

## CHAPTER 4.3

### USE OF FIXED TANKS (TANK-VEHICLES), DEMOUNTABLE TANKS, TANK-CONTAINERS AND TANK SWAP BODIES WITH SHELLS MADE OF METALLIC MATERIALS, AND BATTERY-VEHICLES AND MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs)

**NOTE:** For portable tanks and UN multiple-element gas containers (MEGCs) see Chapter 4.2; for fibre-reinforced plastics tanks, see Chapter 4.4; for vacuum operated waste tanks, see Chapter 4.5.

#### 4.3.1 Scope

4.3.1.1 Provisions which take up the whole width of the page apply both to fixed tanks (tank-vehicles), demountable tanks and battery-vehicles, and to tank-containers, tank swap bodies and MEGCs. Provisions contained in a single column apply only to:

- fixed tanks (tank-vehicles), demountable tanks and battery-vehicles (left-hand column);
- tank-containers, tank swap bodies and MEGCs (right-hand column).

4.3.1.2 These provisions apply to:

|   |   |
|---|---|
| fixed tanks (tank-vehicles), demountable tanks and battery-vehicles | tank-containers, tank swap bodies and MEGCs |
|---|---|

used for the carriage of gaseous, liquid, powdery or granular substances.

4.3.1.3 Section 4.3.2 lists the provisions applicable to fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, intended for the carriage of substances of all classes, and to battery-vehicles and MEGCs intended for the carriage of gases of Class 2. Sections 4.3.3 and 4.3.4 contain special provisions adding to or amending the provisions of Section 4.3.2.

4.3.1.4 For requirements concerning the construction, equipment, type approval, tests and marking, see Chapter 6.8.

4.3.1.5 For transitional measures concerning the application of this Chapter, see:

|        |        |
|--------|--------|
| 1.6.3. | 1.6.4. |
|--------|--------|

#### 4.3.2 Provisions applicable to all classes

##### 4.3.2.1 Use

4.3.2.1.1 A substance subject to ADR may be carried in fixed tanks (tank-vehicles), demountable tanks, battery-vehicles, tank-containers, tank swap bodies and MEGCs only when provision is made for a tank code according to 4.3.3.1.1 and 4.3.4.1.1 in Column (12) of Table A in Chapter 3.2.

4.3.2.1.2 The required type of tank, battery-vehicle and MEGC is given in code form in Column (12) of Table A in Chapter 3.2. The identification codes appearing there are made up of letters or

numbers in a given order. The explanations for reading the four parts of the code are given in 4.3.3.1.1 (when the substance to be carried belongs to Class 2) and in 4.3.4.1.1 (when the substance to be carried belongs to Classes 3 to 9)<sup>1</sup>.

4.3.2.1.3 The required type according to 4.3.2.1.2 corresponds to the least stringent construction requirements which are acceptable for the dangerous substance in question unless otherwise prescribed in this Chapter or in Chapter 6.8. It is possible to use tanks corresponding to codes prescribing a higher minimum calculation pressure, or more stringent requirements for filling or discharge openings or for safety valves/devices (see 4.3.3.1.1 for Class 2 and 4.3.4.1.1 for Classes 3 to 9).

4.3.2.1.4 For certain substances, tanks, battery-vehicles or MEGCs are subject to additional provisions which are included as special provisions in Column (13) of Table A in Chapter 3.2.

4.3.2.1.5 Tanks, battery-vehicles and MEGCs shall not be loaded with any dangerous substances other than those for the carriage of which they have been approved according to 6.8.2.3.1 and which, in contact with the materials of the shell, gaskets, equipment and protective linings, are not liable to react dangerously with them (see "dangerous reaction" in 1.2.1), to form dangerous products or appreciably to weaken these materials<sup>2</sup>.

4.3.2.1.6 Foodstuffs shall not be carried in tanks used for dangerous substances unless the necessary steps have been taken to prevent any harm to public health.

#### **4.3.2.2 Degree of filling**

4.3.2.2.1 The following degrees of filling shall not be exceeded in tanks intended for the carriage of liquids at ambient temperatures:

- (a) for flammable substances without additional risks (e.g. toxicity or corrosivity), in tanks with a venting system or with safety valves (even where preceded by a bursting disc):

$$\text{Degree of filling} = \frac{100}{1 + \alpha (50 - t_F)} \% \text{ of capacity}$$

- (b) for toxic or corrosive substances (whether flammable or not) in tanks with a venting system or with safety valves (even where preceded by a bursting disc):

$$\text{Degree of filling} = \frac{98}{1 + \alpha (50 - t_F)} \% \text{ of capacity}$$

- (c) for flammable substances and for slightly toxic or corrosive substances (whether flammable or not) in hermetically closed tanks without a safety device:

$$\text{Degree of filling} = \frac{97}{1 + \alpha (50 - t_F)} \% \text{ of capacity}$$

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<sup>1</sup> An exception is made for tanks intended for the carriage of substances of classes 5.2 or 7 (see 4.3.4.1.3).

<sup>2</sup> It may be necessary to consult the manufacturer of the substance and the competent authority for guidance on the compatibility of the substance with the materials of the tank, battery-vehicle or MEGC.

- (d) for highly toxic, toxic, highly corrosive or corrosive substances (whether flammable or not) in hermetically closed tanks without a safety device:

$$\text{Degree of filling} = \frac{95}{1 + \alpha (50 - t_F)} \% \text{ of capacity}$$

4.3.2.2.2 In these formulae,  $\alpha$  is the mean coefficient of cubical expansion of the liquid between 15 °C and 50 °C, i.e. for a maximum variation in temperature of 35 °C.

$\alpha$  is calculated by the formula:

$$\alpha = \frac{d_{15} - d_{50}}{35d_{50}}$$

where  $d_{15}$  and  $d_{50}$  are the relative densities of the liquid at 15 °C and 50 °C respectively.  $t_F$  is the mean temperature of the liquid during filling.

4.3.2.2.3 The provisions of 4.3.2.2.1 (a) to (d) above shall not apply to tanks whose contents are, by means of a heating device, maintained at a temperature above 50 °C during carriage. In this case the degree of filling at the outset shall be such, and the temperature so regulated, that the tank is not full to more than 95% of its capacity and that the filling temperature is not exceeded, at any time during carriage.

4.3.2.2.4 Where shells intended for the carriage of liquids <sup>3</sup> are not divided by partitions or surge plates into sections of not more than 7 500 litres capacity, they shall be filled to not less than 80% or not more than 20% of their capacity.

#### 4.3.2.3 **Operation**

4.3.2.3.1 The thickness of the walls of the shell shall not, throughout its use, fall below the minimum figure prescribed in:

6.8.2.1.17 to 6.8.2.1.21. | 6.8.2.1.17 to 6.8.1.20.

4.3.2.3.2

During carriage tank-containers/MEGCs shall be loaded on the carrying vehicle in such a way as to be adequately protected by the fittings of the carrying vehicle or of the tank-container/MEGC itself against lateral and longitudinal impact and against overturning <sup>4</sup>. If the tank-containers/MEGCs, including the service equipment, are so constructed as to withstand impact or overturning they need not be protected in this way.

<sup>3</sup> Under this provision, substances whose kinematic viscosity at 20 °C is below 2 680 mm<sup>2</sup>/s shall be deemed to be liquids.

<sup>4</sup> Examples of protection of shells:

- protection against lateral impact may, for example, consist of longitudinal bars protecting the shell on both sides at the level of the median line;
- protection against overturning may, for example, consist of reinforcing rings or bars fixed transversally in relation to the frame;
- protection against rear impact, may, for example, consist of a bumper or frame.

- 4.3.2.3.3 During filling and discharge of tanks, battery-vehicles and MEGCs, appropriate measures shall be taken to prevent the release of dangerous quantities of gases and vapours. Tanks, battery-vehicles and MEGCs shall be closed so that the contents cannot spill out uncontrolled. The openings of bottom-discharge tanks shall be closed by means of screw-threaded plugs, blank flanges or other equally effective devices. The leakproofness of the closures of the tanks, and of the battery-vehicles and MEGCs shall be checked by the filler after the tank is filled. This applies in particular to the upper part of the dip tube.
- 4.3.2.3.4 Where several closure systems are fitted in series, that nearest to the substance being carried shall be closed first.
- 4.3.2.3.5 No dangerous residue of the filling substance shall adhere to the outside of the tank during carriage.
- 4.3.2.3.6 Substances which may react dangerously with each other shall not be carried in adjoining compartments of tanks.

Substances which may react dangerously with each other may be carried in adjoining compartments of tanks, when these compartments are separated by a partition with a wall thickness equal to or greater than that of the tank itself. They may also be carried separated by an empty space or an empty compartment between loaded compartments.

#### **4.3.2.4 *Empty tanks, battery-vehicles and MEGCs, uncleaned***

*NOTE: For empty tanks, battery-vehicles and MEGCs, uncleaned, special provisions TUI, TU2, TU4, TUI6 and TU35 of 4.3.5 may apply.*

- 4.3.2.4.1 No dangerous residue of the filling substance shall adhere to the outside of the tank during carriage.
- 4.3.2.4.2 To be accepted for carriage, empty tanks, battery-vehicles and MEGCs, uncleaned, shall be closed in the same manner and be leakproof to the same degree as if they were full.
- 4.3.2.4.3 Where empty tanks, battery-vehicles and MEGCs, uncleaned, are not closed in the same manner and are not leakproof to the same degree as if they were full and where the provisions of ADR cannot be complied with, they shall be carried, with due regard to adequate safety, to the nearest suitable place where cleaning or repair can be carried out. Carriage is adequately safe if suitable measures have been taken to ensure equivalent safety commensurate with the provisions of ADR and to prevent the uncontrolled release of the dangerous goods.
- 4.3.2.4.4 Empty fixed tanks (tank-vehicles), demountable tanks, battery-vehicles, tank-containers, tank swap bodies and MEGCs, uncleaned, may also be carried after the expiry of the periods established in 6.8.2.4.2 and 6.8.2.4.3 for undergoing the inspection.

### 4.3.3 Special provisions applicable to Class 2

#### 4.3.3.1 Coding and hierarchy of tanks

##### 4.3.3.1.1 Coding of tanks, battery-vehicles and MEGCs

The four parts of the codes (tank codes) given in Column (12) of Table A in Chapter 3.2 have the following meanings:

| Part | Description                            | Tank Code  |
|------|--|--|
| 1    | Types of tank, battery-vehicle or MEGC | C = tank, battery-vehicle or MEGC for compressed gases;<br>P = tank, battery-vehicle or MEGC for liquefied gases or dissolved gases;<br>R = tank for refrigerated liquefied gases.   |
| 2    | Calculation pressure                   | X = value of the minimum relevant test pressure according to the table in 4.3.3.2.5; or<br>22 = minimum calculation pressure in bar.   |
| 3    | Openings (see 6.8.2.2 and 6.8.3.2)     | B = tank with bottom filling or discharge openings with 3 closures; or battery-vehicle or MEGC with openings below the surface of the liquid or for compressed gases;<br>C = tank with top filling or discharge openings with 3 closures with only cleaning openings below the surface of the liquid;<br>D = tank with top filling or discharge openings with 3 closures; or battery-vehicle or MEGC with no openings below the surface of the liquid. |
| 4    | Safety valves/devices                  | N = tank, battery-vehicle or MEGC with safety valve according to 6.8.3.2.9 or 6.8.3.2.10 which is not hermetically closed;<br>H = hermetically closed tank, battery-vehicle or MEGC (see 1.2.1);   |

**NOTE 1:** The special provision TU17 indicated in Column (13) of Table A in Chapter 3.2 for certain gases means that the gas may only be carried in a battery-vehicle or MEGC the elements of which are composed of receptacles.

**NOTE 2:** The pressures indicated on the tank itself or on the panel shall be not less than the value of "X" or the minimum calculation pressure.

#### 4.3.3.1.2 Hierarchy of tanks

| <b>Tank code</b> | <b>Other tank code(s) permitted for the substances under this code</b> |
|------------------|--|
| C*BN             | C#BN, C#CN, C#DN, C#BH, C#CH, C#DH                                     |
| C*BH             | C#BH, C#CH, C#DH   |
| C*CN             | C#CN, C#DN, C#CH, C#DH   |
| C*CH             | C#CH, C#DH   |
| C*DN             | C#DN, C#DH   |
| C*DH             | C#DH   |
| P*BN             | P#BN, P#CN, P#DN, P#BH, P#CH, P#DH                                     |
| P*BH             | P#BH, P#CH, P#DH   |
| P*CN             | P#CN, P#DN, P#CH, P#DH   |
| P*CH             | P#CH, P#DH   |
| P*DN             | P#DN, P#DH   |
| P*DH             | P#DH   |
| R*BN             | R#BN, R#CN, R#DN   |
| R*CN             | R#CN, R#DN   |
| R*DN             | R#DN   |

The figure represented by "#" shall be equal to or greater than the figure represented by "\*".

**NOTE:** This hierarchy does not take any special provisions into account (see 4.3.5 and 6.8.4) for each entry.

#### 4.3.3.2 Filling conditions and test pressures

4.3.3.2.1 The test pressure for tanks intended for the carriage of compressed gases shall be at least 1.5 times the working pressure as defined in 1.2.1 for pressure receptacles.

4.3.3.2.2 The test pressure for tanks intended for the carriage of:

- high pressure liquefied gases; and
- dissolved gases

shall be such that, when the shell is filled to the maximum filling ratio, the pressure reached in the shell by the substance at 55 °C for tanks with thermal insulation or 65 °C for tanks without thermal insulation does not exceed the test pressure.

4.3.3.2.3 The test pressure for tanks intended for the carriage of low pressure liquefied gases will be:

- If the tank is equipped with thermal insulation, at least equal to the vapour pressure, reduced by 0.1 MPa (1 bar) of the liquid at 60 °C, but not less than 1 MPa (10 bar);
- If the tank is not equipped with thermal insulation, at least equal to the vapour pressure, reduced by 0.1 MPa (1 bar), of the liquid at 65 °C, but not less than 1 MPa (10 bar).

The maximum permissible mass of contents per litre of capacity is calculated as follows:

*Maximum permissible mass of contents per litre of capacity = 0.95 × density of the liquid phase at 50 °C (in kg/l)*

Moreover the vapour phase shall not disappear below 60 °C.

If the shells are not more than 1.5 m in diameter, the values of the test pressure and maximum filling ratio conforming to packing instruction P200 in 4.1.4.1 shall be applicable.

4.3.3.2.4 The test pressure for tanks intended for the carriage of refrigerated liquefied gases shall be not less than 1.3 times the maximum allowable working pressure and indicated on the tank but not less than 300 kPa (3 bar) (gauge pressure); for tanks with vacuum insulation the test pressure shall be not less than 1.3 times the maximum allowable working pressure increased by 100 kPa (1 bar).

4.3.3.2.5 *Table of gases and gas mixtures which may be carried in fixed tanks (tank-vehicles), battery-vehicles, demountable tanks, tank-containers or MEGCs indicating the minimum test pressure for tanks and as far as applicable the filling ratio*

In the case of gases and gas mixtures classified under n.o.s. entries, the values of the test pressure and the filling ratio shall be prescribed by the expert approved by the competent authority.

When tanks for compressed or high pressure liquefied gases have been subjected to a test pressure lower than shown in the table, and the tanks are fitted with thermal insulation, a lower maximum load may be prescribed by the expert approved by the competent authority, provided that the pressure reached in the tank by the substance at 55 °C does not exceed the test pressure stamped on the tank.

| UN No. | Name  | Classification code | Minimum test pressure for tanks                            |     |                            |     | Maximum permissible mass of contents per litre of capacity |
|--------|---|---------------------|--|-----|----------------------------|-----|--|
|        |   |                     | With thermal insulation                                    |     | Without thermal insulation |     |  |
|        |   |                     | MPa  | bar | MPa                        | bar | kg   |
| 1001   | Acetylene, dissolved                            | 4 F                 | only in battery-vehicles and MEGCs composed of receptacles |     |                            |     |  |
| 1002   | Air, compressed                                 | 1 A                 | see 4.3.3.2.1  |     |                            |     |  |
| 1003   | Air, refrigerated liquid                        | 3 O                 | see 4.3.3.2.4  |     |                            |     |  |
| 1005   | Ammonia, anhydrous                              | 2 TC                | 2.6  | 26  | 2.9                        | 29  | 0.53   |
| 1006   | Argon, compressed                               | 1 A                 | see 4.3.3.2.1  |     |                            |     |  |
| 1008   | Boron trifluoride                               | 2 TC                | 22.5   | 225 | 22.5                       | 225 | 0.715  |
|        |   |                     | 30   | 300 | 30                         | 300 | 0.86   |
| 1009   | Bromotrifluoromethane (Refrigerant gas R13B1)   | 2 A                 | 12   | 120 |                            |     | 1.50   |
|        |   |                     |  |     | 4.2                        | 42  | 1.13   |
|        |   |                     |  |     | 12                         | 120 | 1.44   |
|        |   |                     |  |     | 25                         | 250 | 1.60   |
| 1010   | BUTADIENES, STABILIZED (1,2-butadiene) or       | 2 F                 | 1  | 10  | 1                          | 10  | 0.59   |
| 1010   | BUTADIENES, STABILIZED (1,3-butadiene) or       | 2 F                 | 1  | 10  | 1                          | 10  | 0.55   |
| 1010   | BUTADIENES AND HYDROCARBON, MIXTURE, STABILIZED | 2 F                 | 1  | 10  | 1                          | 10  | 0.50   |
| 1011   | Butane  | 2 F                 | 1  | 10  | 1                          | 10  | 0.51   |
| 1012   | 1-butylene or                                   | 2 F                 | 1  | 10  | 1                          | 10  | 0.53   |
| 1012   | trans-2-butylene or                             | 2 F                 | 1  | 10  | 1                          | 10  | 0.54   |
| 1012   | cis-2-butylene or                               | 2 F                 | 1  | 10  | 1                          | 10  | 0.55   |
| 1012   | butylenes mixture                               | 2 F                 | 1  | 10  | 1                          | 10  | 0.50   |
| 1013   | Carbon dioxide                                  | 2 A                 | 19   | 190 |                            |     | 0.73   |
|        |   |                     | 22.5   | 225 |                            |     | 0.78   |
|        |   |                     |  |     | 19                         | 190 | 0.66   |
|        |   |                     |  |     | 25                         | 250 | 0.75   |

| UN No. | Name  | Classification code | Minimum test pressure for tanks                      |     |                            |      | Maximum permissible mass of contents per litre of capacity |
|--------|---|---------------------|--|-----|----------------------------|------|--|
|        |   |                     | With thermal insulation                              |     | Without thermal insulation |      |  |
|        |   |                     | MPa  | bar | MPa                        | bar  | kg   |
| 1014   | Carbon dioxide and oxygen mixtures compressed   | 1 O                 | see 4.3.3.2.1  |     |                            |      |  |
| 1015   | Carbon dioxide and nitrous oxide mixture  | 2 A                 | see 4.3.3.2.2 or 4.3.3.2.3                           |     |                            |      |  |
| 1016   | Carbon monoxide, compressed   | 1 TF                | see 4.3.3.2.1  |     |                            |      |  |
| 1017   | Chlorine  | 2 TC                | 1.7  | 17  | 1.9                        | 19   | 1.25   |
| 1018   | Chlorodifluoromethane (Refrigerant gas R22)   | 2 A                 | 2.4  | 24  | 2.6                        | 26   | 1.03   |
| 1020   | Chloropentafluoroethane (Refrigerant gas R115)  | 2 A                 | 2  | 20  | 2.3                        | 23   | 1.08   |
| 1021   | 1-chloro-1,2,2,2- tetrafluoroethane (Refrigerant gas R124)  | 2 A                 | 1  | 10  | 1.1                        | 11   | 1.2  |
| 1022   | Chlorotrifluoromethane (Refrigerant gas R13)  | 2 A                 | 12   | 120 |                            |      | 0.96   |
|        |   |                     | 22.5   | 225 |                            |      | 1.12   |
|        |   |                     |  |     | 10                         | 100  | 0.83   |
|        |   |                     |  |     | 12                         | 120  | 0.90   |
|        |   |                     |  |     | 19                         | 190  | 1.04   |
|        |   |                     |  | 25  | 250                        | 1.10 |  |
| 1023   | Coal gas, compressed  | TF                  | see 4.3.3.2.1  |     |                            |      |  |
| 1026   | Cyanogen  | 2 TF                | 10   | 100 | 10                         | 100  | 0.70   |
| 1027   | Cyclopropane  | 2 F                 | 1.6  | 16  | 1.8                        | 18   | 0.53   |
| 1028   | Dichlorodifluoromethane (Refrigerant gas R12)   | 2 A                 | 1.5  | 15  | 1.6                        | 16   | 1.15   |
| 1029   | Dichlorofluoromethane (Refrigerant gas R21)   | 2 A                 | 1  | 10  | 1                          | 10   | 1.23   |
| 1030   | 1,1-difluoroethane (Refrigerant gas R152a)  | 2 F                 | 1.4  | 14  | 1.6                        | 16   | 0.79   |
| 1032   | Dimethylamine, anhydrous  | 2 F                 | 1  | 10  | 1                          | 10   | 0.59   |
| 1033   | Dimethyl ether  | 2 F                 | 1.4  | 14  | 1.6                        | 16   | 0.58   |
| 1035   | Ethane  | 2 F                 | 12   | 120 |                            |      | 0.32   |
|        |   |                     |  |     | 9.5                        | 95   | 0.25   |
|        |   |                     |  |     | 12                         | 120  | 0.29   |
|        |   |                     |  |     | 30                         | 300  | 0.39   |
| 1036   | Ethylamine  | 2 F                 | 1  | 10  | 1                          | 10   | 0.61   |
| 1037   | Ethyl chloride  | 2 F                 | 1  | 10  | 1                          | 10   | 0.8  |
| 1038   | Ethylene, refrigerated liquid   | 3 F                 | see 4.3.3.2.4  |     |                            |      |  |
| 1039   | Ethyl methyl ether  | 2 F                 | 1  | 10  | 1                          | 10   | 0.64   |
| 1040   | Ethylene oxide with nitrogen up to a total pressure of 1MPa (10 bar) at 50 °C                     | 2 TF                | 1.5  | 15  | 1.5                        | 15   | 0.78   |
| 1041   | Ethylene oxide and carbon dioxide mixture, with more than 9% but not more than 87% ethylene oxide | 2 F                 | 2.4  | 24  | 2.6                        | 26   | 0.73   |
| 1046   | Helium, compressed  | 1 A                 | see 4.3.3.2.1  |     |                            |      |  |
| 1048   | Hydrogen bromide, anhydrous   | 2 TC                | 5  | 50  | 5.5                        | 55   | 1.54   |
| 1049   | Hydrogen, compressed  | 1 F                 | see 4.3.3.2.1  |     |                            |      |  |
| 1050   | Hydrogen chloride, anhydrous  | 2 TC                | 12   | 120 |                            |      | 0.69   |
|        |   |                     |  |     | 10                         | 100  | 0.30   |
|        |   |                     |  |     | 12                         | 120  | 0.56   |
|        |   |                     |  |     | 15                         | 150  | 0.67   |
|        |   |                     |  |     | 20                         | 200  | 0.74   |
| 1053   | Hydrogen sulphide   | 2 TF                | 4.5  | 45  | 5                          | 50   | 0.67   |
| 1055   | Isobutylene   | 2 F                 | 1  | 10  | 1                          | 10   | 0.52   |
| 1056   | Krypton, compressed   | 1 A                 | see 4.3.3.2.1  |     |                            |      |  |
| 1058   | Liquefied gases, non flammable, charged with nitrogen, carbon dioxide or air                      | 2 A                 | 1.5 H filling pressure<br>see 4.3.3.2.2 or 4.3.3.2.3 |     |                            |      |  |



| UN No. | Name   | Classification code | Minimum test pressure for tanks                            |     |                            |     | Maximum permissible mass of contents per litre of capacity |
|--------|--|---------------------|--|-----|----------------------------|-----|--|
|        |  |                     | With thermal insulation                                    |     | Without thermal insulation |     |  |
|        |  |                     | MPa  | bar | MPa                        | bar | kg   |
| 1060   | Methylacetylene and propadiene mixture, stabilized:                    | 2 F                 | see 4.3.3.2.2 or 4.3.3.2.3                                 |     |                            |     |  |
|        | mixture P1   | 2 F                 | 2.5  | 25  | 2.8                        | 28  | 0.49   |
|        | mixture P2   | 2 F                 | 2.2  | 22  | 2.3                        | 23  | 0.47   |
|        | propadiene with 1% to 4% methylacetylene                               | 2 F                 | 2.2  | 22  | 2.2                        | 22  | 0.50   |
| 1061   | Methylamine, anhydrous   | 2 F                 | 1  | 10  | 1.1                        | 11  | 0.58   |
| 1062   | Methyl bromide with not more than 2% chloropicrin                      | 2 T                 | 1  | 10  | 1                          | 10  | 1.51   |
| 1063   | Methyl chloride (Refrigerant gas R40)                                  | 2 F                 | 1.3  | 13  | 1.5                        | 15  | 0.81   |
| 1064   | Methyl mercaptan   | 2 TF                | 1  | 10  | 1                          | 10  | 0.78   |
| 1065   | Neon, compressed   | 1 A                 | see 4.3.3.2.1  |     |                            |     |  |
| 1066   | Nitrogen, compressed   | 1 A                 | see 4.3.3.2.1  |     |                            |     |  |
| 1067   | Dinitrogen tetroxide (nitrogen dioxide)                                | 2 TOC               | only in battery-vehicles and MEGCs composed of receptacles |     |                            |     |  |
| 1070   | Nitrous oxide  | 2 O                 | 22.5   | 225 |                            |     | 0.78   |
|        |  |                     |  |     | 18                         | 180 | 0.68   |
|        |  |                     |  |     | 22.5                       | 225 | 0.74   |
|        |  |                     |  |     | 25                         | 250 | 0.75   |
| 1071   | Oil gas, compressed  | 1 TF                | see 4.3.3.2.1  |     |                            |     |  |
| 1072   | Oxygen, compressed   | 1 O                 | see 4.3.3.2.1  |     |                            |     |  |
| 1073   | Oxygen, refrigerated liquid  | 3 O                 | see 4.3.3.2.4  |     |                            |     |  |
| 1076   | Phosgene   | 2 TC                | only in battery-vehicles and MEGCs composed of receptacles |     |                            |     |  |
| 1077   | Propylene  | 2 F                 | 2.5  | 25  | 2.7                        | 27  | 0.43   |
| 1078   | Refrigerant gases, n.o.s. such as:                                     | 2 A                 | see 4.3.3.2.2 or 4.3.3.2.3                                 |     |                            |     |  |
|        | mixture F1   | 2 A                 | 1  | 10  | 1.1                        | 11  | 1.23   |
|        | mixture F2   | 2 A                 | 1.5  | 15  | 1.6                        | 16  | 1.15   |
|        | mixture F3   | 2 A                 | 2.4  | 24  | 2.7                        | 27  | 1.03   |
|        | other mixtures   | 2 A                 | see 4.3.3.2.2 or 4.3.3.2.3                                 |     |                            |     |  |
| 1079   | Sulphur dioxide  | 2 TC                | 1  | 10  | 1.2                        | 12  | 1.23   |
| 1080   | Sulphur hexafluoride   | 2 A                 | 12   | 120 |                            |     | 1.34   |
|        |  |                     |  |     | 7                          | 70  | 1.04   |
|        |  |                     |  |     | 14                         | 140 | 1.33   |
|        |  |                     |  |     | 16                         | 160 | 1.37   |
| 1082   | Trifluorochloroethylene, stabilized                                    | 2 TF                | 1.5  | 15  | 1.7                        | 17  | 1.13   |
| 1083   | Trimethylamine, anhydrous  | 2 F                 | 1  | 10  | 1                          | 10  | 0.56   |
| 1085   | Vinyl bromide, stabilized  | 2 F                 | 1  | 10  | 1                          | 10  | 1.37   |
| 1086   | Vinyl chloride, stabilized   | 2 F                 | 1  | 10  | 1.1                        | 11  | 0.81   |
| 1087   | inyl methyl ether, stabilized  | 2 F                 | 1  | 10  | 1                          | 10  | 0.67   |
| 1581   | Chloropicrin and methyl bromide mixture with more than 2% chloropicrin | 2 T                 | 1  | 10  | 1                          | 10  | 1.51   |
| 1582   | Chloropicrin and methyl chloride mixture                               | 2 T                 | 1.3  | 13  | 1.5                        | 15  | 0.81   |
| 1612   | Hexaethyl tetraphosphate and compressed gas mixture                    | 1 T                 | see 4.3.3.2.1  |     |                            |     |  |
| 1749   | Chlorine trifluoride   | 2 TOC               | 3  | 30  | 3                          | 30  | 1.40   |
| 1858   | Hexafluoropropylene (Refrigerant gas R 1216)                           | 2A                  | 1.7  | 17  | 1.9                        | 19  | 1.11   |
| 1859   | Silicon tetrafluoride  | 2 TC                | 20   | 200 | 20                         | 200 | 0.74   |
|        |  |                     | 30   | 300 | 30                         | 300 | 1.10   |
| 1860   | Vinyl fluoride, stabilized   | 2 F                 | 12   | 120 |                            |     | 0.58   |
|        |  |                     | 22.5   | 225 |                            |     | 0.65   |
|        |  |                     |  |     | 25                         | 250 | 0.64   |

| UN No. | Name  | Classification code | Minimum test pressure for tanks |     |                            |     | Maximum permissible mass of contents per litre of capacity |
|--------|---|---------------------|---------------------------------|-----|----------------------------|-----|--|
|        |   |                     | With thermal insulation         |     | Without thermal insulation |     |  |
|        |   |                     | MPa                             | bar | MPa                        | bar | kg   |
| 1912   | Methyl chloride and methylene chloride mixture  | 2 F                 | 1.3                             | 13  | 1.5                        | 15  | 0.81   |
| 1913   | Neon, refrigerated liquid   | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1951   | Argon, refrigerated liquid  | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1952   | Ethylene oxide and carbon dioxide mixture, with not more than 9% ethylene oxide   | 2 A                 | 19                              | 190 | 19                         | 190 | 0.66   |
|        |   |                     | 25                              | 250 | 25                         | 250 | 0.75   |
| 1953   | Compressed gas, toxic, flammable, n.o.s. <sup>a</sup>   | 1 TF                | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 1954   | Compressed gas, flammable n.o.s.  | 1 F                 | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 1955   | Compressed gas, toxic, n.o.s. <sup>a</sup>  | 1 T                 | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 1956   | Compressed gas, n.o.s.  | 1 A                 | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 1957   | Deuterium, compressed   | 1 F                 | see 4.3.3.2.1                   |     |                            |     |  |
| 1958   | 1,2-dichloro-1,1,2,2-tetrafluoroethane (Refrigerant gas R114)   | 2 A                 | 1                               | 10  | 1                          | 10  | 1.3  |
| 1959   | 1,1-difluoroethylene (Refrigerant gas R1132a)   | 2 F                 | 12                              | 120 |                            |     | 0.66   |
|        |   |                     | 22.5                            | 225 |                            |     | 0.78   |
|        |   |                     |                                 |     | 25                         | 250 | 0.77   |
| 1961   | Ethane, refrigerated liquid   | 3 F                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1962   | Ethylene  | 2 F                 | 12                              | 120 |                            |     | 0.25   |
|        |   |                     | 22.5                            | 225 |                            |     | 0.36   |
|        |   |                     |                                 |     | 22.5                       | 225 | 0.34   |
|        |   |                     |                                 |     | 30                         | 300 | 0.37   |
| 1963   | Helium, refrigerated liquid   | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1964   | Hydrocarbon gas mixture, compressed, n.o.s.   | 1 F                 | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 1965   | Hydrocarbon gas mixture, liquefied, n.o.s.:   | 2 F                 |                                 |     |                            |     |  |
|        | Mixture A   | 2 F                 | 1                               | 10  | 1                          | 10  | 0.50   |
|        | Mixture A01   | 2 F                 | 1.2                             | 12  | 1.4                        | 14  | 0.49   |
|        | Mixture A02   | 2 F                 | 1.2                             | 12  | 1.4                        | 14  | 0.48   |
|        | Mixture A0  | 2 F                 | 1.2                             | 12  | 1.4                        | 14  | 0.47   |
|        | Mixture A1  | 2 F                 | 1.6                             | 16  | 1.8                        | 18  | 0.46   |
|        | Mixture B1  | 2 F                 | 2                               | 20  | 2.3                        | 23  | 0.45   |
|        | Mixture B2  | 2 F                 | 2                               | 20  | 2.3                        | 23  | 0.44   |
|        | Mixture B   | 2 F                 | 2                               | 20  | 2.3                        | 23  | 0.43   |
|        | Mixture C   | 2 F                 | 2.5                             | 25  | 2.7                        | 27  | 0.42   |
|        | Other mixtures  | 2 F                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 1966   | Hydrogen, refrigerated liquid   | 3 F                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1967   | Insecticide gas, toxic, n.o.s. <sup>a</sup>   | 2 T                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 1968   | Insecticide gas, n.o.s.   | 2 A                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 1969   | Isobutane   | 2 F                 | 1                               | 10  | 1                          | 10  | 0.49   |
| 1970   | Krypton, refrigerated liquid  | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1971   | Methane, compressed or natural gas, compressed with high methane content  | 1 F                 | see 4.3.3.2.1                   |     |                            |     |  |
| 1972   | Methane, refrigerated liquid or natural gas, refrigerated liquid with high methane content  | 3 F                 | see 4.3.3.2.4                   |     |                            |     |  |
| 1973   | Chlorodifluoromethane and chloropentafluoroethane mixture with fixed boiling point, with approximately 49% chlorodifluoromethane (Refrigerant gas R502) | 2 A                 | 2.5                             | 25  | 2.8                        | 28  | 1.05   |

<sup>a</sup> Allowed if LC<sub>50</sub> equal to or greater than 200 ppm.

| UN No. | Name   | Classification code | Minimum test pressure for tanks |     |                            |     | Maximum permissible mass of contents per litre of capacity |      |
|--------|--|---------------------|---------------------------------|-----|----------------------------|-----|--|------|
|        |  |                     | With thermal insulation         |     | Without thermal insulation |     |  |      |
|        |  |                     | MPa                             | bar | MPa                        | bar | kg   |      |
| 1974   | Chlorodifluorobromomethane (Refrigerant gas R12B1)                     | 2 A                 | 1                               | 10  | 1                          | 10  | 1.61   |      |
| 1976   | Octafluorocyclobutane (Refrigerant gas RC318)                          | 2 A                 | 1                               | 10  | 1                          | 10  | 1.34   |      |
| 1977   | Nitrogen, refrigerated liquid  | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |      |
| 1978   | Propane  | 2 F                 | 2.1                             | 21  | 2.3                        | 23  | 0.42   |      |
| 1979   | Rare gases mixture, compressed   | 1 A                 | see 4.3.3.2.1                   |     |                            |     |  |      |
| 1980   | Rare gases and oxygen mixture, compressed                              | 1 A                 | see 4.3.3.2.1                   |     |                            |     |  |      |
| 1981   | Rare gases and nitrogen mixture, compressed                            | 1 A                 | see 4.3.3.2.1                   |     |                            |     |  |      |
| 1982   | Tetrafluoromethane (Refrigerant gas R14)                               | 2 A                 | 20                              | 200 | 20                         | 200 | 0.62   |      |
|        |  |                     | 30                              | 300 | 30                         | 300 | 0.94   |      |
| 1983   | 1-chloro-2,2,2-trifluoroethane (Refrigerant gas R133a)                 | 2 A                 | 1                               | 10  | 1                          | 10  | 1.18   |      |
| 1984   | Trifluoromethane (Refrigerant gas R23)                                 | 2 A                 | 19                              | 190 |                            |     | 0.92   |      |
|        |  |                     | 25                              | 250 |                            |     | 0.99   |      |
|        |  |                     |                                 |     | 19                         | 190 |  | 0.87 |
|        |  |                     |                                 |     | 25                         | 250 |  | 0.95 |
| 2034   | Hydrogen and methane mixture, compressed                               | 1 F                 | see 4.3.3.2.1                   |     |                            |     |  |      |
| 2035   | 1,1,1-trifluoroethane (Refrigerant gas R143a)                          | 2 F                 | 2.8                             | 28  | 3.2                        | 32  | 0.79   |      |
| 2036   | Xenon  | 2 A                 | 12                              | 120 |                            |     | 1.30   |      |
|        |  |                     |                                 |     | 13                         | 130 | 1.24   |      |
| 2044   | 2,2-dimethylpropane  | 2 F                 | 1                               | 10  | 1                          | 10  | 0.53   |      |
| 2073   | Ammonia solutions, relative density less than 0.880 at 15 °C in water: | 4 A                 |                                 |     |                            |     |  |      |
|        | with more than 35% and not more than 40% ammonia                       | 4 A                 | 1                               | 10  | 1                          | 10  | 0.80   |      |
|        | with more than 40% and not more than 50% ammonia                       | 4 A                 | 1.2                             | 12  | 1.2                        | 12  | 0.77   |      |
| 2187   | Carbon dioxide, refrigerated liquid                                    | 3 A                 | see 4.3.3.2.4                   |     |                            |     |  |      |
| 2189   | Dichlorosilane   | 2 TFC               | 1                               | 10  | 1                          | 10  | 0.90   |      |
| 2191   | Sulfuryl fluoride  | 2 T                 | 5                               | 50  | 5                          | 50  | 1.1  |      |
| 2193   | Hexafluoroethane (Refrigerant gas R116)                                | 2 A                 | 16                              | 160 |                            |     | 1.28   |      |
|        |  |                     | 20                              | 200 |                            |     | 1.34   |      |
|        |  |                     |                                 |     | 20                         | 200 | 1.10   |      |
| 2197   | Hydrogen iodide, anhydrous   | 2 TC                | 1.9                             | 19  | 2.1                        | 21  | 2.25   |      |
| 2200   | Propadiene, stabilized   | 2 F                 | 1.8                             | 18  | 2.0                        | 20  | 0.50   |      |
| 2201   | Nitrous oxide, refrigerated liquid                                     | 3 O                 | see 4.3.3.2.4                   |     |                            |     |  |      |
| 2203   | Silane <sup>b</sup>  | 2 F                 | 22.5                            | 225 | 22.5                       | 225 | 0.32   |      |
|        |  |                     | 25                              | 250 | 25                         | 250 | 0.36   |      |
| 2204   | Carbonyl sulphide  | 2 TF                | 2.7                             | 27  | 3.0                        | 30  | 0.84   |      |
| 2417   | Carbonyl fluoride  | 2 TC                | 20                              | 200 | 20                         | 200 | 0.47   |      |
|        |  |                     | 30                              | 300 | 30                         | 300 | 0.70   |      |
| 2419   | Bromotrifluoroethylene   | 2 F                 | 1                               | 10  | 1                          | 10  | 1.19   |      |
| 2420   | Hexafluoroacetone  | 2 TC                | 1.6                             | 16  | 1.8                        | 18  | 1.08   |      |
| 2422   | Octafluorobut-2-ene (Refrigerant gas R1318)                            | 2 A                 | 1                               | 10  | 1                          | 10  | 1.34   |      |
| 2424   | Octafluoropropane (Refrigerant gas R218)                               | 2 A                 | 2.1                             | 21  | 2.3                        | 23  | 1.07   |      |

<sup>b</sup> Considered as pyrophoric.

| UN No. | Name  | Classification code | Minimum test pressure for tanks |     |                            |      | Maximum permissible mass of contents per litre of capacity |
|--------|---|---------------------|---------------------------------|-----|----------------------------|------|--|
|        |   |                     | With thermal insulation         |     | Without thermal insulation |      |  |
|        |   |                     | MPa                             | bar | MPa                        | bar  | kg   |
| 2451   | Nitrogen trifluoride  | 2 O                 | 20                              | 200 | 20                         | 200  | 0.50   |
|        |   |                     | 30                              | 300 | 30                         | 300  | 0.75   |
| 2452   | Ethylacetylene, stabilized  | 2 F                 | 1                               | 10  | 1                          | 10   | 0.57   |
| 2453   | Ethyl fluoride<br>(Refrigerant gas R161)  | 2 F                 | 2.1                             | 21  | 2.5                        | 25   | 0.57   |
| 2454   | Methyl fluoride<br>(Refrigerant gas R41)  | 2 F                 | 30                              | 300 | 30                         | 300  | 0.36   |
| 2517   | 1-chloro-1,1-difluoroethane<br>(Refrigerant gas R142b)  | 2 F                 | 1                               | 10  | 1                          | 10   | 0.99   |
| 2591   | Xenon, refrigerated liquid  | 3 A                 | see 4.3.3.2.4                   |     |                            |      |  |
| 2599   | Chlorotrifluoromethane and trifluoromethane, azeotropic mixture with approximately 60% chlorotrifluoromethane<br>(Refrigerant gas R503)                             | 2 A                 | 3.1                             | 31  | 3.1                        | 31   | 0.11   |
|        |   |                     | 4.2                             | 42  |                            |      | 0.21   |
|        |   |                     | 10                              | 100 |                            |      | 0.76   |
|        |   |                     |                                 |     | 4.2                        | 42   | 0.20   |
|        |   |                     |                                 | 10  | 100                        | 0.66 |  |
| 2600   | Carbon monoxide and hydrogen mixture, compressed  | 1 TF                | see 4.3.3.2.1                   |     |                            |      |  |
| 2601   | Cyclobutane   | 2 F                 | 1                               | 10  | 1                          | 10   | 0.63   |
| 2602   | Dichlorodifluoromethane and difluoro-1,1 ethane, azeotropic mixture with approximately 74% dichlorodifluoromethane<br>(Refrigerant gas R500)                        | 2 A                 | 1.8                             | 18  | 2                          | 20   | 1.01   |
| 2901   | Bromine chloride  | 2 TOC               | 1                               | 10  | 1                          | 10   | 1.50   |
| 3057   | Trifluoroacetyl chloride  | 2 TC                | 1.3                             | 13  | 1.5                        | 15   | 1.17   |
| 3070   | Ethylene oxide and dichlorodifluoromethane mixture with not more than 12.5% ethylene oxide  | 2 A                 | 1.5                             | 15  | 1.6                        | 16   | 1.09   |
| 3083   | Perchloryl fluoride   | 2 TO                | 2.7                             | 27  | 3.0                        | 30   | 1.21   |
| 3136   | Trifluoromethane, refrigerated liquid   | 3 A                 | See 4.3.3.2.4                   |     |                            |      |  |
| 3138   | Ethylene, acetylene propylene in mixture, refrigerated liquid, containing at least 71.5% ethylene with not more than 22.5% acetylene and not more than 6% propylene | 3 F                 | see 4.3.3.2.4                   |     |                            |      |  |
| 3153   | Perfluoro(methyl vinyl ether)   | 2 F                 | 1.4                             | 14  | 1.5                        | 15   | 1.14   |
| 3154   | Perfluoro(ethyl vinyl ether)  | 2 F                 | 1                               | 10  | 1                          | 10   | 0.98   |
| 3156   | Compressed gas, oxidizing, n.o.s.   | 1 O                 | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |      |  |
| 3157   | Liquefied gas, oxidizing, n.o.s.  | 2 O                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |      |  |
| 3158   | Gas, refrigerated liquid, n.o.s.  | 3 A                 | see 4.3.3.2.4                   |     |                            |      |  |
| 3159   | 1,1,1,2-tetrafluoroethane (Refrigerant gas R134a)   | 2 A                 | 1.6                             | 16  | 1.8                        | 18   | 1.04   |
| 3160   | Liquefied gas, toxic, flammable, n.o.s. <sup>a</sup>  | 2 TF                | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |      |  |
| 3161   | Liquefied gas, flammable, n.o.s.  | 2 F                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |      |  |
| 3162   | Liquefied gas, toxic, n.o.s. <sup>a</sup>   | 2 T                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |      |  |
| 3163   | Liquefied gas, n.o.s.   | 2 A                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |      |  |
| 3220   | Pentafluoroethane<br>(Refrigerant gas R125)   | 2 A                 | 4.1                             | 41  | 4.9                        | 49   | 0.95   |
| 3252   | Difluoromethane<br>(Refrigerant gas R32)  | 2 F                 | 3.9                             | 39  | 4.3                        | 43   | 0.78   |
| 3296   | Heptafluoropropane<br>(Refrigerant gas R227)  | 2 A                 | 1.4                             | 14  | 1.6                        | 16   | 1.20   |

<sup>a</sup> Allowed if LC<sub>50</sub> equal to or greater than 200 ppm.

| UN No. | Name  | Classification code | Minimum test pressure for tanks |     |                            |     | Maximum permissible mass of contents per litre of capacity |
|--------|---|---------------------|---------------------------------|-----|----------------------------|-----|--|
|        |   |                     | With thermal insulation         |     | Without thermal insulation |     |  |
|        |   |                     | MPa                             | bar | MPa                        | bar | kg   |
| 3297   | Ethylene oxide and chlorotetrafluoroethane mixture, with not more than 8.8% ethylene oxide        | 2 A                 | 1                               | 10  | 1                          | 10  | 1.16   |
| 3298   | Ethylene oxide and pentafluoroethane mixture, with not more than 7.9% ethylene oxide              | 2 A                 | 2.4                             | 24  | 2.6                        | 26  | 1.02   |
| 3299   | Ethylene oxide and tetrafluoroethane mixture, with not more than 5.6% ethylene oxide              | 2 A                 | 1.5                             | 15  | 1.7                        | 17  | 1.03   |
| 3300   | Ethylene oxide and carbon dioxide mixture, with more than 87% ethylene oxide                      | 2 TF                | 2.8                             | 28  | 2.8                        | 28  | 0.73   |
| 3303   | Compressed gas, toxic, oxidizing, n.o.s. <sup>a</sup>   | 1 TO                | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 3304   | Compressed gas, toxic, corrosive, n.o.s. <sup>a</sup>   | 1 TC                | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 3305   | Compressed gas, toxic, flammable, corrosive, n.o.s. <sup>a</sup>                                  | 1 TFC               | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 3306   | Compressed gas, toxic, oxidizing, corrosive, n.o.s. <sup>a</sup>                                  | 1 TOC               | see 4.3.3.2.1 or 4.3.3.2.2      |     |                            |     |  |
| 3307   | Liquefied gas, toxic, oxidizing, n.o.s. <sup>a</sup>  | 2 TO                | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 3308   | Liquefied gas, toxic, corrosive, n.o.s. <sup>a</sup>  | 2 TC                | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 3309   | Liquefied gas, toxic, flammable, corrosive, n.o.s. <sup>a</sup>                                   | 2 TFC               | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 3310   | Liquefied gas, toxic, oxidizing, corrosive, n.o.s. <sup>a</sup>                                   | 2 TOC               | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 3311   | Gas, refrigerated liquid, oxidizing, n.o.s.   | 3 O                 | see 4.3.3.2.4                   |     |                            |     |  |
| 3312   | Gas, refrigerated liquid, flammable, n.o.s.   | 3 F                 | see 4.3.3.2.4                   |     |                            |     |  |
| 3318   | Ammonia solutions, relative density less than 0.880 at 15 °C in water, with more than 50% ammonia | 4 TC                | see 4.3.3.2.2                   |     |                            |     |  |
| 3337   | Refrigerant gas R404A   | 2 A                 | 2.9                             | 29  | 3.2                        | 32  | 0.84   |
| 3338   | Refrigerant gas R407A   | 2 A                 | 2.8                             | 28  | 3.2                        | 32  | 0.95   |
| 3339   | Refrigerant gas R407B   | 2 A                 | 3.0                             | 30  | 3.3                        | 33  | 0.95   |
| 3340   | Refrigerant gas R407C   | 2 A                 | 2.7                             | 27  | 3.0                        | 30  | 0.95   |
| 3354   | Insecticide gas, flammable, n.o.s.  | 2 F                 | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |
| 3355   | Insecticide gas, toxic, flammable, n.o.s. <sup>a</sup>  | 2 TF                | see 4.3.3.2.2 or 4.3.3.2.3      |     |                            |     |  |

### 4.3.3.3 *Operation*

4.3.3.3.1 When tanks, battery-vehicles or MEGCs are approved for different gases, the change of use shall include emptying, purging and evacuation operations to the extent necessary for safe operation.

4.3.3.3.2 When tanks, battery-vehicles or MEGCs are handed over for carriage, only the particulars specified in 6.8.3.5.6 applicable to the gas loaded or just discharged shall be visible; all particulars concerning other gases shall be covered up.

4.3.3.3.3 All the elements of a battery-vehicle or MEGC shall contain only one and the same gas.

4.3.3.4 (*Reserved*)

<sup>a</sup> Allowed if LC<sub>50</sub> equal to or greater than 200 ppm.

#### 4.3.4 Special provisions applicable to Classes 3 to 9

##### 4.3.4.1 Coding, rationalized approach and hierarchy of tanks

###### 4.3.4.1.1 Coding of tanks

The four parts of the codes (tank codes) given in Column (12) of Table A in Chapter 3.2 have the following meanings:

| Part | Description              | Tank code   |
|------|--------------------------|---|
| 1    | Types of tank            | L = tank for substances in the liquid state (liquids or solids handed over for carriage in the molten state);<br>S = tank for substances in the solid state (powdery or granular).  |
| 2    | Calculation pressure     | G = minimum calculation pressure according to the general requirements of 6.8.2.1.14; or<br>1.5; 2.65; 4; 10; 15 or 21 = minimum calculation pressure in bar (see 6.8.2.1.14).  |
| 3    | Openings (see 6.8.2.2.2) | A = tank with bottom-filling and discharge openings with 2 closures;<br>B = tank with bottom-filling and discharge openings with 3 closures;<br>C = tank with top-filling and discharge openings with only cleaning openings below the surface of the liquid;<br>D = tank with top-filling and discharge openings with no openings below the surface of the liquid.           |
| 4    | Safety valves/devices    | V = tank with a venting system, according to 6.8.2.2.6, but no flame trap; or non-explosion-pressure proof tank;<br>F = tank with a venting system, according to 6.8.2.2.6, fitted with a flame trap; or explosion-pressure proof tank;<br>N = tank without a venting system according to 6.8.2.2.6 and not hermetically closed;<br>H = hermetically closed tank (see 1.2.1). |

###### 4.3.4.1.2 Rationalized approach for assignment of ADR tank codes to groups of substances and hierarchy of tanks

**NOTE:** Certain substances and groups of substances are not included in the rationalized approach, see 4.3.4.1.3

| <b>Rationalized approach</b>  |                                      |                            |  |
|---|--------------------------------------|----------------------------|--|
| <b>Tank code</b>  | <b>Group of permitted substances</b> |                            |  |
|   | <b>Class</b>                         | <b>Classification code</b> | <b>Packing group</b>   |
| LIQUIDS   | 3                                    | F2                         | III  |
| LGAV  | 9                                    | M9                         | III  |
| LGBV  | 4.1                                  | F2                         | II, III  |
|   | 5.1                                  | O1                         | III  |
|   | 9                                    | M6                         | III  |
|   |                                      | M11                        | III  |
| and groups of permitted substances for tank code LGAV                         |                                      |                            |  |
| LGBF  | 3                                    | F1                         | II<br>vapour pressure at 50 °C ≤ 1.1 bar                                     |
|   |                                      | F1                         | III  |
|   |                                      | D                          | II<br>vapour pressure at 50 °C ≤ 1.1 bar                                     |
|   |                                      | D                          | III  |
| and groups of permitted substances for tank codes LGAV and LGBV               |                                      |                            |  |
| L1.5BN  | 3                                    | F1                         | I, II<br>1.1 bar<br>< vapour pressure at 50 °C ≤ 1.75 bar                    |
|   |                                      | F1                         | III<br>flashpoint <23°C, viscous, 1.1bar < vapour pressure at 50°C ≤ 1.75bar |
|   |                                      | D                          | I, II<br>1.1bar < vapour pressure at 50°C ≤ 1.75bar                          |
| and groups of permitted substances for tank codes LGAV, LGBV and LGBF         |                                      |                            |  |
| L4BV  | 5.1                                  | O1                         | -  |
| L4BN  | 3                                    | F1                         | I, III<br>vapour pressure at 50 °C > 1.75 bar                                |
|   |                                      | FC                         | III  |
|   |                                      | D                          | I<br>vapour pressure at 50°C > 1.75 bar                                      |
|   | 5.1                                  | O1                         | I, II  |
|   |                                      | OT1                        | I  |
|   | 8                                    | C1                         | II, III  |
|   |                                      | C3                         | II, III  |
|   |                                      | C4                         | II, III  |
|   |                                      | C5                         | II, III  |
|   |                                      | C7                         | II, III  |
|   |                                      | C8                         | II, III  |
|   |                                      | C9                         | II, III  |
|   |                                      | C10                        | II, III  |
|   |                                      | CF1                        | II   |
|   |                                      | CF2                        | II   |
|   |                                      | CS1                        | II   |
|   |                                      | CW1                        | II   |
|   |                                      | CW2                        | II   |
|   |                                      | CO1                        | II   |
|   |                                      | CO2                        | II   |
| CT1   | II, III                              |                            |  |
| CT2   | II, III                              |                            |  |
| CFT   | II                                   |                            |  |
| M11   | III                                  |                            |  |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF and L1.5BN |                                      |                            |  |

| <b>Rationalized approach</b>   |                                      |                            |                      |
|--|--------------------------------------|----------------------------|----------------------|
| <b>Tank code</b>   | <b>Group of permitted substances</b> |                            |                      |
|  | <b>Class</b>                         | <b>Classification code</b> | <b>Packing group</b> |
| L4BH   | 3                                    | FT1                        | II, III              |
|  |                                      | FT2                        | II                   |
|  |                                      | FC                         | II                   |
|  |                                      | FTC                        | II                   |
|  | 6.1                                  | T1                         | II, III              |
|  |                                      | T2                         | II, III              |
|  |                                      | T3                         | II, III              |
|  |                                      | T4                         | II, III              |
|  |                                      | T6                         | II, III              |
|  |                                      | T7                         | II, III              |
|  |                                      | TF1                        | II                   |
|  |                                      | TF2                        | II, III              |
|  |                                      | TF3                        | II                   |
|  |                                      | TS                         | II                   |
|  |                                      | TW1                        | II                   |
|  |                                      | TW2                        | II                   |
|  |                                      | TO1                        | II                   |
|  |                                      | TO2                        | II                   |
|  |                                      | TC1                        | II                   |
|  |                                      | TC2                        | II                   |
|  | TC3                                  | II                         |                      |
| TC4  | II                                   |                            |                      |
| TFC  | II                                   |                            |                      |
| 6.2  | I3                                   | II                         |                      |
| 9  | M2                                   | II                         |                      |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN and L4BN        |                                      |                            |                      |
| L4DH   | 4.2                                  | S1                         | II, III              |
|  |                                      | S3                         | II, III              |
|  |                                      | ST1                        | II, III              |
|  |                                      | ST3                        | II, III              |
|  |                                      | SC1                        | II, III              |
|  | 4.3                                  | SC3                        | II, III              |
|  |                                      | W1                         | II, III              |
|  |                                      | WF1                        | II, III              |
|  |                                      | WT1                        | II, III              |
|  | 8                                    | WC1                        | II, III              |
| CT1  |                                      | II, III                    |                      |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN and L4BH  |                                      |                            |                      |
| L10BH  | 8                                    | C1                         | I                    |
|  |                                      | C3                         | I                    |
|  |                                      | C4                         | I                    |
|  |                                      | C5                         | I                    |
|  |                                      | C7                         | I                    |
|  |                                      | C8                         | I                    |
|  |                                      | C9                         | I                    |
|  |                                      | C10                        | I                    |
|  |                                      | CF1                        | I                    |
|  |                                      | CF2                        | I                    |
|  |                                      | CS1                        | I                    |
|  |                                      | CW1                        | I                    |
|  |                                      | CW2                        | I                    |
|  |                                      | CO1                        | I                    |
|  |                                      | CO2                        | I                    |
|  |                                      | CT1                        | I                    |
|  |                                      | CT2                        | I                    |
|  |                                      | COT                        | I                    |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN, and L4BH |                                      |                            |                      |



| <b>Rationalized approach</b>  |                                      |                            |                      |
|---|--------------------------------------|----------------------------|----------------------|
| <b>Tank code</b>  | <b>Group of permitted substances</b> |                            |                      |
|   | <b>Class</b>                         | <b>Classification code</b> | <b>Packing group</b> |
| L10CH   | 3                                    | FT1                        | I                    |
|   |                                      | FT2                        | I                    |
|   |                                      | FC                         | I                    |
|   |                                      | FTC                        | I                    |
|   | 6.1                                  | T1                         | I                    |
|   |                                      | T2                         | I                    |
|   |                                      | T3                         | I                    |
|   |                                      | T4                         | I                    |
|   |                                      | T6                         | I                    |
|   |                                      | T7                         | I                    |
|   |                                      | TF1                        | I                    |
|   |                                      | TF2                        | I                    |
|   |                                      | TF3                        | I                    |
|   |                                      | TS                         | I                    |
|   |                                      | TW1                        | I                    |
|   |                                      | TO1                        | I                    |
|   |                                      | TC1                        | I                    |
|   |                                      | TC2                        | I                    |
|   |                                      | TC3                        | I                    |
|   |                                      | TC4                        | I                    |
| TFC   | I                                    |                            |                      |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN, L4BH, and L10BH                           |                                      |                            |                      |
| L10DH   | 4.3                                  | W1                         | I                    |
|   |                                      | WF1                        | I                    |
|   |                                      | WT1                        | I                    |
|   |                                      | WC1                        | I                    |
|   |                                      | WFC                        | I                    |
|   | 5.1                                  | OTC                        | I                    |
| 8   | CT1                                  | I                          |                      |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN, L4BH, L4DH, L10BH and L10CH               |                                      |                            |                      |
| L15CH   | 3                                    | FT1                        | I                    |
|   | 6.1                                  | TF1                        | I                    |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN, L4BH, L10BH and L10CH                     |                                      |                            |                      |
| L21DH   | 4.2                                  | S1                         | I                    |
|   |                                      | S3                         | I                    |
|   |                                      | SW                         | I                    |
|   |                                      | ST3                        | I                    |
| and groups of permitted substances for tank codes LGAV, LGBV, LGBF, L1.5BN, L4BN, L4BH, L4DH, L10BH, L10CH, L10DH and L15CH |                                      |                            |                      |
| <i>SOLIDS</i><br>SGAV   | 4.1                                  | F1                         | III                  |
|   |                                      | F3                         | III                  |
|   | 4.2                                  | S2                         | II, III              |
|   |                                      | S4                         | III                  |
|   | 5.1                                  | O2                         | II, III              |
|   | 8                                    | C2                         | II, III              |
|   |                                      | C4                         | III                  |
|   |                                      | C6                         | III                  |
|   |                                      | C8                         | III                  |
|   |                                      | C10                        | II, III              |
|   |                                      | CT2                        | III                  |
|   | 9                                    | M7                         | III                  |
|   |                                      | M11                        | II, III              |

| <b>Rationalized approach</b>   |  |                            |                      |         |
|--|--|----------------------------|----------------------|---------|
| <b>Tank code</b>   | <b>Group of permitted substances</b>                   |                            |                      |         |
|  | <b>Class</b>   | <b>Classification code</b> | <b>Packing group</b> |         |
| SGAN   | 4.1  | F1                         | II                   |         |
|  |  | F3                         | II                   |         |
|  |  | FT1                        | II, III              |         |
|  |  | FT2                        | II, III              |         |
|  |  | FC1                        | II, III              |         |
|  |  | FC2                        | II, III              |         |
|  | 4.2  | S2                         | II                   |         |
|  |  | S4                         | II, III              |         |
|  |  | ST2                        | II, III              |         |
|  |  | ST4                        | II, III              |         |
|  |  | SC2                        | II, III              |         |
|  |  | SC4                        | II, III              |         |
|  |  | 4.3                        | W2                   | II, III |
|  |  |                            | WF2                  | II      |
|  | WS   |                            | II, III              |         |
|  | WT2  |                            | II, III              |         |
|  | WC2  |                            | II, III              |         |
|  | 5.1  | O2                         | II, III              |         |
|  |  | OT2                        | II, III              |         |
|  |  | OC2                        | II, III              |         |
|  | 8  | C2                         | II                   |         |
|  |  | C4                         | II                   |         |
|  |  | C6                         | II                   |         |
|  |  | C8                         | II                   |         |
|  |  | C10                        | II                   |         |
|  |  | CF2                        | II                   |         |
|  |  | CS2                        | II                   |         |
|  |  | CW2                        | II                   |         |
|  |  | CO2                        | II                   |         |
|  |  | CT2                        | II                   |         |
|  | 9  | M3                         | III                  |         |
|  | and groups of permitted substances for tank codes SGAV |                            |                      |         |
|  | SGAH   | 6.1                        | T2                   | II, III |
| T3   |  |                            | II, III              |         |
| T5   |  |                            | II, III              |         |
| T7   |  |                            | II, III              |         |
| T9   |  |                            | II                   |         |
| TF3  |  |                            | II                   |         |
| TS   |  |                            | II                   |         |
| TW2  |  |                            | II                   |         |
| TO2  |  |                            | II                   |         |
| TC2  |  |                            | II                   |         |
| TC4  |  | II                         |                      |         |
| 9  | M1   | II, III                    |                      |         |
| and groups of permitted substances for tanks codes SGAV and SGAN       |  |                            |                      |         |
| S4AH   | 6.2  | I3                         | II                   |         |
|  | 9  | M2                         | II                   |         |
| and groups of permitted substances for tanks codes SGAV, SGAN and SGAH |  |                            |                      |         |
| S10AN  | 8  | C2                         | I                    |         |
|  |  | C4                         | I                    |         |
|  |  | C6                         | I                    |         |
|  |  | C8                         | I                    |         |
|  |  | C10                        | I                    |         |
|  |  | CF2                        | I                    |         |
|  |  | CS2                        | I                    |         |
|  |  | CW2                        | I                    |         |
|  |  | CO2                        | I                    |         |
| CT2  | I  |                            |                      |         |
| and groups of permitted substances for tank codes SGAV and SGAN        |  |                            |                      |         |

| Rationalized approach  |                               |                     |               |
|--|-------------------------------|---------------------|---------------|
| Tank code  | Group of permitted substances |                     |               |
|  | Class                         | Classification code | Packing group |
| S10AH  | 6.1                           | T2                  | I             |
|  |                               | T3                  | I             |
|  |                               | T5                  | I             |
|  |                               | T7                  | I             |
|  |                               | TS                  | I             |
|  |                               | TW2                 | I             |
|  |                               | TO2                 | I             |
|  |                               | TC2                 | I             |
|  |                               | TC4                 | I             |
| and groups of permitted substances for tank codes SGAV, SGAN, SGAH and S10AN |                               |                     |               |

### *Hierarchy of tanks*

Tanks with tank codes different from those indicated in this table or in Table A of Chapter 3.2 may also be used provided that the first part of the code (L or S) remains unchanged and that any other element (number or letter) of parts 2 to 4 of these tank codes correspond to a level of safety at least equivalent to the corresponding element of the tank code indicated in Table A of Chapter 3.2, according to the following increasing order:

Part 2: Calculation pressure

G → 1.5 → 2.65 → 4 → 10 → 15 → 21 bar

Part 3: Openings

A → B → C → D

Part 4: Safety valves/devices

V → F → N → H

For example, a tank with the tank code L10CN is authorized for the carriage of a substance to which the tank code L4BN has been assigned.

**NOTE:** *The hierarchy does not take account of any special provisions for each entry (see 4.3.5 and 6.8.4)*

#### 4.3.4.1.3

The following substances and groups of substances in respect of which a "(+)" is given after the tank code in Column (12) of Table A in Chapter 3.2 are subject to special provisions. In that case the alternate use of the tanks for other substances and groups of substances is permitted only where this is specified in the certificate of type approval. Higher value tanks according to the provisions at the end of the table in 4.3.4.1.2 may be used with due regard to the special provisions indicated in Column (13) of Table A in Chapter 3.2.

(a) Class 4.1:

UN No. 2448 sulphur, molten: code LGBV;

(b) Class 4.2:

UN No. 1381 phosphorus, white or yellow, dry, or under water or in solution and UN No. 2447 phosphorus, white or yellow molten: code L10DH;

(c) Class 4.3:

UN No. 1389 alkali metal amalgam, liquid, UN No. 1391 alkali metal dispersion or alkaline earth metal dispersion, UN No. 1392 alkaline earth metal amalgam, liquid, UN No. 1415 lithium, UN No. 1420 potassium metal alloys, liquid, UN No. 1421 alkali metal alloy, liquid, n.o.s, UN No. 1422 potassium sodium alloys, liquid, UN No. 1428 sodium and UN No. 2257 potassium: code L10BN;

UN No. 1407 caesium and UN No. 1423 rubidium: code L10CH;

UN No. 3401 alkali metal amalgam, solid, UN No. 3402 alkaline earth metal amalgam, solid, 3403 potassium metal alloys, solid and UN No. 3404 potassium sodium alloys, solid: code L10BN;

(d) Class 5.1:

UN No. 1873 perchloric acid 50-72%: code L4DN;

UN No. 2015 hydrogen peroxide, aqueous solution, stabilized with more than 70% hydrogen peroxide: code L4DV;

UN No. 2015 hydrogen peroxide, aqueous solution, stabilized with 60-70% hydrogen peroxide: code L4BV;

UN No. 2014 hydrogen peroxide, aqueous solution with 20-60% hydrogen peroxide, and UN No. 3149 hydrogen peroxide and peroxyacetic acid mixture, stabilized: code L4BV;

UN No. 2426 ammonium nitrate, liquid, hot concentrated solution with more than 80% but not more than 93%: code L4BV;

UN No. 3375 ammonium nitrate emulsion, suspension or gel, liquid: code LGAV;

UN No. 3375 ammonium nitrate emulsion, suspension or gel, solid: code SGAV;

(e) Class 5.2:

UN No. 3109 organic peroxide type F, liquid and UN No. 3119 organic peroxide, type F, liquid temperature controlled: code L4BN;

UN No. 3110 organic peroxide, type F, solid and UN No. 3120 organic peroxide, type F, solid, temperature controlled: code S4AN;

(f) Class 6.1:

UN No. 1613 hydrogen cyanide, aqueous solution and UN No. 3294 hydrogen cyanide solution in alcohol: code L15DH;

(g) Class 7:

All substances: special tanks;

Minimum requirements for liquids: code L2,65CN; for solids: code S2,65AN

Notwithstanding the general requirements of this paragraph, tanks used for radioactive material may also be used for the carriage of other goods provided the requirements of 5.1.3.2 are complied with.

(h) Class 8:

UN No. 1052 hydrogen fluoride, anhydrous and UN No. 1790 hydrofluoric acid, solution, with more than 85% hydrofluoric acid: code L21DH;

UN No. 1744 bromine or bromine solution: code L21DH;

UN No. 1791 hypochlorite solution and UN No. 1908 chlorite solution: code L4BV.

4.3.4.1.4

Tanks intended for the carriage of liquid wastes complying with the requirements of Chapter 6.10 and equipped with two closures in accordance with 6.10.3.2, shall be assigned to tank code L4AH. If the tanks concerned are equipped for the alternate carriage of liquid and solid substances, they shall be assigned to the combined codes L4AH+S4AH.

#### 4.3.4.2 **General provisions**

4.3.4.2.1 Where hot substances are loaded, the temperature of the outer surface of the tank or of the thermal insulation shall not exceed 70 °C during carriage.

4.3.4.2.2 The connecting pipes between independent but interconnected tanks of a transport unit shall be empty during carriage. Flexible filling and discharge pipes which are not permanently connected to the shells shall be empty during carriage.

4.3.4.2.3 *(Reserved)*

#### 4.3.5 **Special provisions**

When they are shown under an entry in Column (13) of Table of A in Chapter 3.2, the following special provisions apply:

TU1 The tanks shall not be handed over for carriage until the substance has solidified completely and been covered by an inert gas. Uncleaned empty tanks which have contained these substances shall be filled with an inert gas.

TU2 The substance shall be covered by an inert gas. Uncleaned empty tanks which have contained these substances shall be filled with an inert gas.

TU3 The inside of the shell and all parts liable to come into contact with the substance shall be kept clean. No lubricant capable of combining dangerously with the substance shall be used for pumps, valves or other devices.

TU4 During carriage, these substances shall be under a layer of inert gas, the gauge pressure of which shall not be less than 50 kPa (0.5 bar).

Uncleaned empty tanks which have contained these substances shall when handed over for carriage be filled with an inert gas at a gauge pressure of at least 50 kPa (0.5 bar).

TU5 *(Reserved)*

TU6 Not authorized for carriage in tanks, battery-vehicles and MEGCs when having a LC<sub>50</sub> lower than 200 ppm.

TU7 The materials used to ensure leakproofness of the joints or for the maintenance of the closures shall be compatible with the contents.

TU8 An aluminium-alloy tank shall not be used for carriage unless the tank is reserved solely for such carriage and the acetaldehyde is free from acid.

TU9 UN No.1203 petrol (gasoline) with a vapour pressure at 50 °C of more than 110 kPa (1.1 bar) but not above 150 kPa (1.5 bar) may also be carried in tanks designed according to 6.8.2.1.14 (a) and having equipment conforming to 6.8.2.2.6.

TU10 *(Reserved)*

- TU11 During filling, the temperature of this substance shall not exceed 60 °C. A maximum filling temperature of 80 °C is allowed provided that smoulder spots are prevented and that the following conditions are met. After filling, the tanks shall be pressurized (e.g. with compressed air) to check tightness. It shall be ensured that no depressurization takes place during carriage. Before discharge, it shall be checked if pressure in the tanks is still above atmospheric. If this is not the case, an inert gas shall be introduced into the tanks prior to discharge.
- TU12 In the event of a change of use, shells and equipment shall be thoroughly cleansed of all residues before and after the carriage of this substance.
- TU13 Tanks shall be free from impurities at the time of filling. Service equipment such as valves and external piping shall be emptied after filling or discharging.
- TU14 The protective caps of closures shall be locked during carriage.
- TU15 Tanks shall not be used for the carriage of foodstuffs, articles of consumption or animal feeds.
- TU16 Uncleaned empty tanks, shall, when handed over for carriage, either:
- be filled with nitrogen; or
  - be filled with water to not less than 96% and not more than 98% of their capacity; between 1 October and 31 March, this water shall contain sufficient anti-freeze agent to make it impossible for the water to freeze during carriage; the anti-freeze agent shall be free from corrosive action and not liable to react with phosphorus.
- TU17 Only to be carried in battery-vehicles or MEGCs the elements of which are composed of receptacles.
- TU18 The degree of filling shall remain below the level at which, if the contents were raised to a temperature at which the vapour pressure equalled the opening pressure of the safety valve, the volume of the liquid would reach 95% of the tank's capacity at that temperature. The provision in 4.3.2.3.4 shall not apply.
- TU19 Tanks may be filled to 98% at the filling temperature and pressure. The provision in 4.3.2.3.4 shall not apply.
- TU20 *(Reserved)*
- TU21 The substance shall, if water is used as a protective agent, be covered with a depth of not less than 12 cm of water at the time of filling; the degree of filling at a temperature of 60 °C shall not exceed 98%. If nitrogen is used as a protective agent, the degree of filling at a temperature of 60 °C shall not exceed 96%. The remaining space shall be filled with nitrogen in such a way that, even after cooling, the pressure at no time falls below atmospheric pressure. The tank shall be closed in such a way that no leakage of gas occurs.
- TU22 Tanks shall be filled to not more than 90% of their capacity; a space of 5% shall remain empty when the liquid is at an average temperature of 50 °C.
- TU23 The degree of filling shall not exceed 0.93 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85%.

- TU24 The degree of filling shall not exceed 0.95 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85%.
- TU25 The degree of filling shall not exceed 1.14 kg per litre of capacity, if filling is by mass. If filling is by volume, the degree of filling shall not exceed 85%.
- TU26 The degree of filling shall not exceed 85%.
- TU27 Tanks shall not be filled to more than 98% of their capacity.
- TU28 Tanks shall be filled to not more than 95% of their capacity at a reference temperature of 15 °C.
- TU29 Tanks shall be filled to not more than 97% of their capacity and the maximum temperature after filling shall not exceed 140 °C.
- TU30 Tanks shall be filled as set out in the test report for the type approval of the tank but shall be filled to not more than 90% of their capacity.
- TU31 Tanks shall not be filled to more than 1 kg per litre of capacity.
- TU32 Tanks shall not be filled to more than 88% of their capacity.
- TU33 Tanks shall be filled to not less than 88% and not more than 92% of their capacity or to 2.86 kg per litre of capacity.
- TU34 Tanks shall not be filled to more than 0.84 kg per litre of capacity.
- TU35 Empty fixed tanks (tank-vehicles), empty demountable tanks and empty tank-containers, uncleaned, which have contained these substances are not subject to the requirements of ADR if adequate measures have been taken to nullify any hazard.
- TU36 The degree of filling according to 4.3.2.2, at the reference temperature of 15 °C, shall not exceed 93% of the capacity.
- TU37 Carriage in tanks is limited to substances containing pathogens which are unlikely to be a serious hazard, and for which, while capable of causing serious infection on exposure, effective treatment and preventive measures are available and the risk of spread of infection is limited (i.e. moderate individual risk and low community risk).
- TU38 *(Reserved)*
- TU39 The suitability of the substance for carriage in tanks shall be demonstrated. The method to evaluate this suitability shall be approved by the competent authority. One method is test 8(d) in Test Series 8 (see Manual of Tests and Criteria, Part 1, sub-section 18.7).

Substances shall not be allowed to remain in the tank for any period that could result in caking. Appropriate measures shall be taken to avoid accumulation and packing of substances in the tank (e.g. cleaning etc.).





## CHAPTER 4.4

### USE OF FIBRE-REINFORCED PLASTICS (FRP) TANKS, FIXED TANKS (TANK-VEHICLES), DEMOUNTABLE TANKS, TANK-CONTAINERS AND TANK SWAP BODIES

**NOTE:** *For portable tanks and UN multiple-element gas containers (MEGCs), see Chapter 4.2; for fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, with shells made of metallic materials, and battery-vehicles and multiple elements gas containers (MEGCs) other than UN MEGCs, see Chapter 4.3; for vacuum operated waste containers, see Chapter 4.5.*

#### 4.4.1 General

The carriage of dangerous substances in fibre-reinforced plastics (FRP) tanks is permitted only when the following conditions are met:

- (a) The substance is classified in Class 3, 5.1, 6.1, 6.2, 8 or 9;
- (b) The maximum vapour pressure (absolute pressure) at 50 °C of the substance does not exceed 110 kPa (1.1 bar);
- (c) The carriage of the substance in metallic tanks is authorized according to 4.3.2.1.1;
- (d) The calculation pressure specified for that substance in part 2 of the tank code given in Column (12) of Table A in Chapter 3.2 does not exceed 4 bar (see also 4.3.4.1.1); and
- (e) The tank complies with the provisions of Chapter 6.9 applicable for the carriage of the substance.

#### 4.4.2 Operation

4.4.2.1 The provisions of 4.3.2.1.5 to 4.3.2.2.4, 4.3.2.3.3 to 4.3.2.3.6, 4.3.2.4.1, 4.3.2.4.2, 4.3.4.1 and 4.3.4.2 shall apply.

4.4.2.2 The temperature of the substance carried shall not exceed, at the time of filling, the maximum service temperature indicated on the tank plate referred to in 6.9.6.

4.4.2.3 When applicable to carriage in metallic tanks, the special provisions (TU) of 4.3.5 shall also apply, as indicated in Column (13) of Table A in Chapter 3.2.



## CHAPTER 4.5

### USE OF VACUUM OPERATED WASTE TANKS

**NOTE:** *For portable tanks and UN multiple-element gas containers (MEGCs), see Chapter 4.2; for fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, with shells made of metallic materials, and battery-vehicles and multiple elements gas containers (MEGCs) other than UN MEGCs, see Chapter 4.3; for fibre reinforced plastics tanks, see Chapter 4.4.*

#### 4.5.1 Use

4.5.1.1 Wastes consisting of substances in Classes 3, 4.1, 5.1, 6.1, 6.2, 8 and 9 may be carried in vacuum-operated waste tanks conforming to Chapter 6.10 if their carriage in fixed tanks, demountable tanks, tank-containers or tank swap bodies is permitted according to Chapter 4.3. Substances assigned to tank code L4BH in Column (12) of Table A of Chapter 3.2 or to another tank code permitted under the hierarchy in 4.3.4.1.2 may be carried in vacuum operated waste tanks with the letter "A" or "B" in part 3 of the tank code, as indicated in No. 9.5 of the vehicle approval certificate conforming to 9.1.2.1.5.

#### 4.5.2 Operation

4.5.2.1 The provisions of Chapter 4.3 except those of 4.3.2.2.4 and 4.3.2.3.3 apply to the carriage in vacuum operated waste tanks and are supplemented by the provisions of 4.5.2.2 to 4.5.2.4 below.

4.5.2.2 For carriage of liquids classified as flammable, vacuum-operated waste tanks shall be filled through fillings which discharge into the tank at a low level. Provisions shall be made to minimize the production of spray.

4.5.2.3 When discharging flammable liquids with a flash-point below 23 °C by using air pressure, the maximum allowed pressure is 100 kPa (1 bar).

4.5.2.4 The use of tanks fitted with an internal piston operating as a compartment wall is allowed only when the substances on either side of the wall (piston) do not react dangerously with each other (see 4.3.2.3.6).

