquid transfer is taking place.
    - A trailer tank fitted with a motorised pump must have an anti-siphon valve fitted.
15. With the exception of tank trailers, no electrical wiring or fittings are to be attached to the tank. All wiring is to be installed and protected to preclude damage and sparking. The vehicle is to be fitted with an electrical cut-out switch fitted as close as practical to the battery.
16. The vehicle exhaust is to be positioned so as to avoid impingement by any spillage which may emanate from the tank or its fittings. In no case shall the exhaust terminate closer than 1.6 m from the tank or 2 m from any tank opening unless it is effectively screened from spillage.
17. The tank is to be marked or labelled in accordance with the provisions of clause 5 of this code.
18. A 30B fire extinguisher is to be carried in the vehicle. In case of a tank trailer this may be carried in the towing vehicle.
19. The vehicle must not be parked within 8 metres of a public place.
20. Trailer tanks designed to carry hazardous substances with 3.1A, 3.1B or 3.1C hazard classifications must have tandem axles with braking on at least the first axle.
21. Single axle tank trailers are to have a means of stabilising when detached from the towing vehicle.
22. Tanks used to convey substances with 3.1A, 3.1B or 3.1C flammable classifications must:
    - Be fitted with bonding reels
    - If equipped with a pump that is powered by a piston engine, it must be diesel driven and fitted with a spark arrestor.
    - Be fitted with roll over protection valves.

APPENDIX C - TANK WAGONS FOR CARRYING 3.1D FLAMMABLE LIQUIDS

This Appendix covers tank wagons carrying hazardous substances of hazard classification 3.1 D, defined in the Hazardous Substances (Classification) Regulations 2001 as liquids that have a flash point greater than 60 degrees Celsius but less than or equal to 93 degrees Celcius.

Tank wagons that will be loading at vehicle loading gantries that also load substances with 2.1.1A, 2.1.1B, 2.1.2A, 3.1A, 3.1B or 3.1C hazard classifications, either in the same loading bay or adjacent loading bays, must be constructed in accordance with the provisions of this Code as if the tank wagon is intended to be utilised for transporting substances with 2.1.1A, 2.1.1B, 2.1.2A, 3.1A, 3.1B or 3.1C hazard classifications except for the following variations:

Tank wagons that do not load at vehicle loading gantries that do not also load substances with a 2.1.1A, 2.1.1B, 2.1.2A, 3.1A, 3.1B or 3.1C hazard classifications, either in the same loading bay or adjacent loading bays, must be constructed in accordance with this Code except for the following variations:

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(i) Clause 2.4 is exempted
(ii) Clause 2.7.6 is exempted

APPENDIX D – VEHICLE FUEL TANK CONSTRUCTION AND TESTING

This Appendix outlines the conditions under which a vehicle fuel tank may be tested as alternative to providing a protection guard (see Clause 2.7.5.2). These requirements are based on those of the USA Federal Highway Administration (Section 393.67) and only apply to side-mounted vehicle fuel tanks containing vehicle fuel (diesel and petrol) at normal atmospheric pressure and temperature.

1. Construction Requirements

1.1. All joints are to be closed by welding such that they are sealed.
1.2. Drains and bottom fittings shall not project more than 25 mm from the bottom of the tank
1.3. All fittings are to be installed via flanges, nozzles or spuds welded into the tank.
1.4. A fuel tank with a capacity greater than 100 litres shall have a vent to prevent over pressurisation during a fire.
1.5. The tank is to be equipped with a non-spill air vent.
1.6. The tank is to be marked with liquid capacity, date of manufacture and indication of acceptance under this Code.

2. Testing Requirements

2.1. Pressure test — the tank and fittings are to be capable of withstanding a pressure of 150% of a minimum of the pressure reached during venting or 500 kPa without leakage.
2.2. Leak test — the tank is to be filled, with feed outlet sealed, and rotated about any axis without any leakage.
2.3. Drop test — fill tank with quantity of water having a weight equal to the weight of the fuel load.
  2.3.1. Drop the tank from a minimum height of 9 m onto an unyielding surface such that it lands squarely on one corner. Tank and fittings to be leak free.
  2.3.2. Drop the tank from a minimum height of 3 m onto an unyielding surface such that it lands squarely on its fill pipe. Tank and fittings to be leak free.

APPENDIX E – VACUUM TANK WAGONS

1. Conditions of use

This appendix specifies the requirements for vehicles used in the recovery, transportation and disposal of material containing substances with Class 3.1A, 3.1B or 3.1C hazard classification where inclusion of solids such as gravel, litter etc. prevent the use of conventional liquid removal.

Under no circumstances are these vehicles to be used for the bulk distribution of substances with 3.1 hazard classification.

2. Design

2.1. To fully comply with the provisions of this Code with the following amendments:

2.1.1. Maximum water capacity is restricted to 7000 litres with a maximum of 5% ullage.

2.1.2. The tank shall be so designed to meet both the requirements of this Code and the internal pressure generated under vacuum. The minimum thickness for the shell and bulkheads to be no less than 4 mm for mild steel and 6 mm for aluminium. The tank shall have circular cross section and the maximum shell radius shall not exceed 950 mm. The un-reinforced length restrictions do not apply.

2.1.3. The maximum inlet size to be 80 mm NB.

2.1.4. The unit is to be bottom loaded only and must not carry any provision for top loading.

2.2. The vacuum system is to be water ring only.

2.2.1. The liquid ring water is to be replaced after each unloading to prevent build up of hydrocarbons.

2.2.2. The vent from the liquid ring vacuum pump is to discharge in a manner that minimises potential ignition.

2.3. The auxiliary engine to power the vacuum pump must comply with the following:

2.3.1. Must be fitted with a method of strangling the engine. This could take the form of a valve which closes the air intake passage to the engine, in which case account must be taken of the effects of vacuum on the intake piping and other passages (such as pump breather pipes) through which air may pass to the air intake of the engine. A CO_2 fire extinguisher of not less than 2.7 kg may be used as a strangler provided that the extinguisher is a 100 percent discharge type and is arranged to discharge into the air intake close to the intake manifold.

2.3.2. Must be fitted with an appropriate electrical isolation switch and wired as per the this Code.

2.3.3. Must be shielded from the load tank to prevent spillage onto the hot surfaces of the engine.

2.3.4. The air cleaner must terminate at least 80 mm above the roll over coaming on the tank.

2.3.5. The exhaust must be fitted with a spark arrestor and must terminate at least 80 mm above the roll over coaming on the tank. Fuel tanks must comply with the provisions of this Code.

2.3.6. The tank must be fitted with an isolation valve in the inlet line to prevent the hazardous substance or vapour returning to the pumping system. This valve must be automatically activated when the prime mover is started and remain closed during transportation.

2.3.7. The tank must be fitted with a device to relieve the vacuum from the tank during transportation and shall be set at not less than 7 kPa as per this Code.

2.3.8. The tank is to be fitted with a pressure relief vent the opening setting of which does not exceed 17 kPa.

3. Operation

3.1. The unit is to be used only by Approved Handlers who are fully conversant with all operating procedures and emergency procedures.

3.2. The unit must carry a minimum of four approved safety cones which are to be used to isolate the vehicle from the public during filling and discharging operations.

3.3. The unit must be equipped with a suitable means of earthing the vehicle during filling and discharge to eliminate the build up of static electricity.

3.4. The vehicle must comply with the fire extinguisher provisions of this Code.

3.5. The unit must carry an industry approved emergency spill response kit and operators must be trained in its use.

3.6. The vehicle must carry a minimum of two large stand alone signs which are to be placed at a minimum of 10 metres from the vehicle. The signs should convey the following:

Danger Flammable Vapours
No Smoking or Sources of Ignition within 15 Metres of Vehicle
Please Keep Clear

3.7. The tank shall be marked on the rear and both sides with a flammable liquid diamond, minimum dimensions 400mm x 400mm. The label is to incorporate the words “No Sources of Ignition within 8 metres”. Note: The requirements in relation to placarding as required by the Land Transport Rule Dangerous Goods 2005 Rule 45001/1.

3.8. A certification plate of a compatible material to the tank not subject to corrosion shall be permanently fixed to the tank or tank runners and bear the following minimum information:

3.8.1. The tank manufacturer's name
3.8.2. The serial number of the tank
3.8.3. Date of manufacture
3.8.4. Date of pressure test
3.8.5. Tank capacity (litres)
3.8.6. Test pressure

3.9. This plate shall be affixed in a place readily accessible for inspection, preferably on the true left side near the front of the tank. The information shall be stamped, embossed, or applied by other suitable means into the material of the plate in characters at least 5 mm high. The plate shall not be painted so as to obscure the marking thereon.

3.9.1. The tank serial number shall also be stamped on a substantial part of the tank structure.