Vehicle Certification Agency

Procedures for Inspection Bodies -Testing and Inspection of UK Tanks

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Contents

Explanatory Note

This document forms the basis of procedures for inspecting ‘UK tanks’. Within the document are a number of boxed areas entitled ‘Guidance’ these are recommendations and do not form a part of the procedure. Please note that some sections of the guidance are currently reserved for future use.

These procedures are for use by Department for Transport / VCA bodies appointed to inspect UK tanks

1 Introduction

1.1 The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009 (as amended) (CDG 2009) bring Directive 2008/68/EC on the inland transport of dangerous goods (DG Directive) into effect in GB and for Northern Ireland Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations (Northern Ireland) 2010 (as amended) SI 160. The DG Directive brings together the requirements for the rail and road transport and adds requirements for inland waterways.

1.2 The DG Directive references RID, ADR and ADN in its annexes and requires tanks to comply with the provisions of the relevant annex for both construction and for use. The DG Directive permits certain derogations from the provisions of RID and ADR as referenced in its annexes. Where this applies, tanks are restricted to national use only. These tanks are known as ‘UK tanks’ in GB and NI.

1.3 Tanks for the carriage of dangerous goods in GB and NI that were not constructed as RID or ADR tanks, were inspected by a ‘competent person’ to a ‘written scheme of examination’. This method of examining tanks did not require the appointment or any verification of the person. On 2 July 2006 inspections by competent persons ended and since then inspections are carried out by inspection bodies appointed by the Secretary of State for Transport. The carrier/operator of the tank still retained the responsibility to have a suitable ‘written scheme of examination’ for the tank and to ensure that it is carried out.

1.4 These procedures replace the individual ‘written schemes of examination’ with an approach based upon the requirements of RID and ADR but taking account of the different constructional differences that may exist between UK tanks and RID or ADR tanks. The requirement for UK tanks to be maintained to a written scheme of examination is set out in the Carriage of Dangerous Goods; Approved Derogations and Transitional Provisions (AD&TP) which include transitional arrangements to change from written schemes of examination to these procedures.

1.5 The competent authority for the appointment of tank and pressure receptacle inspection bodies in Great Britain is the Secretary of State for Transport and in Northern Ireland; it is the Health and Safety Executive Northern Ireland (HSENI). Compliance with these procedures is necessary for appointment and continuation of appointment as an inspection body. These procedures cannot anticipate all situations and will be amended in the light of experience and changes in legislation.

1.6 The issue of an inspection report does not imply that the tank may be used in any particular mode of transport or for any particular substance. The type of tank, its capacity and any special requirements are specified for each substance and for each mode of transport in RID, ADR, IMDG, ICAO as applicable.

2 Background

2.1 The United Nations Committee of Experts on the Transport of Dangerous Goods and the Globally Harmonised System of Classification and Labelling of Chemicals have developed the UN Recommendations on the Transport of Dangerous Goods (Model Regulations). Development of the Model Regulations continues in the light of scientific and technical progress, the advent of new substances and materials, the exigencies of modern transport systems and above all the need to ensure the safety of people, property and the environment.
Amongst other aspects, the Model Regulations list the principal dangerous goods, define methods for classification, set out general packing, marking, labelling, placarding

requirements, testing procedures, and specify shipping documentation. There are in addition special recommendations related to particular classes of goods.

2.2 The Model Regulations are given legal entity by the provisions of a series of international modal agreements and national legislation for the transport of dangerous goods.
The international agreements include: The European Agreement Concerning the International Carriage of Dangerous Goods by Road (ADR) (covering most of Europe); Regulations concerning the International Carriage of Dangerous Goods by Rail (RID) (covering most of Europe, parts of North Africa and the Middle East); the International Maritime Dangerous Goods Code (IMDG Code) (worldwide); the International Civil Aviation Organization's Technical Instructions for the Safe Transport of Dangerous Goods by Air (ICAO TIs) (worldwide).

2.3 In each country, the Government may appoint one or more competent authorities to administer the dangerous goods regulations including the testing, inspection and certification of pressure receptacles, tanks and packagings.

2.4 The background described above sets the context in which this document should be seen. For the purposes of UK tank inspections the international regulations are not generally relevant although the principles adopted in ADR and RID are being used wherever possible in this document.

3 Definitions and Standards

3.1 The terms and definitions used in these procedures are taken as those given by the relevant regulations (ADR and RID) concerning the transport of dangerous goods unless otherwise stated in Table 1 below.

Table 1 - Terms

Term	Definition
'inspector'	Individual employed by and carrying out inspections for an inspection body.
'inspection body'	Body appointed by the Secretary of State in accordance with Regulation 29 of the Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2009
'intermediate inspection'	Inspection carried out between the initial and the first periodic inspection or between two periodic inspections
'UK tank'	Tank as defined in the 'Carriage of Dangerous Goods Approved Derogations and Transitional provisions'
'protective lining or coating'	Lining or coating protecting the metallic tank material against the corrosive attack by the substances to be carried NOTE: This does not apply to lining or coating used only to protect the substance to be carried.
'major repair'	Repair without which the safety of the tank or structure would have been compromised. This will include any repair that requires hot work to the pressure containment part of the tank
'tank record'	File containing all the important technical information such as the original design documentation, previous inspection reports and records of repairs (NOTE: see 5.2).
'technical code'	Code according to which the tank has been designed and constructed

The standards and guidance listed in Table 2 below are indispensable for the application of this document. For dated references, only the edition cited applies.

Table 2 - Standards and Guides

Standards and Codes	Title Identifier
EN 444:1994	Non-destructive testing. General principles for radiographic examination of metallic materials by X- and gamma-rays
EN 473: 2000	Non-destructive testing - Qualification and certification of NDT personnel – General principles
EN 571-1:1997	Non-destructive testing. Penetrant testing. General principles
EN 837–2: 1998	Pressure gauges - Selection and installation recommendations for pressure gauges
EN 1290:1998	Non-destructive examination of welds. Magnetic particle examination of welds.
EN 1432: 1997	Swap bodies. Swap tanks. Dimensions, requirements, test methods, operating conditions
EN 1435: 1997	Non-destructive examination of welds. Radiographic examination of welded joints
ISO 1496: 1995	Series 1 freight containers – Specification and testing – Part 3: Tank containers for liquids, gases and pressurised dry bulk
EN 1714:1998	Non-destructive testing of welded joints. Ultrasonic testing of welded joints
EN 12266–1:2003	Industrial valves – Testing of valves – Part 1: Pressure tests, test procedures and acceptance criteria – Mandatory requirements
EN 12972:2007	Tanks for the transport of dangerous goods – Testing, inspection and marking of metallic tanks
EN 14025: 2008	Tanks for transport of dangerous goods. Metallic pressure tanks. Design and construction
HSE Guidance Note GS4	Safety in Pressure Testing, which is supported by Contract Research Report CRR168: 'Pressure Test Safety', 1998 (ISBN 9780717616299)

Sources:

BS, EN ISO Standards are obtainable from the British Standards Institution http://www.standardsuk.com/HSE publications are obtainable from HSE Books: http://books.hse.gov.uk/hse/public/home.jsf

4 Scope and Frequency of Inspections

4.1. UK tanks, constructed on or after10 May 2004 or in Northern Ireland on or after 31 July 2006, shall be inspected in as if they are RID or ADR tanks, as appropriate. Although inspected as if they are RID or ADR tanks, the form of certificate of any type approval, initial, periodic or intermediate inspection and exceptional check shall be a certificate which references Directive 2008 /86 /EC instead of RID or ADR. Certificates for UK tanks constructed after the dates given above which reference RID or ADR shall not be issued or accepted.

4.2. The following procedures specify the testing, inspection and marking for the periodic inspection, intermediate inspection and exceptional check of UK tanks constructed on or before 9 May 2004 or in Northern Ireland, on or before 31 July 2006 (shell and equipment) that are fixed tanks (tank vehicles), demountable tanks, rail tank wagons, portable tanks and

tank containers for the transport of dangerous goods. These procedures are not applicable to pressure receptacles including gas cylinders or intermediate bulk containers (IBCs).
The intervals between inspections shall not exceed those shown in Tables 3, 4 and 5 below.

Table 3 Carriage by road

Tank	Intermediate	Periodic
Fixed tanks (tank vehicles), demountable tanks and battery-vehicles	3 years	6 years
Tanks carrying refrigerated liquefied gases	6 years	12 years
Fixed Tanks carrying chlorine	N/A	3 years

Table 4 Carriage by rail

Tank	Intermediate	Periodic
Tanks wagons, demountable tanks and battery-/ wagons	4 years	8 years
Tanks carrying refrigerated liquefied gases	6 years	12 years
Tanks carrying chlorine	N/A	5 years

Table 5 Tank Containers for carriage by road or rail

Tank	Intermediate	Periodic
Tank containers	2.5 years	5 years

5 Tank records and Documentation

5.1 Records

5.1.1 Records, including the data plate and previous reports shall be checked at every inspection. Where records are missing or incomplete then at the first periodic Inspection performed in accordance with these procedures, the information listed at 5.1.2 shall be established and recorded.

5.1.2 The Inspection body at the first periodic Inspection under these procedures shall carry out a specification check as far as reasonably practical and it shall include:

- dimensions (nominal length, breadth and maximum/minimum diameter)
- capacity (nominal)
- tank shell thickness
- service equipment
- date of manufacture (if known)

5.1.3 An Inspection Body may take account of any construction standards used for the tank being inspected.

GUIDANCE:
The tank record including the inspection files should be available for the life of the tank. On transfer of ownership, the tank records must be transferred to new owner. At the end of the tank's working life, the owner disposing of the tank must retain the tank records for at least 15 months.

Owners /operators of tanks should maintain a file of inspection records and include a history of at least 6 years for road tanks and 8 years for rail tanks, where the tank is at least 6/8 years old. If the original design specifications including technical codes are available, they should form part of a tank record.

5.2 Documentation

Although type approval certificates may not exist for UK tanks, the carrier/operator should have a record of previous inspections and of the original approval documentation from the time of purchase and these shall be used by the inspection body to complete records. The use of electronic records is acceptable provided access is readily available and printouts are provide on request to the Secretary of State and the enforcement agencies or UKAS.

6 Inspection Requirements

6.1. Periodic and intermediate inspections shall be carried out in accordance with the relevant sections of these procedures.

Table 6 Periodic and Intermediate inspections

Relevant sections	Periodic Inspection	Intermediate Inspection
Section 5 - Examination of documents	x	x
Section 7.2 - Check of design characteristics	Only required at first periodic inspection of these procedures (see 5.1)	
Section 7.4 - Inspection of the tank interior	x	
Section 7.5 - Inspection of the tank exterior	x	x
Section 7.6 - Hydraulic - pressure test (see 7.6 regarding application)	x	
Section 7.8 - Leakproofness test	x	x
Section 7.10 - Inspection of service equipment	x	x
Section 7.11 - Inspection of the frame or other structural equipment of portable tanks and tank containers where required by regulation	x	x

For vacuum insulated tanks the inspection of the tank interior and the hydraulic pressure test are not required provided that a satisfactory vacuum is confirmed by measurement.

In the case of tanks intended for the carriage of powdery or granular substances, the hydraulic pressure test may be omitted and replaced by the leakproofness test.

The results of the inspection shall be recorded by the inspector on the certificate or where appropriate the notification of refusal to issue a certificate. Any defect found which could impair the safety of the tank or the equipment and any related repairs carried out shall be recorded on the notification of refusal.

Certification, including where appropriate notification of refusal and marking shall be in accordance with 7.12 - 7.13.

(Reserved)

Where an exceptional check is required following major damage a preliminary report can be issued after examination of documents.

For rail tank wagons, Railway Group Standard GM/RT2101 ‘Requirements for the design, construction, testing and use of the tanks of rail wagons’ may be used in addition to these procedures but the IB shall be accredited to that standard and it shall be identified on the

scope of accreditation . The requirements of Parts 5 and 7.12 - 7.13 of this document shall also be complied with when using this Railway Group Standard.

6.8. Exceptional checks

The tests, inspections and checks required following damage or major repair to the tank or its support structure or the replacement of equipment are identified in Table 7 below.

Table 7 Exceptional Checks

Relevant sections	Service Equipment	Service Equipment where hot work has occurred	Tank Repairs and modifications	Frame or mountings for Running Gear	Liner or Coating
Section 5 - Examination of documents (tank records and certificates)	x	x	x	x	x
Section 7.2 - Check of design characteristics	(for first inspection under these procedures see 5.1)				
Section 7.4 - Inspection of the tank interior		x	x		x
Section 7.5 - Inspection of the tank exterior		x	x		
Section 7.6 - Hydraulic pressure test		X1	x		x
Section 7.8 - Leakproofness test	x	x	x		x
Section 7.10 - Inspection of service equipment	x	x	x		
Section 7.11 - Inspection of frame or other structural equipment of portable tanks and tank containers where required by regulation			x	x	

1 Applicable when there has been the replacement of service equipment involving the application of heat

GUIDANCE: The routine replacement of P&V valves (breather valves) would not normally require an Exceptional Check and no leakproofness test is required.

7 Tank Inspection Procedures

7.1 General

Permits to work according to the legislation dealing with health and safety at work shall be complied with. This is also a requirement when necessary for the safety of the inspecting personnel and any other persons in the vicinity even when other inspections are carried out.

Where the interior of the tanks is to be inspected the tanks shall be empty, clean and safe (e.g. no electrical services, no heating, safe atmosphere) at the time of inspection.

7.2 Check of the design characteristics and tank identity

The inspector shall establish the identity of the tank from the records held by the carrier/operator and markings (e.g. tank identification from manufacturer) including plates on the tank.

GUIDANCE: To aid inspection, schematic drawings should normally be available as described in section 5. Where these are missing, a note should be placed on the tank inspection report and the tank file.

7.2.2 Inspection of the materials and wall thicknesses

At the first Periodic Inspection in accordance with section 5 or following any major repair, the materials used for the shell, the piping and the structural and service equipment shall be checked to confirm it corresponds to the original design data.

If data is unavailable, a visible identification of the material shall be made to the extent that it is practical and it shall be recorded in the tanks documentation.

The actual thickness of materials of the shell shall be verified by appropriate measurement of the tank and shall not be less than that given by the original design documents, where available.

7.2.3 Examination of the manufacturing methods following major repair

The manufacturing methods and data of the heat treatment, the rolling and the forming of the materials used for the shell, the piping and the structural equipment shall be examined to ensure compliance with the design specifications of the tank.

The type of welded joints shall be examined to ensure compliance with the type specified in the design of the tank.

Where this cannot be ascertained, an explanatory note shall be added to the file.

7.2.4 Inspection of the condition of the tank

A complete visual inspection shall be performed to identify any surface defect and shall take account of the original specification (see 5.2). Where this cannot be ascertained, an explanatory note shall be added to the file.

7.2.5 Inspection of main dimensions

The main dimensions of the tank and if relevant of the framework shall be inspected for conformity with the dimensions given by the design drawings.

GUIDANCE: It should be possible to check portable tank and tank container dimensions against standards for freight containers

7.2.6 Non-destructive testing of the welds

General

GUIDANCE: This section would normally only apply following major repairs to the tank. However it

can also be applied to assist with the assessment of the size and extent of defects identified in the visual examination.

The non-destructive testing of the welds may be by radiographic or ultrasonic methods. Welds, which cannot be tested by ultrasonic or radiographic methods because of the design or the position of the weld, may be tested by dye penetrant or magnetic particle inspection.

GUIDANCE: Where NDT is used, the type and extent should be in accordance with the original specifications. Where the original specification is unknown, the inspector may carry such testing as is appropriate to the age and type of tank

The non-destructive testing of welds should be carried out in accordance with the technical code such as ASME VIII used for design and construction of the tank, e.g. EN 14025 for pressure tanks, BS5500, BS 1515 etc. and carried out in accordance with EN1435 and EN1714.

GUIDANCE: The following Table 8 should only be used where there are complete records of design and original construction of the tank.

Table 8 Weld efficiency factors

Weld efficiency factor	Extent of examination
(λ) of 0·8	All weld 'Tee' junctions with the total length of weld examined to be not less than 10 % of the sum of the length of all longitudinal, circumferential and radial (e.g. in tank ends) welds shall be tested.
(λ) of 0·9	The total length of all longitudinal welds, all 'Tee' junctions and 25 % of the total length of circumferential and radial (e.g. in tank ends) welds shall be tested.
(λ) of 1·0	The total length of all longitudinal, circumferential and radial (e.g. in tank ends) welds shall be tested.

7.3 (Reserved)

7.4 Inspection of the tank interior

7.4.1 Tank shell material

7.4.1.1. A complete visual inspection shall be performed (provided no protective lining or coating is used) to identify any surface defect. The tank shell shall be examined internally to identify any of the following defects:

- surface corrosion
- cracks
- weld defects
- linings that may be damaged or delaminated to an extent, which could affect the integrity of the tank

This inspection should wherever possible be carried out by physical entry into the tank. If this is not possible, inspection may be accomplished with suitable remote visual inspection equipment through a manhole or other adequate sized openings. Inspection performed remotely shall be able to detect the same level of defect that would otherwise be detected by entry into the tank.

The method for the inspection of the tank interior may be replaced by an equivalent method based on non-invasive inspection (NII). Any such procedure shall be identified in the inspection body's scope of accreditation.

Non Invasive Inspection (NII) is an assessment regime that may use a combination of non-destructive testing (NDT) techniques such as ultrasonics, acoustic emission, radiography, dye penetrant, magnetic particle, electromagnetic, leaking testing or other suitable non-destructive test method.

Suitable methods may be found in the following Standards:

- radiographic techniques in accordance with EN 444 and EN 1435
- ultrasonic techniques in accordance with EN 1714
- magnetic particle techniques in accordance with EN 1290
- dye penetrant techniques in accordance with EN 571-1.

GUIDANCE: Non-destructive testing systems may be used but the conditions of EN 473 shall be met.

7.4.1.2. The wall thickness shall be verified by appropriate measurement and where possible checked against the thickness given by the original design documents and/or tank plate. If the tank shows indication of reduction of wall thickness, the wall thickness should not fall below that specified in the tank design document and not below the minimum of ADR etc.

When it is necessary to verify wall thickness, then a suitable ultrasonic thickness measurement technique shall be applied. When there is concern that there may be cracking in welds or in other parts of the tank then the defects shall be verified by applying an appropriate non-destructive testing technique, e.g. radiography or ultrasonic test, dye penetrant or magnetic particle examination. The person undertaking the non-destructive testing shall be appropriately qualified to the requirements of EN 473.

7.4.1.3. Any lining or coating not falling under the definition of protective lining or coating given in this document shall be visually inspected for integrity. In particular bonding defects or delaminations shall be identified and recorded in the report.

7.4.2 Inspection of protective lining or coating

Where a tank is fitted with a protective lining or coating it shall be inspected by appropriate methods, e.g. spark test, and in accordance with the manufacturer's recommendations. In particular bonding defects shall be identified and recorded in the report.

7.5 Inspection of the tank exterior

7.5.1 Inspection of the condition of the tank

A complete visual inspection shall be performed to identify any surface defect. Sheathing, thermal or other insulation shall be removed only to the extent required to achieve a reliable appraisal of the condition of the tank.

7.5.2 Inspection of the fastenings of the tank and its structural equipment

GUIDANCE: This section is intended for an inspection of any structural fitting that may affect the tank's integrity.

The following elements shall be inspected by an appropriate method to ensure that they are in good condition:

- structures supporting and reinforcing the tank;
- means of attachment to the frame or chassis;
- any structural protective equipment e.g. the cover assembly, the sun shield.
- sheathing, thermal or other insulation shall be removed only to the extent required to achieve a reliable appraisal.

7.5.3 Inspection of marking

The marking of the tank shall be verified against the requirements of 7.13.2.

7.5.4 Inspection of earthing terminal

Shells required to be fitted with an earth connection shall be inspected for conformity of the earth connection with the design requirements. The electrical resistance 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, shall not exceed 10Ω.

7.6 Hydraulic pressure test including alternative methods

7.6.1 General

A UK tank constructed, before 10 May 2004 to the requirements in force in Great Britain or before 31 July 2006 to the requirements in force in Northern Ireland, which by virtue of its design and construction is not suitable to undergo a hydraulic pressure test shall not be subject to the hydraulic test set out in these procedures. Such a tank, provided it remains suitable, may continue in service until 1 July 2021.

Before the beginning of the test the tank shall be dry and clean on its outside so that any leakage can be detected. If the ambient temperature is below 7°C, a hydraulic pressure test with water is only permitted only if precautions have been taken to ensure the contents of the tank, of the measuring equipment and of the piping systems cannot freeze. Tests shall not be carried out on tanks made of carbon steel when the ambient temperature is less than 7°C unless precautions are taken against fracture.

The use of a suitable antifreeze solution is permitted.

The hydraulic pressure test may be omitted for tanks designed for the carriage of powdery or granular substances and replaced by a leakproofness test (see 7.8).

GUIDANCE:
Where pneumatic pressure testing is undertaken inspection bodies should take account of the following publication:

HSE – Safety in Pressure testing GS4 published by the HSE.

7.6.2 Extent of test

The whole tank and each self-contained compartment including the partitions shall be tested as prescribed in 7.6.3 – 7.6.8.

During the test of a compartment, the adjacent compartment(s) shall be empty and unpressurised.

All service equipment and the whole piping system with the exception of venting devices, safety valves and bursting discs shall be included in the hydraulic pressure test.

Single items of the equipment and the piping system may be tested separately.

Safety valves and vents shall be sealed or removed and replaced by blanking plates before testing begins.

7.6.3 Test pressure

7.6.3.1 Test pressure of the whole tank

The hydraulic pressure test of the whole tank shall be carried out at the test pressure given by the tank plate or original design documents. The pressure shall relate to the highest point of the tank.

7.6.3.2 Test pressure of compartments

Each compartment of subdivided tank containers, portable tanks and tanks of rail tank wagons shall be tested with the hydraulic pressure required by 7.6.3.1.

Each compartment of fixed tanks or demountable tanks shall be tested with a hydraulic pressure of 1.3 times the maximum working pressure.

Partitions of compartments of tanks having a maximum working pressure originating only from hydrostatic pressure shall be tested with a hydraulic pressure of 2 times the static pressure of the heaviest goods to be carried, but not less than a hydraulic pressure of 2 times the static pressure of water, in both cases referred to the bottom of the tank.

Hydraulic pressure means the pressure arising from the highest possible column of fluid in the tank.

The test pressure shall be related to the highest point of the compartment.

GUIDANCE: Tanks should be subjected to individual compartment tests unless the original design of the compartments makes this unsuitable in which case the whole tank may be pressurised. The Inspection body report should note where they deviate from the preferred method and record their reasons.

7.6.3.3 Test fluid

The fluid used for hydraulic pressure testing shall be water.

With the agreement of the competent authority other liquids, meeting the definition of liquids in RID/ADR, may be used for pressure testing. The flash point of alternative test liquids shall be above 61 °C. Toxic or corrosive liquids shall not be used.

With the agreement of the competent authority gases may be used for pressure testing. Flammable or toxic gases shall not be used.

In particular, when using gas as the test medium, precautions given in Annex C of EN12972 should be observed.

GUIDANCE:
RID / ADR Chapters 6.8.2.4.2 requires a hydraulic pressure test to be carried at periodic examinations but this is qualified by a footnote which states:

'In special cases and with the agreement of the expert approved by the competent authority, the hydraulic pressure test may be replaced by a pressure test using another liquid or gas, where such an operation does not present any danger.'

Where an inspection body intends to undertake a pressure test with another fluid, a detailed procedure shall be developed, based on the procedure for water. The procedure shall incorporate a risk assessment to show that testing with the alternative fluid presents no danger. The procedure shall take account of factors such as differences in viscosity, density and surface tension and shall demonstrate the technical equivalence of the proposed method to that of testing with water.

The procedure shall be assessed by UKAS and identified in the accreditation schedule of the inspection body.

Where alternative fluids are used a different decay rate may be appropriate and shall be defined in the inspection bodies' accredited procedures

7.6.3.4 Pressurisation

The tank may be filled with the test fluid and gradually pressurised before the inspector commences witnessing the test. The tank shall be filled with the test liquid to not less than 99 % of the water capacity.

When using a standpipe for pressurizing the tank, only water shall be used as a test fluid.

For tanks having a maximum working pressure not exceeding 0·5 bar an alternative test procedure may be carried out using water or another liquid as follows: the tank shall be filled with the test liquid to not less than 99 % of the water capacity.

A non-flammable, non-toxic gas shall be used to pressurize the space above the liquid.

A safety device shall be included in the gas pressurizing system. The device shall ensure that the pressure in the shell cannot exceed 105% of the required test pressure.

7.6.3.5 Test duration

The test pressure shall be held for the time necessary for the inspector to carry out the inspection of the shell or a compartment but not less than 15 min for a non-insulated tank and not less than 30 min for an insulated tank.

7.6.3.6 Measurement

The test pressure may be measured either by the height of the column of test liquid standing in the standpipe or U-tube, or by other pressure gauges.

For selection and installation of pressure gauges, EN 837-2 shall be used. The measuring equipment shall be capable of registering pressure changes of 50 millibar or less; this shall be confirmed by a valid certificate of calibration issued by a UKAS accredited laboratory.

When only a gas is used as test fluid the pressure in the tank shall be indicated in a way that it may be seen from a safe location (see Annex C of EN12972).

7.6.3.7 Evaluation of the test

Where gas is used as the pressurising medium, valves and all openings shall be liberally coated with a soap solution and observed for the entire test duration.

The tank fails the hydraulic pressure test if any of the following occur:

- a leak is detected;
- there is a fall in pressure during the test period exceeding 1kPa per minute;
- there is visible permanent deformation.
- any evidence of leakage or loss of pressure shall be investigated, identified and recorded.

7.6.3.8 Alternatives to hydraulic testing

The hydraulic pressure test may be replaced by an equivalent method based on Non-Invasive Inspection (NII) accredited by UKAS.

Non Invasive Inspection (NII) is an assessment regime that may use a combination of Non-Destructive Testing (NDT) techniques such as ultrasonics, acoustic emission, radiography, dye penetrant, magnetic particle, electromagnetic, leaking testing or other suitable non-destructive test method.

Suitable methods may be found in Table 9 below:

Table 9 - Standards for NDT

Standard	Application
EN 444	Radiographic techniques
EN 571-1	Non-destructive testing. Penetrant testing. General principles
EN 1435	Radiographic techniques
EN 1714	Ultrasonic techniques
EN 1290	Magnetic particle techniques

The requirements of EN12972 Annex C shall be complied with if pressure testing with gas. The procedure and supporting training shall take account of the differing conditions found at the test site.

7.7 (Reserved)

7.8 Leakproofness test

7.8.1 General

Before the beginning of the test the tank shall be dry and clean on its outside so that any leakage can be detected. If the ambient temperature is below 7°C, a leakproofness test with water is only allowed if the contents of the tank, of the measuring equipment and of the piping system cannot freeze.

GUIDANCE
Tests should not be carried out on tanks made of carbon steel when the ambient temperature is less than 7°C unless precautions are taken against fracture.

7.8.2 Extent of test

The leakproofness test shall be carried out on the tank and service equipment that will be used with the tank including any permanently attached hoses after assembly in accordance with the requirements of 7.8.3-7.8.7. This testing shall include each compartment partition. During the test of a compartment, the adjacent compartment(s) shall be empty and unpressurised.

Where shut-off valves are fitted in series they shall be tested separately to ensure that with the pressure on the tank side of the device, the leakage does not exceed the rate given in 7.8.7.

When the device is a valve, the test is to determine the leak-tightness of the valve seat and the glands of the valve operating mechanism.

GUIDANCE:
The test should commence at low pressure which shall be gradually increased until the required pressure is achieved. While the pressure increases, poppet type valves should be observed to confirm they are not leaking prior to reaching the full test pressure. The pass/fail criteria shall include 'lack of any drip or bubble'.

7.8.3 Leakproofness test pressure

The leakproofness test shall be carried out with the pressure given by the relevant regulation. The test pressure shall be related to the highest point of the tank or compartment.

If there is no specific regulation, a pressure of not less than 25% of the maximum allowable working pressure with a minimum of 0·2 bar shall be applied. The leakproofness test for refrigerated liquefied gases shall be carried out with a pressure of not less than 90% of the maximum working pressure and for compressed gases, liquefied gases and dissolved gases not less than 20% of the test pressure.

Internal leakproofness of shut-off devices shall be tested at the leakproofness test pressure as well as at a pressure of not more than 0·2 bar.

For UK tanks intended for the carriage of powdery or granular substances the periodic hydraulic pressure test may be omitted and replaced by leakproofness at an effective internal pressure at least equal to the maximum working pressure.

7.8.4 Leakproofness test fluid

The test fluid shall be compatible with the materials of the tank and the goods to be transported.

The test fluid shall in no case create a hazard to the inspecting personnel or any other persons in the vicinity. In particular when using gas as the test fluid, precautions given in Annex C of EN12972 should be observed.

7.8.5 Pressurisation

The tank may be filled with the test fluid and gradually pressurised before the inspector commences witnessing the test.

The tank shall be filled with the test liquid to not less than 99% of the water capacity.

When using a standpipe for pressurizing the tank, only water may be used as a test fluid.

For tanks having a working pressure not exceeding 0·5 bar an alternative test procedure may be carried out using water or another liquid as follows:

- tank shall be filled with the test liquid to not less than 95% of the water capacity, a non-flammable, non-toxic gas shall be used to pressurize the space above the liquid;
- a safety device shall be included in the gas pressurizing system. The device shall ensure that the pressure in the shell does not exceed 105% of the required leakproofness test pressure.

7.8.6 Test duration

The test pressure shall be held for the time necessary for the inspector to carry out the inspection of the shell, a compartment or the equipment but not less than 5 minutes in each case.

7.8.7 Evaluation of the test

Where gas is used as the pressurising medium, valves, flanges and all other openings shall be liberally coated with a soap solution and observed for leakage over the entire test duration.

The pressure shall be monitored for the test duration using equipment conforming to the requirements of 7.6.3.6. The maximum allowable leakage rate shall be in accordance with Table A.5 of EN 12266-1:2003 Rate A.

GUIDANCE:
'No visually detectable leakage' means no visible weeping or formation of drops or bubbles and is a lower leakage rate than Rate B. For this purpose, it is not necessary to enter adjacent compartments.

7.9 (Reserved)

7.10 Inspection of service equipment

7.10.1 Inspection of service equipment for the tank

The inspection shall determine that the service equipment and its marking conform to the requirements of the applicable regulations. The inspection shall also determine that all the service equipment is suitable for the operating conditions of the tank.

Where PRV's with frangible discs (bursting discs) are fitted, the 'tell-tale' shall be checked for evidence of use. Test of relief valves, shall be carried out on a calibrated test bench to be verified, the valve must begin opening at, or not more than 10% above, of its set pressure and must close at a point not more than 10% below the pressure at which opening begins, and remain closed at all lower pressures.
NB: This does not apply to 'breather vents' (P&V vents - 7.10.3.2) which are open during transport which have ± 20% tolerance

7.10.2 Inspection of service equipment for other inspections.

The inspection shall determine that the service equipment is in accordance with that given in the original design documentation, where possible.

7.10.3 Inspection of correct functioning of service equipment

7.10.3.1 All service equipment including any permanently attached hoses shall be inspected in the mounted position for correct functioning. Where it is not possible to inspect the equipment in the mounted position, e.g. in the case of venting devices, the equipment shall be tested separately.

7.10.3.2 The parts of venting devices which are open during transport (e.g. breathing valve) shall be tested to ensure that they are leak tight in the 90°, 180° and 270° positions. The test pressure shall be at least 1.1 times the static pressure of the substances to be transported (e.g. petrol, diesel-, heating-oil) which arises from the possible fluid column on the venting

device. If the venting devices need a relief pressure to open during transport they shall be tested for correct opening at this relief pressure.

7.10.3.3 The adjustment of the start-to-discharge-pressure of safety valves shall be inspected for conformity with the relevant regulations.

7.10.3.4 If bursting discs are installed, they shall be inspected for integrity and correct rating.

7.10.3.5 Flexible joints and fixed hoses as part of the filling and/or discharging system shall be visually inspected. Paint or coating shall be removed where necessary.

7.10.3.6 Where the bursting disc is to be replaced, the rating and type should be checked to confirm it is correct.

7.10.3.7 Bolted flanges, caps to valves at bottom outlets shall be checked for worn threads and damaged gaskets.

7.11 Inspection of the frame or other structural equipment of portable tanks and tank containers.

7.11.1 Inspection of frame or other structural equipment

The frame or other structural equipment of a portable tank or tank container which has not been designed or constructed in accordance with a standard (e.g. ISO 668 or EN 1432) or other requirements (e.g. UIC 592-4) shall be shown to be suitable for the intended purpose either by calculation or, if required, by testing (e. g. the appropriate tests specified in ISO 1496-3).

In addition, the applicable requirements of the CSC shall be fulfilled by any portable tank that meets the definition of a ‘container’ within the terms of that Convention.

7.11.2 Periodic, intermediate inspection and exceptional check of the frame or other structural equipment of portable tanks and tank containers.

The framework supports and arrangements for lifting the portable tank are in a satisfactory condition. This inspection shall include a visual inspection of the welded joints and the surface of all structural parts. Where necessary, the insulation shall be removed to the extent required to achieve a reliable appraisal of the condition of the frame or other structural equipment.

Any damage or corrosion which could influence the safety or function of the frame shall be repaired.

7.12 Failure at inspection

A tank that fails one or more of the tank inspection procedures shall, once the failure has been investigated and corrected, be retested in accordance with the requirements of those units.
If, in the opinion of the inspector, the repair may have impaired the safety of the tank or equipment or affected the validity of any previous tests these tests shall be repeated.

Depending on the result of the inspections, additional inspections may be necessary.

7.13 Test report, certification and marking

7.13.1 Certification of periodic, intermediate inspection and exceptional check.

7.13.1.1 Wherever defects or deficiencies are identified during the inspection, they shall be noted in the report. Wherever a defect could be considered a safety issue e.g. severe corrosion, leaking joints etc, in the judgement of the inspector, an inspection report along with a Notification of Refusal shall be issued.

7.13.1.2 Following the successful completion of the periodic or intermediate inspection or the exceptional check, a certificate shall be issued. The issue of certificates is subject to a separate procedure, Annex A lists some of the information which will be included.

7.13.3 Additional requirements or remarks, which can influence the next regular inspection or exceptional check, shall be stated on the certificate.

7.1.3.4 Periodic Tests must have the ‘Month / Year’ followed by a ‘P’ Intermediate Tests must have the ‘Month / Year’ followed by an ‘L.

7.13.2 Marking

7.13.2.1 The tank plates shall contain the following minimum data:

- Manufacturer (if known)
- Date of manufacture (if known)
- Serial/identification number
- Number of compartments
- Code to which built ((if known)
- Stamp to indicate inspections carried out.

Where information is not known, the Inspection body shall ensure that the Tank record (5.1) has a record that the information is not available.

7.13.2.2 The minimum height of the letters shall be 3 mm.

7.13.2.3 Any modification to any data on the tank plate required by this Procedure shall be attested by the inspector's stamp close to the modified information.

7.13.2.4 Markings not necessarily required to be given on the tank plate shall comply with the relevant regulation.
If information is given on the tank plate as well as in other places (e.g. on the shell) this information shall be identical. In each case, the information shall comply with the valid documents.

ANNEX A

TANK INSPECTION CERTIFICATE FOR UK TANK INSPECTIONS

The tank certificate and procedures for issuing them will be issued to accredited inspection bodies.

The tank certificate will include:

- Name of the inspector's organisation and address
- Number of test report
- Applicant / User
- Manufacturer's serial number
- Year of manufacture
- Date and kind of last inspection
- Wall thickness shell, required: mm, actually measured: mm
- Wall thickness ends, required: mm, actually measured: mm
- Wall thickness partitions, required: mm, actually measured: mm
- Test pressure: bar
- Maximum allowable working pressure: bar, external design pressure - bar
- Design pressure: min. bar, max. bar
- Compartment
- Capacity in litre
- Pass or fail