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RESTRUCTURING OF RID/ADR

CHAPTER 6.7 - UN PORTABLE TANKS

Transmitted by the Secretariat */

1. This proposal sets out the proposed text for Chapter 6.7 to be included in the restructured RID/ADR. The text is based on Chapter 6.7 of the UN Model Regulations on the Transport of Dangerous Goods, but only includes those sections directly referred to in Chapter 4.2, and the sections concerning inspection, testing and marking, for ease of reference.

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CHAPTER 6.7

REQUIREMENTS FOR THE DESIGN, CONSTRUCTION, INSPECTION, TESTING AND MARKING OF UN PORTABLE TANKS

(see definition in section 1.2.1)

6.7.1 Application and general requirements

6.7.1.1 UN portable tanks used for the carriage of dangerous goods shall meet all the relevant requirements of Chapter 6.7 of the UN Model Regulations on the Transport of Dangerous Goods.

6.7.1.2 For ease of reference and understanding of Chapter 4.2, those paragraphs of Chapter 6.7 of the UN Model Regulations referred to in Chapter 4.2 are set out below.

6.7.2.4 *Minimum shell thickness* (*see Chapter 4.2, section 4.2.4.2.6)*

6.7.2.4.1 The minimum shell thickness shall be the greater thickness based on:

(a) The minimum thickness determined in accordance with the requirements of 6.7.2.4.2 to 6.7.2.4.10;

(b) The minimum thickness determined in accordance with the recognized pressure vessel code including the requirements in 6.7.2.3 of the UN Model Regulations; and

(c) The minimum thickness specified in the applicable portable tank instruction in 4.2.4.2.6 or by a portable tank special provision indicated in Column [11] of Table A of Chapter 3.2.

6.7.2.4.2 The cylindrical portions, ends (heads) and manhole covers of shells not more than 1.80 m in diameter shall be not less than 5 mm thick in the reference steel or of equivalent thickness in the metal to be used. Shells more than 1.80 m in diameter shall be not less than 6 mm thick in the reference steel or of equivalent thickness in the metal to be used, except that for powdered or granular solid substances of Packing Group II or III the minimum thickness requirement may be reduced to not less than 5 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.2.4.3 When additional protection against shell damage is provided, portable tanks with test pressures less than 2.65 bar, may have the minimum shell thickness reduced, in proportion to the protection provided, as approved by the competent authority. However, shells not more than 1.80 m in diameter shall be not less than 3 mm thick in the reference steel or of equivalent thickness in the metal to be used. Shells more than 1.80 m in diameter shall be not less than 4 mm thick in the reference steel or of equivalent thickness in the metal to be used.

6.7.2.4.4 The cylindrical portions, ends (heads) and manhole covers of all shells shall be not less than 3 mm thick regardless of the material of construction.

6.7.2.4.5 The additional protection referred to in 6.7.2.4.3 may be provided by overall external structural protection, such as suitable "sandwich" construction with the outer sheathing (jacket) secured to the shell, double wall construction or by enclosing the shell in a complete framework with longitudinal and transverse structural members.

6.7.2.4.6 The equivalent thickness of a metal other than the thickness prescribed for the reference steel in 6.7.2.4.3 shall be determined using the following formula:

$$e_1 = \frac{21.4e_o}{\sqrt[3]{Rm_1 \times A_1}}$$

Where:

e_1 = required equivalent thickness (in mm) of the metal to be used;
e_0 = minimum thickness (in mm) of the reference steel specified in the applicable portable tank instruction identified in Column [10] of Table A of Chapter 3.2 and described in 4.2.4.2.6 or by a portable tank special provision indicated in Column [11] of Table A of Chapter 3.2;
Rm_1 = guaranteed minimum tensile strength (in N/mm^2) of the metal to be used (see 6.7.2.3.3 of the UN Model Regulations);
A_1 = guaranteed minimum elongation at fracture (in %) of the metal to be used according to national or international standards.

6.7.2.4.7 When in the applicable portable tank instruction in 4.2.4.2.6, a minimum thickness of 8 mm, 10 mm or 12 mm is specified, it shall be noted that these thicknesses are based on the properties of the reference steel and a shell diameter of 1.80 m. When a metal other than mild steel (see 1.2.1) is used or the shell has a diameter of more than 1.80 m, the thickness shall be determined using the following formula:

$$e_1 = \frac{21.4e_o d_l}{1.8\sqrt[3]{Rm_1 \times A_1}}$$

Where:

e_1 = required equivalent thickness (in mm) of the metal to be used;
e_0 = minimum thickness (in mm) of the reference steel specified in the applicable portable tank instruction identified in Column [10] of Table A of Chapter 3.2 and described in 4.2.4.2.6 or by a portable tank special provision indicated in Column [11] of Table A of Chapter 3.2;
d_1 = diameter of the shell (in m), but not less than 1.80 m;
Rm_1 = guaranteed minimum tensile strength (in N/mm^2) of the metal to be used (see 6.7.2.3.3 of the UN Model Regulations);
A_1 = guaranteed minimum elongation at fracture (in %) of the metal to be used according to national or international standards.

6.7.2.4.8 In no case shall the wall thickness be less than that prescribed in 6.7.2.4.2, 6.7.2.4.3 and 6.7.2.4.4. All parts of the shell shall have a minimum thickness as determined by 6.7.2.4.2 to 6.7.2.4.4. This thickness shall be exclusive of any corrosion allowance.

6.7.2.4.9 When mild steel is used (see 1.2.1), calculation using the formula in 6.7.2.4.6 is not required.

6.7.2.4.10 There shall be no sudden change of plate thickness at the attachment of the ends (heads) to the cylindrical portion of the shell.

6.7.2.6 ***Bottom openings***

6.7.2.6.1 Certain substances shall not be transported in portable tanks with bottom openings. When the applicable portable tank instruction identified in Column [10] of Table A of Chapter 3.2 and described in 4.2.4.2.6 indicates that bottom openings are prohibited there shall be no openings below the liquid level of the shell when it is filled to its maximum permissible filling limit. When an existing opening is closed it shall be accomplished by internally and externally welding one plate to the shell.

6.7.2.6.2 Bottom discharge outlets for portable tanks carrying certain solid, crystallizable or highly viscous substances shall be equipped with not less than two serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and shall include:

(a) An external stop-valve fitted as close to the shell as reasonably practicable; and

(b) A liquid tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

6.7.2.6.3 Every bottom discharge outlet, except as provided in 6.7.2.6.2, shall be equipped with three serially fitted and mutually independent shut-off devices. The design of the equipment shall be to the satisfaction of the competent authority or its authorized body and include:

(a) A self-closing internal stop-valve, that is a stop-valve within the shell or within a welded flange or its companion flange, such that:

(I) The control devices for the operation of the valve are designed so as to prevent any unintended opening through impact or other inadvertent act;
(ii) The valve may be operable from above or below;
(iii) If possible, the setting of the valve (open or closed) shall be capable of being verified from the ground;
(iv) Except for portable tanks having a capacity of not more than 1,000 litres, it shall be possible to close the valve from an accessible position of the portable tank that is remote from the valve itself; and
(v) The valve shall continue to be effective in the event of damage to the external device for controlling the operation of the valve;

(b) An external stop-valve fitted as close to the shell as reasonably practicable; and

(c) A liquid tight closure at the end of the discharge pipe, which may be a bolted blank flange or a screw cap.

6.7.2.6.4 For a lined shell, the internal stop-valve required by 6.7.2.6.3.1 may be replaced by an additional external stop-valve. The manufacturer shall satisfy the requirements of the competent authority or its authorized body.

6.7.2.8 ***Pressure-relief devices***

6.7.2.8.1 Every portable tank with a capacity not less than 1,900 litres and every independent compartment of a portable tank with a similar capacity, shall be provided with one or more pressure-relief devices of the spring-loaded type and may in addition have a frangible disc or fusible element in parallel with the spring-loaded devices except when prohibited by reference to 6.7.2.8.3 in the applicable portable tank instruction in 4.2.4.2.6. The pressure-relief devices shall have sufficient capacity to prevent rupture of the shell due to over pressurization or vacuum resulting from filling, discharging, or from heating of the contents.

6.7.2.8.2 Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of liquid and the development of any dangerous excess pressure.

6.7.2.8.3 When required for certain substances by the applicable portable tank instruction identified in Column [10] of Table A of Chapter 3.2 and described in 4.2.4.2.6, portable tanks shall have a pressure-relief device approved by the competent authority. Unless a portable tank in dedicated service is fitted with an approved relief device constructed of materials compatible with the load, the relief device shall comprise a frangible disc preceding a spring-loaded pressure-relief device. When a frangible disc is inserted in series with the required pressure-relief device, the space between the frangible disc and the

pressure-relief device shall be provided with a pressure gauge or suitable tell-tale indicator for the detection of disc rupture, pin holing, or leakage which could cause a malfunction of the pressure-relief system. The frangible disc shall rupture at a nominal pressure 10% above the start to discharge pressure of the relief device.

6.7.2.8.4 Every portable tank with a capacity less than 1,900 litres shall be fitted with a pressure-relief device which may be a frangible disc when this disc complies with the requirements of 6.7.2.11.1 of the UN Model Regulations. When no spring-loaded pressure-relief device is used, the frangible disc shall be set to rupture at a nominal pressure equal to the test pressure.

6.7.2.8.5 When the shell is fitted for pressure discharge, the inlet line shall be provided with a suitable pressure-relief device set to operate at a pressure not higher than the MAWP of the shell, and a stop-valve shall be fitted as close to the shell as reasonably practicable.

6.7.3.7.1 Portable tanks for non-refrigerated liquefied gases shall be provided with one or more spring-loaded pressure-relief devices. The pressure-relief devices shall open automatically at a pressure not less than the MAWP and be fully open at a pressure equal to 110% of the MAWP. These devices shall, after discharge, close at a pressure not lower than 10% below the pressure at which discharge starts and shall remain closed at all lower pressures. The pressure-relief devices shall be of a type that will resist dynamic forces including liquid surge. Frangible discs not in series with a spring-loaded pressure-relief device are not permitted.

6.7.3.7.2 Pressure-relief devices shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

6.7.3.7.3 Portable tanks intended for the transport of certain non-refrigerated liquefied gases identified in portable tank instruction T50 in 4.2.4.2.6 shall have a pressure-relief device approved by the competent authority. Unless a portable tank in dedicated service is fitted with an approved relief device constructed of materials compatible with the load, such device shall comprise a frangible disc preceding a spring-loaded device. The space between the frangible disc and the device shall be provided with a pressure gauge or a suitable tell-tale indicator. This arrangement permits the detection of disc rupture, pinholing or leakage which could cause a malfunction of the pressure-relief device. The frangible discs shall rupture at a nominal pressure 10% above the start-to-discharge pressure of the relief device.

6.7.3.7.4 In the case of multi-purpose portable tanks, the pressure-relief devices shall open at a pressure indicated in 6.7.3.7.1 for the gas having the highest maximum allowable pressure of the gases allowed to be transported in the portable tank.

6.7.2.19 ***Inspection and testing***

6.7.2.19.1 For portable tanks meeting the definition of container in the CSC, a prototype representing each design shall be subjected to an impact test. The prototype portable tank shall be shown to be capable of absorbing the forces resulting from an impact not less than 4 times (4 g) the MPGM of the fully loaded portable tank at a duration typical of the mechanical shocks experienced in rail transport. The following is a listing of standards describing methods acceptable for performing the impact test:

Association of American Railroads,
Manual of Standards and Recommended Practices,
Specifications for Acceptability of Tank Containers (AAR.600), 1992

Canadian Standards Association (CSA),
Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods (B620-1987)

Deutsche Bahn AG
Zentralbereich Technik, Minden
Portable tanks, longitudinal dynamic impact test

Société Nationale des Chemins de Fer Français
C.N.E.S.T. 002-1966.
Tank containers, longitudinal external stresses and dynamic impact tests

Spoornet, South Africa
Engineering Development Centre (EDC)
Testing of ISO Tank Containers
Method EDC/TES/023/000/1991-06

6.7.2.19.2 The shell and items of equipment of each portable tank shall be inspected and tested before being put into service for the first time (initial inspection and test) and thereafter at not more than five-year intervals (5 year periodic inspection and test) with an intermediate periodic inspection and test (2.5 year periodic inspection and test) midway between the 5 year periodic inspections and tests. The 2.5 year inspection and test may be performed within 3 months of the specified date. An exceptional inspection and test shall be performed regardless of the date of the last periodic inspection and test when necessary according to 6.7.2.19.7.

6.7.2.19.3 The initial inspection and test of a portable tank shall include a check of the design characteristics, an internal and external examination of the portable tank and its fittings with due regard to the substances to be transported, and a pressure test. Before the portable tank is placed into service, a leakproofness test and a test of the satisfactory operation of all service equipment shall also be performed. When the shell and its fittings have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.2.19.4 The 5-year periodic inspection and test shall include an internal and external examination and, as a general rule, a hydraulic pressure test. Sheathing, thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the condition of the portable tank. When the shell and equipment have been pressure-tested separately, they shall be subjected together after assembly to a leakproofness test.

6.7.2.19.5 The intermediate 2.5 year periodic inspection and test shall at least include an internal and external examination of the portable tank and its fittings with due regard to the substances intended to be transported, a leakproofness test and a test of the satisfactory operation of all service equipment. Sheathing, thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the condition of the portable tank. For portable tanks dedicated to the transport of a single substance, the 2.5 year internal examination may be waived or substituted by other test methods or inspection procedures by the competent authority or its authorized body.

6.7.2.19.6 A portable tank may not be filled and offered for transport after the date of expiry of the last 5 year or 2.5 year periodic inspection and test as required by 6.7.2.19.2. However a portable tank filled prior to the date of expiry of the last periodic inspection and test may be transported for a period not to exceed three months beyond the date of expiry of the last periodic test or inspection. In addition, a portable tank may be transported after the date of expiry of the last periodic test and inspection:

(a) After emptying but before cleaning, for purposes of performing the next required test or inspection prior to refilling; and

(b) Unless otherwise approved by the competent authority, for a period not to exceed six months beyond the date of expiry of the last periodic test or inspection, in order to allow the return of dangerous goods for proper disposal or recycling. Reference to this exemption shall be mentioned in the transport document.

6.7.2.19.7 The exceptional inspection and test is necessary when the portable tank shows evidence of damaged or corroded areas, or leakage, or other conditions that indicate a deficiency that could affect the integrity of the portable tank. The extent of the exceptional inspection and test shall depend on the amount of damage or deterioration of the portable tank. It shall include at least the 2.5 year inspection and test according to 6.7.2.19.5.

6.7.2.19.8 The internal and external examinations shall ensure that:

(a) The shell is inspected for pitting, corrosion, or abrasions, dents, distortions, defects in welds or any other conditions, including leakage, that might render the shell unsafe for transport;

(b) The piping, valves, heating/cooling system, and gaskets are inspected for corroded areas, defects, and other conditions, including leakage, that might render the portable tank unsafe for filling, discharge or transport;

(c) Devices for tightening manhole covers are operative and there is no leakage at manhole covers or gaskets;

(d) Missing or loose bolts or nuts on any flanged connection or blank flange are replaced or tightened;

(e) All emergency devices and valves are free from corrosion, distortion and any damage or defect that could prevent their normal operation. Remote closure devices and self-closing stop-valves shall be operated to demonstrate proper operation;

(f) Linings, if any, are inspected in accordance with criteria outlined by the lining manufacturer;

(g) Required markings on the portable tank are legible and in accordance with the applicable requirements; and

(h) The framework, supports and arrangements for lifting the portable tank are in a satisfactory condition.

6.7.2.19.9 The inspections and tests in 6.7.2.19.1, 6.7.2.19.3, 6.7.2.19.4, 6.7.2.19.5 and 6.7.2.19.7 shall be performed or witnessed by an expert approved by the competent authority or its authorized body. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the portable tank. While under pressure, the portable tank shall be inspected for any leaks in the shell, piping or equipment.

6.7.2.19.10 In all cases when cutting, burning or welding operations on the shell have been effected, that work shall be to the approval of the competent authority or its authorized body taking into account the pressure vessel code used for the construction of the shell. A pressure test to the original test pressure shall be performed after the work is completed.

6.7.2.19.11 When evidence of any unsafe condition is discovered, the portable tank shall not be returned to service until it has been corrected and the test is repeated and passed.

6.7.2.20 ***Marking***

6.7.2.20.1 Every portable tank shall be fitted with a corrosion resistant metal plate permanently attached to the portable tank in a conspicuous place readily accessible for inspection. When for reasons of portable tank arrangements the plate cannot be permanently attached to the shell, the shell shall be marked with at least the information required by the pressure vessel code. As a minimum at least the following information shall be marked on the plate by stamping or by any other similar method.

Country of manufacture

UN	Approval Country	Approval Number	For Alternative Arrangements "AA"

Manufacturer's name or mark

Manufacturer's serial number

Authorized body for the design approval

Owner's registration number

Year of manufacture

Pressure vessel code to which the shell is designed

Test pressure _____bar/kPa gauge1/

MAWP_____ bar/kPa gauge */

External design pressure 2/ _____ bar/kPa gauge */

Design temperature range_____ °C to_____°C

Water capacity at 20 °C _____litres

Water capacity of each compartment at 20 °C _____ litres

Initial pressure test date and witness identification

MAWP for heating/cooling system _____ bar/kPa gauge */

Shell material(s) and material standard reference(s)

Equivalent thickness in reference steel _____mm

Lining material (when applicable)

Date and type of most recent periodic test(s)

Month_____ Year_____ Test pressure_____bar/kPa gauge */

Stamp of expert who performed or witnessed the most recent test

6.7.2.20.2 The following information shall be marked either on the portable tank itself or on a metal plate firmly secured to the portable tank:

Name of the operator

Name of substance(s) being transported and maximum mean bulk temperature when higher than 50 °C

Maximum permissible gross mass (MPGM) _____ kg

Unladen (tare) mass _____ kg

***Note**: For the identification of the substances being transported, see also Part 5.*

6.7.2.20.3 If a portable tank is designed and approved for handling in open seas, the words "OFFSHORE PORTABLE TANK" shall be marked on the identification plate.

1/ *The unit used shall be marked.*

2/ *See 6.7.2.2.10 of the UN Model Regulations.*

Proposals concerning definitions in Part 1, section 1.2.1:

1. Amend the definition of "portable tank"to read:

"**Portable tank**" means a multimodal tank having a capacity of more than 450 litres used for the transport of substances of classes 3 to 9 or non-refrigerated or refrigerated gases of Class 2. The portable tank includes a shell fitted with service equipment and structural equipment necessary for the transport of dangerous substances."

2. Insert the following definition of "MAWP" (Maximum allowable working pressure):

"**Maximum allowable working pressure (MAWP)** means a pressure that shall be not less than the highest of the following pressures measured at the top of the shell while in operating position:

(a) The maximum effective gauge pressure allowed in the shell during filling or discharge; or

(b) The maximum effective gauge pressure to which the shell is designed which shall be not less than the sum of:

(i) the absolute vapour pressure (in bar) of the substance at 65EC, minus 1 bar; and

(ii) the partial pressure (in bar) of air or other gases in the ullage space being determined by a maximum ullage temperature of 65EC and a liquid expansion due to an increase in mean bulk temperature of t_T - t_f (t_f = filling temperature, usually 15EC; t_T =50EC, maximum mean bulk temperature).