Vehicle Certification Agency

Vacuum-Operated Waste Tanks
DfT / VCA guidance on the interpretation of ADR Chapter 6.10

Introduction

This guidance has been developed by the Department for Transport (DfT) and stems from the discussions of an informal working group that was convened by the DfT which consisted of representatives from DfT, Vehicle Certification Agency (VCA), Vacuum-Operated Waste Tank (VOWT) manufacturers, Appointed Inspection Bodies (AIBs) and the United Kingdom Accreditation Service (UKAS).

Circulated by the VCA, its purpose is to provide guidance to AIBs and stakeholders on the interpretation of certain aspects of the paragraphs within ADR Chapter 6.10 and, where appropriate, provide guidance on the minimum requirements that should be considered acceptable for the type approval, inspection and in-service operation of VOWTs. This should result in a more consistent application of the requirements of ADR Chapter 6.10.

The approaches adopted in this guidance are based on the following general principles:

- consistency with the intention and interpretation of ADR, clarified as necessary
- allowing tanks that had already entered into service before the application of this guidance to continue in operation provided the tanks are safe and fit for purpose
- requiring tanks that entered into service after the application of this guidance to fully comply with ADR

This guidance should not be used as a substitute for consulting ADR. AIBs should continue to use ADR as their primary reference point, exercising their engineering judgement where appropriate, and using this guidance to aid their interpretation of particular requirements. Where examples are shown in this document, these should be regarded as examples of how compliance with the requirements of ADR might be achieved. However, it should be noted that the requirements may also be met by other means, and Inspectors should therefore exercise their judgement in assessing whether alternative designs are acceptable.

AIBs are reminded of the need to make sound judgements when carrying out inspections and should note that knowingly granting an inspection certificate to a tank that does not comply with the legal requirements could lead to a prosecution under Regulation 5 of the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended).

Application of guidance

The requirements set out this guidance must be applied from 06 November 2020.

General guidance

Inspection certificates

For guidance on the substances that need to be listed on the certificates for VOWTs please refer to VCA guidance note 2 (GN2).

Dismantling of equipment for inspection

It should not be common practice for dismantling to be necessary but it is recognised that partial dismantling may, by exception, be needed to fully assess the presence and/or serviceability of certain components. For example, the presence of flame traps.

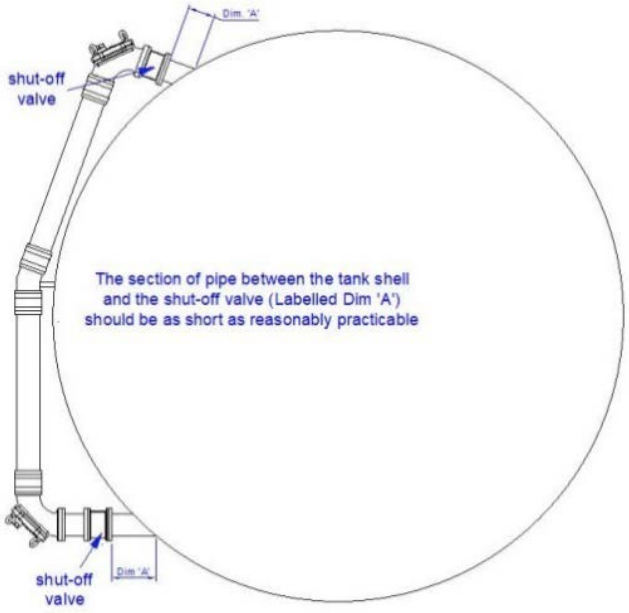
Routine maintenance and maintenance records

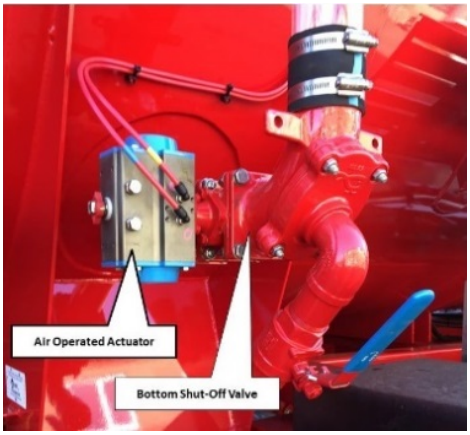
VOWTs and any associated equipment must, at all times, be fit for purpose, and so maintained in a safe and serviceable condition. Operators are reminded that ADR requires a tank maintenance record to be retained by the owner or the operator and for this documentation to be provided to the competent authority on request.

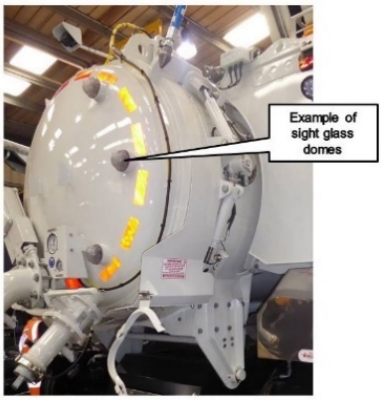
Additional guidance for Inspectors

This guidance should be read and used in conjunction with the VCA publication “Guidance for the application of EN12972:2018” which also provides guidance on certain aspects of VOWT inspections.

Guidance on specific aspects of ADR 6.10 (ADR 2019)

Sight glasses and sight domes		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.3.8 (f)(ii)	The tank or in the case of compartmentalised tanks, every compartment, shall be equipped with a level indicating device. Glass level-gauges and level-gauges of other suitable transparent material may be used as level indicating devices provided:….. (ii) the top and bottom connections to the tank are equipped with shut off valves fixed directly to the shell and…	ADR 1.2.1: *"Shell"* (for tanks), means the part of the tank which retains the substance intended for carriage, including openings and their closures, but does not include service equipment or external structural equipment; Given the above definition, any section of pipe welded directly to the 'tank shell' and incorporating a provision that enables the shut-off valves to be attached (such as a flange or threaded connection) should be regarded as falling within the definition of the *"Shell".* The section of pipe may be straight, as in the example shown below, or incorporate a 90^0 bend or tee piece to enable the shut-off valves to be kept as close to the shell as possible. However, in all cases the pipe length must be as **short as reasonably practicable.**  It should be noted that any sections of pipe and shut-off valves must also be protected against the risk of being wrenched off or damaged during carriage or handling in accordance with ADR 6.10.3.1.

		For tanks that entered into service before the application of this guidance and which may not fully meet the above requirements, AIBs shall not refuse to grant inspection certificates if the shut-off valves are protected in accordance with ADR 6.10.3.1 and they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the position of the shut off valves may not fully meet the requirements of ADR.
	…so arranged that carriage with the valves in an open position is prevented;	As per the VCA instruction issued on 23 August 2017, this should be interpreted as being a requirement for the vehicle to be constructed in such a way that it is not possible for it to be driven with the shut-off valves in the open position e.g. a drive off interlock system should be fitted.  It is anticipated that an interlock system, incorporating air operated actuators that automatically close the shut off valve before the vehicle may be driven, as shown in the example above, will be needed. Clearly, an operational instruction such as a label to the driver / operator reminding them to ensure the valves are closed, should not be considered to meet the ADR requirement. Inspection certificates should not be granted unless the above requirements are met.
6.10.3.8 (f)(iii)	The tank or in the case of compartmentalised tanks, every compartment, shall be equipped with a level indicating device. Glass level-gauges and level-gauges of other suitable transparent	It has been noted that some ‘dome’ type sight glasses, that may be similar to the example shown below, have failed in service.

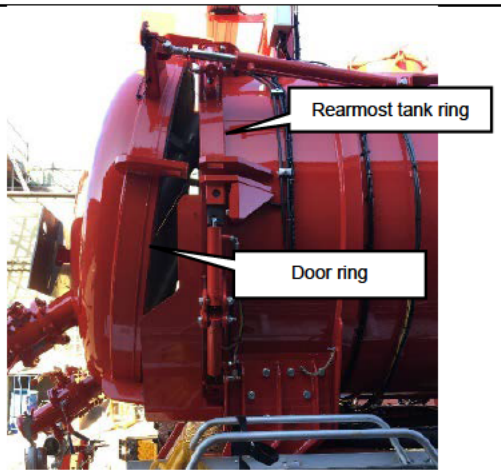
	material may be used as level indicating devices provided:….. (iii) are suitable for operation at the maximum working pressure of the tank; and	 AIB's are not however, expected to refuse to grant inspection certificates to tanks equipped with 'dome' type sight glasses unless these devices fail a specific part of the inspection (e.g. pressure test) or there is evidence that they are not suitable for operation at the maximum working pressure of the tank.
6.10.3.8 (f) (iv)	The tank or in the case of compartmentalised tanks, every compartment, shall be equipped with a level indicating device. Glass level-gauges and level-gauges of other suitable transparent material may be used as level indicating devices provided:….. (iv) are placed in a position where they will not be liable to accidental damage.	Sight glasses must be in a position where they are not likely to sustain accidental damage. Provided they are located in a position where they are likely to be protected against accidental impacts with objects such as roadside furniture or tree branches this should be considered acceptable. As a minimum, any protective bars or similar devices designed to create a position in which the sightglass is protected should be considered equivalent to (i.e. the same or better than) the following examples:  For tanks that entered into service before the application of this guidance and which may not fully meet the above requirements, AIBs shall not refuse to grant inspection certificates if the sight glass has some form of protection and they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the protection afforded to the sight glass may not fully meet the requirements of ADR. Inspection certificates should not be granted to any

		tanks manufactured after the application of this guidance unless the above requirements are met.
Loading of Class 3 substances (Flammable liquids)		
ADR reference	ADR requirement	DfT guidance / interpretation
4.5.2.2	For carriage of liquids meeting the flash point criteria of Class 3, vacuum-operated waste tanks shall be filled through filling devices which discharge into the tank at a low level. Measures shall be taken to minimise the production of spray.	This is an operational requirement and is therefore considered to be outside the scope of AIB inspections. Manufacturers should however consider measures to highlight this requirement to the driver / operator, such as using the safety labelling shown below:   AIBs should note the absence of labelling and any suspected operational non-compliance on the inspection certificate.
Pressure labels		
ADR reference	ADR requirement	DfT guidance / interpretation
4.5.2.3	When discharging flammable liquids with a flash point below 23°C by using air pressure, the maximum allowed pressure is 100kPa (1 bar).	This is an operational requirement and is therefore considered to be outside the scope of AIB inspections. However, AIBs should consider noting any suspected operational non-compliance on the inspection certificate. Manufacturers should consider making operators aware of this requirement via an instruction such as a label or a note in any handbook setting out the operation of the tank and its equipment.
Bursting Discs and Safety Devices (including pressure relief valves)		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.3.9	The shells of vacuum operated waste tanks shall be fitted with a safety valve preceded by a bursting disc. The valve shall be capable of opening automatically at a pressure between	The safety (pressure relief) valve must open automatically at a pressure between 0.9 and 1.0 times the test pressure of the tank (typically 3.6 to 4.0 bar in the case of a tank having a test pressure of 4.0 bar). Any identifying marks, such as the make, model and serial number, on the pressure relief valve should be recorded in the notes section of inspection certificates. Bursting discs must be visually inspected at periodic and

	0.9 and 1.0 times the test pressure of the tank to which it is fitted….The 'burst disc' shall burst at the earliest, at the opening pressure of the safety (relief) valve, and at the latest, at the test pressure of the tank.	intermediate inspections. The inspector must make an assessment as to whether the discs are serviceable (this assessment should be as to whether the discs are currently serviceable, not whether they will be serviceable until the next inspection). Should the inspector suspect the discs might not be serviceable until the next inspection, this should be noted on the inspection certificate and drawn to the attention of the operator.
Calculation pressure		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.2.1	Tanks shall be designed for a calculation pressure equal to 1.3 times the filling or discharge pressure but not less than 400 kPa (4 bar) (gauge pressure). For the carriage of substances for which a higher calculation pressure of the tank is specified in Chapter 6.8, this higher pressure shall apply.	To be considered a VOWT, the tank must have the appropriate ADR tank code (such as L4AH). Any tanks that have been approved to a lower calculation pressure, such as 1.5 bar (and having the associated tank code) may not therefore be considered a VOWT according to ADR 6.10. For any tanks that may have been approved to a calculation pressure less than 4bar, these will either need to be modified and reapproved to ADR 6.10 requirements or be classified as a vacuum operated tank under ADR 6.8. However, if it is not possible for such a tank to meet the full requirements of ADR 6.8 during any 'reclassification', an application for an authorisation may be submitted to DfT. Such applications would be considered on a case by case basis and would require suitable justification and a robust safety case. If a tank meets the full requirements of ADR 6.8 or 6.10 there is no requirement for an authorisation to be obtained from DfT.
Hydraulic tests and rear doors		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.3.5 (a)	The tanks may be equipped with openable ends. Openable ends shall comply with the following conditions: (a) The ends shall be designed to be secured leak tight when closed;	All tanks must be tested in their 'in-service' condition. i.e. any pressure tests that may be required must be conducted without the use of additional temporary clamps. An authorisation cannot be issued for vehicles that do not meet this requirement and therefore, any tanks failing this aspect of the inspection must be brought into compliance (or used for an alternative purpose for which they would comply).

6.10.3.5 (b)	(b) unintentional opening shall not be possible	Inspection certificates must not be granted to any tanks that do not have a safety device which prevents unintended opening. As in such situations it would be unlikely that any safety risks could be mitigated, it is unlikely that an authorisation could be granted to a non-compliant tank. Examples of safety devices that may be considered to meet this requirement are: (i) a pneumatic interlock system as shown below, which incorporates a button that must be pressed before the lever controlling the opening of the rear door becomes operational.  (ii) a mechanical device, such as a guard over a lever controlling the opening of the rear door, which prevents the lever from being operated until the device is disengaged. The device must be designed so that, in order to open the rear door, two discrete steps must be taken and it is not possible for the lever to be operated inadvertently, for example, by a person leaning against the lever. It should however be noted that these are just two examples and other designs may meet the relevant requirements. Inspectors should therefore exercise their judgement in assessing whether alternative designs are equivalent to (i.e. the same or better than) the above examples. Inspection certificates should not be granted if safety devices have been bypassed in such a way that would allow the rear door to be inadvertently opened. If it is suspected that a safety device has been or will be bypassed when the tank is in-service, this should be noted on the inspection certificate and drawn to the attention of the operator.
6.10.3.5 (d)	(d) A safety or break seal device shall be	For openable ends that are manually operated, a safety or break seal device must be fitted to ensure safety of

	incorporated to ensure that the openable end cannot be opened when there is still a residual over pressure in the tank. This requirement does not apply to openable ends which are power-operated, where the movement is positively controlled. In this case the controls shall be of the dead-man type and be so positioned that the operator can observe the movement of the openable end at all times and is not endangered during opening and closing of the openable end; and…	the operator. An example of such a device is shown below, but other designs may also meet the requirements of 6.10.3.5 (d).  It should be noted that the **requirement for a safety or break seal device does not apply to power operated rear doors**. Where rear doors are power operated it should be noted that as an operator safety provision, any controls must be positioned such that the operator can observe the movement of the openable end at all times. Any controls must not be positioned such that the operator could be exposed to danger when opening or closing the openable end. Inspection certificates must not be granted to any tanks that do not meet the full requirements of paragraph 6.10.3.5 (d). It is considered unlikely that sufficient justification could be provided for an authorisation to be granted to a tank that does not meet these requirements, given that it would be unlikely that any safety risks could be mitigated. However, if suitable justification should be provided, the DfT would give consideration on a case by case basis to granting an authorisation to exempt specific VOWTs from this requirement.
6.10.3.5 (e)	(e) provisions shall be made to protect the openable end and prevent it from being forced open during a rollover of the vehicle, tank-container or tank swap body.	To meet the requirements of 6.10.3.5 (e) the following requirements must be fulfilled: (i) roll-over protection must be provided to the openable end and (ii) the openable end locking mechanism must be designed in such a way that it is protected against being forced open in the event of a roll-over. (i) Roll-over protection for the openable end. This may for example be achieved by designing the 'rearmost tank ring' and the 'door ring' in such a way that the door protection is an integral part of a robust design.



It should however be noted that this is just one example of how this provision may be achieved and other designs may also meet the relevant requirements. Inspectors should therefore exercise their judgement in assessing whether alternative designs are equivalent to (i.e. the same or better than) the above example.

(ii) Openable end locking mechanisms.

The openable end locking mechanism must be designed in such a way that it is protected against being forced open in the event of a roll-over. The examples below show how this requirement might be met:

Manual hand wheel door clamps

The clamps are protected by substantial brackets on the tank and door from damage during a roll-over. In the event of a roll-over, the hand wheels are designed to fracture and leave a nut securing the door in place, thus preventing the door from being forced open.

Hydraulic wedge type door clamps.

This type of clamp is fully automatic, controlled by hydraulic linear actuators. The wedge on the end of the ram is guided though slotted brackets on the door and the end of the tank, and the wedge pulls the seal tight onto the sealing face. The hydraulic oil is locked in the rams preventing the rams from opening.

The circumferential alignment of the rams around the door ring is likely to mean they will not be damaged in such a way that their effectiveness is reduced in the event of a roll-over and allow the rear door to be forced open.

Hydraulic over centre type clamps

This type of clamp is fully automatic, controlled by hydraulic linear actuators. A hook style clamp is connected to a hydraulic ram with a series of linkages. When the ram extends, the hook clamp rotates on a pivot and clamps the door shut.

The door clamping mechanism shown above is likely to be vulnerable to circumferential forces in the event of a roll-over incident and likely to be subject to damage that might force the clamps and therefore the door open.

Given this vulnerability, this type of door locking mechanism must be designed in such a way that it is guarded against being forced open in the event of a roll-over. Protection must be provided for this type of door clamping mechanism and this could be achieved by fitting substantial brackets on the tank and door or through additional measures such as a protective cover. The following image shows a method by which protection might be provided.

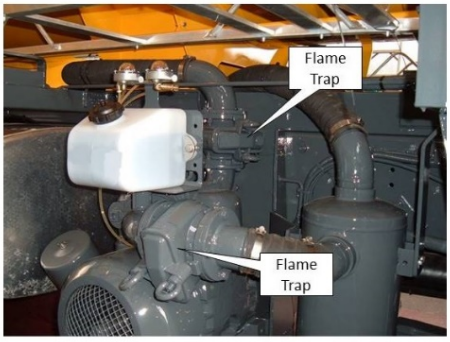
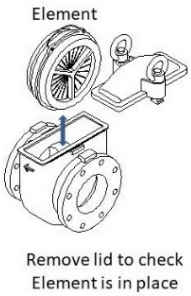
In cases where the protection may not appear to be sufficiently robust, inspectors may also take into consideration evidence provided by the tank manufacturer. This evidence must demonstrate by test or calculation that the opening end is protected against being forced open during a roll-over incident even if the clamps on the top and / or one side of the door should be rendered ineffective.

It should however be noted that, in addition to these examples, other designs may meet the relevant requirements. Inspectors should therefore exercise their judgement in assessing whether alternative designs are equivalent to (i.e. the same or better than) the above examples.

For tanks that entered into service before the application of this guidance and which may not fully meet the above

		requirements, AIBs shall not refuse to grant inspection certificates if they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the means used to prevent the openable end from being forced open during a roll-over may not fully meet the requirements of ADR.
Overturn protection		
ADR reference	ADR requirement	DfT guidance / interpretation
6.8.2.1.28	The fittings and accessories mounted on the upper part of the tank shall be protected against damage caused by overturning. This protection may take the form of strengthening rings, protective canopies or transverse or longitudinal members so shaped that effective protection is given.	At the September 2019 session of the Joint Meeting, following the submission of papers by the UK, the Working Group on Tanks concluded that ADR 6.8.2.1.28 applies to Vacuum-Operated Waste Tanks. Any fittings and accessories mounted on the upper part of the tank must therefore be protected against any damage that may be caused by overturning, and should take the form of or be equivalent to (i.e. the same or better than) the examples provided in 6.8.2.1.28. Inspectors should exercise their judgement in assessing whether alternative designs meet the above requirement. For tanks that entered into service before the application of this guidance and which may not fully meet the above requirements, AIBs shall not refuse to grant inspection certificates if they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the tank does not fully meet the requirements in 6.8.2.1.28 of ADR.
Flammable and toxic vapours		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.3.8 (a)	The tanks shall be fitted with the following additional service equipment: (a) The outlet of a pump/exhauster unit shall be so arranged as to ensure that any flammable or toxic vapours are diverted to a place where they will not	At the September 2019 session of the Joint Meeting, following the submission of a paper by the UK agreement was reached within the Working Group on Tanks that 6.10.3.8 (a) allows the outlet of a pump / exhauster unit to be positioned at either a high or low level. To make the text clear, the following footnote will be added to 6.10.3.8 (a) in the 2021 edition of ADR: “Note; this requirement may, for example, be complied with by the use of a vertical pipe or a low level outlet with a connection which allows, when necessary, attachment of a hose.”

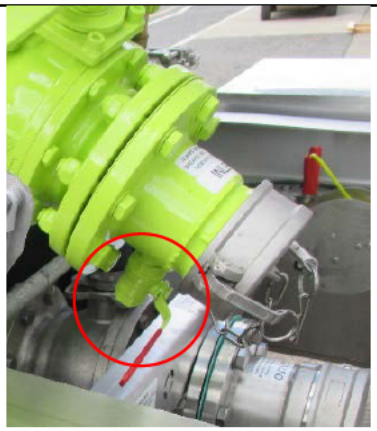
	cause danger.	This requirement may therefore be achieved by a high level outlet as shown in the following image:  Or alternatively, a low-level outlet that is equipped with a connection designed for the attachment of an extension hose as shown in the following examples:   Other designs may also meet the requirements of ADR and inspectors should therefore exercise their judgement in assessing whether alternative designs are acceptable. For tanks that entered into service before the application of this guidance and which may not fully meet the above requirements, AIBs shall not refuse to grant inspection certificates if they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the tank does not fully meet the requirements in 6.10.3.8 (a) of ADR.
6.10.3.8 (b)	(b) A device to prevent immediate passage of flame shall be fitted to all openings of a vacuum pump/exhauster unit which may provide a source of ignition and which is fitted on a tank used for	Tanks must either: (i) be designed to be “explosion pressure shock resistant” or (ii) have all openings of the vacuum pump / exhauster unit fitted with a device to prevent the immediate passage of flame For any tanks that may fall within (ii), AIBs must check for the presence of flame traps and flame trap elements,

	the carriage of flammable wastes, **or** the tank shall be explosion pressure shock resistant, which means being capable of withstanding without leakage, but allowing deformation, an explosion resulting from the passage of the flame.	even if partial dismantling is needed to confirm the element is in place. The image below shows a typical example:   Remove lid to check Element is in place ADR clearly requires flame traps to be fitted to all openings of a vacuum pump / exhauster and therefore, inspection certificates should not be granted to designs which incorporate openings to atmosphere (including those within any valve) that are before the flame trap. An authorisation could only be granted to a VOWT not meeting the requirements of 6.10.3.8(b) if evidence can be provided that the design in question was of no greater safety risk. This could, for example, be in the form of a safety case from the manufacturer of the vacuum pump / exhauster unit showing that their design posed no greater safety risk than a design that fully complied with 6.10.3.8(b).
Earth equipment		
ADR reference	ADR requirement	DfT guidance / interpretation
6.8.2.1.27	Shells intended for the carriage of liquids having a flash-point of not more than 60 ºC or for the carriage of flammable gases, or of UN No.1361 carbon or UN No.1361 carbon black, packing group II, shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electrochemical	The electrical continuity between the earth connection and the metallic parts of the tank and equipment, including any frame and where applicable between the earth connection and the vehicle chassis must be checked. The maximum resistance should not exceed 10Ω. 

	corrosion shall be avoided. Shells shall be provided with at least one earth fitting clearly marked with the symbol "⏚", capable of being electrically connected.	 Example of Continuity Bonding Any lead that is used for connecting the vehicle to an earth point when loading and unloading should be checked and should not have a resistance greater than 10Ω.  Example of Earth Reel Should the inspector suspect that the earth lead and the continuity of the connection might not be serviceable until the next inspection, this should be noted on the inspection certificate and drawn to the attention of the operator. For any vehicles that have the required earth point (as shown in the image below) and do not have a connecting lead on or within the vehicle at the time of test, the absence of such a lead should be recorded in the notes section of the certificate.  Example of Earth Point The earth point must be clearly marked with the symbol "⏚" (as shown in the image above). Inspection certificates should not be granted if the earth point is not

		clearly marked.
Valves		
ADR reference	ADR requirement	DfT guidance / interpretation
6.10.3.3	The position and closing direction of the stop-valve(s) connected to the shell, or to any compartment in the case of compartmented shells, shall be unambiguous, and be able to be checked from the ground.	AIBs must check that the position and closing direction of stop-valves are clearly marked and visible from the ground. This could, for example, be achieved with suitable safety instruction labels. It is anticipated that all manually operated valves will be labelled or marked to indicate their operation, and any pneumatically operated valves will have instructions in the tanker control panel which detail the operation of any pneumatic switches. Inspection certificates should not be granted if the method of valve operation is not clearly marked or labelled.
6.10.3.4	In order to avoid any loss of contents in the event of damage to the external filling and discharge fittings (pipes, lateral shut-off devices), the internal stop-valve, or the first external stop valve (where applicable), and its seatings shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to withstand them. The filling and discharge devices (including flanges or threaded plugs) and protective caps (if any) shall be capable of being secured against any unintended opening.	The internal stop-valve or the first external stop-valve must be designed in such a way that they are protected against the risk of being wrenched off. Any first external valve should be fitted as close to the tank as possible and either robustly braced or protected by an engineering solution that offers an equivalent (i.e. the same or better) level of protection. Stop valves located in an area protected by the vehicle chassis and a rear under run protective device fitted to the vehicle (as shown in the example below) should be considered to meet the requirements of 6.10.3.4.  It should be noted that in order for the stop valve to be considered to be protected by being in such a position, the stop valve should not project beyond this ‘protected’ area. The valve should not, for example, be in a position such that any part of the valve is lower than the lowest part of either the rear under run protection device and/or the vehicle chassis.

		AIBs should exercise their judgement in assessing whether the relevant requirements have been met. For tanks that entered into service before the application of this guidance and which may not fully meet the above requirements, AIBs shall not refuse to grant inspection certificates if they believe the design is in the condition in which it was type approved. In such cases AIBs shall note on the inspection certificate that in their opinion the tank does not fully meet the requirements in 6.10.3.4 of ADR.
6.8.2.2.1	Suitable non-metallic materials may be used to manufacture service and structural equipment. …The gaskets shall be made of a material compatible with the substance carried and shall be replaced as soon as their effectiveness is impaired, for example as a result of ageing. Gaskets ensuring the leakproofness of fittings requiring manipulation during normal use of tanks shall be so designed and arranged that manipulation of the fittings incorporating them does not damage them.	If the effectiveness of gaskets and seals should be impaired, i.e. through aging, or are identified as being incompatible with the products being carried, AIBs should refuse to grant inspection certificates. AIBs must obtain the necessary documentation to identify whether any gaskets that are fitted are compatible with the products being carried.
6.8.2.2.2	…This closing device shall be sufficiently tight so that the substance is contained without loss. Measures shall be taken to enable the safe release of pressure in the discharge pipe before the closing device is	AIBs must check that it is possible to safely release any pressure in the discharge pipe before the closing device is completely removed. The image below provides one example of how this requirement may be achieved:

	completely removed.	 Inspection certificates should not be granted unless it is possible to safely release any pressure in the discharge pipe before the closing device is completely removed.