

No. 8940. EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR). DONE AT GENEVA ON 30 SEPTEMBER 1957¹

ENTRY INTO FORCE of amendments to annexes A and B, as amended,² of the above-mentioned Agreement

The amendments were proposed by the Federal Republic of Germany and circulated by the Secretary-General on 1 April 1978. They came into force on 1 October 1978, in accordance with article 14 (3) of the Agreement.

[TRANSLATION — TRADUCTION]

A N N E X A

PROVISIONS CONCERNING DANGEROUS SUBSTANCES AND ARTICLES

Contents

Amend the title of appendix A.2 to read:

“*Appendix A.2.* Provisions relating to the nature of aluminium-alloy receptacles for certain gases of class 2; provisions relating to the materials and construction of receptacles, of fixed tanks, of demountable tanks, and of shells of tank-containers, intended for the carriage of deeply-refrigerated liquefied gases of class 2; and provisions relating to tests on aerosol dispensers and non-refillable containers for gases under pressure of class 2, 10° and 11°”.

3200 *et seq.*

PART I. DEFINITIONS AND GENERAL PROVISIONS

2003 (3) Replace the second subparagraph by:

“*Appendix A.2.* Provisions relating to the nature of aluminium-alloy receptacles for certain gases of class 2; provisions relating to the materials and construction of receptacles, of fixed tanks, of demountable tanks, and of shells of tank-containers, intended for the carriage of deeply-refrigerated liquefied gases of class 2; and provisions relating to tests on aerosol dispensers and non-refillable containers for gases under pressure of class 2, 10° and 11°”.

Replace the whole of class 2 by the following:

Class 2. GASES: COMPRESSED, LIQUEFIED OR DISSOLVED UNDER PRESSURE

1. *List of substances*

2200 (1) Among the substances and articles covered by the heading of class 2, only those listed in marginal 2201 are to be accepted for carriage, and then only subject to the requirements of this annex and to the provisions of annex B. These

¹ United Nations, *Treaty Series*, vol. 619, p. 77; for subsequent actions, see references in Cumulative Indexes Nos. 9, 11 and 12, as well as annex A in volumes 827, 828, 848, 883, 892, 905, 907, 920, 921, 922, 926, 940, 943, 951, 966, 973, 982, 987, 995, 1003, 1023, 1035 and 1074.

² *Ibid.*, vol. 731, p. 3, as well as annex A in volumes 774, 828, 883, 907, 921, 922, 926, 951, 982, 987, 1003, 1023, 1035 and 1074.

substances and articles to be accepted for carriage under certain conditions are to be considered as substances and articles of ADR.

(2) Substances having a critical temperature lower than 50°C or, at 50°C, a vapour pressure greater than 3 kg/cm² are deemed to be substances of class 2.

(3) The substances and articles of class 2 are classified as follows:

- A, compressed gases having a critical temperature below –10°C;
- B, liquefied gases having a critical temperature of –10°C or above:
 - (a) Liquefied gases having a critical temperature of 70°C or above;
 - (b) Liquefied gases having a critical temperature of –10°C or above, but below 70°C;
- C, deeply-refrigerated liquefied gases;
- D, gases dissolved under pressure;
- E, aerosol dispensers and non-refillable containers of gas under pressure;
- F, gases subject to special requirements; and
- G, empty receptacles and empty tanks.

The substances and articles of class 2 are subdivided according to their chemical properties, as follows:

- (a) Non-inflammable;
- (a t) Non-inflammable, toxic;
- (b) Inflammable;
- (b t) Inflammable, toxic;
- (c) Chemically unstable;
- (c t) Chemically unstable, toxic.

Unless otherwise specified, chemically unstable substances shall be considered to be inflammable.

The names of corrosive gases and of articles containing such gases shall be followed by the word “corrosive” in brackets.

(4) Substances of class 2 which are listed among the chemically unstable gases are to be accepted for carriage only if the necessary steps have been taken to prevent their dangerous decomposition, dismutation or polymerization during carriage.

To this end, care should in particular be taken to ensure that receptacles and tanks do not contain any substances liable to promote these reactions.

2201

A. *Compressed gases* [see also marginal 2201a under (a). For gases of 1° (a) and (b) and 2° (a) in aerosol dispensers or in non-refillable containers for gases under pressure, see under 10° and 11°]

Gases having a critical temperature below –10°C are considered to be compressed gases for the purposes of ADR.

1° *Pure gases and technically-pure gases*

(a) *Non-inflammable*. Argon; helium; krypton; neon; nitrogen; oxygen; tetrafluoromethane (R 14).

(a t) *Non-inflammable, toxic*. Boron trifluoride; fluorine (corrosive); silicon tetrafluoride (corrosive).

(b) *Inflammable*. Deuterium; hydrogen; methane.

(b t) *Inflammable, toxic*. Carbon monoxide.

(c t) *Chemically unstable, toxic*. Nitric oxide (nitrogen monoxide) NO (non-inflammable).

2° Mixtures of gases

(a) *Non-inflammable*. Mixtures of two or more of the following gases: rare gases (containing not more than 10 per cent xenon by volume), nitrogen, oxygen, carbon dioxide (not more than 30 per cent by volume); non-inflammable mixtures of two or more of the following gases: hydrogen, methane, nitrogen, rare gases (containing not more than 10 per cent xenon by volume), not more than 30 per cent carbon dioxide by volume; nitrogen containing not more than 6 per cent ethylene by volume; air.

(b) *Inflammable*. Mixtures of not less than 90 per cent methane by volume with hydrocarbons of 3°(b) and 5°(b); inflammable mixtures of two or more of the following gases: hydrogen, methane, nitrogen, rare gases (containing not more than 10 per cent xenon by volume), not more than 30 per cent carbon dioxide by volume; natural gas.

(b t) *Inflammable, toxic*. Town gas; mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; water gas; synthesis gas (e.g. from the Fischer-Tropsch process); mixtures of carbon monoxide with hydrogen or with methane.

(c t) *Chemically unstable, toxic*. Mixtures of hydrogen with not more than 10 per cent diborane by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume.

B. *Liquefied gases* [see also marginal 2201a under (b) and (e). For gases of 3° to 6° in aerosol dispensers or in non-refillable containers for gases under pressure, see under 10° and 11°]

Gases having a critical temperature of -10°C or above are considered to be liquefied gases for the purposes of ADR.

(a) *Liquefied gases having a critical temperature of 70°C or above*

3° Pure gases and technically-pure gases

(a) *Non-inflammable*. Bromochlorodifluoromethane (R 12 B 1); chlorodifluoromethane (R 22); chloropentafluoroethane (R 115); 1-chloro-2,2,2-trifluoroethane (R 133a); dichlorodifluoromethane (R 12); dichlorofluoromethane (R 21); 1,2-dichloro-1,1,2,2-tetrafluoroethane (R 114); octafluorocyclobutane (RC 318).

(a t) *Non-inflammable, toxic*. Ammonia; boron chloride (corrosive); chlorine (corrosive); chlorine trifluoride (corrosive); hexafluoropropylene (R 216); hydrogen bromide (corrosive); methyl bromide; nitrosyl chloride (corrosive); nitrogen dioxide NO_2 (nitrogen peroxide, nitrogen tetroxide N_2O_4) (corrosive); phosgene (corrosive); sulphur dioxide; sulphuryl fluoride; tungsten hexafluoride.

(b) *Inflammable*. Butane; 1-butylene (1-butene); 1-chloro-1,1-difluoroethane (R 142b); *cis*-2-butylene (*cis*-2-butene); cyclopropane; 1,1-difluoroethane (R 152a); isobutane; isobutylene (isobutene); methylsilane; propane; propylene; *trans*-2-butylene (*trans*-2-butene); 1,1,1-trifluoroethane.

(b t) *Inflammable, toxic*. Arsine; dichlorosilane; dimethylamine; dimethyl ether; dimethylsilane; ethylamine; ethyl chloride; hydrogen selenide; hydrogen sulphide; methylamine; methyl chloride; methyl mercaptan; trimethylamine; trimethylsilane.

(c) *Chemically unstable*. 1,3-butadiene; vinyl chloride.

(c t) *Chemically unstable, toxic.* Cyanogen; cyanogen chloride (non-inflammable) (corrosive); ethylene oxide; methyl vinyl ether; trifluorochloroethylene (R 1113); vinyl bromide.

NOTE. In the case of halogenated hydrocarbons, the use of names customary in the trade, such as the following, is also permitted: Algofrene, Arcton, Edifren, Flugene, Forane, Freon, Fresane, Frigen, Isceon, Kaltron, followed by the substance identification number without the letter R.

4° *Mixtures of gases*

(a) *Non-inflammable.* Mixtures of substances listed under 3°(a) with or without hexafluoropropylene of 3°(a t), which as:

- Mixture F 1 have a vapour pressure at 70°C not exceeding 13 kg/cm² and a density at 50°C not lower than that of dichlorofluoromethane (1.30);
- Mixture F 2 have a vapour pressure at 70°C not exceeding 19 kg/cm² and a density at 50°C not lower than that of dichlorodifluoromethane (1.21);
- Mixture F 3 have a vapour pressure at 70°C not exceeding 30 kg/cm² and a density at 50°C not lower than that of chlorodifluoromethane (1.09);

NOTE. 1. Trichlorofluoromethane (R 11), trichlorotrifluoroethane (R 113) and chlorotrifluoroethane (R 133) are not liquefied gases within the meaning of ADR and thus are not subject to the requirements of ADR. They may however enter into the composition of mixtures F 1 to F 3.

2. See Note under 3°.

- The azeotropic mixture of dichlorodifluoromethane (R 12) and 1,1-difluoroethane (R 152a), known as R 500;
- The azeotropic mixture of chloropentafluoroethane (R 115) and chlorodifluoromethane (R 22), known as R 502;
- The mixture of 19 to 21 per cent by weight dichlorodifluoromethane (R 12) and 79 to 81 per cent by weight bromochlorodifluoromethane (R 12 B 1).

(a t) *Non-inflammable, toxic.* Mixtures of methyl bromide and chloropicrin having a vapour pressure above 3 kg/cm² at 50°C.

(b) *Inflammable.* Mixtures of hydrocarbons listed under 3°(b) and of ethane and ethylene of 5°(b), which as:

- Mixture A have a vapour pressure at 70°C not exceeding 11 kg/cm² and a density at 50°C not lower than 0.525;
- Mixture A 0 have a vapour pressure at 70°C not exceeding 16 kg/cm² and a density at 50°C not lower than 0.495;
- Mixture A 1 have a vapour pressure at 70°C not exceeding 21 kg/cm² and a density at 50°C not lower than 0.485;
- Mixture B have a vapour pressure at 70°C not exceeding 26 kg/cm² and a density at 50°C not lower than 0.450;
- Mixture C have a vapour pressure at 70°C not exceeding 31 kg/cm² and a density at 50°C not lower than 0.440.

NOTE. In the case of the foregoing mixtures the use of the following names customary in the trade is permitted for describing these substances:

<i>Name given under 4° (b)</i>	<i>Name customary in the trade</i>
Mixture A, mixture A 0	Butane
Mixture C	Propane

Mixtures of hydrocarbons of 3° (b) and 5° (b) containing methane.

(b t) *Inflammable, toxic.* Mixtures of two or more of the following gases: methylsilane, dimethylsilane, trimethylsilane; methyl chloride and methylene chloride in mixtures having a vapour pressure above 3 kg/cm² at 50°C; mixtures of methyl chloride and chloropicrin and mixtures of methyl bromide and ethylene bromide having in either case a vapour pressure above 3 kg/cm² at 50°C.

(c) *Chemically unstable.* Mixtures of methylacetylene and propadiene with the hydrocarbons of 3° (b), which as:

- Mixture P1 contain not more than 63 per cent methylacetylene and propadiene by volume and not more than 24 per cent propane and propylene by volume, the percentage of C₄-saturated hydrocarbons being not less than 14 per cent by volume; and as
- Mixture P2 contain not more than 48 per cent methylacetylene and propadiene by volume and not more than 50 per cent propane and propylene by volume, the percentage of C₄-saturated hydrocarbons being not less than 5 per cent by volume.

(c t) *Chemically unstable, toxic.* Ethylene oxide containing not more than 10 per cent carbon dioxide by weight; ethylene oxide containing not more than 50 per cent methyl formate by weight, with nitrogen up to a total pressure not exceeding 10 kg/cm² at 50°C; ethylene oxide with nitrogen up to a total pressure of 10 kg/cm² at 50°C; dichlorodifluoromethane containing 12 per cent ethylene oxide by weight.

(b) *Liquefied gases having a critical temperature of -10°C or above, but below 70°C*

5° *Pure gases and technically-pure gases*

(a) *Non-inflammable.* Bromotrifluoromethane (R 13 B 1); carbon dioxide; chlorotrifluoromethane (R 13); hexafluoroethane (R 116); nitrous oxide N₂O; sulphur hexafluoride; trifluoromethane (R 23); xenon.

With regard to carbon dioxide, see also marginal 2201a under (c).

NOTE. 1. Nitrous oxide is to be accepted for carriage only if it is not less than 99 per cent pure.

2. See Note under 3°.

(a t) *Non-inflammable, toxic.* Hydrogen chloride (corrosive).

(b) *Inflammable.* Ethane; ethylene; silane.

(b t) *Inflammable, toxic.* Germane; phosphine.

(c) *Chemically unstable.* 1,1-difluoroethylene; vinyl fluoride.

(c t) *Chemically unstable, toxic.* Diborane.

6° *Mixtures of gases*

(a) *Non-inflammable.* Carbon dioxide containing not less than 1 per cent and not more than 10 per cent nitrogen, oxygen, air or rare gases by weight; the azeotropic mixture of chlorotrifluoromethane (R 13) and trifluoromethane (R 23) known as R 503.

NOTE. Carbon dioxide containing less than 1 per cent nitrogen, oxygen, air or rare gases by weight is a substance of 5° (a).

(c) *Chemically unstable.* Carbon dioxide containing not more than 35 per cent ethylene oxide by weight.

(c t) *Chemically unstable, toxic.* Ethylene oxide containing more than 10 per cent but not more than 50 per cent carbon dioxide by weight.

C. *Deeply-refrigerated liquefied gases*

7° *Pure gases and technically-pure gases*

(a) *Non-inflammable.* Argon; carbon dioxide; helium; krypton; neon; nitrogen; nitrous oxide N_2O ; oxygen; xenon.

(b) *Inflammable.* Ethane; ethylene; hydrogen; methane.

8° *Mixtures of gases*

(a) *Non-inflammable.* Air; mixtures of substances of 7° (a).

(b) *Inflammable.* Mixtures of substances of 7° (b); natural gas.

D. *Gases dissolved under pressure*

9° *Pure gases and technically-pure gases*

(a t) *Non-inflammable, toxic.* Ammonia dissolved in water with more than 35 per cent but not more than 40 per cent ammonia by weight; ammonia dissolved in water with more than 40 per cent but not more than 50 per cent ammonia by weight.

NOTE. Ammonia solution with an ammonia content not exceeding 35 per cent by weight is not subject to the requirements of ADR.

(c) *Chemically unstable.* Acetylene dissolved in a solvent (e.g. acetone) absorbed by porous substances.

E. *Aerosol dispensers and non-refillable containers of gas under pressure* [see also marginal 2201a under (d)]

NOTE. 1. Aerosol dispensers are receptacles which can be used only once, are equipped with a release valve or dispersal device, and contain, under pressure, a gas or mixture of gases listed in marginal 2208 (2) or contain an active substance (insecticide, cosmetic, etc.) together with such a gas or mixture of gases as a propellant.

2. Non-refillable containers of gas under pressure are receptacles which can be used only once and contain a gas or a mixture of gases listed in marginal 2208 (2) and (3) (e.g. butane for camp-cookers, refrigerant gases, etc.), but are not equipped with a release valve.

3. The term “inflammable substances” means:

- (i) Gases (propellant in aerosol dispensers; contents of non-refillable containers of gas under pressure) whose mixtures with air can be ignited and have a lower and an upper inflammability limit;
- (ii) Liquids (active substances in aerosol dispensers) of class 3.

4. The term “chemically unstable” is applied to contents which in the absence of special precautions undergo dangerous decomposition or self-polymerization at a temperature of not more than 70°C.

10° *Aerosol dispensers*

(a) *Non-inflammable.* With non-inflammable contents.

(a t) *Non-inflammable, toxic.* With non-inflammable toxic contents.

(b) *Inflammable.* 1. With not more than 45 per cent of inflammable contents by weight.

2. With more than 45 per cent of inflammable contents by weight.
 - (b t) *Inflammable, toxic.* 1. With toxic contents and not more than 45 per cent of inflammable contents by weight.
 2. With toxic contents and more than 45 per cent of inflammable contents by weight.
- (c) *Chemically unstable.* With chemically-unstable contents.
 - (c t) *Chemically unstable, toxic.* With chemically-unstable toxic contents.
- 11° *Non-refillable containers of gas under pressure*
 - (a) *Non-inflammable.* With non-inflammable contents.
 - (a t) *Non-inflammable, toxic.* With non-inflammable toxic contents.
 - (b) *Inflammable.* With inflammable contents.
 - (b t) *Inflammable, toxic.* With inflammable toxic contents.
 - (c) *Chemically unstable.* With chemically unstable contents.
 - (c t) *Chemically unstable, toxic.* With chemically unstable toxic contents.

F. *Gases subject to special requirements*

12° *Various mixtures of gases*

Mixtures containing gases listed under other item numbers of this class, and mixtures of one or more gases listed under other item numbers of this Class with one or more vapours of substances not excluded from carriage under ADR, on condition that during carriage:

1. The mixture remains entirely gaseous; and
2. All possibility of a dangerous reaction is excluded.

13° *Test gases*

Gases and mixtures of gases not listed under other item numbers of this class and used only in laboratory tests, on condition that during carriage:

- (a) The gas or mixture of gases remains entirely gaseous; and
- (b) All possibility of a dangerous reaction is excluded.

G. *Empty receptacles and empty tanks*

14° *Empty receptacles and empty tanks, uncleaned, which have contained tetrafluoromethane of 1° (a), substances of 1° (a t) — (c t); 2° (b) — (c t); 3° — 6°; carbon dioxide and nitrous oxide of 7° (a); or substances of 7° (b), 8° (b), 9°, 12° or 13°*

NOTE. 1. Receptacles and tanks which after being emptied of substances listed under 14° still contain small residual amounts are regarded as empty receptacles or empty tanks, uncleaned.

2. Empty receptacles or empty tanks, uncleaned, which have contained gases of 1° (a) other than tetrafluoromethane (R 14), or gases of 2° (a), 7° (a) other than carbon dioxide and nitrous oxide, or 8° (a), are not subject to the requirements of ADR.

2201a

Gases and articles handed over for carriage in conformity with the following provisions are not subject to the requirements or provisions relating to this Class set out elsewhere in this annex or in annex B:

- (a) Compressed gases which are neither inflammable nor toxic nor corrosive and whose pressure in the receptacle, referred to a temperature of 15°C, does not exceed 2 kg/cm²; the same rule applies to mixtures of gases containing not more than 2 per cent inflammable components;

- (b) Liquefied gases contained, in quantities not exceeding 60 l, or in quantities of less than 5 l with not more than 25 g hydrogen, in freezing appliances (refrigerators, ice machines, etc.) and necessary for their operation;
- (c) Carbon dioxide [5° (a)] in metal capsules (sodas, sparklets) if the carbon dioxide in the gaseous state does not contain more than 0.5 per cent air and the capsules contain not more than 25 g carbon dioxide and not more than 0.75 g per cm³ of capacity;
- (d) Articles of 10° and 11° of a capacity not exceeding 50 cm³. A package of such articles shall not weigh more than 10 kg;
- (e) Liquefied petroleum gases contained in motor-vehicle tanks firmly secured to the vehicles; the fuel cock between tank and engine must be closed and the electrical contact open.

2. Provisions

A. Packages

1. General conditions of packing

2202

(1) The materials of which the receptacles and their closures are made must not be liable to attack by the contents or form harmful or dangerous compounds therewith.

NOTE. Care must be taken not to allow any moisture to enter receptacles when they are being filled, and to dry receptacles completely after hydraulic pressure tests (see marginal 2216) carried out with water or with aqueous solutions.

(2) Packagings, including their closures, shall be sufficiently rigid and strong in all their parts to prevent any loosening during carriage and to meet the normal requirements of carriage. When outer packagings are prescribed, the receptacles shall be firmly secured therein. Unless otherwise specified in the section entitled "Packing of a single substance or of articles of the same kind", inner packagings may be enclosed in outer packagings, either singly or in groups.

(3) Metal receptacles intended for the carriage of gases of 1° to 6° and 9° shall contain only the gas for which they have been tested and whose name is inscribed on the receptacle [see marginal 2218 (1) (a)].

Derogations are allowed:

1. For metal receptacles tested for one of the substances of 3° (a) or 4° (a) or for bromotrifluoromethane, chlorotrifluoromethane or trifluoromethane of 5° (a). These receptacles may also be filled with some other substance of the aforesaid items on condition that the minimum test pressure prescribed for that substance does not exceed the test pressure of the receptacle and that the name of the substance and its permissible maximum filling weight are inscribed on the receptacle;
2. For metal receptacles tested for hydrocarbons of 3° (b) or 4° (b). These receptacles may also be filled with some other hydrocarbon on condition that the minimum test pressure prescribed for that substance does not exceed the test pressure of the receptacle and that the name of the substance and its permissible maximum filling weight are inscribed on the receptacle.

For 1 and 2, see also marginals 2215, 2218 (1)(a) and 2220 (1) to (3).

(4) A change in the use to which a receptacle is assigned is allowed in principle if it does not conflict with national regulations; it requires however the approval of the competent authority and replacement of the former markings by markings relating to the new use.

2. *Packing of a single substance or of articles of the same kind*

NOTE. Carbon dioxide and nitrous oxide [7°(a)] and mixtures of these two gases [8°(a)] may not be carried otherwise than in specially-equipped tanks (see annex B, marginal 21 400).

(a) *Nature of receptacles*

2203

(1) Receptacles intended for the carriage of gases of 1° to 6°, 9°, 12° and 13° shall be so closed and leak-proof as to prevent any escape of the gases.

(2) These receptacles shall be made of carbon steel or of alloy steel (special steels).

The following may however be used:

(a) Copper receptacles for:

1. Compressed gases of 1° (a), (b) and (b t), and 2° (a) and (b), whose filling pressure referred to a temperature of 15°C does not exceed 20 kg/cm²; and
2. Liquefied gases of 3° (a); sulphur dioxide of 3° (a t); dimethyl ether, ethyl chloride and methyl chloride of 3° (b t); vinyl chloride of 3° (c); vinyl bromide of 3° (c t); mixtures F 1, F 2 and F 3 of 4° (a); and ethylene oxide containing not more than 10 per cent carbon dioxide by weight, of 4° (c t);

(b) Aluminium-alloy receptacles (see appendix A.2) for:

1. Compressed gases of 1° (a), (b) and (b t); nitric oxide (nitrogen monoxide) NO of 1° (c t); and compressed gases of 2° (a), (b) and (b t);
2. Liquefied gases of 3° (a); sulphur dioxide of 3° (a t); liquefied gases of 3° (b) other than methylsilane; dimethyl ether, hydrogen selenide, and methyl mercaptan of 3° (b t); ethylene oxide of 3° (c t); liquefied gases of 4° (a) and (b); ethylene oxide containing not more than 10 per cent carbon dioxide by weight, of 4° (c t); and liquefied gases of 5° (a) and (b), and 6° (a) and (c). Sulphur dioxide of 3° (a t) and substances of 3° (a) and 4° (a) shall be dry; and
3. Dissolved acetylene of 9° (c).

All gases which are to be carried in aluminium-alloy receptacles shall be free from alkaline impurities.

2204

(1) Receptacles for dissolved acetylene [9° (c)] shall be entirely filled with a porous material, uniformly distributed, of a type approved by the competent authority and which:

- (a) Does not attack the receptacles or form harmful or dangerous compounds either with acetylene or with the solvent;
- (b) Does not shake down, even after prolonged use or through jolting, at temperatures up to 60°C;
- (c) Is capable of preventing the spread of decomposition of the acetylene in the mass.

(2) The solvent must not attack the receptacles.

2205

(1) The following liquefied gases may, in addition, be carried in thick-walled glass tubes on condition that the quantity of substance in each tube and the degree of filling of the tubes do not exceed the figures indicated below:

<i>Names of gases</i>	<i>Quantity of substance</i>	<i>Degree of filling of tube</i>
Carbon dioxide, nitrous oxide N ₂ O [5° (a)], ethane, ethylene [5° (b)]	3 g	One-half of capacity
Ammonia, chlorine, methyl bromide [3° (a t)], cyclopropane [3° (b)], ethyl chloride [3° (b t)]	20 g	Two-thirds of capacity
Phosgene, sulphur dioxide [3° (a t)]	100 g	Three-quarters of capacity

(2) The glass tubes shall be flame-sealed and secured separately by infusorial-earth cushioning in closed sheet-metal capsules which shall be placed in a wooden case or in some other outer packaging of sufficient strength (see also marginal 2222).

(3) For sulphur dioxide of 3° (a t) stout glass siphons containing not more than 1.5 kg of substance and filled to not more than 88 per cent of their capacity are also allowed. The siphons shall be secured by infusorial earth, sawdust or powdered carbonate of lime, or by a mixture of the two latter, in strong wooden cases or in some other outer packaging of sufficient strength. A package shall not weigh more than 100 kg. If it weighs more than 30 kg it shall be fitted with means of handling.

2206

(1) Gases of 3° (a); 3° (b) other than methylsilane; 3° (b t) other than arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane; 3° (c); 3° (c t) other than cyanogen chloride; and mixtures of 4° (a) and 4° (b) may also, on condition that the weight of liquid per litre of capacity does not exceed either the maximum weight of contents indicated in marginal 2220 or 150 g per tube, be contained in thick-walled glass tubes, or in thick-walled metal tubes made of a metal allowed by marginal 2203 (2). The tubes shall be free from faults liable to impair their strength; in particular, internal stresses in glass tubes shall have been suitably relieved and the thickness of the tube walls shall not be less than 2 mm. The leakproofness of the closure system shall be ensured by an additional device (cap, crown, seal, binding, etc.) capable of preventing any loosening of the closure system during carriage. The tubes shall be secured by cushioning material in small boxes made of wood or fibreboard, the number of tubes per box being such that the weight of the liquid contained in a box does not exceed 600 g. These small boxes shall be placed in wooden cases or in some other outer packaging of sufficient strength; if the liquid contents of a case weigh more than 5 kg the case shall be lined with soft-soldered sheet-metal.

(2) A package shall not weigh more than 75 kg.

2207

(1) Gases of 7° (a), other than carbon dioxide and nitrous oxide, and of 8° (a), other than mixtures containing carbon dioxide and nitrous oxide, shall be enclosed in closed, double-walled metal receptacles which are so insulated that they cannot become coated with dew or hoar-frost and which are fitted with safety valves.

(2) Gases of 7° (a) other than carbon dioxide and nitrous oxide, and of 8° (a) other than mixtures containing carbon dioxide and nitrous oxide, may also be enclosed in receptacles which are not hermetically closed and which are:

(a) Double-walled vacuum-jacketed glass receptacles surrounded by an absorbent insulating material; these receptacles shall be protected by iron-wire baskets and placed in metal cases; or

- (b) Metal receptacles protected against heat transmission in such a way that they cannot become coated with dew or hoar-frost; the capacity of these receptacles shall not exceed 100 litres.

(3) The metal cases referred to in subparagraph (2) (a) and the receptacles referred to in subparagraph (2) (b) above shall be fitted with means of handling. The openings of the receptacles referred to in subparagraphs (2) (a) and (b) shall be fitted with devices allowing gases to escape, preventing any splashing out of the liquid, and so fixed that they cannot fall out. In the case of oxygen of 7° (a) and mixtures containing oxygen of 8° (a), the devices referred to above and the absorbent insulating material surrounding the receptacles referred to in subparagraph (2) (a) shall be made of incombustible materials.

2208

(1) Aerosol dispensers (10°) and non-refillable containers for gas under pressure (11°) shall satisfy the following requirements:

- (a) Aerosol dispensers containing only a gas or a mixture of gases, and non-refillable containers for gas under pressure, shall be made of metal. This requirement shall not apply to non-refillable containers for gas under pressure with a maximum capacity of 100 ml for butane. Other aerosol dispensers shall be made of metal, a plastics material or glass. Receptacles made of metal and having an outside diameter of not less than 40 mm shall have a concave bottom;
- (b) Receptacles made of materials liable to shatter, such as glass or certain plastics materials, shall be enclosed in a device (close-mesh wire netting, flexible cover made of a plastics materials, etc.) affording protection against fragments and their dispersal. Receptacles whose capacity does not exceed 150 cm³ and whose internal pressure at 20°C is below 1.5 kg/cm² are exempted from this requirement;
- (c) The capacity of receptacles made of metal shall not exceed 1,000 cm³; that of receptacles made of a plastics material or of glass shall not exceed 500 cm³;
- (d) Each model of receptacle shall, before being put into service, satisfy a hydraulic pressure test carried out in conformity with appendix A.2, marginal 3291. The internal pressure to be applied (test pressure) shall be 1.5 times the internal pressure at 50°C, with a minimum pressure of 10 kg/cm²;
- (e) The release valves of aerosol dispensers, and their dispersal devices, shall ensure that the dispensers are so closed as to be leak-proof and shall be protected against accidental opening. Valves and dispersal devices which close only by the action of the internal pressure are not to be accepted.

(2) The following gases shall be accepted as propellants, or as constituents of propellants, or as filler gases, for aerosol dispensers: gases of 1° (a) and (b); 2° (a) and (b); 3° (a) and (b) other than methylsilane; ethyl chloride and dimethyl ether of 3° (b t); 1,3-butadiene of 3° (c); trifluorochloroethylene of 3° (c t); gases of 4° (a) and (b); gases of 5° (a) and (b) other than silane; gases of 5° (c) and 6° (a) and (c).

(3) All the gases listed under (2) and, in addition, the following gases shall be accepted as filling gases for non-refillable containers for gas under pressure; methyl bromide of 3° (a t); dimethylamine, ethylamine, methylamine, methyl mercaptan and trimethylamine of 3° (b t); ethylene oxide, methyl vinyl ether and

vinyl bromide of 3° (c t); ethylene oxide containing not more than 10 per cent carbon dioxide by weight, of 4° (c t).

2209

(1) The internal pressure at 50°C of aerosol dispensers and of non-refillable containers of gas under pressure shall exceed neither two-thirds of the test pressure of the receptacle nor 12 kg/cm².

(2) Aerosol dispensers and non-refillable containers of gas under pressure shall be so filled that at 50°C the liquid phase does not exceed 95 per cent of their capacity. The capacity of aerosol dispensers is the available volume in a closed dispenser fitted with the valve support, the valve and the dip tube.

(3) All aerosol dispensers and non-refillable containers for gas under pressure shall satisfy a tightness (leakproofness) test in conformity with appendix A.2, marginal 3292.

2210

(1) Aerosol dispensers and non-refillable containers of gas under pressure shall be placed in wooden cases or strong fibreboard or metal boxes; aerosol dispensers made of glass or a plastics material and liable to shatter shall be separated from one another by interposed sheets of fibreboard or of another suitable material.

(2) A package shall not weigh more than 50 kg if fibreboard boxes are used or more than 75 kg if other packagings are used.

(3) Where carriage is by full load, each load comprising only aerosol dispensers made of metal, the dispensers may be grouped together and secured on trays with the aid of an appropriate plastics material, by means of a shrinkage and heat-sealing process, on condition that the groups of dispensers are then stacked and suitably secured on pallets.

(b) *Conditions governing metal receptacles* (these conditions are not applicable to the metal tubes referred to in marginal 2206, to the receptacles referred to in marginal 2207 (2) (b), or to the aerosol dispensers or non-refillable metal containers for gas under pressure referred to in marginal 2208)

2211

1. CONSTRUCTION AND FITTINGS (see also marginal 2238)

(1) At the test pressure, the stress in the metal at the most severely stressed point of the receptacle (marginals 2215, 2219 and 2220) shall not exceed three-quarters of the guaranteed minimum yield stress (Re). By "yield stress" is meant the stress at which a permanent elongation of 2‰ (i.e. 0.2 per cent) or, for austenitic steels, 1 per cent of the gauge length on the test-piece, has been produced.

NOTE. In the case of sheet-metal the axis of the tensile test-piece shall be at right angles to the direction of rolling. The permanent elongation at fracture ($l = 5d$) shall be measured on a test-piece of circular cross-section in which the gauge length l is equal to five times the diameter d ; if test-pieces of rectangular cross-section are used, the gauge length shall be calculated by the formula $l = 5.65 \sqrt{F_0}$, where F_0 indicates the initial cross-sectional area of the test-piece.

(2) (a) Steel receptacles whose test pressure exceeds 60 kg/cm² shall be of seamless construction or welded. For welded receptacles, steels (carbon or alloy) of fully satisfactory weldability shall be used.

(b) Receptacles whose test pressure does not exceed 60 kg/cm² shall either conform to the provisions of subparagraph (a) above, or be riveted or hard-soldered on condition that the manufacturer guarantees the workmanship of the riveting and hard-soldering and that the competent authorities of the country of origin have given their approval.

(3) Aluminium-alloy receptacles shall be seamless or welded.

(4) Welded receptacles are to be accepted only on condition that the manufacturer guarantees the workmanship of the welding and that the competent authorities of the country of origin have given their approval.

2212

(1) A distinction is made between the following types of receptacles:

- (a) Cylinders of a capacity not exceeding 150 litres;
- (b) Receptacles of a capacity of not less than 100 litres [with the exception of cylinders in conformity with subparagraph (a)] and not more than 1,000 litres (e.g. cylindrical receptacles equipped with rolling hoops, and receptacles on skids);
- (c) Tanks (see annex B);
- (d) Assemblies, known as "frames", of cylinders in conformity with subparagraph (1) (a), the cylinders being interconnected by a manifold and held firmly together by a metal fitting.

(2) (a) If under the regulations of the country of departure the cylinders referred to in subparagraph (1) (a) are required to be fitted with a device to prevent rolling, this device shall not be integral with the valve cap (marginal 2213 (2)).

(b) Receptacles in conformity with subparagraph (1) (b) which are capable of being rolled shall be equipped with rolling hoops or be otherwise protected against damage due to rolling (e.g. by corrosion-resistant metal sprayed on to the receptacle's outer surface).

Receptacles in conformity with subparagraphs (1) (b) and (1) (c) which are not capable of being rolled shall be fitted with devices (skids, rings, straps) ensuring that they can be safely handled by mechanical means and so arranged as not to impair the strength of, nor cause undue stresses in, the wall of the receptacle.

(c) Frames of cylinders in conformity with subparagraph (1) (d) shall be fitted with devices ensuring that they can be handled safely. The manifold and the master cock shall be situated within the frame and be so mounted as to be protected against any damage.

(3) (a) With the exception of gases of 7° and 8°, gases of class 2 may be carried in cylinders in conformity with subparagraph (1) (a).

NOTE. For possible limitations on the capacity of cylinders for certain gases, see marginal 2219.

(b) With the exception of fluorine and silicon tetrafluoride [1° (a t)]; nitric oxide (NO) [1° (c t)]; mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume [2° (b t)]; mixtures of hydrogen with not more than 10 per cent diborane by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume [2° (c t)]; boron chloride, chlorine trifluoride, nitrosyl chloride, sulphuryl fluoride and tungsten hexafluoride [3° (a t)]; methylsilane [3° (b)]; arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane [3° (b t)]; cyanogen chloride, cyanogen and ethylene oxide [3° (c t)]; mixtures of methylsilanes [4° (b t)]; substances of 4°(c) and 4°(c t) other than dichlorodifluoromethane containing 12 per cent ethylene oxide by weight; nitrous oxide [5° (a)]; silane [5° (b)]; and substances of 5° (b t), 5° (c t), 7°, 8°, 12° and 13°, gases of class 2 may be carried in receptacles in conformity with subparagraph (1) (b).

(c) With the exception of silicon tetrafluoride [1° (a t)]; nitric oxide [1° (c t)]; mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume [2° (b t)]; mixtures of hydrogen with not more than 10 per cent diborane by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume [2° (c t)]; boron chloride, chlorine trifluoride, nitrosyl chloride, sulphuryl fluoride and tungsten hexafluoride [3° (a t)]; methylsilane [3° (b)]; arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane [3° (b t)]; cyanogen chloride, cyanogen and ethylene oxide [3° (c t)]; mixtures of methylsilanes [4° (b t)]; substances of 4° (c) and 4° (c t) other than dichlorodifluoromethane containing 12 per cent ethylene oxide by weight; nitrous oxide [5° (a)]; silane [5° (b)]; and substances of 5° (b t), 5° (c t), 7°, 8°, 12° and 13°, gases of class 2 may be carried in frames of cylinders in conformity with subparagraph (1) (d). The individual cylinders in a frame of cylinders shall contain only one and the same compressed gas, liquefied gas or gas dissolved under pressure. Each cylinder in a frame of cylinders for fluorine [1° (a t)] or dissolved acetylene [9° (c)] shall however be fitted with a cock. The cylinders in a frame of cylinders for acetylene shall all contain the same porous material (marginal 2204).

2213

(1) Openings for filling and emptying receptacles shall be fitted with flap valves or needle-valves. Valves of other types may however be allowed if they present equivalent guarantees of safety and have been approved in the country of origin. Nevertheless, whatever the type of valve adopted, its system of attachment shall be strong and such that its satisfactory condition can be verified easily before each filling.

Apart from a manhole, which if provided shall be closed by an effective closure, and from the necessary orifice for the removal of deposits, receptacles and tanks in conformity with marginal 2212 (1) (b) and (c) shall not be equipped with more than two openings, for filling and discharge respectively. Nevertheless, receptacles of a capacity of not less than 100 l intended for the carriage of dissolved acetylene [9°(c)] may have more than two openings for filling and discharge.

Similarly, receptacles and tanks in conformity with marginal 2212 (1), (b) and (c), intended for the carriage of substances of 3° (b) and 4° (b) may be provided with other openings intended in particular for verifying the level of the liquid and the gauge pressure.

(2) Valves (cocks) shall be effectively protected by caps or fixed flanges. Caps shall possess vent-holes of sufficient cross-sectional area to evacuate gases if leakage occurs at the valves. The caps or flanges shall adequately protect the valve if the cylinder falls and during carriage and stacking. Valves placed inside the neck of the receptacles and protected by a screw-threaded plug, and receptacles carried packed in protective cases, shall not require a cap. Likewise, no protective cap shall be required for valves (cocks) on frames of cylinders.

(3) Receptacles containing fluorine [1° (a t)]; chlorine trifluoride [3° (a t)]; or cyanogen chloride [3° (c t)] shall, whether or not they are carried packed in protective cases, be fitted with steel caps. These caps shall have no openings and shall, throughout carriage, be fitted with a gasket ensuring gas-tightness and made of a material not liable to attack by the contents of the receptacle.

2214

(1) In the case of receptacles containing boron trifluoride or fluorine [1° (a t)]; chlorine trifluoride or liquefied ammonia [3° (a t)]; ammonia dissolved in water [9° (a t)]; nitrosyl chloride [3° (a t)]; or dimethylamine, ethylamine, methylamine or trimethylamine [3° (b t)], valves made of copper or of any other metal liable to be attacked by these gases are not to be accepted.

(2) The use of substances containing grease or oil for ensuring the leak-proofness of joints (seams) or for maintaining the closure devices of receptacles used for oxygen [1° (a)]; fluorine [1° (a t)]; mixtures with oxygen [2° (a)]; nitrogen dioxide, chlorine trifluoride [3° (a t)]; nitrous oxide [5° (a)]; or mixtures of 12° containing more than 10 per cent oxygen by volume is prohibited.

(3) The following requirements shall apply to the construction of the receptacles referred to in marginal 2207 (1):

(a) The materials and construction of the receptacles shall be in conformity with the requirements of appendix A.2, B, marginals 3250 to 3254. All the mechanical and technological characteristics of the material used shall be established for each receptacle at the first test; with regard to the impact strength and the bending coefficient, see appendix A.2, B, marginals 3265 to 3285.

(b) Receptacles shall be fitted with a safety valve which shall be capable of opening at the working pressure shown on the receptacle. The valves shall be so constructed as to work perfectly even at their lowest working temperature. Their reliability of functioning at that temperature shall be established and checked by testing each valve or a sample of valves of the same type of construction.

(c) The vents and safety valves of receptacles shall be so designed as to prevent the liquid from splashing out.

(d) The closing devices shall be so arranged that they cannot be opened by unqualified persons.

(e) Receptacles whose filling is measured by volume shall be provided with a level indicator.

(f) The receptacles shall be thermally insulated. The thermal insulation shall be protected against impact by means of continuous metal sheathing. If the space between the receptacle and the metal sheathing is airless (vacuum insulation), the protective sheathing shall be designed to withstand without deformation an external pressure of at least 1 kg/cm². If the sheathing is so closed as to be gas-tight (e.g. in the case of vacuum insulation), a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-tightness of the receptacle or its fittings. The device shall prevent moisture from penetrating into the insulation.

(4) In the case of receptacles containing mixtures of 4° (c) or dissolved acetylene [9° (c)], metal parts of closing devices in contact with the contents shall not contain more than 70 per cent copper. Receptacles for dissolved acetylene [9° (c)] may also have stop-valves taking yoke connectors.

(5) Receptacles containing oxygen of 1° (a) or 7° (a) and fitted in fish-tanks are likewise to be accepted if they are provided with appliances enabling the oxygen to escape gradually.

2. OFFICIAL TEST OF RECEPTACLES (for aluminium-alloy receptacles, see also appendix A.2)

- 2215 (1) Metal receptacles shall be subjected to initial and periodic tests under the supervision of an expert approved by the competent authority. The nature of these tests is specified in marginals 2216 and 2217.
- (2) In order to ensure compliance with the requirements of marginals 2204 and 2221 (2), tests of receptacles intended to contain dissolved acetylene [9° (c)] shall include, in addition, examination of the nature of the porous material and of the quantity of solvent.
- 2216 (1) The initial test of new or unused receptacles shall comprise:
- A. On an adequate sample of receptacles:
 - (a) Testing of the material of construction in respect at least of yield stress, tensile strength, and permanent elongation at fracture; the values yielded by these tests shall comply with national regulations;
 - (b) Measurement of wall thickness at the thinnest point, and calculation of the stress;
 - (c) Checking the homogeneity of the material for each manufacturing batch, and inspection of the external and internal condition of the receptacles;
 - B. For all receptacles:
 - (d) A hydraulic pressure test in conformity with the provisions of marginals 2219 to 2221;
 - (e) An inspection of the markings on the receptacles (see marginal 2218);
 - C. In addition, for receptacles intended for the carriage of dissolved acetylene [9° (c)]:
 - (f) An inspection as required by national regulations.
- (2) Receptacles shall withstand the test pressure without undergoing permanent deformation or exhibiting cracks.
- (3) At the periodic inspections the following shall be repeated: the hydraulic pressure test; check of the external and internal condition of the receptacle (e.g. by weighing, internal inspection, checks of wall thickness); verification of the equipment and markings and, if necessary, verification of the characteristics of the material by suitable tests.
- Periodic inspections shall be carried out:
- (a) Every 2 years in the case of receptacles intended for the carriage of gases of 1° (a t) and 1° (c t); town gas of 2° (b t); gases of 3° (a t) other than ammonia, hexafluoropropylene and methyl bromide; cyanogen chloride of 3° (c t); and substances of 5° (a t);
 - (b) Every 5 years in the case of receptacles intended for the carriage of other compressed and liquefied gases (subject to the provisions of subparagraph (c) below) and of receptacles for the carriage of ammonia dissolved under pressure [9° (a t)];
 - (c) Every 10 years in the case of receptacles intended for the carriage of gases of 1° (a) other than oxygen; of mixtures of nitrogen with rare gases, of 2° (a); of gases of 3° (a) and 3° (b) other than 1,1-difluoroethane, 1-chloro-1,1-difluoroethane, methylsilane and 1,1,1-trifluoroethane, and of mixtures of gases of 4° (a) and 4° (b), if the receptacles have a capacity of not more than 150 litres and the country of origin does not prescribe a shorter interval;

- (d) In the case of receptacles intended for the carriage of dissolved acetylene [9° (c)], marginal 2217 (1) shall apply, and in that of receptacles conforming to marginal 2207 (1), marginal 2217 (2) shall apply.

2217

(1) The external condition (corrosion, deformation) of, and the condition (loosening, settlement) of the porous material in, receptacles intended for the carriage of dissolved acetylene [9° (c)] shall be examined every 5 years. Sampling shall be performed by cutting up, if considered necessary, a suitable number of receptacles and inspecting them internally for corrosion and for any changes that may have occurred in the constituent materials and in the porous material.

(2) Receptacles conforming to marginal 2207 (1) shall be subjected every 5 years to external inspection and to a tightness (leakproofness) test. The tightness (leakproofness) test shall be carried out with the gas contained in the receptacle or with an inert gas at a pressure of 2 kg/cm². Checking shall be performed by means of a pressure gauge or by vacuum measurement. The thermal insulation shall not be removed. The pressure shall not decline during the 8-hour test period. Changes resulting from the nature of the test gas or from variations in temperature shall be taken into account.

3. MARKS ON RECEPTACLES

2218

(1) Metal receptacles shall bear the following particulars in clearly legible and durable characters:

- (a) One of the names of the gas or of the mixture of gases in full, as given in marginal 2201, 1° to 9°; the name or mark of the maker or owner; and the number of the receptacle [see also marginal 2202 (3)]. In the case of halogenated hydrocarbons of 1° (a), 3° (a), 3° (a t), 3° (b), 3° (c t), 4° (a), 5° (a) and 6° (a), the use of the letter R followed by the substance identification number is also permitted;
- (b) In the case of receptacles intended for liquefied gases, the tare of the receptacle including such fittings and accessories as valves, cocks, metal plugs, etc., but excluding the protective cap;
- (c) In the case of receptacles intended for compressed gases, the tare of the receptacle proper;
- (d) The test pressure (see marginals 2219 to 2221) and the date (month, year) of the last test undergone (see marginals 2216 and 2217);
- (e) The stamp of the expert who carried out the tests and inspections, and in addition UN;
- (f) In the case of compressed gases or mixtures of compressed gases [1°, 2°, 12° and 13°]: the maximum filling pressure at 15°C allowed for the receptacle in question (see marginal 2219);
- (g) In the case of boron fluoride [1° (a t)], liquefied gases [3° to 6°] and ammonia dissolved in water [9° (a t)]: the maximum filling allowed, and the capacity. In the case of deeply-refrigerated gases of 7° and 8°: the capacity;
- (h) In the case of acetylene dissolved in a solvent [9° (c)]: the permitted filling pressure [see marginal 2221 (2)], and the weight of the empty receptacle including the weight of the fittings and accessories, of the porous material, and of the solvent;
- (i) In the case of mixtures of gases of 12° and test gases of 13°, the words "mixtures of gases" or "test gases", as the case may be, shall be engraved on the receptacle as a general indication of the contents;

- (j) An exact description of the contents shall be shown in a durable form throughout carriage;
- (k) In the case of metal receptacles which, under marginal 2202 (3), are accepted for the carriage of a number of different gases (multi-purpose receptacles), an exact description of the contents shall be shown in a durable form during carriage.

(2) The marks shall be engraved either on a reinforced part of the receptacle, or on a ring, or on a data plate, immovably affixed to the receptacle. In addition, the name of the substance may be indicated on the receptacle by an adherent and clearly-visible inscription applied by painting or by any other, equivalent, process.

- (c) *Test pressure, degree of filling, and limitation of capacity, of receptacles* (see also marginals 2238, 211 180 and 212 180)

2219

(1) In the case of receptacles intended for the carriage of compressed gases of 1°, 2° and 12°, the internal pressure (test pressure) to be applied in the hydraulic pressure test shall be at least one and one-half times the filling pressure at 15°C indicated on the receptacle, but shall not be less than 10 kg/cm².

(2) In the case of receptacles used for the carriage of substances of 1° (a) other than tetrafluoromethane; of deuterium and hydrogen of 1° (b); or of gases of 2° (a), the filling pressure shall not exceed 300 kg/cm² referred to a temperature of 15°C. In the case of tanks, the filling pressure shall not exceed 250 kg/cm² referred to a temperature of 15°C.

In the case of receptacles and tanks intended for the carriage of other gases of 1° and 2° the filling pressure shall not exceed 200 kg/cm² referred to a temperature of 15°C.

(3) In the case of receptacles intended for the carriage of fluorine [1° (a t)] the internal pressure (test pressure) to be applied in the hydraulic pressure test shall be 200 kg/cm² and the filling pressure shall not exceed 28 kg/cm² at a temperature of 15°C; in addition, no receptacle may contain more than 5 kg fluorine.

In the case of receptacles intended for the carriage of boron trifluoride [1° (a t)] the hydraulic pressure to be applied in the test (test pressure shall be either 300 kg/cm², in which case the maximum weight of the contents per litre of capacity shall not exceed 0.86 kg, or 225 kg/cm², in which case the maximum weight of the contents per litre of capacity shall not exceed 0.715 kg).

(4) In the case of receptacles intended for the carriage of nitric oxide NO [1° (c t)], the capacity shall be limited to 50 l; the hydraulic pressure to be applied in the test (test pressure) shall be 200 kg/cm²; and the filling pressure shall not exceed 50 kg/cm² at a temperature of 15°C.

(5) In the case of receptacles intended for the carriage of mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; of mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume [2° (b t)]; of mixtures of hydrogen with not more than 10 per cent diborane by volume; or of mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume [2° (c t)], the capacity shall be limited to 50 l; the hydraulic pressure to be applied in the

test (test pressure) shall be not less than 200 kg/cm²; and the filling pressure shall not exceed 50 kg/cm² at a temperature of 15°C.

(6) Receptacles in conformity with marginal 2207 (1) shall not, at the filling temperature and at a pressure of 1 kg/cm², be filled beyond 98 per cent of their capacity.

Where oxygen of 7° (a) is carried, steps shall be taken to prevent any spillage of the liquid phase.

(7) Where dissolved acetylene [9° (c)] is carried in receptacles in conformity with marginal 2212 (1) (b), the capacity of the receptacles shall not exceed 150 l.

(8) The capacity of receptacles intended for the carriage of mixtures of gases of 12° shall not exceed 50 l. The pressure of the mixture shall not exceed 150 kg/cm² at a temperature of 15°C.

(9) The capacity of receptacles intended for the carriage of test gases of 13° shall not exceed 50 l. The filling pressure at a temperature of 15°C shall not exceed 7 per cent of the test pressure of the receptacle.

(10) In the case of tungsten hexafluoride [3° (a t)] the capacity of the receptacles shall be limited to 60 l.

The capacity of receptacles for silicon tetrafluoride [1° (a t)]; boron chloride, nitrosyl chloride and sulphuryl fluoride [3° (a t)]; methylsilane [3° (b)]; arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane [3° (b t)]; cyanogen chloride and cyanogen [3° (c t)]; mixtures of methylsilanes [4° (b t)]; substances of 4° (c t) other than dichlorodifluoromethane containing 12 per cent ethylene oxide by weight; silane [5° (b)]; and substances of 5° (b t) and (c t), shall be limited to 50 l.

(11) In the case of receptacles intended for chlorine trifluoride [3° (a t)] the capacity shall be limited to 40 l. After filling, a receptacle containing chlorine trifluoride [3° (a t)] shall, before being handed over for carriage, be held back for not less than seven days in order to verify that it is leak-proof.

2220

(1) In the case of receptacles intended for the carriage of liquefied gases of 3° to 6°, and of receptacles intended for the carriage of gases dissolved under pressure of 9°, the hydraulic pressure to be applied in the test (test pressure) shall be not less than 10 kg/cm².

(2) In the case of liquefied gases of 3° and 4° the following values shall be complied with for the hydraulic pressure to be applied to the receptacles in the test (test pressure) and for the maximum degree of filling allowed:*

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Bromochlorodifluoromethane (R 12 B 1)	3° (a)	10	1.61
Chlorodifluoromethane (R 22)	3° (a)	29	1.03
Chloropentafluoroethane (R 115)	3° (a)	25	1.06
1-chloro-2,2,2-trifluoroethane (R 133a)	3° (a)	10	1.18

* See the end of the table in paragraph (2).

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Dichlorodifluoromethane (R 12)	3° (a)	18	1.15
Dichlorofluoromethane (R 21)	3° (a)	10	1.23
1,2-Dichloro-1,1,2,2-tetrafluoroethane (R 114) . . .	3° (a)	10	1.30
Octafluorocyclobutane (RC 318)	3° (a)	11	1.34
Ammonia	3° (a t)	33	0.53
Boron chloride	3° (a t)	10	1.19
Chlorine	3° (a t)	22	1.25
Chlorine trifluoride	3° (a t)	30	1.40
Hexafluoropropylene (R 216)	3° (a t)	22	1.11
Hydrogen bromide	3° (a t)	60	1.20
Methyl bromide	3° (a t)	10	1.51
Nitrogen dioxide	3° (a t)	10	1.30
Nitrosyl chloride	3° (a t)	13	1.10
Phosgene	3° (a t)	20	1.23
Sulphur dioxide	3° (a t)	14	1.23
Sulphuryl fluoride	3° (a t)	50	1.10
Tungsten hexafluoride	3° (a t)	10	2.70
Butane	3° (b)	10	0.51
1-Butene	3° (b)	10	0.53
1-Chloro-1,1-difluoroethane (R 142b)	3° (b)	10	0.99
Cis-2-butene	3° (b)	10	0.55
Cyclopropane	3° (b)	20	0.53
1,1-Difluoroethane (R 152a)	3° (b)	18	0.79
Isobutane	3° (b)	10	0.49
Isobutene	3° (b)	10	0.52
Methylsilane	3° (b)	225	0.39
Propane	3° (b)	25	0.42
Propylene	3° (b)	30	0.43
Trans-2-butene	3° (b)	10	0.54
1,1,1-Trifluoroethane	3° (b)	35	0.75
Arsine	3° (b t)	42	1.10
Dichlorosilane	3° (b t)	10	0.90
Dimethylamine	3° (b t)	10	0.59
Dimethyl ether	3° (b t)	18	0.58
Dimethylsilane	3° (b t)	225	0.39
Ethylamine	3° (b t)	10	0.61
Ethyl chloride	3° (b t)	10	0.80
Hydrogen selenide	3° (b t)	31	1.60
Hydrogen sulphide	3° (b t)	55	0.67
Methylamine	3° (b t)	13	0.58
Methyl chloride	3° (b t)	17	0.81
Methyl mercaptan	3° (b t)	10	0.78
Trimethylamine	3° (b t)	10	0.56
Trimethylsilane	3° (b t)	225	0.39
1,3-Butadiene	3° (c)	10	0.55
Vinyl chloride	3° (c)	12	0.81
Cyanogen	3° (c t)	100	0.70
Cyanogen chloride	3° (c t)	20	1.03
Ethylene oxide	3° (c t)	10	0.78
Methyl vinyl ether	3° (c t)	10	0.67
Trifluorochloroethylene (R 1113)	3° (c t)	19	1.13
Vinyl bromide	3° (c t)	10	1.37
Mixture F 1	4° (a)	12	1.23

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Mixture F 2	4° (a)	18	1.15
Mixture F 3	4° (a)	29	1.03
Mixture of gases R 500	4° (a)	22	1.01
Mixture of gases R 502	4° (a)	31	1.05
Mixture of 19 to 21 per cent by weight dichlorodi- fluoromethane (R 12) and 79 to 81 per cent by weight bromochlorodifluoromethane (R 12 B1)	4° (a)	12	1.50
Mixtures of methyl bromide and chloropicrin	4° (a t)	10	1.51
Mixture A (trade name: butane)	4° (b)	10	0.50
Mixture A 0 (trade name: butane)	4° (b)	15	0.47
Mixture A 1	4° (b)	20	0.46
Mixture B	4° (b)	25	0.43
Mixture C (trade name: propane)	4° (b)	30	0.42
Mixtures of hydrocarbons containing methane	4° (b)	225 300	0.187 0.244
Mixtures of methylsilanes	4° (b t)	225	0.39
Mixtures of methyl chloride and methylene chloride	4° (b t)	17	0.81
Mixtures of methyl chloride and chloropicrin	4° (b t)	17	0.81
Mixtures of methyl bromide and ethylene bro- mide	4° (b t)	10	1.51
Mixtures of methylacetylene/propadiene and hydro- carbons			
Mixture P 1	4° (c)	30	0.49
Mixture P 2	4° (c)	24	0.47
Ethylene oxide containing not more than 10 per cent carbon dioxide by weight	4° (c t)	28	0.73
Ethylene oxide containing not more than 50 per cent methyl formate by weight with nitrogen up to a maximum total pressure of 10 kg/cm ² at 50°C	4° (c t)	25	0.80
Ethylene oxide with nitrogen up to a total pressure of 10 kg/cm ² at 50°C	4° (c t)	15	0.78
Dichlorodifluoromethane containing 12 per cent eth- ylene oxide by weight	4° (c t)	18	1.09

(*) (1) The test pressures prescribed are at least equal to the vapour pressures of the liquids at 70°C, reduced by 1 kg/cm², the minimum test pressure required being however 10 kg/cm².

(2) In view of the high degree of toxicity of phosgene (carbonyl chloride) [3° (a t)] and of cyanogen chloride [3° (c t)], the minimum test pressure for these gases has been fixed at 20 kg/cm².

(3) The maximum values prescribed for the degree of filling in kg/litre have been determined as follows: maximum weight of contents per litre of capacity = 0.95 times the density of the liquid phase at 50°C; in addition, the vapour phase must not disappear below 60°C.

(3) In the case of receptacles intended to contain liquefied gases of 5° and 6° the degree of filling shall be such that the internal pressure at 65°C does not exceed the test pressure of the receptacles. The following values shall be complied with [see also paragraph (4)]:

<i>Description of substance</i>	<i>Item Number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Bromotrifluoromethane (R 13 B 1)	5° (a)	42 120 250	1.13 1.44 1.60
Carbon dioxide	5° (a)	190 250	0.66 0.75
Chlorotrifluoromethane (R 13)	5° (a)	100 120 190 250	0.83 0.90 1.04 1.10
Hexafluoroethane (R 116)	5° (a)	200	1.10
Nitrous oxide N ₂ O	5° (a)	180 225 250	0.68 0.74 0.75
Sulphur hexafluoride	5° (a)	70 140	1.04 1.37
Trifluoromethane (R 23)	5° (a)	190 250	0.87 0.95
Xenon	5° (a)	130	1.24
Hydrogen chloride	5° (a t)	100 120 150 200	0.30 0.56 0.67 0.74
Ethane	5° (b)	95 120 300	0.25 0.29 0.39
Ethylene	5° (b)	225 300	0.34 0.37
Silane	5° (b)	225 250	0.32 0.41
Germane	5° (b t)	250	1.02
Phosphine	5° (b t)	225 250	0.30 0.51
1.1-Difluoroethylene	5° (c)	250	0.77
Vinyl fluoride	5° (c)	250	0.64
Diborane	5° (c t)	250	0.072
<i>Constituents (weight per cent)</i>			
Carbon dioxide containing 1-10 per cent nitrogen, oxygen, air or rare gases by weight	6° (a)	190 1 190 1 - 10 250 1 250 1 - 10	0.64 0.48 0.73 0.59
Mixture of gases R 503	6° (a)	31 42 100	0.11 0.20 0.66
Carbon dioxide containing not more than 35 per cent ethylene oxide by weight	6° (c)	190 250	0.66 0.75
Ethylene oxide containing more than 10 per cent but not more than 50 per cent carbon dioxide by weight	6° (c t)	190 250	0.66 0.75

(4) For substances of 5° other than hydrogen chloride [5° (a t)]; germane and phosphine [5° (b t)]; and diborane [5° (c t)], and for substances of 6°, the use of receptacles tested at a lower pressure than that indicated in paragraph (3) for the substance in question is allowed, but the quantity of substance per receptacle shall not exceed that which at 65°C would produce inside the receptacle a pressure equal to the test pressure. In such a case the permissible maximum load shall be prescribed by the expert approved by the competent authority.

2221

(1) In the case of gases dissolved under pressure, of 9°, the following values shall be complied with for the hydraulic pressure to be applied to the receptacles in the test (test pressure), and for the maximum degree of filling allowed:

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Ammonia dissolved under pressure in water:			
— With more than 35 per cent but not more than 40 per cent ammonia by weight	9° (a t)	10	0.80
— With more than 40 per cent but not more than 50 per cent ammonia by weight	9° (a t)	12	0.77
Dissolved acetylene	9° (c)	60	See under (2)

(2) In the case of dissolved acetylene [9° (c)], once equilibrium has been achieved at 15°C the cylinder-filling pressure shall not exceed the value prescribed by the competent authority for the porous mass, which value shall be engraved on the cylinder. The quantity of solvent and the quantity of acetylene shall likewise correspond to the figures specified in the approval.

3. *Mixed packing*

2222

(1) Substances of this class other than substances of 7° and 8° may be enclosed in the same package with one another if they are contained:

- (a) In metal pressure-receptacles of a volume not exceeding 10 litres;
- (b) In thick-walled glass tubes or glass syphons in accordance with marginals 2205 and 2206, on condition that these fragile receptacles are secured in accordance with the provisions of marginal 2001 (5). The cushioning materials shall be suited to the properties of the contents. Inner packagings shall be placed in an outer packaging in which they shall be effectively kept apart from one another.

(2) Articles of 10° and 11° may be enclosed in the same package with one another under the conditions prescribed in marginal 2210.

(3) In addition, substances packed in accordance with marginals 2205 and 2206 may be enclosed in the same package with one another subject to the following special conditions.

(4) A package which meets the requirements of (1) and (3) shall not weigh more than 100 kg, or more than 75 kg if it contains fragile receptacles.

SPECIAL CONDITIONS				
Item no. or letter	Description of substance	Maximum quantity		Special requirements
		Per receptacle	Per package	
<i>Gases packed in accordance with marginal 2205</i>				
	All gases listed in this marginal	In the quantities prescribed in marginal 2205	6 kg	Chlorine [3° (a t)] shall not be packed together with sul- phur dioxide [3° (a t)]
(a)	Non-inflammable gases			Shall not be packed together with sub- stances of classes 1a, 1b, 1c, 3, 4.2, 5.2 or 7
(a t)	Non-inflammable toxic gases			
(b)	Inflammable gases			Shall not be packed together with sub- stances of classes 1a, 1b, 1c, 3, 4.1, 4.2, 4.3, 5.1, 5.2, 7 or 8
<i>Gases packed in accordance with marginal 2206</i>				
	All gases listed in the marginal except ammonia and cyclopropane			
(a)	Non-inflammable gases			Shall not be packed together with sub- stances of classes 1a, 1b, 1c, 3, 4.2, 5.2 or 7
(a t)	Non-inflammable toxic gases			
		150 g	6 kg	
(b)	Inflammable gases			Shall not be packed together with sub- stances of classes 1a, 1b, 1c, 3, 4.1, 4.2, 4.3, 5.1, 5.2 or 7
(b t)	Inflammable toxic gases			
(c)	Chemically unstable gases			
(c t)	Chemically unstable toxic gases			
3° (a t)	Ammonia	20 g	6 kg	or 7
3° (b)	Cyclopropane			

4. Markings and labels on packages (see appendix A.9)

2223

(1) Every package containing receptacles holding gases of 1° to 9°, 12° or 13° or non-refillable containers of gas under pressure of 11° shall be marked legibly and indelibly with an indication of its contents, with the addition: "CLASS 2". This marking shall be in an official language of the country of departure and also, if that language is not English, French or German, in English, French or German, unless any agreements concluded between the countries concerned in the transport operation provide otherwise.

This provision need not be complied with if the receptacles and their markings are clearly visible.

(2) Packages containing aerosol dispensers of 10° shall be marked with the word "AEROSOL" in clearly legible and indelible characters.

(3) Where a consignment constitutes a full load, the markings referred to in paragraph (1) are not mandatory.

2224 (1) Packages which contain receptacles made of materials liable to shatter, such as glass or certain plastics materials, shall bear a label conforming to model No. 9.

(2) Every package containing gases of 7° (a) or 8° (a) shall bear, on two opposite sides, labels conforming to model No. 8, and if the substances it contains are enclosed in glass receptacles [marginal 2207 (2)(a)] it shall, in addition, bear a label conforming to model No. 9.

2225 Every package containing aerosol dispensers of 10° (b) 2, 10° (b t) 2, 10° (c) or 10° (c t), or non-refillable containers of gas under pressure of 11° (b), 11° (b t), 11° (c) or 11° (c t), shall bear a label conforming to model No. 2A.

B. Particulars in the transport document

2226 (1) The description of the goods in the transport document must be:

- (a) In the case of pure and technically-pure gases of 1°, 3°, 5°, 7° or 9°, of aerosol dispensers of 10°, of non-refillable containers of gas under pressure of 11°: one of the names underlined in marginal 2201;
- (b) In the case of mixtures of gases of 2°, 4°, 6°, 8°, 12° or 13°: "MIXTURE OF GASES". This description must be supplemented by an indication of the composition of the mixture of gases in volume per cent or weight per cent. Constituents below one per cent need not be indicated. In the case of mixtures of gases of 2° (a), 2° (b), 2° (b t), 4° (a), 4° (b), 4° (c), 6° (a), 8° (a) or 8° (b) the descriptions or names customary in the trade which are underlined in marginal 2201 may likewise be used, without indication of the composition.

These descriptions must be underlined in red and followed by particulars of the class, the item number (together with the letter, if any), and the initials "ADR" or "RID" [e.g., 2, 5° (a t), ADR].

(2) In the case of consignments of gases which are listed among the chemically unstable gases, the sender shall certify as follows in the transport document: "THE NECESSARY STEPS HAVE BEEN TAKEN TO SATISFY THE REQUIREMENTS OF ADR MARGINAL 2200 (4)". In the case of consignments of mixtures of gases of 12° or test gases of 13°, the sender shall certify as follows in the transport document: "THE CONDITIONS LAID DOWN IN ADR MARGINAL 2201, 12° OR 13°, HAVE BEEN COMPLIED WITH".

(3) In the case of consignments of chlorine trifluoride [3° (a t)] the sender shall certify as follows in the transport document: "AFTER FILLING WITH CHLORINE TRIFLUORIDE, THE RECEPTACLE HAS BEEN KEPT UNDER OBSERVATION FOR NOT LESS THAN SEVEN DAYS AND ITS LEAKPROOFNESS HAS BEEN VERIFIED".

(4) In the case of tanks containing gases of 7° (a) or 8° (a) other than carbon dioxide and nitrous oxide, the transport document shall bear the following entry: "THE TANK IS IN PERMANENT COMMUNICATION WITH THE ATMOSPHERE".

2227-
2236

C. Empty packagings

2237 (1) Receptacles and tanks of 14° shall be closed in the same manner as though they were full.

(2) The description in the transport document must be: “EMPTY RECEPTACLE (or “EMPTY TANK”), UNCLEARED, 2, 14°, ADR (OR ITEM 14, RID)”. This text must be underlined in red.

D. Transitional provisions

2238 The following transitional provisions shall apply to receptacles for compressed or liquefied gases or gases dissolved under pressure:

- (a) Receptacles already in service shall, subject to the following exceptions, be accepted in international traffic so long as the requirements of the contracting country in which the tests in accordance with marginal 2216 were carried out so permit and as the intervals prescribed in marginals 2216 (3) and 2217 for the periodic inspections are observed;
- (b) In the case of receptacles manufactured under the previous system (permissible stress two-thirds, instead of three-quarters, of the yield stress), no increase in either the test pressure or the filling pressure shall be permitted [see marginal 2211 (1)];
- (c) Transitional measures for tanks: see marginal 211 180;
- (d) Transitional measures for tank-containers: see marginal 212 180.

2239-
2299

Class 3. INFLAMMABLE LIQUIDS

- 2307 (1) The last subparagraph to read as follows:
“Packages containing acrylaldehyde or chloroprene (chlorobutadiene) (1° (a)) or methanol (methyl alcohol) (5°) shall in addition bear a label conforming to model No. 4”.
- (2) Delete.
- (3) and (4) to be renumbered (2) and (3).
- 2316 (3) Read as follows:
“(3) Empty receptacles, uncleaned, of 6° which have contained substances of 1° to 3° and 5° shall bear a label conforming to model No. 2A. Those which have contained acrylaldehyde or chloroprene (chlorobutadiene) (1° (a)) or methanol (methyl alcohol) (5°) shall in addition bear a label conforming to model No. 4”.

Class 4.2. SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION

- 2431 Amend 3° to read:
“3° Zinc alkyls, magnesium alkyls, aluminium alkyls, and halides and hydrides of aluminium alkyls. See also marginal 2431a under (a)”.

Class 6.1. TOXIC SUBSTANCES

- 2601 Amend 3° to read:
“3° Other nitrogenous organic substances, such as: ethyleneimine and propyleneimine containing not more than 0.003 per cent total chlorine, and their

aqueous solutions; normal butyl isocyanate, tertiary butyl isocyanate, isobutyl isocyanate and isopropyl isocyanate.

NOTE. Ethyleneimine and propyleneimine of any other nature are not to be accepted for carriage”.

Amend the end of the Note under 12° (d) to read:

“[see marginal 2201, 4° (b t)]”.

Class 7. RADIOACTIVE SUBSTANCES

2703
schedule 5

Amend paragraph 11 to read:

“11. Carriage in tank-vehicles and tank-containers

“(a) Carriage in tank-vehicles: permitted for liquids or solids other than uranium hexafluoride and substances liable to spontaneous ignition (see appendix A.6, marginal 3660);

(b) Carriage in tank-containers: permitted for liquids or solids, including natural or depleted uranium hexafluoride (see appendix A.6, marginal 3661)”.

2703
schedule 11

Amend paragraph 11 to read:

“11. Carriage in tank-vehicles and tank-containers

— Not applicable”.

Class 8. CORROSIVE SUBSTANCES

2801

Amend the end of Note 2, under 5°, to read:

“[see marginal 2201, 3° (a t) and 5° (a t)]”.

Amend 6° to read:

“6° Hydrogen fluoride (anhydrous hydrofluoric acid) and aqueous solutions of hydrofluoric acid:

(a) Hydrogen fluoride (anhydrous hydrofluoric acid);

(b) Aqueous solutions of hydrofluoric acid containing more than 85 per cent hydrogen fluoride;

(c) Aqueous solutions of hydrofluoric acid containing more than 60 per cent but not more than 85 per cent hydrogen fluoride;

(d) Aqueous solutions of hydrofluoric acid containing not more than 60 per cent hydrogen fluoride.

For (c) and (d), see also marginal 2801a under (a)”.

2801a

Amend the beginning of subparagraph (a) to read:

“(a) Substances of 1° (a) to (d); 2° (b) and (c); 3° (b); 4°; 5°; 6° (c) and (d); 7° to 9°, . . .” [the remainder unchanged] . . .”.

2805

Amend this marginal to read:

“(1) Substances of 6° (c) and (d), 7° and 8° shall be packed:

(a) . . . (existing text);

(b) . . . (existing text);

(c) . . . (existing text).

(2) Substances of 6° (a) and (b) shall be packed in receptacles made of carbon steel of suitable alloy steel. The receptacles must be able to withstand a test pressure of 10 kg/cm². The following kinds of receptacle shall be accepted:

(a) Cylinders with a capacity not exceeding 150 litres;

- (b) Cylindrical receptacles equipped with rolling hoops and having a capacity of not less than 100 litres and not more than 1,000 litres.

At the test pressure, the stress in the metal at the most severely stressed point of the receptacle shall not exceed three-quarters of the yield stress. By "yield stress" is meant the stress at which a permanent elongation of 2‰ (i.e. 0.2 per cent) of the gauge length on the test-piece has been produced. In addition, the material used for the receptacles must have adequate impact strength down to a temperature of -20°C .

The receptacles must be of seamless construction or welded. For welded receptacles, a steel of fully satisfactory weldability must be used. Welded receptacles are to be accepted only on condition that the manufacturer guarantees the workmanship of the welding and that the competent authority of the country of origin has given its approval.

The wall thickness of the receptacles must not be less than 3 mm.

Openings for filling and discharging receptacles shall be fitted with flap valves or needle-valves. Valves (cocks) of other types may however be accepted if they present equivalent guarantees of safety and have been approved in the country of origin. Nevertheless, whatever the type of valve adopted, its system of attachment shall be strong and such that its satisfactory condition can be verified easily before each filling.

Apart from a manhole, which if provided shall be closed by an effective closure, receptacles shall not be equipped with more than two openings, for filling and discharge.

Valves (cocks) shall be protected by caps having vents. Valves placed inside the neck of the receptacles and protected by a screw-threaded plug, and receptacles carried packed in protective cases, shall not require a cap.

Receptacles shall be subjected, under the supervision of an expert approved by the competent authority, to a hydraulic pressure test at an internal pressure of not less than 10 kg/cm^2 before being placed in service, and subsequently to the following periodic tests:

The pressure test shall be repeated every eight years and shall be accompanied by an internal inspection of the receptacles and a check of their equipment. In addition, the resistance of the receptacles to corrosion shall be checked by means of suitable instruments (e.g. by ultrasound), and the condition of the equipment verified, every two years.

Receptacles shall bear in clearly legible and durable characters:

- (a) The name of the substance in full, the name or mark of the maker and the manufacturer's identification number of the receptacle;
- (b) The tare of the receptacle, including fittings other than the protective cap;
- (c) The test pressure, the date (month, year) of the most recent test undergone and the stamp of the expert who carried out the test and inspections;
- (d) The capacity and permissible maximum load of the receptacle.

The permissible maximum weight shall be 0.84 kg per litre of capacity."

2835

Amend the beginning of paragraph (3) to read:

"(3) Uncleaned receptacles which have contained substances of 6° or bromine (14°) . . .".

APPENDICES

Replace the whole of Appendix A.2 by the following:

“APPENDIX A.2

A. PROVISIONS RELATING TO THE NATURE OF ALUMINIUM-ALLOY
RECEPTACLES FOR CERTAIN GASES OF CLASS 2

I. *Quality of the material*

3200

(1) The materials of aluminium-alloy receptacles which are to be accepted for the gases referred to in marginal 2203 (2) (b) shall satisfy the following requirements:

	A	B	C	D
Tensile strength, Rm, in kg/mm ²	5 to 19	20 to 38	20 to 38	35 to 50
Yield stress, Re, in kg/mm ² (permanent set) = 0.2%	1 to 17	6 to 32	14 to 34	21 to 42
Permanent elongation at fracture (l = 5d) in per cent	12 to 40	12 to 30	12 to 30	11 to 16
Bend test (diameter of former d = n.e., where e is the thickness of the test-piece)	n = 5 (Rm ≤ 10) n = 6 (Rm > 10)	n = 6 (Rm ≤ 33) n = 7 (Rm > 33)	n = 6 (Rm ≤ 33) n = 7 (Rm > 33)	n = 7 (Rm ≤ 40) n = 8 (Rm > 40)
Aluminum Association Series Number*	1,000	5,000	6,000	2,000

* See “Aluminum Standards and Data”, fifth edition, January 1976, published by the Aluminum Association, 750 Third Avenue, New York.

The actual properties will depend on the composition of the alloy concerned and on the final treatment of the receptacle, but whatever alloy is used the thickness of the receptacle shall be calculated by the following formula:

$$e = \frac{P \times D}{\frac{200 Re}{1.30} + P},$$

where e = minimum thickness of receptacle wall, in mm

P = test pressure, in kg/cm²

D = nominal external diameter of the receptacle, in mm

Re = guaranteed minimum 0.2-per-cent proof stress, in kg/mm².

In addition, the value of the minimum guaranteed proof stress (Re) introduced into the formula is in no case to be greater than 0.85 times the guaranteed minimum tensile strength (Rm), whatever the type of alloy used.

NOTES. 1. The above characteristics are based on previous experience with the following materials used for receptacles:

- Column A, Aluminium, unalloyed, 99.5 per cent pure;
- Column B, Alloys of aluminium and magnesium;

- Column C, Alloys of aluminium, silicon and magnesium, such as ISO/R209-Al-Si-Mg (Aluminum Association 6351);
- Column D, Alloys of aluminium, copper and magnesium.

2. The permanent elongation at fracture ($l = 5d$) is measured by means of test-pieces of circular section in which the gauge length l is equal to five times the diameter d ; if test-pieces of rectangular section are used the gauge length must be calculated by the formula $l = 5.65 \sqrt{F_0}$, where F_0 is the initial cross-sectional area of the test-piece.

3. (a) The bend test (see diagram) shall be carried out on specimens obtained by cutting into two equal parts of width $3e$, but in no case less than 25 mm, an annular section of a cylinder. The specimens shall not be machined elsewhere than on the edges.

(b) The bend test shall be carried out between a mandrel of diameter (d) and two circular supports separated by a distance of $(d + 3e)$. During the test the inner faces shall be separated by a distance not greater than the diameter of the mandrel.

(c) The specimen shall not exhibit cracks when it has been bent inwards around the mandrel until the inner faces are separated by a distance not greater than the diameter of the mandrel.

(d) The ratio (n) between the diameter of the mandrel and the thickness of the specimen shall conform to the values given in the table.

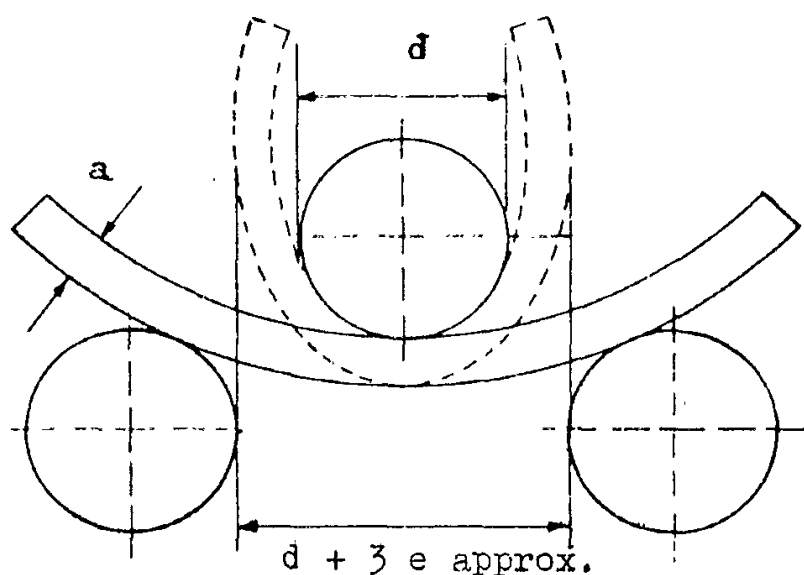


DIAGRAM OF BEND TEST

(2) A lower minimum elongation value is acceptable on condition that an additional test approved by the competent authority of the country in which the receptacles are made proves that safety of carriage is ensured to the same extent as in the case of receptacles constructed to comply with the characteristics given in the table in paragraph (1).

(3) The wall thickness of the receptacles at the thinnest point shall be the following:

- Where the diameter of the receptacle is less than 50 mm: not less than 1.5 mm;
- Where the diameter of the receptacle is from 50 to 150 mm: not less than 2 mm; and
- Where the diameter of the receptacle is more than 150 mm: not less than 3 mm.

(4) The ends of the receptacles shall have a semicircular, elliptical or "basket-handle" section; they shall afford the same degree of safety as the body of the receptacle.

II. *Additional official test for aluminium alloys*

3201

(1) In addition to the tests required by marginals 2215, 2216 and 2217, it is necessary to test for possible intercrystalline corrosion of the inside wall of the receptacle where use is made of an aluminium alloy containing copper, or where use is made of an aluminium alloy containing magnesium and manganese and the magnesium content is greater than 3.5 per cent or the manganese content lower than 0.5 per cent.

(2) In the case of an aluminium/copper alloy the test shall be carried out by the manufacturer at the time of approval of a new alloy by the competent authority; it shall thereafter be repeated, in the course of production, for each pour of the alloy.

(3) In the case of an aluminium/magnesium alloy the test shall be carried out by the manufacturer at the time of approval of a new alloy and of the manufacturing process by the competent authority. The test shall be repeated whenever a change is made in the composition of the alloy or in the manufacturing process.

(4) (a) *Preparation of aluminium/copper alloys.* Before the aluminium/copper alloy is subjected to the corrosion test, the samples shall be cleansed of grease by means of a suitable solvent, and dried.

(b) *Preparation of aluminium/magnesium alloys.* Before the aluminium/magnesium alloy is subjected to the corrosion test, the samples shall be heated for seven days at 100°C; they shall then be cleansed of grease by means of a suitable solvent, and dried.

(c) *Performance of test.* The inner side of a specimen measuring 1,000 mm² (33.3 × 30 mm) of the material containing copper shall be treated at ambient temperature, for 24 hours, with 1,000 ml of an aqueous solution containing 3 per cent NaCl and 0.5 per cent HCl.

(d) *Examination.* After being washed and dried, a section of the specimen 20 mm long shall be examined micrographically at a magnification of 100 to 500 X, preferably after electropolishing.

The depth of attack shall not go beyond the second layer of grains from the surface subjected to the corrosion test; in principle, if the entire first layer of grains is attacked, only part of the second row should be.

In the case of sections, examination shall be performed at right angles to the surface.

Where after electropolishing it is found necessary to render the grain boundaries particularly visible for subsequent examination, this shall be done by a method acceptable to the competent authority.

III. *Protection of the inner surface*

3202 The inner surface of aluminium-alloy receptacles shall be provided with a suitable anti-corrosion coating if the competent testing stations so consider necessary.

3203-
3249

B. REQUIREMENTS CONCERNING THE MATERIALS AND CONSTRUCTION OF RECEPTACLES, OF FIXED TANKS, OF DEMOUNTABLE TANKS, AND OF SHELLS OF TANK-CONTAINERS, INTENDED FOR THE CARRIAGE OF DEEPLY-REFRIGERATED LIQUEFIED GASES OF CLASS 2

3250 (1) Receptacles, tanks and shells shall be made of steel, aluminium, aluminium alloy, copper, or copper alloy, e.g. brass. However, receptacles, tanks and shells made of copper or copper alloy shall be accepted only for gases containing no acetylene; ethylene may however contain not more than 0.005 per cent acetylene.

(2) Only materials appropriate to the lowest working temperature of the receptacles, tanks and shells, and of their fittings and accessories, may be used.

3251 The following materials shall be accepted for the manufacture of receptacles, tanks and shells:

(a) Steels not subject to brittle fracture at the lowest working temperature (see marginal 3265); the following may be used:

1. Fine-grained unalloyed steels, down to a temperature of -60°C ;
2. Nickel steels (with a nickel content of 0.5 to 9 per cent), down to a temperature of -196°C , depending on the nickel content;
3. Austenitic chrome-nickel steels, down to a temperature of -270°C ;

(b) Aluminium not less than 99.5 per cent pure, or aluminium alloys (see marginal 3266);

(c) Deoxidized copper not less than 99.9 per cent pure, or copper alloys having a copper content of over 56 per cent (see marginal 3267).

3252 (1) Receptacles, tanks and shells shall be either seamless or welded.

(2) Receptacles under marginal 2207 made of austenitic steel, of copper or of copper alloy may alternatively be hard-soldered.

3253 The fittings and accessories may either be screwed to the receptacles, tanks and shells or be affixed thereto as follows:

(a) Receptacles, tanks and shells made of steel, of aluminium or of aluminium alloy: by welding;

(b) Receptacles, tanks and shells made of austenitic steel, of copper or of copper alloy: by welding or hard-soldering.

3254

The construction of receptacles, tanks and shells and their mode of affixing to the vehicle, to the underframe or in the container frame shall be such as to preclude with certainty any such reduction in the temperature of the load-bearing components as would be likely to render them brittle. The fastenings of the receptacles, tanks and shells shall themselves be so designed that even when the receptacle, tank or shell is at its lowest working temperature they still possess the necessary mechanical properties.

3255-
3264

1. *Materials, receptacles, tanks and shells*

(a) *Steel receptacles, tanks and shells*

3265

The materials used for the manufacture of receptacles, tanks and shells, and the weld beads, shall at their lowest working temperature meet at least the following requirements as to impact strength.

The tests may be conducted with test-pieces having either a U-shaped or a V-shaped notch.

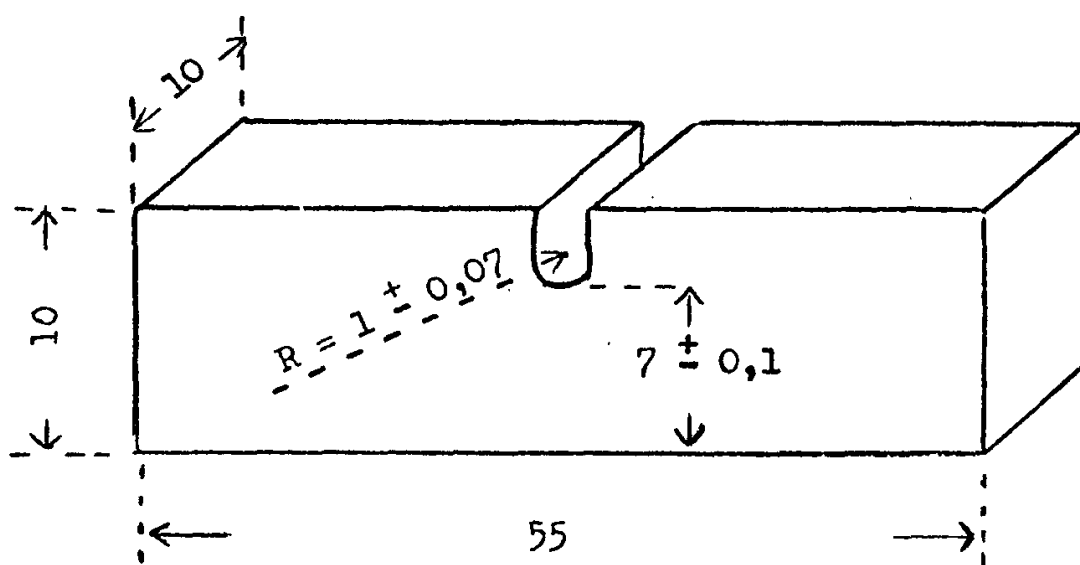
Material	Impact strength ^{1,2} of sheet metal and weld beads at lowest working temperature	
	(kgf/cm ²) ⁽³⁾	(kgf/cm ²) ⁽⁴⁾
Unalloyed killed steel	3.5	2.8
Ferritic alloy steel, Ni < 5%	3.5	2.2
Ferritic alloy steel, 5% ≤ Ni ≤ 9%	4.5	3.5
Austenitic Cr-Ni steel	4.0	3.2

(1) Impact strengths determined with different test-pieces are not mutually comparable.

(2) See marginals 3275 to 3277.

(3) The values relate to test-pieces with a U-shaped notch as illustrated below.

(4) The values relate to test-pieces with a V-shaped notch conforming to ISO R 148.



In the case of austenitic steels, only the weld bead need be subjected to an impact-strength test.

For working temperatures below -196°C , the impact-strength test is not performed at the lowest working temperature, but at -196°C .

(b) *Receptacles, tanks and shells made of aluminium or aluminium alloy*

3266

The seams of receptacles, tanks and shells shall at ambient temperature meet the following requirements as to bending coefficient:

Thickness of sheet <i>e</i> in mm	Bending coefficient k^1 for the seam	
	Root in compression zone	Root in tension zone
≤ 12	≥ 15	≥ 12
> 12 to 20	≥ 12	≥ 10
> 20	≥ 9	≥ 8

¹ See marginal 3285.

(c) *Receptacles, tanks and shells made of copper or copper alloy*

3267

It is not necessary to carry out tests to determine whether the impact strength is adequate.

3268-
3274

2. Tests

(a) *Impact-strength tests*

3275

The impact strengths shown in marginal 3265 relate to test-pieces measuring 10×10 mm and having a U-shaped or a V-shaped notch.

NOTES. 1. With regard to the shape of the test-piece, see marginal 3265 (table), footnotes 3 and 4.

2. For sheets less than 10 mm but not less than 5 mm thick, test-pieces having a cross-section of $10 \times e$ mm, where "e" represents the thickness of the sheet, shall be used. Such impact-strength tests generally yield higher values than do such tests on standard test-pieces.

3. No impact-strength test shall be carried out on sheets less than 5 mm thick, or on their seams.

3276

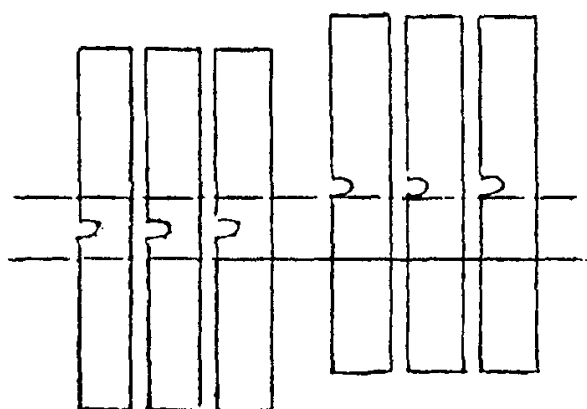
(1) For testing sheet metal the impact strength shall be determined on three test-pieces. The test-pieces shall be removed at right angles to the direction of rolling in the case of test-pieces with a U-shaped notch and in the direction of rolling in the case of test-pieces with a V-shaped notch.

(2) For testing seams the test-pieces shall be taken as follows:

$e \leq 10$

— Three test-pieces from the centre of the weld;

- Three test-pieces from the zone of deformation created by the weld (the notch shall be completely outside the melted area but as near to it as possible);

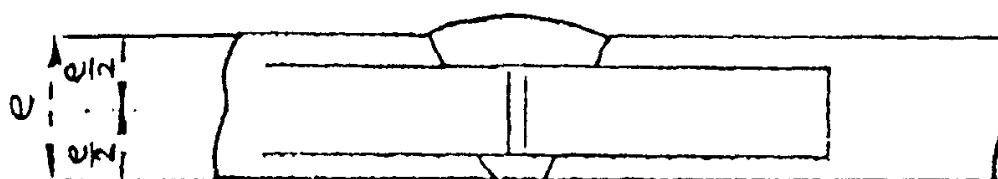
CENTRE
OF WELDZONE
OF DEFORMATION

- i.e. six test-pieces in all.

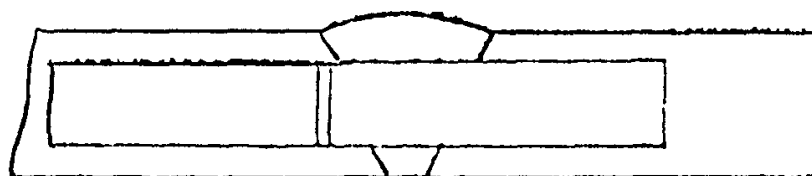
The test-pieces shall be so machined as to have the maximum possible thickness.

$$10 < e \leq 20$$

- Three test-pieces from the centre of the weld;
- Three test-pieces from the zone of deformation;



CENTRE OF WELD

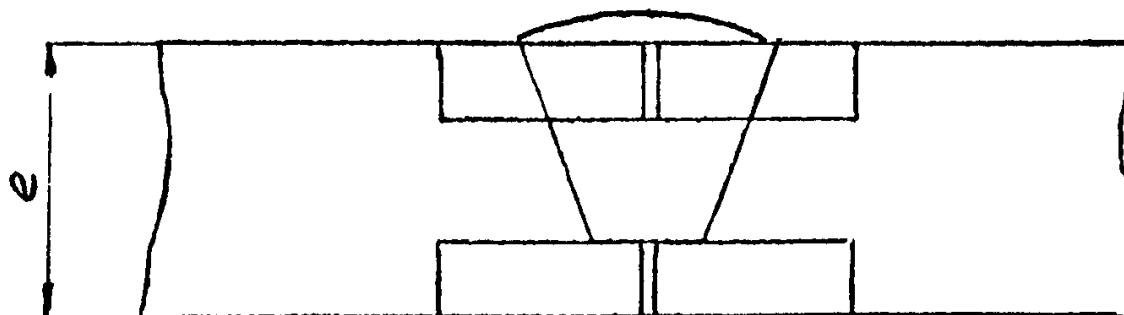


ZONE OF DEFORMATION

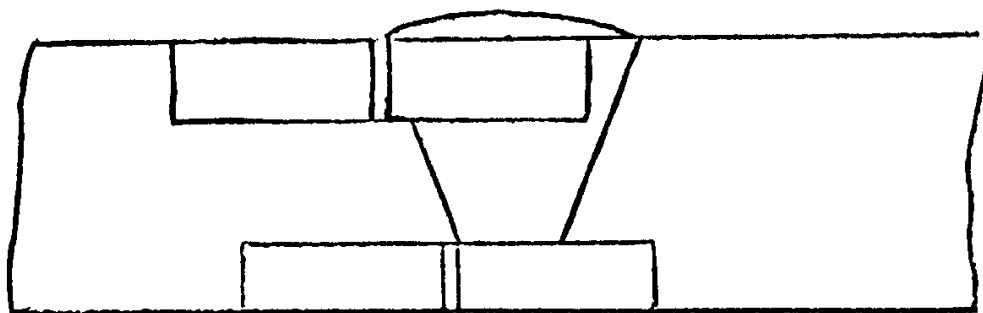
- i.e. six test-pieces in all.

$$e > 20$$

- Two sets of three test-pieces (one set on the upper face, one set on the lower face) at each of the points indicated below:



CENTRE OF WELD



ZONE OF DEFORMATION

- i.e. twelve test-pieces in all.

3277

(1) For sheet metal the average of three tests shall meet the minimum values given in marginal 3265; none of the values may be more than 30 per cent below the minimum specified.

(2) For welds the average values obtained from the three test-pieces taken at the different points, centre of weld and zone of deformation, shall correspond to the minimum values shown. None of the values may be more than 30 per cent below the minimum specified.

3278-
3284

(b) *Determination of bending coefficient*

3285

(1) The bending coefficient k referred to in marginal 3266 is defined as follows:

$$k = 50 \frac{e}{r},$$

where e = thickness of sheet in mm

r = mean radius of curvature in mm of the test-piece when the first crack appears in the tension zone.

(2) The bending coefficient k shall be determined for the seam. The width of the test piece shall be equal to $3e$.

(3) Four tests shall be performed on the seam, two with the root in the compression zone (figure 1) and two with the root in the tension zone (figure 2); all values obtained shall meet the minimum value requirements of marginal 3266.

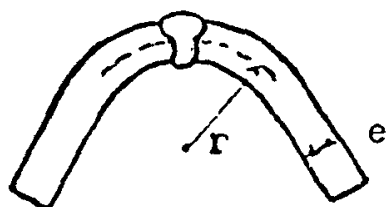


FIGURE 1

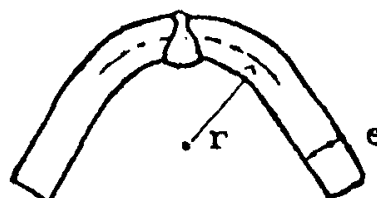


FIGURE 2

3286-
3290

C. PROVISIONS RELATING TO TESTS ON AEROSOL DISPENSERS AND NON-REFILLABLE CONTAINERS FOR GASES UNDER PRESSURE OF CLASS 2, 10° AND 11°

1. *Pressure and bursting tests on receptacle model*

3291 Hydraulic pressure tests shall be carried out on at least five empty receptacles of each model:

- (a) Until the prescribed test pressure is reached, by which time no leakage or visible permanent deformation shall have occurred; and
- (b) Until leakage or bursting occurs; the dished end, if any, should yield first and the receptacle should not leak or burst until a pressure 1.2 times the test pressure has been reached or passed.

2. *Tightness (leakproofness) tests on all receptacles*

3292 (1) For the test on aerosol dispensers (10°) and non-refillable containers for gas under pressure (11°) in a hot-water bath, the temperature of the bath and the duration of the test shall be such that the internal pressure of each receptacle reaches at least 90 per cent of the internal pressure that would be reached at 55°C.

However, if the contents are sensitive to heat or if the receptacles are made of a plastics material which softens at this test temperature, the temperature of the bath shall be from 20° to 30°C; in addition, one dispenser out of every 2,000 shall be tested at the temperature prescribed in the foregoing paragraph.

(2) No leakage or permanent deformation of receptacles shall occur. The provision concerning permanent deformation is not applicable to receptacles which, being made of a plastics material, soften''.

3293-
3299

APPENDIX A.6

REGULATIONS RELATING TO RADIOACTIVE SUBSTANCES OF CLASS 7

3660 Replace the existing text by:

“Low-specific-activity substances, LSA (I), of marginal 2703, schedule 5, other than uranium hexafluoride and substances liable to spontaneous ignition, may be carried in tank-vehicles in accordance with the requirements of appendix B.1a”.

3661

Read:

“Low specific-activity substances, LSA (I), of marginal 2703, schedule 5, including natural or depleted uranium hexafluoride, may be carried in tank-containers in accordance with the requirements of appendix B.1*b*”.

APPENDIX A.9

2. *Explanation of symbols*

3902

At the beginning of the second line, replace “5.2” by “8”.

Amend the left-hand column as follows:

- No. 2A, add “2316(3)”;
- No. 4, replace “2307(2)” by “2307(1)”.

A N N E X B

PROVISIONS CONCERNING TRANSPORT EQUIPMENT
AND TRANSPORT OPERATIONS

Contents

Amend the last section of the list of contents to read:

“Appendices

Provisions common to the B.1 appendices	200 000 - 211 099
Appendix B.1 <i>a</i> . Provisions concerning fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles	211 100 - 212 099
Appendix B.1 <i>b</i> . Provisions concerning tank-containers	212 100 - 213 099
Appendix B.1 <i>c</i> . Provisions concerning fixed tanks and demountable tanks in reinforced plastics	213 100 - 213 999
Appendix B.1 <i>d</i> . Requirements concerning the mate- rials and construction of receptacles, of fixed tanks, of demountable tanks, and of shells of tank-containers, intended for the carriage of deeply-refrigerated liq- uefied gases of class 2	214 000 - 219 999
Appendix B.2. Electrical equipment	220 000 - 229 999”
(the remainder unchanged)	

Plan of the annex

10 000 (1) *c*)

Amend the beginning of the subparagraph to read:

“(c) Appendices as follows:

- Appendix B.1*a* concerning fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles;
- Appendix B.1*b* concerning tank-containers;
- Appendix B.1*c* concerning fixed tanks and demountable tanks in reinforced plastics;
- Appendix B.1*d* relating to requirements concerning the materials and construction of receptacles, of fixed tanks, of demountable tanks, and of shells of tank-containers, intended for the carriage of deeply-refrigerated liquefied gases of Class 2;

- Appendix B.2 concerning electrical equipment;”
(The remainder unchanged.)

10 100 (2) b) 2.

Against “class 2”, read

- Cyanogen chloride of 3° (a t) : 5 Kg;
- Phosgene (carbonyl chloride) of 3° (c t) : 25 Kg;
- Fluorine of 1° (a t) : 50 Kg.”

Chapter I. *General provisions applicable to the carriage
of dangerous substances of all classes*

10 102 (1) Amend the following two items to read as follows:

“The term ‘tank’, when used alone, means a tank-container or a tank of a capacity exceeding 1 m³ which may be a fixed tank, a demountable tank or a battery of receptacles. (See, however, a limitation of the meaning of the word ‘tank’ in the provisions common to the B.1 appendices, marginal 200 000 (2));”, and

The term ‘tank-vehicle’ means a vehicle built to carry liquids, gases, or powdery or granular substances and comprising one or more fixed tanks;”.

10 121 (1) Add at the end of the paragraph:

“See marginal 10 500 for the marking and labelling of vehicles.”.

10 127 (1) Read the last part as follows:

“... will be found in appendix B.1a and, so far as the design of fixed tanks, demountable tanks and batteries of receptacles intended for the carriage of deeply-refrigerated liquefied gases of class 2 is concerned, in appendix B.1d (for the approval of tank-vehicles, see marginal 10 182)”.

(2) Add the following after the words “... in appendix B.1b”:

“and, so far as the construction of tank-containers intended for the carriage of deeply-refrigerated liquefied gases of class 2 is concerned, in appendix B.1d”.

(3) Read:

“(3) The provisions concerning the construction of fixed tanks and demountable tanks in reinforced plastics are to be found in appendix B.1c”.

(4) Read:

“(4) The provisions common to the B.1 appendices are to be found in marginal 200 000”.

(5) Read:

“(5) For receptacles, see annex A”.

10 182 (4) Read the last part as follows:

“... at intervals shorter than those laid down in appendices B.1a and B.1c”.

10 200-
10 215

10 216 “*Rear protection for vehicles carrying fixed tanks, demountable tanks or batteries of receptacles*

A bumper sufficiently resistant to rear impacts shall be fitted over the full width of the tank at the rear of the vehicle. There shall be a clearance of at least 100 mm between the rear wall of the tank and the rear of the bumper, this clearance being measured from the rearmost point of the tank wall or from projecting fittings or accessories in contact with the liquid being carried”.

10 217-

10 239

10 500

Read the heading:

“Marking and labelling of vehicles”.

10 500 (6)

Read the beginning of the paragraph:

“(6) The foregoing requirements are also applicable to empty tanks, uncleaned and not degassed. . . .”

[The remainder unchanged.]

(7)

Add a new paragraph:

“(7) Tank-vehicles shall also bear on both sides and at the rear the labels prescribed in section 5 of each class”.

Chapter II. *Special provisions applicable to the carriage
of dangerous substances of classes 1 to 8*

Replace the whole of the provisions concerning class 2 by the following:

“Class 2. GASES: COMPRESSED, LIQUEFIED OR DISSOLVED UNDER PRESSURE

Section 1. GENERAL

21 000-

21 117

21 118

Carriage in containers

The carriage in small containers of packages containing gases of 7° (a) and 8° (a) is prohibited.

21 119-

21 120

21 121

Carriage in tanks

(1) Gases of class 2 other than those listed below may be carried in fixed tanks, in demountable tanks, or in batteries of receptacles: fluorine and silicon tetrafluoride [1° (a t)]; nitric oxide [1° (c t)]; mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume [2° (b t)]; mixtures of hydrogen with not more than 10 per cent diborane by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume [2° (c t)]; boron chloride, chlorine trifluoride, nitrosyl chloride, sulphuryl fluoride and tungsten hexafluoride [3° (a t)]; methylsilane [3° (b)]; arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane [3° (b t)]; cyanogen, cyanogen chloride and ethylene oxide [3° (c t)]; mixtures of methylsilanes [4° (b t)]; ethylene oxide containing not more than 50 per cent methyl formate by weight [4° (c t)]; silane [5° (b)]; substances of 5° (b t) and (c t); dissolved acetylene [9° (c)]; and gases of 12° and 13°.

(2) Gases of class 2 other than those listed below may be carried in tank-containers: fluorine and silicon tetrafluoride [1° (a t)]; mixtures of hydrogen with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by volume or with not more than 15 per cent arsine by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent hydrogen selenide or phosphine or silane or germane by

volume or with not more than 15 per cent arsine by volume [2° (b t)]; mixtures of hydrogen with not more than 10 per cent diborane by volume; mixtures of nitrogen or rare gases (containing not more than 10 per cent xenon by volume) with not more than 10 per cent diborane by volume [2° (c t)]; boron chloride, chlorine trifluoride, nitrosyl chloride, sulphuryl fluoride and tungsten hexafluoride [3° (a t)]; methylsilane [3° (b)]; arsine, dichlorosilane, dimethylsilane, hydrogen selenide and trimethylsilane [3° (b t)]; cyanogen, cyanogen chloride and ethylene oxide [3° (c t)]; mixtures of methylsilanes [4° (b t)]; ethylene oxide containing not more than 50 per cent methyl formate by weight [4° (c t)]; silane [5° (b)], and the gases of 12° and 13°. However, chlorine and phosgene [3° (a t)] shall not be carried in tank-containers of a cubic capacity exceeding 1 m³.

(3) Tank-containers containing substances of 1° (b); 2° (b); 3° (b); chloroethane (ethyl chloride) or dimethyl ether of 3° (b t); substances of 3° (c); vinyl bromide or methyl vinyl ether of 3° (c t); or substances of 4° (b), 4° (c), 5° (b), 5° (c), 6° (c), 7° (b) or 8° (b) shall bear on both their sides a label conforming to model No. 2A.

Tank-containers containing oxygen of 1° (a); boron trifluoride of 1° (a t); mixtures containing more than 20 per cent oxygen by volume, of 2° (a); nitrous oxide of 5° (a); nitrous oxide or oxygen of 7° (a); or liquid air or mixtures containing more than 20 per cent oxygen by weight, of 8° (a), shall bear on both their sides a label conforming to model No. 3.

Tank-containers containing ammonia, bromomethane, chlorine or sulphur dioxide, of 3° (a t), or ethylene oxide containing not more than 10 per cent by weight carbon dioxide, of 4° (c t), shall bear on both their sides a label conforming to model No. 4.

Tank-containers containing gases of 1° (b t) or 2° (b t), or dimethylamine, ethylamine, hydrogen sulphide, methylamine, methyl chloride, methyl mercaptan, or trimethylamine, of 3° (b t), shall bear on both their sides labels conforming to models Nos. 2A and 4.

Tank-containers containing nitrogen dioxide or phosgene of 3° (a t) shall bear on both their sides labels conforming to models Nos. 3 and 4.

Tank-containers containing hydrogen bromide of 3° (a t) or hydrogen chloride of 5° (a t) shall bear on both their sides labels conforming to models Nos. 4 and 5.

21 122-

21 127

21 128

Empty tanks

(1) For empty fixed tanks, empty batteries of receptacles and empty demountable tanks, see annex A, marginal 2201, 14°, Note 1.

(2) For tank-containers, see marginal 212 177.

21 129-

21 170

21 171

Crews of vehicles; supervision

The provisions of marginal 10 171 (2) shall apply only to the dangerous goods listed below in quantities exceeding the weights indicated:

- Boron trifluoride and fluorine [1° (a t)]; the substances of 3° (a t); of 3° (b t) other than dimethyl ether and ethyl chloride; and of 3° (c t); hydrogen chloride of 5° (a t); and the deeply-refrigerated liquefied gases of 7° (a) and 8° (a): 1,000 kg

- The substances of 3° (b); dimethyl ether and ethyl chloride of 3° (b t); vinyl chloride of 3° (c); the substances of 4° (b); and the inflammable liquefied gases of 7° (b) and 8° (b): 10,000 kg

21 172-
21 199

Section 2. SPECIAL REQUIREMENTS TO BE FULFILLED BY VEHICLES AND THEIR EQUIPMENT

21 200-
21 211

21 212 *Ventilation*

If packages containing gases of 1° to 6° and 9° (c) are carried in a closed vehicle, the vehicle shall be provided with adequate ventilation.

21 213-
21 230

21 231 *Engine and exhaust system*
(new)

The engine of a vehicle carrying a gas of Class 2 in a fixed tank, in a demountable tank or in a battery of receptacles, and where appropriate the engine driving the decanting pump, shall be so equipped and placed, and the exhaust pipes so directed or protected, as to avoid any danger to the load through heating or ignition.

21 232-
21 239

21 240 *Fire-fighting appliances*

The provisions of marginal 10 240 (1) (b) and (3) shall not apply to carriage other than that of inflammable gases or articles listed in marginal 220 002, or of empty packagings of 10° which have contained such gases.

21 241-
21 250

21 251 *Electrical equipment*

The provisions of appendix B.2 shall not apply to carriage other than that of inflammable gases or articles listed in marginal 220 002, or of empty packagings of 10° which have contained such gases.

21 252-
21 259

21 260 *Special equipment*

When compressed gases or liquefied gases harmful to the respiratory organs or entailing a poison risk and identified by the letter "t" in the list of substances are being carried, the crew of the vehicle shall be provided with gas masks (respirators) of a type appropriate to the gases being carried.

21 261-
21 299

Section 3. GENERAL SERVICE PROVISIONS

21 300-
21 352

21 353 *Portable lighting apparatus*

When inflammable gases or articles listed in marginal 220 002 are being carried, a closed vehicle may not be entered by persons carrying lighting apparatus other than portable lamps so designed and constructed that they cannot ignite any gases which may have penetrated into the interior of the vehicle.

21 354-
21 399*Section 4. SPECIAL PROVISIONS CONCERNING LOADING, UNLOADING, AND HANDLING*21 400 *Method of dispatch and restrictions on forwarding*

Carbon dioxide and nitrous oxide of 7° (a), mixtures containing carbon dioxide and nitrous oxide of 8° (a), and the gases of 7° (b) and 8° (b) may be carried only in fixed tanks, in demountable tanks, in batteries of receptacles or in tank-containers.

21 401-
21 40221 403 *Prohibition of mixed loading on one vehicle*

Articles of class 2 enclosed in packages bearing a label conforming to model No. 2A shall not be loaded together on one vehicle with substances or articles of classes 1a, 1b or 1c enclosed in packages bearing a label or two labels conforming to model No. 1.

21 404-
21 40621 407 *Places of loading and unloading*

(1) The following operations are prohibited:

- (a) Loading or unloading the following substances in a public place in a built-up area without special permission from the competent authorities: hydrogen bromide, chlorine, nitrogen dioxide, sulphur dioxide or phosgene [3° (a t)]; hydrogen sulphide [3° (b t)]; and hydrogen chloride [5° (a t)];
- (b) Loading or unloading the substances listed under (a) above in a public place elsewhere than in a built-up area without prior notice thereof having been given to the competent authorities, unless the said operations are justified for serious reasons of safety.

(2) If for any reason handling operations have to be carried out in a public place, then:

- Substances and articles of different kinds shall be separated according to the labels; and
- Packages fitted with means of handling shall be kept flat while being handled.

21 408-
21 41321 414 *Handling and stowage*

(1) Packages shall not be thrown or subjected to impact.

(2) Receptacles shall be so stowed in the vehicle that they cannot overturn or fall and that the following requirements are met:

(a) The cylinders referred to in marginal 2212 (1) (a) shall be laid parallel to or at right angles to the longitudinal axis of the vehicle; however, those situated near the forward transverse wall shall be laid at right angles to the said axis.

Short cylinders of large diameter (about 30 cm and over) may be stowed longitudinally with their valve-protecting devices directed towards the middle of the vehicle.

Cylinders which are sufficiently stable or are carried in suitable devices effectively preventing them from overturning may be placed upright.

Cylinders which are laid flat shall be so wedged or attached that they cannot shift.

(b) Receptacles containing gases of 7° (a) or 8° (a) shall always be placed in the position for which they were designed and be protected against any possibility of being damaged by other packages.

21 415-
21 499

Section 5. SPECIAL PROVISIONS CONCERNING THE OPERATION OF VEHICLES

21 500

Vehicle signs

(1) The provisions of marginal 10 500, paragraphs (1) and (6), shall apply to the carriage of dangerous substances of class 2. The provisions of paragraphs (2) to (5) shall additionally apply to the carriage of substances listed in appendix B.5.

(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear the following labels on both sides and at the rear:

Air, liquefied..... 3	Isobutane..... 2A
Ammonia, anhydrous..... 4	Isobutylene..... 2A
Butadiene..... 2A	Methane, liquid (refrigerated) ... 2A
Butane..... 2A	Methylamine, anhydrous..... 4
Butylene..... 2A	Methyl bromide..... 4
Chlorine..... 4	Methyl chloride..... 2A + 4
Cyclopropane..... 2A	Methyl vinyl ether..... 2A
Dimethyl ether..... 2A	Natural gas, liquid (refrigerated) 2A
Ethyl chloride..... 2A	Nitrogen dioxide NO ₂ 3 + 4
Ethylene..... 2A	Nitrous oxide N ₂ O..... 3
Ethylene, liquid (refrigerated) ... 2A	Oxygen (refrigerated)..... 3
Hydrocarbons, mixtures of (Mix- tures A, A0, A1, B and C) ... 2A	Phosgene..... 3 + 4
Hydrogen bromide..... 4 + 5	Propylene..... 2A
Hydrogen chloride..... 4 + 5	Trimethylamine, anhydrous..... 2A + 4
	Vinyl chloride..... 2A

21 501-
21 508

21 509

Halts of limited duration for service requirements

In the carriage of dangerous substances of Class 2 other than those of 1°, (a) and (a t); 2° (a); 7° (a); 8° (a); and 10°, halts for service requirements shall so far as possible not be made near inhabited places or places of resort. A halt near such a place may not be prolonged except with the agreement of the competent authorities.

21 510-
21 599

Section 6. TRANSITIONAL PROVISIONS, DEROGATIONS AND PROVISIONS PECULIAR TO CERTAIN COUNTRIES

21 600-
21 609

21 610 *Provisions peculiar to certain countries*

The carriage of dangerous substances of class 2 shall be subject in the territory of the United Kingdom to the regulations in force in that country at the time of carriage.

21 611-
30 999''

Class 3. INFLAMMABLE LIQUIDS

31 128 (2) Replace "212 707" by "212 177".

31 200-
31 215

Insert the new marginals:

"31 216
(new)

Cab

No readily-inflammable material shall be used in the construction of the cabs of vehicles carrying liquids of 1° in fixed tanks or in demountable tanks.

31 217-
31 230

31 231
(new)

Engine and exhaust system

The engine of a vehicle carrying a liquid of 1° in a fixed tank or in a demountable tank shall be so constructed and placed, and the exhaust pipe so directed or protected, as to avoid any danger to the load through heating or ignition.

31 232
(new)

Air-intake piping

In the case of vehicles carrying liquids of 1° in fixed tanks or in demountable tanks, the intake pipe of every petrol engine shall be fitted with a filter capable of serving as a flame-trap.

31 233-
31 234

31 235
(new)

Fuel tank

"The fuel tank supplying the engine of a vehicle carrying a liquid of 1° in a fixed tank or in a demountable tank shall be so placed that it is protected so far as possible against forceful impact and that in the event of leakage of fuel the latter can drain directly to the ground. The fuel tank shall in no circumstances be placed directly above the exhaust pipe. If the tank contains petrol, it shall be equipped with an efficient flame-trap fitting the filler hole or with a device by which the filler hole can be kept hermetically closed".

31 236-
31 250

31 500 (2)

End the existing text as follows:

"... on both sides and at the rear a label conforming to model No. 2A; those containing or (empty tanks, uncleaned) having contained acrylaldehyde (acrolein) or chloroprene (chlorobutadiene) [1° (a)] or methanol (methyl alcohol) (5°) shall in addition bear a label conforming to model No. 4".

Class 4.1. INFLAMMABLE SOLIDS

41 121

Amend to read:

"(1) Sulphur [2°], phosphorus sesquisulphide, phosphorus pentasulphide [8°] and naphthalene [11°] may be carried in fixed tanks or in demountable tanks.

(2) These same substances may also be carried in tank-containers".

41 128 Replace “212 707” by “212 177”.

41 500 (2) Amend the beginning to read:

“(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.

Class 4.2. SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION

42 121 Amend to read:

“(1) White or yellow phosphorus (1°) and newly-quenched charcoal, powdered or granulated, (8°) may be carried in fixed tanks or in demountable tanks.

(2) White or yellow phosphorus (1°), aluminium alkyls, halides and hydrides of aluminium alkyls (3°) and newly-quenched charcoal, powdered or granulated, (8°) may be carried in tank-containers.”.

42 128 (2) Replace “212 707” by “212 177” and “215 704” by “212 474”.

42 500 (2) Amend the beginning to read:

“(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.

Class 4.3. SUBSTANCES WHICH GIVE OFF INFLAMMABLE GASES ON CONTACT WITH WATER

43 121 Amend to read:

“(1) Sodium, potassium, and alloys of sodium or potassium [1° (a)], and trichlorosilane (silicochloroform) (4°), may be carried in fixed tanks or in demountable tanks.

(2) These same substances may also be carried in tank-containers”.

43 128 (2) Replace “212 707” by “212 177”.

43 500 Existing text should be numbered “(1)”.

Amend the beginning to read:

“(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.

Class 5.1. OXIDIZING SUBSTANCES

51 121 Replace the text of paragraph (1) by the following:

“(1) Substances of 1° to 3°; solutions of 4° (also powdery sodium chlorate in the moist or the dry state); and hot aqueous solutions of ammonium nitrate of 6° (a) in a concentration of more than 80 per cent but not more than 93 per cent on condition that:

(a) The pH value, measured in a 10 per cent aqueous solution of the substance carried, is between 5 and 7, and that

(b) The solutions not containing any combustible substance in a quantity greater than 0.2 per cent or any chlorine compound in such quantity that the chlorine content exceeds 0.02 per cent,

may be carried in fixed tanks or in demountable tanks”.

51 128 (2) Replace “212 707” by “212 177”.

Insert the new marginals:

- “51 216
(new) *Cab*
- The following provisions shall apply to the carriage of liquids of 1° in fixed tanks or in demountable tanks:
- (1) Unless the driver's cab is made of fire-proof materials, a metal shield of the same width as the tank shall be fitted at the back of the cab;
 - (2) Any windows in the back of the driver's cab or in the metal shield shall be hermetically closed. They shall be made of fire-resistant safety glass and have fire-proof frames; and
 - (3) There shall be a clear space of not less than 15 cm between the tank and the driver's cab or the shield.
- 51 217
(new) *Vehicle body*
- For the carriage of liquids of 1° in fixed tanks or in demountable tanks, no wood (unless covered with metal or a suitable synthetic material) shall be used in the construction of any part of the vehicle situated to the rear of the shield prescribed in marginal 51 216 (1).
- 51 218-
51 230
- 51 231
(new) *Engine*
- For the carriage of liquids of 1° in fixed tanks or in demountable tanks, the engine and (except where the vehicle is driven by a diesel engine) the fuel tank shall be placed forward of the rear wall of the driver's cab or of the shield, or shall if placed otherwise be specially protected.
- 51 232-
51 259
- 51 260
(new) *Special equipment*
- Vehicles carrying liquids of 1° in fixed tanks or in demountable tanks shall carry on board a tank having a capacity of about 30 litres of water. The water tank shall be placed as securely as possible, and there shall be admixed to the water it contains an anti-freeze preparation which does not attack the skin or the mucous membranes and does not react chemically with the load.
- 51 261-
51 299”
- 51 500 (2) Amend the beginning to read:
- “(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.
- Class 5.2. ORGANIC PEROXIDES*
- 52 121 (1) Amend the beginning to read
- “(1) Substances of 1°, 10°, 14°, 15° and 18° may be carried . . .”.
- 52 128 (2) Replace “212 707” by “212 177”.
- 52 500 (2) Amend the beginning to read:
- “(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.

Class 6.1. TOXIC SUBSTANCES

- 61 121 Replace paragraphs (1) and (2) by the following:
 “(1) The following substances may be carried in fixed tanks or in demountable tanks:
 (a) The highly toxic substances listed by name in 1° (b) to 5°;
 (b) The toxic substances, carried in the liquid state, of 11° (a); 12°, (b) to (e); 13° (b); 14°; 52°; 81° (a); and 82° (a); and substances assimilable to them;
 (c) The other toxic and harmful substances, carried in the liquid state, of 11° to 13°; 21° to 23°; 31°, (b) and (c); 32° (b); 61°; 62°; 81° to 83°; and substances assimilable to them; and
 (d) The powdery or granular toxic and harmful substances of 21° to 23°; 31° (a); 41°; 62°; 71° to 75°; 82° to 84°; and substances assimilable to them”.
- Renumber paragraph (3) as paragraph (2).
- 61 128 (2) Replace “212 707” by “212 177”.
- 61 251 Read:
 “(1) The provisions of appendix B.2, marginal 220 000, shall not apply to the carriage of dangerous substances of class 6.1.
 (2) However, vehicles carrying liquids of 14° in fixed tanks or in demountable tanks shall be fitted with a switch enabling the entire electric circuit to be opened (cut-out switch). The switch shall be situated near the storage batteries. The electrical equipment shall satisfy the provisions of marginal 220 000 (2) (c) 2”.
- 61 500 (3) Amend and supplement as follows:
 “. . . bear on both sides and at the rear a label conforming to model No. 4. Those containing or (empty tanks, uncleaned) having contained acetonitrile, 2-cyanopropan-2-ol (acetone cyanohydrin), allyl chloride or acrylonitrile shall in addition bear a label conforming to model No. 2A.”.

Class 8. CORROSIVE SUBSTANCES

- 81 121 Read paragraphs 1 and 2 as follows:
 “(1) All substances of marginal 2801 or covered by a collective heading may, if their physical state so permits, be carried in fixed tanks or in demountable tanks.
 (2) These same substances may also be carried in tank-containers. However, hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] may not be carried in tank-containers of a cubic capacity exceeding 1m³”.
- 81 128 (2) Replace “212 707” by “212 177”.
- 81 500 (2) Amend the beginning to read:
 “(2) Fixed tanks containing or (empty tanks, uncleaned) having contained substances listed in appendix B.5 shall in addition bear on both sides and at the rear . . .”.

APPENDICES

Replace the provisions common to appendices B.1 and B.1b, and also appendices B.1, B.1a, B.1b and B.1c, by the following:

“PROVISIONS COMMON TO THE B.1 APPENDICES

- 200 000 (1) The scope of application of the various B.1 appendices is as follows:
 (a) Appendix B.1a applies to tanks other than tank-containers;

- (b) Appendix B.1b applies to tank-containers;
- (c) Appendix B.1c applies to tanks, other than batteries of receptacles and tank-containers, made of reinforced plastics;
- (d) For receptacles, see the relevant requirements of annex A (Packages); and
- (e) Appendix B.1d is concerned with the materials and construction of receptacles, of fixed tanks, of demountable tanks, and of shells of tank-containers, intended for the carriage of deeply-refrigerated liquefied gases of class 2.

(2) By derogation from the definition given in marginal 10 102 (1), the term "tank" when used alone in appendix B.1a and appendix B.1c does not cover tank-containers. However, some of the requirements of appendix B.1a may be made applicable to tank-containers by the provisions of annex B and appendix B.1b.

(3) It is recalled that marginal 10 121 (1) prohibits the carriage of dangerous substances in tanks except where such carriage is expressly authorized. The B.1 appendices are therefore confined to provisions applicable to tanks or tank-containers used for transport operations which are expressly allowed."

200 001-
211 099

"APPENDIX B.1a

PROVISIONS CONCERNING FIXED TANKS (TANK-VEHICLES), DEMOUNTABLE TANKS AND BATTERIES OF RECEPTACLES

NOTE. Chapter I sets out the requirements applicable to fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles intended for the carriage of substances of any class. Chapter II contains special requirements supplementing or modifying the requirements of chapter I.

Chapter I. *Requirements applicable to all classes*

Section 1. GENERAL; SCOPE; DEFINITIONS

211 100

These requirements shall apply to fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles used for the carriage of liquid, gaseous, powdery or granular substances.

211 101

(1) In addition to the vehicle proper, or the units of running gear used in its stead, a tank-vehicle comprises one or more shells, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units.

(2) When attached to the carrier vehicle, the demountable tank or battery of receptacles shall meet the requirements prescribed for tank-vehicles.

211 102

In the following requirements:

(1) (a) "Shell" means the tank proper (including the openings and their closures).

(b) "Service equipment of the shell" means the filling, discharge, venting, safety, heating and heat-insulating devices and the measuring instruments.

(c) "Structural equipment" means the reinforcing, fastening, protective and stabilizing members external or internal to the shell.

(2) (a) "Calculation pressure" means a notional pressure which is used to calculate the thickness of the wall of the shell. It is equal to the test pressure except in relation to certain dangerous goods for which a special, higher calculation pressure is laid down. External or internal reinforcing devices shall not be taken into account in this calculation.

(b) "Maximum working pressure" means the highest of the following three pressures:

1. The highest effective pressure allowed in the shell during filling (maximum filling pressure allowed);
2. The highest effective pressure allowed in the shell during discharge (maximum discharge pressure allowed);
3. The effective pressure to which the shell is subjected by its contents (including such extraneous gases as it may contain) at the maximum working temperature.

(c) "Test pressure" means the highest effective pressure applied during the pressure test of the shell.

(d) "Filling pressure" means the highest pressure actually built up in the shell when it is being filled under pressure.

(e) "Discharge pressure" means the highest pressure actually built up in the shell when it is being discharged under pressure.

(3) "Leakage test" or "leakproofness test" means the test which consists in subjecting the shell to an effective internal pressure equal to the maximum working pressure, but not less than 0.2 kg/cm² (gauge pressure), by a procedure approved by the competent authority.

211 103-
211 119

Section 2. CONSTRUCTION

211 120

The materials used shall meet the following requirements:

(1) Shells shall be made of suitable metallic materials which, unless other temperature ranges are prescribed in the various classes, shall be resistant to brittle fracture and to fissurizing corrosion under tensile stress between -20°C and $+50^{\circ}\text{C}$.

(2) For welded shells only materials of faultless weldability and whose adequate impact strength at an ambient temperature of -20°C can be guaranteed, particularly in the welds and the zones adjacent thereto, shall be used.

(3) Welds shall be skilfully made and shall afford the fullest safety.

With regard to the execution and checking of weld beads, see also marginal 211 127 (7).

Shells whose minimum wall thicknesses have been determined in accordance with marginal 211 127 (3) to (6) shall be checked by the methods described in the definition of the weld coefficient 0.8.

(4) The materials of shells, or of their protective linings in contact with the contents, shall not contain substances liable to react dangerously with the contents, to form dangerous compounds, or substantially to weaken the material.

(5) The protective lining shall be so designed that its leakproofness remains unimpaired whatever the deformation liable to occur in normal carriage [211 127 (1)].

(6) If contact between the substance carried and the material used for the construction of the shell entails a progressive decrease in the thickness of the walls, this thickness shall be increased at manufacture by an appropriate amount. This additional thickness to allow for corrosion shall not be taken into consideration in calculating the thickness of the shell walls.

- 211 121 (1) Shells, their attachments and their service and structural equipment shall be designed to withstand without loss of contents (other than quantities of gas escaping through any degassing vents):
- Static and dynamic stresses in normal carriage;
 - Prescribed minimum stresses as defined in marginals 211 125 and 211 127.
- (2) In the case of vehicles in which the shell constitutes a stressed self-supporting member, the shell shall be designed to withstand the stresses thus imposed in addition to stresses from other sources.
- 211 122 The pressure on which the wall thickness of the shell is based shall not be less than the calculation pressure, but the stresses referred to in marginal 211 121 shall also be taken into account.
- 211 123 Unless specially prescribed otherwise in the various Classes, the following particulars shall be taken into account in the design of shells:
- (1) Gravity-discharge shells intended for the carriage of substances having at 50°C a total pressure (i.e. vapour pressure plus partial pressure of inert gases, if any) of not more than 1.1 kg/cm² (absolute) shall be designed to a calculation pressure of twice the static pressure of the substance to be carried, but not less than twice the static pressure of water.
- (2) Pressure-filled or pressure-discharge shells intended for the carriage of substances having at 50°C a total pressure (i.e. vapour pressure plus partial pressure of inert gases, if any) of not more than 1.1 kg/cm² (absolute) shall be designed to a calculation pressure equal to 1.3 times the filling or discharge pressure.
- (3) Shells — whatever their filling or discharge system — intended for the carriage of substances having at 50°C a total pressure (i.e. vapour pressure plus partial pressure of inert gases, if any) of not less than 1.1 and not more than 1.75 kg/cm² (absolute) shall be designed to a calculation pressure of at least 1.5 kg/cm² (gauge pressure), or 1.3 times the filling or discharge pressure, whichever is the higher.
- (4) Shells — whatever their filling or discharge system — intended for the carriage of substances having at 50°C a total pressure (i.e. vapour pressure plus partial pressure of inert gases, if any) of more than 1.75 kg/cm² (absolute) shall be designed to a calculation pressure equal to the higher of the following two pressures:
- 1.5 times the total pressure at 50°C, less 1 kg/cm², subject to a minimum of 4 kg/cm² (gauge);
 - 1.3 times the filling or discharge pressure.
- 211 124 Tanks intended to contain certain dangerous substances shall be provided with special protection which shall be determined for the various Classes.
- 211 125 At the calculation pressure, the stress σ (sigma) at the most severely stressed point of the shell shall not exceed the material-dependent limits prescribed below. Allowance shall be made for any weakening due to the welds. In addition, in choosing the material and determining wall thickness, the maximum and minimum filling and working temperatures should be taken into account.
- (1) For metals and alloys exhibiting a clearly-defined yield point or characterized by a guaranteed conventional yield stress (R_e) (generally 0.2 per cent of

residual elongation and, in the case of austenitic steels, 1 per cent of maximum elongation):

- (a) Where the ratio R_e/R_m is not more than 0.66: (R_e = apparent yield stress, or 0.2 per cent proof stress or 1 per cent proof stress in the case of austenitic steels; R_m = guaranteed minimum tensile strength):

$$\sigma \leq 0.75 R_e$$

- (b) Where the ratio R_e/R_m exceeds 0.66:

$$\sigma \leq 0.5 R_m$$

(2) For metals and alloys exhibiting no clearly-defined apparent yield stress and characterized by a guaranteed minimum tensile strength R_m :

$$\sigma \leq 0.43 R_m$$

- (3) For steel, the elongation at fracture shall be not less than

$$\frac{1,000}{\text{determined tensile strength in kg/mm}^2}$$

but in any case it shall be not less than 16 per cent for fine-grained steels and not less than 20 per cent for other steels. For aluminium alloys the elongation at fracture shall be not less than 12 per cent.*

211 126

Tanks intended for the carriage of liquids having a flash-point of or below 55°C and for the carriage of inflammable gases shall be connected to all parts of the vehicle by equipotential connexion and shall be capable of being electrically earthed. Any metal contact capable of causing electrochemical corrosion shall be avoided.

211 127

Shells and their fastenings shall withstand the stresses specified in paragraph (1), and the wall thicknesses of shells shall be at least as determined in accordance with paragraphs (2) to (6) below.

(1) The shells and their fastenings shall be capable of absorbing, under the maximum permissible load, the following stresses:

- In the direction of travel: twice the total weight;
- At right angles to the direction of travel: the total weight;
- Vertically upwards: the total weight;
- Vertically downwards: twice the total weight.

Under the stresses defined above, the stress at the most severely stressed point of the shell and its fastenings shall not exceed the value σ defined in marginal 211 125.

(2) The thickness of the cylindrical wall of the shell shall be at least equal to that obtained by the following formula:

$$e = \frac{P \times D}{200 \times \sigma \times \lambda} \text{ mm,}$$

where P = calculation pressure in kg/cm²

D = internal diameter of shell in mm

* In the case of sheet metal the axis of the tensile test-piece shall be at right angles to the direction of rolling. The permanent elongation at fracture ($l = 5d$) shall be measured on a test-piece of circular cross-section in which the gauge length l is equal to five times the diameter d ; if test-pieces of rectangular section are used, the gauge length shall be calculated by the formula $l = 5.65 \sqrt{F_0}$, where F_0 is the initial cross-sectional area of the test piece.

σ = permissible stress, as defined in marginal 211 125 (1), (a) and (b), and (2), in kg/mm²

λ = a coefficient, not exceeding 1, allowing for any weakening due to welds.

The thickness shall in no case be less than that defined in paragraphs (3) to (6) below.

(3) The walls and ends of shells of circular cross-section not more than 1.80 m in diameter,* other than those referred to in paragraph (6), shall not be less than 5 mm thick if of mild steel,** or of equivalent thickness if of another metal. If the diameter exceeds 1.80 m,* this thickness shall be increased to 6 mm if the shell is of mild steel,** or to an equivalent thickness if the shell is of other metal. "Equivalent thickness" means the thickness obtained by the following formula:

$$e_1 = \frac{10 \times e_0}{\sqrt[3]{Rm_1 \times A_1}}^{***}$$

(4) Where protection of the shell against damage through lateral impact or overturning is provided, the competent authority may allow the aforesaid minimum thicknesses to be reduced in proportion to the protection provided; however, the said thicknesses shall not be less than 3 mm in the case of mild steel,** or than an equivalent thickness in the case of other materials, for shells not more than 1.80 m in diameter.* For shells with a diameter exceeding 1.80 m* the aforesaid minimum thickness shall be increased to 4 mm in the case of mild steel* and to an equivalent thickness in the case of other metal. "Equivalent thickness" means the thickness obtained by the following formula:

$$e_1 = \frac{10 \times e_0}{\sqrt[3]{Rm_1 \times A_1}}^{***}$$

NOTE: The following measures or equivalent measures may be adopted to protect the shell against damage:

(a) The shell may be provided on both sides, at a height situated between its centreline and its lower half, with protection against lateral impact consisting of a rolled metal girder extending at least 25 mm beyond the extreme outer edge

* For shells not of circular cross-section, for example box-shaped or elliptical shells, the indicated diameters shall correspond to those calculated on the basis of a circular cross-section of the same area. For such shapes of cross-section the radius of convexity of the shell wall shall not exceed 2,000 mm at the sides or 3,000 mm at the top and bottom.

** "Mild steel" means a steel having a minimum breaking strength between 37 and 44 kg/mm².

*** This formula is derived from the general formula

$$e_1 = e_0 \sqrt[3]{\frac{Rm_0 \times A_0}{Rm_1 \times A_1}},$$

where $Rm_0 = 37$;

$A_0 = 27$ for the mild steel of reference;

Rm_1 = minimum tensile strength of the metal chosen, in kg/mm²; and

A_1 = minimum elongation of the metal chosen on fracture under tensile stress, in per cent.

of the shell. This girder shall be of such cross-section that if it is of mild steel* or a stronger material it has a section modulus of at least 5 cm³, the force being directed horizontally and at right angles to the direction of travel. If weaker materials are used, the section modulus shall be increased proportionately to the limits of elongation. Protection against overturning may take the form of strengthening rings, protective canopies, or transverse or longitudinal members so shaped that in the event of overturning no damage is caused to the fittings and accessories mounted on the upper part of the shell.

(b) There is also protection:

1. Where shells are made with double walls, the space between the latter being evacuated of air. The aggregate thickness of the outer metal wall and the shell wall shall correspond to the minimum wall thickness prescribed in paragraph (3), and the minimum thickness of the wall of the shell itself shall not be less than the minimum thickness prescribed in paragraph (4);
2. Where the shells are made with double walls with an intermediate layer of solid materials at least 50 mm thick, the outer wall having a thickness of at least 0.5 mm if it is made of mild steel* and at least 2 mm if it is made of a plastics material reinforced with glass fibre. Solid foam (with an impact-absorption capacity like that, for example, of polyurethane foam of about 400 kg/m³ density) may be used as the intermediate layer of solid material.

(5) The thickness of tank shells designed in accordance with marginal 211 123 (1) which either are of not more than 5,000 litres capacity or are divided into leak-proof compartments of not more than 5,000 litres unit capacity may be adjusted to a level which, unless prescribed otherwise in the various classes, shall however not be less than the appropriate value shown in the following table:

<i>Maximum radius of curvature of shell (m)</i>	<i>Capacity of shell or shell compartment (m³)</i>	<i>Minimum thickness (mm) Mild steel</i>
≤ 2	≤ 5.0	3
2 - 3	≤ 3.5	3
	> 3.5 but ≤ 5.0	4

Where a metal other than mild steel is used, the thickness shall be determined by the equivalence formula given in paragraph (3).

The thickness of the partitions and surge-plates shall in no case be less than that of the shell.

([6])¹ Surge-plates and partitions shall be dished, with a depth of dish of not less than 10 cm, or shall be corrugated, profiled or otherwise reinforced to give equivalent strength. The area of the surge-plate shall be at least 70 per cent of the cross-sectional area of the tank in which the surge-plate is fitted.

([7]) The manufacturer's qualification for performing welding operations shall be one recognized by the competent authority. Welding shall be performed

* "Mild steel" means a steel having a minimum breaking strength between 37 and 44 kg/mm².

¹ Following discussions which took place at Geneva during the annual session of the Group of Experts on the Transport of Dangerous Goods in May 1978, it was decided to correct an error of presentation in the text by creating a paragraph (6) by inserting after the first sentence of the last sub-paragraph of paragraph (5) the figure "(6)" and to renumber accordingly paragraph (6) as paragraph (7).

by skilled welders using a welding process whose effectiveness (including any heat treatments required) has been demonstrated by test. Non-destructive tests shall be carried out by radiography or by ultrasound and must confirm that the quality of the welding is appropriate to the stresses.

In determining the thickness of the shell walls in accordance with paragraph (2), the following values of the coefficient λ should be adopted for the welds:

- 0.8 : where the weld beads are so far as possible inspected visually on both faces and are subjected to a non-destructive spot check with particular attention to connexions;
- 0.9 : where all longitudinal beads throughout their length, all connexions, 25 per cent of circular beads, and welds for the assembly of large-diameter items of equipment are subjected to non-destructive checks. Beads shall be checked visually on both sides as far as possible;
- 1.0 : where all beads are subjected to non-destructive checks and are so far as possible inspected visually on both sides. A weld test-piece shall be removed.

Where the competent authority has doubts regarding the quality of weld beads, it may require additional checks.

(8) Measures shall be taken to protect shells against the risk of deformation as a result of a negative internal pressure.

(9) The thermal insulation shall be so designed as not to hinder access to, or the operation of, filling and discharge devices and safety valves.

Stability

- 211 128 The overall width of the ground-level bearing surface (distance between the outer points of contact with the ground of the right-hand tyre and the left-hand tyre of the same axle) shall be at least equal to 90 per cent of the height of the centre of gravity of the laden tank-vehicle. In an articulated vehicle the weight on the axles of the load-carrying unit of the laden semi-trailer shall not exceed 60 per cent of the nominal total laden weight of the complete articulated vehicle.

211 129

Section 3. ITEMS OF EQUIPMENT

- 211 130 The items of equipment, wherever situated, shall be so arranged as to be protected against the risk of being wrenched off or damaged during carriage or handling. They shall possess a degree of safety adapted to and comparable to that of the shells themselves, and shall in particular:

- Be compatible with the substances carried; and
- Meet the requirements of marginal 211 121.

As many operating parts as possible shall be served by the smallest possible number of apertures in the shell wall.

The leakproofness of the items of equipment shall be ensured even in the event of overturning of the vehicle.

Gaskets shall be made of a material compatible with the substance carried and shall be replaced as soon as their effectiveness is impaired, for example as a result of aging.

Gaskets ensuring the leakproofness of operating parts needing to be manipulated during normal use of the vehicle shall be so designed and arranged that manipulation of the operating part in which they are incorporated does not damage them.

- 211 131 Every bottom-discharge shell, and in the case of compartmented bottom-discharge shells every compartment, shall be equipped with two mutually independent shut-off devices mounted in series, the first taking the form of an internal stop-valve* mounted, with its seating, inside the shell and the second that of a sluice-valve or other equivalent device, at each end of the discharge pipe-socket. The internal stop-valve shall be operable from above or from below. If possible, the setting — open or closed — of the internal stop-valve shall be capable of being verified from the ground in both cases. The controls of the internal stop-valve shall be so designed as to prevent any inadvertent opening through impact or unconsidered action. The internal shut-off device must continue to be effective in the event of damage to the external control.
- The position and/or direction of closure of the sluice-valves must be clearly apparent.
- In order to avoid any loss of contents in the event of damage to the external filling and discharge fittings (pipes, lateral shut-off devices), the internal stop-valve and its seating shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to withstand them. The filling and discharge devices (including flanges or threaded plugs) and protective caps (if any) shall be capable of being secured against any inadvertent opening.
- The shell or each of its compartments shall be provided with an opening large enough to permit inspection.
- 211 132 Shells intended for the carriage of substances all the openings for which are above the surface level of the liquid may be equipped, in the lower part of the body, with a cleaning aperture (fist-hole). This aperture must be capable of being sealed by a flange so closed as to be leakproof and whose design must be approved by the competent authority or by a body designated by that authority.
- 211 133 Shells intended for the carriage of liquids having a vapour pressure of not more than 1.1 kg/cm² (absolute) at 50°C shall have a venting system and a safety device to prevent the contents from spilling out if the shell overturns; otherwise they must conform to the requirements of marginals 211 134 or 211 135.
- 211 134 Shells intended for the carriage of liquids having a vapour pressure of not less than 1.1 and not more than 1.75 kg/cm² (absolute) at 50°C shall have a safety valve set at not less than 1.5 kg/cm² gauge pressure and which must be fully open at a pressure not exceeding the test pressure; otherwise they must conform to the requirements of marginal 211 135.
- 211 135 Shells intended for the carriage of liquids having a vapour pressure of not less than 1.75 and not more than 3 kg/cm² (absolute) at 50°C shall have a safety valve set at not less than 3 kg/cm² gauge pressure and which must be fully open at a pressure not exceeding the test pressure; otherwise they must be hermetically closed.**
- 211 136 No movable parts such as covers, closures, etc., which are liable to come into frictional or percussive contact with aluminium shells intended for the carriage of inflammable liquids having a flash-point of or below 55°C or for the carriage of inflammable gases may be made of unprotected corrodible steel.

* Save as may be otherwise provided in the case of shells intended for the carriage of certain crystallizable or highly viscous substances, of deeply refrigerated liquefied gases, or of powdery or granular substances.

** "Hermetically closed shells" means shells whose openings are hermetically closed and which are not equipped with safety valves, frangible discs or other similar safety devices. Shells having safety valves preceded by a frangible disc shall be deemed to be hermetically closed.

211 137-
211 139

Section 4. TYPE APPROVAL

211 140

The competent authority or a body designated by that authority shall issue in respect of each new type of tank a certificate attesting that the prototype tank, including the shell fastenings which it has surveyed, is suitable for the purpose for which it is intended and meets the construction requirements of section 2, the equipment requirements of section 3 and the conditions peculiar to the classes of substances carried.

The test results, the substances for the carriage of which the tank is approved, and its approval number as a prototype shall be recorded in a test report.

This approval shall be valid for tanks manufactured according to this prototype without modification.

211 141-
211 149

Section 5. TESTS

211 150

Tanks and their equipment shall, either together or separately, undergo an initial inspection before being put into service. This inspection shall include a check that the tank conforms to the approved prototype, a check of the design characteristics, an external and internal examination, a hydraulic pressure test at the test pressure indicated on the data plate, and a check of satisfactory operation of the equipment.

The hydraulic pressure test shall be carried out before the installation of such thermal insulation as may be necessary. If the shells and their equipment are tested separately, they shall be jointly subjected to a leakproofness test after assembly.

211 151

Tanks shall undergo periodic inspections at fixed intervals.

The periodic inspections shall include an external and internal examination and, as a general rule, a hydraulic pressure test.* Sheathing for thermal insulation and the like shall be removed only to the extent required for reliable appraisal of the shell's characteristics.

The maximum intervals between periodic inspections shall be six years.

In addition, a leakproofness test and a check of the satisfactory operation of all the equipment shall be carried out every three years.

211 152

The tests, inspections and checks in accordance with marginals 211 150 and 211 151 shall be carried out by the expert approved by the competent authority. Certificates shall be issued showing the results of these operations.

211 153

When the safety of the shell or of its equipment may be impaired as a result of repairs, alterations or accident, an exceptional check shall be carried out by the competent authority or by the expert approved by that authority.

211 154-
211 159

Section 6. MARKING

211 160

Every shell shall be fitted with a corrosion-resistant metal plate permanently attached to the shell in a place readily accessible for inspection. The following

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

particulars at least shall be marked on the plate by stamping or by any other similar method. These particulars may be engraved directly on the walls of the shell itself, if the walls are so reinforced that the strength of the shell is not impaired:

- Approval number;
- Manufacturer's name or mark;
- Manufacturer's serial number;
- Year of manufacture;
- Test pressure in kg/cm² (gauge pressure);
- Capacity in litres — in the case of multiple-element shells, the capacity of each element;
- Design temperature (only if above +50°C or below -20°C);
- Date (month and year) of initial test and most recent periodic test; and
- Stamp of the expert who carried out the tests.

In addition, the maximum working pressure allowed shall be inscribed on pressure-filled or pressure-discharge shells.

211 161 The following particulars shall be inscribed on the tank-vehicle itself or on a plate:

- Name of operator;
- Unladen weight; and
- Permissible maximum weight.

In addition, tank-vehicles shall bear the prescribed danger labels.

211 162-
211 169

Section 7. OPERATION

211 170 The thickness of the walls of the shell shall not, throughout its use, fall below the minimum figure prescribed in marginal 211 127 (2).

211 171 Shells shall not be loaded with any dangerous substances other than those for whose carriage they have been approved. Foodstuffs may not be carried in these shells unless the necessary measures have been taken to prevent any danger to public health.

211 172 The following degrees of filling shall not be exceeded in shells intended for the carriage of liquids at ambient temperatures:

(1) (a) Where inflammable substances not presenting additional risks (e.g. toxic or corrosive properties) are loaded in shells with a venting system, with or without safety valves: degree of filling = $\frac{100}{1 + \alpha(50 - t_r)}$ or $\frac{100}{1 + 35\alpha}$ % of capacity;

(b) Where toxic or corrosive substances, whether or not presenting a fire risk, are loaded in shells with a venting system, with or without safety valves: degree of filling = $\frac{98}{1 + \alpha(50 - t_r)}$ or $\frac{98}{1 + 35\alpha}$ % of capacity;

(c) Where low-concentration inflammable substances and low-concentration acids and lyes are loaded in closed shells: degree of filling = $\frac{97}{1 + \alpha(50 - t_r)}$ or $\frac{97}{1 + 35\alpha}$ % of capacity;

(d) Where high-concentration toxic substances and high-concentration acids and lyes are loaded in closed shells: degree of filling = $\frac{95}{1 + \alpha(50 - t_f)}$ or $\frac{95}{1 + 35\alpha}$ % of capacity.

(2) In these formulae, α represents the mean coefficient of cubic expansion of the liquid between 15° and 50°C, i.e. for a maximum variation in temperature of 35°C.

α is calculated by the formula: $\alpha = \frac{d_{15} - d_{50}}{35 \times d_{50}}$, where d_{15} and d_{50} are the densities of the liquid at 15°C and 50°C respectively and t_f is the mean temperature of the liquid at the time of filling.

(3) The provisions of paragraph (1) above shall not apply to shells whose contents are, by means of a heating device, maintained at a temperature above 50°C during carriage. In such a case the degree of filling at the outset shall be such, and the temperature so regulated, that the shell is not full to more than 95 per cent of its capacity at any time during carriage, and that the filling temperature is not exceeded.

(4) Where hot substances are loaded, the temperature of the outer surface of the shell or of the thermal insulation shall not exceed 70°C during carriage.

211 173 Where shells intended for the carriage of liquids* 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 per cent of their capacity unless they are practically empty.

211 174 Shells shall be closed in such a way that the contents cannot run out uncontrolled. The leakproofness of the shell closures, particularly in the upper part of the dip-tube, shall be verified by the sender after the shell has been filled.

211 175 Where several closure systems are fitted in series, that nearest to the substance being carried shall be closed first.

211 176 No dangerous residue shall adhere to the outside of shells during carriage, whether they are full or empty.

211 177 To be accepted for carriage, empty shells must be closed in the same manner and leakproof in the same degree as though they were full.

211 178 The connecting pipes between independent but interconnected shells of a transport unit shall be empty during carriage.

Flexible filling and discharge pipes which are not permanently connected to the shell shall be empty during carriage.

211 179

Section 8. TRANSITIONAL MEASURES

211 180 Fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles built before 1 October 1978 and not conforming to the requirements of this Appendix may, if they were built in conformity with the requirements of ADR, be used during a period of six years from 1 October 1978. Fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles intended for the carriage of gases

* For the purposes of this provision, substances whose efflux time at 20°C from a DIN cup with a 4-mm orifice does not exceed 10 minutes (corresponding to an efflux time of less than 96 sec. at 20°C from a No. 4 Ford cup, or to less than 2,680 centistokes) shall be deemed to be liquids.

of Class 2 may however be used for 12 years from the same date if the periodic-test requirement is complied with.

211 181 On the expiry of this period the aforesaid units may be kept in service if the equipment of the shell meets the present requirements. The thickness of the shell wall, except in the case of shells intended for the carriage of gases of Class 2, 7° and 8°, shall be appropriate to a calculation pressure of not less than 4 kg/cm² (gauge pressure) in the case of mild steel and of not less than 2 kg/cm² (gauge pressure) in the case of aluminium and aluminium alloys. For other than circular cross-sections of tanks, the diameter to be used as a basis for calculation shall be that of a circle whose area is equal to that of the real cross-section of the tank.

211 182 The periodic tests for fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles kept in service under these transitional provisions shall be conducted in accordance with the provisions of section 5 and with the pertinent special provisions for the various classes. Unless the earlier provisions prescribed a higher test pressure, a test pressure of 2 kg/cm² (gauge pressure) shall suffice for aluminium shells and aluminium-alloy shells.

211 183 Fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles which meet these transitional provisions may be used during a period of 15 years from 1 October 1978 for the carriage of the dangerous goods for which they have been approved. This transitional period shall not apply to fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles intended for the carriage of substances of class 2, or to fixed tanks (tank-vehicles), demountable tanks and batteries of receptacles whose wall thickness and items of equipment meet the requirements of this appendix.

211 184-
211 199

Chapter II. *Special requirements supplementing or modifying the requirements of chapter I*

Class 2. GASES: COMPRESSED, LIQUEFIED OR DISSOLVED UNDER PRESSURE

211 200-
211 219

211 220 *Section 1. GENERAL; SCOPE; DEFINITIONS*

Section 2. CONSTRUCTION

211 221 Shells intended for the carriage of substances of 1° to 6° and 9° shall be made of steel. By derogation from marginal 211 125 (3), a minimum elongation at fracture of 14 per cent may be accepted in the case of weldless shells.

211 222 The requirements of appendix B.1d, marginals 214 250 to 214 285, shall apply to the materials and construction of shells intended for the carriage of gases of 7° and 8°.

Shells intended for the carriage of chlorine or phosgene [3° (a t)] shall be designed for a pressure of at least 22 kg/cm (gauge pressure).

211 223-
211 229

Section 3. ITEMS OF EQUIPMENT

- 211 230 The discharge pipes of shells shall be capable of being closed not only by the devices prescribed in marginal 211 131 but in addition by means of a blank flange or some other equally reliable device.
- 211 231 Shells intended for the carriage of liquefied gases may be provided with, in addition to the openings prescribed in marginal 211 131, openings for the fitting of gauges (including pressure gauges), thermometers and bleed holes, as required for their operation and safety.
- 211 232 Safety devices shall meet the following requirements:
- (1) Filling and discharge openings of shells intended for the carriage of liquefied inflammable and/or toxic gases shall be equipped with an instant-closing internal safety device which closes automatically in the event of an inadvertent movement of the tank. It must also be possible to close the device by remote control.
- (2) All openings, other than those accommodating safety valves and than closed bleed holes, of shells intended for the carriage of liquefied inflammable and/or toxic gases shall, if their nominal diameter is more than 1.5 mm, be equipped with an internal shut-off device.
- (3) By derogation from the provisions of paragraphs (1) and (2), shells intended for the carriage of deeply-refrigerated inflammable and/or toxic liquefied gases may be equipped with external devices in place of internal devices if the external devices afford protection at least equivalent to that afforded by the wall of the shell.
- (4) If the shells are equipped with gauges, the latter shall not be made of a transparent material in direct contact with the substance carried. If there are thermometers, they shall not project directly into the gas or liquid through the shell wall.
- (5) Shells intended for the carriage of chlorine or sulphur dioxide [3° (a t)] or methyl mercaptan or hydrogen sulphide [3° (b t)] shall not have any opening below the surface level of the liquid. In addition, cleaning apertures (fist-holes) as referred to in marginal 211 132 shall not be permitted.
- (6) Filling and discharge openings situated in the upper part of shells shall be equipped not only with what is prescribed in paragraph (1), but in addition with a second, external, closing device. This device shall be capable of being closed by a blank flange or some other equally reliable device.
- 211 233 Safety valves shall meet the following requirements:
- (1) Shells intended for the carriage of gases of 1° to 6° and 9° may be provided with not more than two safety valves whose aggregate clear cross-sectional area of passage at the seating or seatings shall be not less than 20 cm² per 30 m³ or part thereof of the receptacle's capacity. These valves shall be capable of opening automatically at a pressure of between 0.9 and 1.0 times the test pressure of the shell to which they are fitted. They shall be of such a type as to resist dynamic stresses, including liquid surge. The use of dead-weight or counter-weight valves is prohibited.
- Shells intended for the carriage of gases of 1° to 9° harmful to the respiratory organs or entailing a poison risk* shall not have safety valves unless the safety valves are preceded by a frangible disc. In the latter case the arrangement of the

* Gases identified by the letter "t" in the list of substances are deemed to be gases harmful to the respiratory organs or entailing a poison risk.

frangible disc and the safety valve shall be required to be satisfactory to the competent authority.

Where tank-vehicles are intended for carriage by sea, the provisions of this paragraph shall not prohibit the fitting of safety valves conforming to the regulations governing that mode of transport.

(2) Shells intended for the carriage of gases of 7° and 8° shall be equipped with two independent safety valves, each so designed as to allow the gases formed by evaporation during normal operation to escape from the shell in such a way that the pressure does not at any time exceed by more than 10 per cent the working pressure indicated on the shell. One of the two safety valves may be replaced by a frangible disc which shall be such as to burst at the test pressure. In the event of loss of the vacuum in a double-walled shell, or of destruction of 20 per cent of the insulation of a single-walled shell, the safety valve and the frangible disc shall permit an outflow such that the pressure in the shell cannot exceed the test pressure.

(3) The safety valves of shells intended for the carriage of gases of 7° and 8° shall be capable of opening at the working pressure indicated on the shell. They shall be so designed as to function faultlessly even at their lowest working temperature. The reliability of their operation at that temperature shall be established and checked either by testing each valve or by testing a specimen valve of each design-type.

211 234

Thermal insulation

(1) If shells intended for the carriage of liquefied gases of 3° and 4° are equipped with thermal insulation, such insulation shall consist of either:

- A sun shield covering not less than the upper third but not more than the upper half of the shell surface and separated from the shell by an air space at least 4 cm across; or
- A complete cladding, of adequate thickness, of insulating materials.

(2) Shells intended for the carriage of gases of 7° and 8° shall be thermally insulated. Thermal insulation shall be ensured by means of a continuous sheathing. If the space between the shell and the sheathing is exhausted of air (vacuum insulation), the protective sheathing shall be so designed as to withstand without deformation an external pressure of at least 1 kg/cm² (gauge pressure). By derogation from marginal 211 102 (2), external and internal reinforcing devices may be taken into account in the calculations. If the sheathing is so closed as to be gas-tight, a device shall be provided to prevent any dangerous pressure from developing in the insulating layer in the event of inadequate gas-tightness of the shell or of its items of equipment. The device shall prevent the infiltration of moisture into the heat-insulating sheath.

(3) Shells intended for the carriage of liquefied gases having a boiling point below -182°C at atmospheric pressure shall not include any combustible material either in the thermal insulation or in the means of attachment to the frame.

The means of attachment of shells intended for the carriage of argon, nitrogen, helium or neon of 7° (a) or hydrogen of 7° (b) may, with the consent of the competent authority, contain plastics substances between the inner and outer sheath.

211 235

For batteries of receptacles (see marginal 2212(1)(c))* the following conditions shall be complied with:

(1) If one of the elements of a multiple-element shell is equipped with a safety valve and shut-off devices are provided between the elements, every element shall be so equipped.

* The provisions of this appendix are not applicable to frames of cylinders.

(2) The filling and discharge devices may be affixed to a manifold.

(3) Each element of a multiple-element shell intended for the carriage of compressed gases of 1° and 2° which are harmful to the respiratory organs or entail a poison risk, or are inflammable, shall be capable of being isolated by a valve (cock).

(4) The elements of a multiple-element shell intended for the carriage of liquefied gases of 3° to 6° shall be so designed that they can be filled separately and can be kept isolated by a valve capable of being sealed.

(5) The following requirements shall apply to demountable tanks:

- (a) They shall not be interconnected by a manifold; and
- (b) If the demountable tanks can be rolled, the valves shall be provided with protective caps.

211 236 By derogation from the provisions of marginal 211 131, shells intended for the carriage of deeply-refrigerated liquefied gases need not have an inspection aperture.

211 237-
211 239

Section 4. TYPE APPROVAL

211 240 (No special requirements.)
211 249

Section 5. TESTS

211 250 The materials of shells intended for the carriage of gases of 7° and 8° shall be tested by the method described in appendix V.1d, marginals 214 275 to 214 285.

211 251 The test-pressure levels shall be as follows:

- (1) For shells intended for the carriage of gases of 1° and 2°: the levels indicated in marginal 2219 (1) and (3).
- (2) For shells intended for the carriage of gases of 3° and 4°:
 - (a) If the shells are not more than 1.5 m in diameter, the levels indicated in marginal 2220 (2);
 - (b) If the shells are more than 1.5 m in diameter, the levels* indicated below:

Description of substance	Item number	Minimum test pressure for shells		Maximum weight of contents per litre of capacity (kg)
		With thermal insulation (kg/cm ²)	Without thermal insulation (kg/cm ²)	
Bromochlorodifluoromethane (R 12 B 1)	3° (a)	10	10	1.61
Chlorodifluoromethane (R 22)	3° (a)	24	26	1.03
Chloropentafluoroethane (R 115)	3° (a)	20	23	1.08

* 1. The prescribed test pressures are:

- (a) If the shell is equipped with thermal insulation, at least equal to the vapour pressure, reduced by 1 kg/cm², of the liquid at 60°C, and not less than 10 kg/cm²;
- (b) If the shell is not equipped with thermal insulation, at least equal to the vapour pressure, reduced by 1 kg/cm², of the liquid at 65°C, and not less than 10 kg/cm².

2. In view of the high toxicity of phosgene [3° (a t)], the minimum test pressure for this gas is fixed at 15 kg/cm² if the shell is equipped with thermal insulation and at 17 kg/cm² if it is not so equipped.

3. The maximum values in kg/litre prescribed for the degree of filling are calculated as follows:
maximum weight of contents per litre of capacity = 0.95 × specific gravity of the liquid phase at 50°C.

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>		<i>Maximum weight of contents per litre of capacity (kg)</i>
1-Chloro-2,2,2-trifluoroethane (R 133 a)	3° (a)	10	10	1.18
Dichlorodifluoromethane (R 12)	3° (a)	15	16	1.15
Dichlorofluoromethane (R 21)	3° (a)	10	10	1.23
1,2-Dichloro-1,2,2-tetrafluoroethane (R 114)	3° (a)	10	10	1.30
Octofluorocyclobutane (RC 318)	3° (a)	10	10	1.34
Ammonia	3° (a t)	26	29	0.53
Methyl bromide	3° (a t)	10	10	1.51
Chlorine	3° (a t)	17	19	1.25
Hexafluoropropylene (R 216)	3° (a t)	17	19	1.11
Hydrogen bromide	3° (a t)	50	55	1.20
Nitrogen dioxide NO ₂	3° (a t)	10	10	1.30
Phosgene	3° (a t)	15	17	1.23
Sulphur dioxide	3° (a t)	10	12	1.23
Butane	3° (b)	10	10	0.51
1-Butene	3° (b)	10	10	0.53
1-Chloro-1,1-difluoroethane (R 142 b)	3° (b)	10	10	0.99
Cis-2-butene	3° (b)	10	10	0.55
Cyclopropane	3° (b)	16	18	0.53
1,1-Difluoroethane (R 152 a)	3° (b)	14	16	0.79
Isobutane	3° (b)	10	10	0.49
Isobutene	3° (b)	10	10	0.52
Propane	3° (b)	21	23	0.42
Propylene	3° (b)	25	27	0.43
Trans-2-butene	3° (b)	10	10	0.54
1,1,1-Trifluoroethane	3° (b)	28	32	0.79
Dimethylamine	3° (b t)	10	10	0.59
Dimethyl ether	3° (b t)	14	16	0.58
Ethylamine	3° (b t)	10	10	0.61
Ethyl chloride	3° (b t)	10	10	0.80
Hydrogen sulphide	3° (b t)	45	50	0.67
Methylamine	3° (b t)	10	11	0.58
Methyl chloride	3° (b t)	13	15	0.81
Methyl mercaptan	3° (b t)	10	10	0.78
Trimethylamine	3° (b t)	10	10	0.56
1,3-Butadiene	3° (c)	10	10	0.55
Vinyl chloride	3° (c)	10	11	0.81
Methyl vinyl ether	3° (c t)	10	10	0.67
Trifluorochlorethylene (R 1113)	3° (c t)	15	17	1.13
Vinyl bromide	3° (c t)	10	10	1.37
Mixture F 1	4° (a)	10	11	1.23
Mixture F 2	4° (a)	15	16	1.15
Mixture F 3	4° (a)	24	27	1.03
Mixture of gases R 500	4° (a)	18	20	1.01
Mixture of gases R 502	4° (a)	25	28	1.05
Mixtures of 19 to 21 per cent by weight dichlorodifluoromethane (R 12) and 79 to 81 per cent by weight bromochlorodifluoro- methane (R 12 B1)	4° (a)	10	11	1.50
Mixtures of methyl bromide and chloropicrin	4° (a t)	10	10	1.51
Mixture A (trade name: butane)	4° (b)	10	10	0.50
Mixture A 0 (trade name: butane)	4° (b)	12	14	0.47
Mixture A 1	4° (b)	16	18	0.46
Mixture B	4° (b)	20	23	0.43

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>		<i>Maximum weight of contents per litre of capacity (kg)</i>
Mixture C (trade name: propane)	4° (b)	25	27	0.42
Mixtures of hydrocarbons containing methane	4° (b)	—	225	0.187
		—	300	0.244
Mixtures of methyl chloride and methylene chloride	4° (b t)	13	15	0.81
Mixtures of methyl chloride and chloropicrin	4° (b t)	13	15	0.81
Mixtures of methyl bromide and ethylene bromide	4° (b t)	10	10	1.51
Methylacetylene/propadiene and hydrocarbon mixtures:				
Mixture P ₁	4° (c)	25	28	0.49
Mixture P ₂	4° (c)	22	23	0.47
Ethylene oxide containing not more than 10 per cent carbon dioxide by weight	4° (c t)	24	26	0.73
Ethylene oxide with nitrogen up to a total pressure of 10 kg/cm ² at 50°C	4° (c t)	15	15	0.78
Dichlorodifluoromethane containing 12 per cent ethylene oxide by weight	4° (c t)	15	16	1.09

(3) For shells intended for the carriage of gases of 5° and 6°:

- (a) If the shells are not sheathed in thermal insulation: the levels indicated in marginal 2220 (3) and (4);
- (b) If the shells are sheathed in thermal insulation: the levels indicated below:

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>		<i>Maximum weight of contents per litre of capacity (kg)</i>
Bromotrifluoromethane (R 13 B 1)	5° (a)	120		1.50
Carbon dioxide	5° (a)	190		0.73
		225		0.78
Chlorotrifluoromethane (R 13)	5° (a)	120		0.96
		225		1.12
Hexafluorethane (R 116)	5° (a)	160		1.28
		200		1.34
Nitrous oxide N ₂ O	5° (a)	225		0.78
Sulphur hexafluoride	5° (a)	120		1.34
Trifluoromethane (R 23)	5° (a)	190		0.92
		250		0.99
Xenon	5° (a)	120		1.30
Hydrogen chloride	5° (a t)	120		0.69
Ethane	5° (b)	120		0.32
Ethylene	5° (b)	120		0.25
		225		0.36
1,1-Difluoroethylene	5° (c)	120		0.66
		225		0.78
Vinyl fluoride	5° (c)	120		0.58
		225		0.65
Mixture of gases R 503	6° (a)	31		0.11
		42		0.21
		100		0.76

<i>Description of substance</i>	<i>Item number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Carbon dioxide containing not more than 35 per cent ethylene oxide by weight ...	6° (c)	190 225	0.73 0.78
Ethylene oxide containing more than 10 per cent but not more than 50 per cent carbon dioxide by weight	6° (c t)	190 250	0.66 0.75

Where shells sheathed in thermal insulation are used which have been subjected to a test pressure lower than that shown in the table, the maximum weight of the contents per litre of capacity shall be such that the pressure reached in the shell by the substance in question at 55°C does not exceed the test pressure stamped on the shell. In such a case the maximum load allowed shall be prescribed by the expert approved by the competent authority.

(4) For shells intended for the carriage of ammonia dissolved under pressure [9° (a t)]:

<i>Description of substance</i>	<i>Item Number</i>	<i>Minimum test pressure (kg/cm²)</i>	<i>Maximum weight of contents per litre of capacity (kg)</i>
Ammonia dissolved under pressure in water:			
With more than 35 per cent but not more than 40 per cent ammonia by weight	9° (a t)	10	0.80
With more than 40 per cent but not more than 50 per cent ammonia by weight	9° (a t)	10	0.77

(5) For shells intended for the carriage of gases of 7° and 8°; not less than 1.3 times the maximum permitted working pressure, as indicated on the shell, but not less than 3 kg/cm² (gauge pressure); for shells with vacuum insulation the test pressure shall be not less than 1.3 times the maximum permitted working pressure increased by 1 kg/cm².

211 252 The first hydraulic pressure test shall be carried out before the thermal insulation is placed in position.

211 253 The capacity of each shell intended for the carriage of gases of 3° to 6° and 9° shall be determined, under the supervision of an expert approved by the competent authority, by weighing or volumetric measurement of the quantity of water which fills the shell; any error in the measurement of shell capacity shall be of less than one per cent. Determination by a calculation based on the dimensions of the shell is not permitted. The maximum filling weights allowed in accordance with marginals 2220 (4) and 211 251 (3) shall be prescribed by an approved expert.

211 254 Checking of the welds shall be carried out in accordance with the lambda-coefficient 1.0 requirements of marginal 211 127 (7).

211 255 By derogation from the requirements of marginal 211 151, the periodic tests shall take place:

(1) Every three years, in the case of shells intended for the carriage of boron trifluoride [1° (a t)], town gas [2° (b t)], hydrogen bromide, chlorine, nitrogen

dioxide, sulphur dioxide or phosgene [3° (a t)], hydrogen sulphide [3° (b t)], or hydrogen fluoride [5° (a t)];

- (2) Every six years, in the case of shells intended for the carriage of other compressed and liquefied gases or of ammonia dissolved under pressure [9° (a t)]; and
- (3) After 6 years' service and thereafter every 12 years, in the case of shells intended for the carriage of gases of 7° or 8°; a leakproofness check shall be performed by an approved expert six years after each periodic test.

Leakproofness tests of shells intended for the carriage of gases of 1° to 6° and 9° shall be performed at a pressure of not less than 4 kg/cm² (gauge pressure).

211 256 In the case of shells heat-insulated by vacuum, the hydraulic-pressure test and the check of the internal condition may, with the consent of the approved expert, be replaced by a leakproofness test and measurement of the vacuum.

211 257 If apertures have been made, on the occasion of periodic inspections, in shells intended for the carriage of gases of 7° or 8°, the method by which they are hermetically closed before the shells are replaced in service shall be approved by the approved expert and shall ensure the integrity of the shell.

211 258-
211 259

Section 6. MARKING

211 260 The following additional particulars shall be marked by stamping or by any other similar method on the plate prescribed in marginal 211 160, or directly on the walls of the shell itself if the walls are so reinforced that the strength of the shell is not impaired:

- (1) On shells intended for the carriage of only one substance, the name of the gas in full; this indication shall be supplemented in the case of shells intended for the carriage of compressed gases of 1° and 2° by an indication of the maximum filling pressure at 15°C allowed for the shell, and in the case of shells intended for the carriage of liquefied gases of 3° to 8° or of ammonia dissolved under pressure of 9° (a t) by an indication of the permissible maximum load in kg and of the filling temperature if below -20°C;
- (2) On multi-purpose shells, the names, in full, of the gases for whose carriage the shell is approved; these particulars shall be supplemented by an indication of the permissible maximum load in kg for each gas;
- (3) On shells intended for the carriage of gases of 7° or 8°, the working pressure; and
- (4) On shells equipped with thermal insulation, the inscription "thermally insulated" or "thermally insulated by vacuum".

211 261 The frame of a multiple-element shell shall bear near the filling point a plate specifying:

- The test pressure of the elements;
- The maximum filling pressure at 15°C allowed for elements intended for compressed gases;
- The number of elements;
- The aggregate capacity of the elements in litres;
- The name of the gas in full; and
- In the case of liquefied gases, the permissible maximum load per element, in kg.

- 211 262 In addition to the particulars prescribed in marginal 211 161, the following shall be inscribed either on the tank-vehicle itself or on a plate:
- (a) Either “minimum filling temperature allowed: -20°C ”, or “minimum filling temperature allowed:”;
 - (b) Where the shell is intended for the carriage of one substance only, the name of the gas in full; for liquefied gases of 3° to 8° and for ammonia dissolved under pressure in water [9° (a t)], the permissible maximum load in kg;
 - (c) Where the shell is a multi-purpose shell, the name in full of all the gases to whose carriage the shell is assigned, with an indication of the permissible maximum load in kg, for each gas;
 - (d) Where the shell is equipped with thermal insulation, the inscription “thermally insulated” or “thermally insulated by vacuum”, in an official language of the forwarding country and also in English, French or German, unless international road transport tariffs, if any, or agreements concluded between the countries concerned in the transport operation, provide otherwise.
- 211 263 The plates on vehicles carrying demountable tanks as referred to in marginal 211 235 (5) shall not bear the particulars prescribed in marginals 211 161 and 211 262.

211 264-
211 269

Section 7. OPERATION

- 211 270 A shell assigned at different times to the carriage of different liquefied gases of 3° to 8° (multi-purpose shell) may not carry substances other than those listed in one, and one only, of the following groups:
- Group 1, halogenated hydrocarbons of 3° (a) and 4° (a);
 - Group 2, hydrocarbons of 3° (b) and 4° (b);
 - Group 3, ammonia [3° (a t)]; dimethyl ether, dimethylamine, ethylamine, methylamine and trimethylamine [3° (b t)]; and vinyl chloride [3° (c)];
 - Group 4, methyl bromide [3° (a t)]; ethyl chloride and methyl chloride [3° (b t)];
 - Group 5, mixtures of ethylene oxide with carbon dioxide and of ethylene oxide with nitrogen [4° (c t)];
 - Group 6, nitrogen, carbon dioxide, rare gases, nitrous oxide N_2O , and oxygen [7° (a)]; air, mixtures of nitrogen with rare gases, and mixtures of oxygen with nitrogen, also when they contain rare gases [8° (a)];
 - Group 7, ethane, ethylene, and methane [7° (b)]; and mixtures of methane with ethane, also when they contain propane or butane [8° (b)].
- 211 271 Shells which have been filled with a substance of group 1 or group 2 shall be emptied of liquefied gas before being loaded with another substance belonging to the same group. Shells which have been filled with a substance of groups 3 to 7 shall be completely emptied of liquefied gas and then blown down before being loaded with another substance belonging to the same group.
- 211 272 The multiple use of shells for the carriage of liquefied gases of the same group shall be allowed if all the requirements prescribed for the gases to be carried in one and the same shell are observed. Such multiple use shall be subject to approval by an approved expert.
- 211 273 The multiple use of shells for the carriage of gases of different groups shall be allowed if permitted by the approved expert.

When shells are reassigned to gases of a different group, the shells shall be completely emptied of liquefied gases, then blown down and, lastly, degassed. The degassing of shells shall be verified and certified by the approved expert.

211 274 When loaded tanks or empty but uncleaned tanks are handed over for carriage, only the particulars specified in marginal 212 602 applicable to the gas loaded or just discharged shall be visible; all particulars concerning other gases shall be covered up.

211 275 All the elements of a multiple-element shell shall contain only one and the same gas. In the case of a multiple-element shell intended for the carriage of liquefied gases, the elements shall be filled separately and be kept isolated by a sealed valve.

211 276 The maximum filling pressure for compressed gases of 1° and 2° other than boron fluoride shall not exceed the values prescribed in marginal 2219 (2).

For boron fluoride [1° (a t)] the maximum filling weight per litre of capacity shall not exceed 0.86 kg.

The maximum filling weight per litre of capacity according to marginals 2220, (2), (3) and (4), and 211 251, (2), (3) and (4), shall be abided by.

211 277 The degree of filling of shells intended for the carriage of gases of 7° (b) and 8° (b) shall remain below the level at which, if the contents were raised to the temperature at which the vapour pressure equalled the valve-opening pressure, the volume of the liquid would reach 95 per cent of the shell's capacity at that temperature. Shells intended for the carriage of gases of 7° (a) and 8° (a) may be filled to 98 per cent at the loading temperature and the loading pressure.

211 278 On shells intended for the carriage of nitrous oxide and oxygen [7° (a)], air, or mixtures containing oxygen [8° (a)], substances containing grease or oil shall not be used to ensure leakproofness of the joints or for the maintenance of the closures.

211 279 The requirement in marginal 211 175 shall not apply to gases of 7° and 8°.

211 280-
211 299

Class 3. INFLAMMABLE LIQUIDS

Section 1. GENERAL; SCOPE; DEFINITIONS

211 300-
211 319

Section 2. CONSTRUCTION

211 320 Shells intended for the carriage of carbon disulphide [1° (a)] shall be designed for a pressure of 10 kg/cm² (gauge pressure).

211 321-
211 329

Section 3. ITEMS OF EQUIPMENT

211 330 Shells which are fitted with a venting device not capable of being closed and which are intended for the carriage of inflammable liquids having a flash-point not exceeding 55°C shall have a flame-trap in the venting device.

211 331 All openings of shells intended for the carriage of acrylaldehyde (acrolein), chloroprene (chlorobutadiene) and carbon disulphide [1° (a)] shall be above the

surface level of the liquid. No piping or pipe connexions shall pass through the walls of the shell below the surface level of the liquid. The openings, other than those equipped with valves, shall be capable of being closed by leakproof closures, and the latter shall be capable of being protected by a lockable cap. If the shells are equipped with safety valves, the latter shall be preceded by a frangible disc. In such a case the arrangement of the frangible disc and the safety valve shall be required to be satisfactory to the competent authority.

211 332-
211 339

Section 4. TYPE APPROVAL

211 340- (No special requirements.)
211 349

Section 5. TESTS

211 350 The minimum test pressure to which shells intended for the carriage of carbon disulphide [1° (a)] shall be subjected shall be 4 kg/cm² (gauge pressure). The minimum test pressure to which shells intended for the carriage of the other substances of the Class shall be subjected shall be equal to that, as defined in marginal 211 123, used for their design.

211 351-
211 359

Section 6. MARKING

211 360- (No special requirements.)
211 369

Section 7. OPERATION

211 370 The following degrees of filling shall not be exceeded when shells filled with liquids having a vapour pressure of more than 1.75 kg/cm² (absolute) at 50°C are hermetically-closed shells:

- in the case of methyl formate [1° (a)] and other liquids having a coefficient of cubical expansion of more than 150×10^{-5} but not more than 180×10^{-5} :91 per cent of capacity;
- in the case of acetaldehyde [5°] and other liquids having a coefficient of cubical expansion of more than 180×10^{-5} but not more than 230×10^{-5} : 90 per cent of capacity.

211 371 An aluminium-alloy shell shall not be used for the carriage of acetaldehyde [5°] unless the shell is assigned solely to such carriage and the acetaldehyde is free from acid.

211 372 In the cold season (October to March), light distillates for cracking and other liquid hydrocarbons having a vapour pressure not exceeding 1.5 kg/cm² (absolute) at 50°C may be carried in shells of the type prescribed in marginal 211 133.

211 373-
211 399

Class 4.1. INFLAMMABLE SOLIDS

Class 4.2. SUBSTANCES LIABLE TO SPONTANEOUS COMBUSTION

*Class 4.3. SUBSTANCES WHICH GIVE OFF INFLAMMABLE
GASES ON CONTACT WITH WATER*

Section 1. GENERAL; SCOPE; DEFINITIONS

211 400-
211 419

Section 2. CONSTRUCTION

211 420 Shells intended for the carriage of white or yellow phosphorus of marginal 2431, 1°, or trichlorosilane (silicochloroform) of marginal 2471, 4°, shall be designed for a pressure of at least 10 kg/cm² (gauge pressure).

211 421-
211 429

Section 3. ITEMS OF EQUIPMENT

211 430 Shells intended for the carriage of sulphur [2° (b)] or naphthalene [11° (c)] of marginal 2401 shall be equipped with thermal insulation made of materials which are not readily inflammable. They may be equipped with valves opening automatically inwards or outwards under the effect of a difference of pressure of 0.2 to 0.3 kg/cm². The discharge devices shall be capable of being protected by a lockable metal cap.

211 431 Shells intended for the carriage of white or yellow phosphorus of marginal 2431, 1°, shall meet the following requirements:

(1) The heating device shall not penetrate into, but shall be exterior to, the body of the shell. However, a pipe used for extracting the phosphorus may be equipped with a heating jacket. The device heating the jacket shall be so regulated as to prevent the temperature of the phosphorus from exceeding the filling temperature of the shell. Other piping shall enter the shell in its upper part; openings shall be situated above the highest permissible level of the phosphorus and be capable of being completely enclosed under lockable caps. In addition, the cleaning apertures (fist-holes) referred to in marginal 211 132 shall not be permitted.

(2) The shell shall be equipped with a gauging system for verifying the level of the phosphorus and, if water is used as the protective agent, with a fixed gauge mark showing the highest permissible level of the water.

211 432 The openings and orifices (valves, sleeves, manholes, etc.) of shells intended for the carriage of substances of marginal 2471, 1° (a), shall be protected by leakproof lockable caps, and such shells shall be equipped with thermal insulation made of materials which are not readily inflammable.

211 433-
211 439

Section 4. TYPE APPROVAL

211 440- (No special requirements.)
211 449

Section 5. TESTS

211 450 Shells intended for the carriage of sulphur [2° (b)] or naphthalene [11° (c)] of marginal 2401 or white or yellow phosphorus of marginal 2431, 1°, and those intended for the carriage of trichlorosilane (silicochloroform) of marginal 2471, 4°, shall be tested at a pressure of 4 kg/cm² (gauge pressure).

211 451-
211 459

Section 6. MARKING

- 211 460- (No special requirements.)
211 469

Section 7. OPERATION

- 211 470 Shells intended for the carriage of sulphur [2° (b)] or naphthalene [11° (c)] of marginal 2401 shall be filled to not more than 98 per cent of their capacity.
- 211 471 White or yellow phosphorus of marginal 2431, 1°, shall, if water is used as the 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 per cent. If nitrogen is used as the protective agent, the degree of filling at a temperature of 60°C shall not exceed 96 per cent. 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 shell shall be hermetically closed so that no leakage of gas occurs.
- 211 472 For the carriage of substances of marginal 2471, 1° (a), caps shall be locked in conformity with marginal 211 432.
- 211 473 In the case of trichlorosilane (silicochloroform) of marginal 2471, 4°, the degree of filling shall not exceed 1.14 kg per litre of capacity if filling is by weight or 85 per cent if filling is by volume.
- 211 474 Shells which have contained phosphorus of marginal 2431, 1°, shall when handed over for carriage either:
- Be filled with nitrogen; the sender shall certify in the transport document that the shell, after closure, is gas-tight; or
 - Be filled with water to not less than 96 per cent and not more than 98 per cent of their capacity; between 1 October and 31 March this water shall contain one or more anti-freeze agents free from corrosive action, not liable to react with phosphorus, and in such concentration as to make it impossible for the water to freeze during carriage.

- 211 475-
211 499

*Class 5.1. OXIDIZING SUBSTANCES**Class 5.2. ORGANIC PEROXIDES**Section 1. GENERAL; SCOPE; DEFINITIONS*

- 211 500-
211 519

Section 2. CONSTRUCTION

- 211 520 Shells intended for the carriage in the liquid state of substances referred to in marginal 51 121 (1) shall be designed for a pressure of at least 4 kg/cm² (gauge pressure).
- 211 521 Shells, and their items of equipment, intended for the carriage of hydrogen peroxide or of aqueous solutions of hydrogen peroxide of marginal 2501, 1°, or of liquid organic peroxides of marginal 2551, 1°, 10°, 14°, 15° and 18°, shall be made of aluminium not less than 99.5 per cent pure or of suitable steel not liable to cause the hydrogen peroxide or the organic peroxides to decompose.

- 211 522 Shells intended for the carriage of concentrated and hot aqueous solutions of ammonium nitrate of marginal 2501, 6° (a), shall be made of austenitic steel.

211 523-
211 529

Section 3. ITEMS OF EQUIPMENT

- 211 530 Shells intended for the carriage of hydrogen peroxide and of aqueous solutions of hydrogen peroxide containing more than 70 per cent hydrogen peroxide, of marginal 2501, 1°, shall have their openings above the surface level of the liquid. In addition, cleaning apertures (fist-holes) as referred to in marginal 211 132 shall not be permitted. In the case of solutions containing more than 60 per cent but not more than 70 per cent hydrogen peroxide, openings below the surface level of the liquid shall be permissible. In this case the shell-discharge system shall be equipped with two mutually independent shut-off devices mounted in series, the first taking the form of a quick-closing internal stop-valve of an approved type and the second that of a sluice-valve, at each end of the discharge pipe-socket. A blank flange, or another device providing the same measure of security, shall also be fitted at the outlet of each external sluice-valve. The internal stop-valve shall be such that if the pipe is wrenched off the stop-valve will remain integral with the shell and in the closed position.

- 211 531 The connexions to the external pipe-sockets of shells shall be made of materials not liable to cause decomposition of hydrogen peroxide.

- 211 532 Shells intended for the carriage of hydrogen peroxide or of aqueous solutions of hydrogen peroxide of 1°, or of concentrated and hot aqueous solutions of ammonium nitrate of 6° (a), of marginal 2501 shall be fitted in their upper part with a shut-off device preventing any build-up of excess pressures inside the receptacle, any leakage of liquid, and any entry of foreign matter into the receptacle. The shut-off devices of shells intended for the carriage of hot solutions of ammonium nitrate shall be so designed as to preclude obstruction of the devices by solidified ammonium nitrate during carriage.

- 211 533 Where shells intended for the carriage of concentrated and hot solutions of ammonium nitrate of marginal 2501, 6° (a), are sheathed in thermally-insulating material, the material shall be of an inorganic nature and entirely free from combustible matter.

- 211 534 Shells intended for the carriage of liquid organic peroxides of marginal 2551, 1°, 10°, 14°, 15° and 18°, shall be equipped with a venting device fitted with a flame-trap and followed in series by a safety valve opening at a gauge pressure of 1.8 to 2.2 kg/cm².

- 211 535 Shells intended for the carriage of liquid organic peroxides of marginal 2551, 1°, 10°, 14°, 15° and 18°, shall be equipped with thermal insulation complying with the requirements of marginal 211 234 (1). The covering and any uncovered part of the shell, or the outer sheathing of a complete lagging, shall be painted white and the paint shall be cleaned before each transport journey and renewed in case of yellowing or deterioration. The thermal insulation shall be free from combustible matter.

211 536-
211 539

Section 4. TYPE APPROVAL

- 211 540- (No special requirements.)
211 549

Section 5. TESTS

- 211 550 Shells intended for the carriage of hydrogen peroxide or of aqueous solutions of hydrogen peroxide of 1°, or of concentrated and hot solutions of ammonium nitrate of 6° (a), of marginal 2501, or of liquid organic peroxides of marginal 2551, 1°, 10°, 14°, 15° and 18°, shall be tested at a pressure of 4 kg/cm² (gauge pressure).

211 551-
211 559

Section 6. MARKING

- 211 260- (No special requirements.)
211 269

Section 7. OPERATION

- 211 570 The inside of the shell, and all parts liable to come into contact with substances referred to in marginal 51 121, shall be kept clean. No lubricant capable of combining dangerously with the substance carried shall be used for pumps, valves or other devices.

- 211 571 Shells intended for the carriage of liquids of marginal 2501, 1° to 3°, shall be filled to not more than 95 per cent of their capacity at a reference temperature of 15°C.

Shells intended for the carriage of hot aqueous solutions of ammonium nitrate of marginal 2501, 6° (a), shall be filled to not more than 97 per cent of their capacity, and the maximum temperature after filling shall not exceed 140°C.

- 211 572 Tanks used for the carriage of hot aqueous solutions of ammonium nitrate of marginal 2501, 6° (a), shall not be used for the carriage of other substances without being first carefully cleansed of any residues.

211 573-
211 599

*Class 6.1. TOXIC SUBSTANCES**Section 1. GENERAL; SCOPE; DEFINITIONS*

211 600-
211 619

Section 2. CONSTRUCTION

- 211 620 Shells intended for the carriage of hydrocyanic acid solutions of 1° (b), or aqueous solutions of ethyleneimine and propyleneimine of 3°, or nickel carbonyl of 5° (a), shall be designed for a pressure of at least 15 kg/cm² (gauge pressure).

- 211 621 Shells intended for the carriage of other substances referred to in marginal 61 121 (1), (a) and (b), shall be designed for a pressure of at least 10 kg/cm² (gauge pressure).

- 211 622 Shells intended for the carriage of substances referred to in marginal 61 121 (1), (c), shall be designed for a pressure of at least 4 kg/cm² (gauge pressure).

- 211 623 Shells intended for the carriage of powdery or granular substances shall be designed in accordance with the requirements of the general section of this Appendix.

211 624-
211 629

Section 3. ITEMS OF EQUIPMENT

211 630 All openings of shells intended for the carriage of substances referred to in marginal 61 121 (1), (a) and (b), shall be above the surface level of the liquid. No piping or pipe connexions shall pass through the walls of the shell below the surface level of the liquid. The openings shall be capable of being hermetically closed, and the closure shall be capable of being protected by a lockable cap. In addition, cleaning apertures (fist-holes) as referred to in marginal 211 132 shall not be permitted for shells intended for the carriage of aqueous solutions of hydrocyanic acid [1° (b)].

211 631 (1) Shells intended for the carriage of substances referred to in marginal 61 121 (1), (c) and (d), may be of the bottom-discharge type.

(2) The bottom-discharge fittings of shells intended for the carriage of the substances referred to in marginal 61 121 (1), (c), shall conform to the requirements of marginal 211 131, and in addition the discharge pipes of the shells shall be capable of being closed by a blank flange, a plug, or some other equally effective device.

(3) All openings of the shells referred to in paragraph (1) shall be capable of being hermetically closed.

211 632 If the shells are fitted with safety valves, the latter shall be preceded by a frangible disc. The arrangement of the frangible disc and the safety valve shall be required to be satisfactory to the competent authority.

Tanks fitted with safety valves and frangible discs and intended for carriage by sea shall conform to the regulations governing that mode of transport.

211 633 *Protection of equipment*

(1) *Fittings and accessories mounted in the upper part of the shell.* Such fittings and accessories shall be either:

- Inserted in a recessed housing; or
- Equipped with an internal safety valve; or
- Shielded by a cap, or by transverse and/or longitudinal members, or by other equally effective devices, so profiled that in the event of overturning the fittings and accessories will not be damaged.

(2) *Fittings and accessories mounted in the lower part of the shell.* Pipe-sockets, lateral shut-off devices, and all discharge devices shall either be recessed by at least 200 mm from the extreme outer edge of the shell or be protected by a rail having a coefficient of inertia of not less than 20 cm³ transversally to the direction of travel; their ground clearance shall be not less than 300 mm with the shell full.

(3) *Fittings and accessories mounted on the rear face of the shell.* All fittings and accessories mounted on the rear face shall be protected by the bumper prescribed in marginal 10 216. Their height above the ground shall be such that they are adequately protected by the bumper.

211 634-
211 639

Section 4. TYPE APPROVAL

211 640 Tanks approved for the carriage of toxic substances shall not be approved for the carriage of foodstuffs, articles of consumption or animal feeding stuffs.

211 641-
211 649

Section 5. TESTS

211 650 Shells intended for the carriage of the substances referred to in marginal 61 121 (1) (a) to (c) shall be tested initially and periodically at a pressure of 4 kg/cm² (gauge pressure).

The periodic tests shall be carried out at intervals of not more than three years in the case of shells intended for the carriage of substances of 14°.

211 651-
211 659

Section 6. MARKING

211 660- (No special requirements.)
211 669

Section 7. OPERATION

211 670 The degree of filling of shells intended for the carriage of substances referred to in marginal 61 121 (1) (a) to (d) shall conform to marginal 211 172 (1) (d).

211 671 Shells intended for the carriage of substances of 5° (a) and 5° (b) shall be filled only to the extent of 1 kg of liquid per litre of capacity.

211 672 The openings of the shells shall be hermetically closed during carriage.

211 673 Tanks used for the carriage of toxic substances shall not be used for the carriage of foodstuffs, articles of consumption or animal feeding stuffs.

211 674-
211 699

*Class 7. RADIOACTIVE SUBSTANCES**Section 1. GENERAL; SCOPE; DEFINITIONS*

211 700-
211 719

Section 2. CONSTRUCTION

211 720 Shells intended for the carriage of the substances referred to in marginal 2703, schedule 5, paragraph 11, shall be designed for a pressure of at least 4 kg/cm² (gauge pressure).

211 721 Where the radioactive substances are in solution or suspension in substances of other classes and the calculation pressures prescribed for the shells of tanks intended for the carriage of the latter substances are greater, the latter pressures shall be applied.

211 722-
211 729

Section 3. ITEMS OF EQUIPMENT

211 730 Shells intended for the carriage of liquid radioactive substances* shall have their openings above the surface level of the liquid. No piping or pipe connexion shall pass through the walls of the shell below the surface level of the liquid.

211 731-
211 739

* For the purposes of this provision, substances whose efflux time at 20°C from a DIN cup with a 4-mm orifice does not exceed 10 minutes (corresponding to an efflux time of less than 96 sec. at 20°C from a No. 4 Ford cup, or to less than 2,680 centistokes) shall be deemed to be liquids.

Section 4. TYPE APPROVAL

- 211 740 Tanks approved for the carriage of radioactive substances shall not be approved for the carriage of foodstuffs, articles of consumption, animal feeding stuffs, cosmetics or medicaments, or of substances used in the manufacture of these products.
- 211 741-
211 749

Section 5. TESTS

- 211 750 Shells intended for the carriage of the substances referred to in marginal 2703, schedule 5, paragraph 11, shall be tested initially and periodically at a pressure of 4 kg/cm² (gauge pressure).
- 211 751 By derogation from the requirements of marginal 211 151, the periodic internal inspection may be replaced by a check of the wall thickness by ultrasound, performed every three years.
- 211 752-
211 759

Section 6. MARKING

- 211 760-
211 769 (No special requirements.)

Section 7. OPERATION

- 211 770 The degree of filling at the reference temperature of 15°C shall not exceed 93 per cent of the total capacity of the shell.
- 211 771 Tanks which have been used for the carriage of radioactive substances shall not be used for the carriage of foodstuffs, articles of consumption, animal feeding stuffs, cosmetics or medicaments, or of substances used in the manufacture of these products.
- 211 772-
211 799

*Class 8. CORROSIVE SUBSTANCES**Section 1. GENERAL; SCOPE; DEFINITIONS*

- 211 800-
211 819

Section 2. CONSTRUCTION

- 211 820
(8.2.1) Shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], of aqueous solutions of hydrofluoric acid [6° (b)], or of bromine (14°) shall be designed for a pressure of at least 21 kg/cm² (gauge pressure). Shells intended for the carriage of bromine shall be equipped with a lead lining not less than 5 mm thick, or with an equivalent lining.
- 211 821 Shells intended for the carriage of substances of 1° (a), 2° (a), 6° (c), 7° to 9°, 21° (a) and 23° shall be designed for a pressure of at least 10 kg/cm² (gauge pressure).
- Where the use of aluminium is necessary for shells intended for the carriage of substances of 2° (a), such shells shall be made of aluminium not less than 99.5 per cent pure, in which case, by derogation from the subparagraph above, the wall thickness need not exceed 15 mm.

Shells intended for the carriage of monochloroacetic acid [21° (a)] shall be equipped with an enamel or equivalent lining if the material of the shell is attacked by that acid.

211 822 Shells intended for the carriage of the substances referred to in marginal 81 121 other than those listed in marginals 211 820 and 211 821 shall be designed for a pressure of not less than 4 kg/cm² (gauge pressure).

211 823 Shells intended for the carriage of aqueous solutions of hydrogen peroxide (41°) shall meet the requirements of marginal 211 520.

211 824-
211 829

Section 3. ITEMS OF EQUIPMENT

211 830 All openings in shells intended for the carriage of substances of 6° and of bromine (14°) shall be above the surface level of the liquid; no piping or pipe connexions shall pass through the walls of the shell below the surface level of the liquid. In addition, cleaning apertures (fist-holes) as referred to in marginal 211 132 shall not be permitted. The closures shall be capable of being effectively protected by a metal cap.

211 831 The following requirements shall apply to demountable tanks intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] and of aqueous solutions of hydrofluoric acid [6° (b)]:

1. They shall not be interconnected by a manifold; and
2. If the demountable tanks can be rolled, the valves shall be fitted with protective caps.

211 832 Shells intended for the carriage of stabilized sulphur trioxide (9°) shall be thermally insulated and be fitted with a heating device on the outside. Shells may be of the bottom-discharge type. In this case the shell-discharge system shall be equipped with two mutually independent shut-off devices mounted in series, the first taking the form of a quick-closing internal stop-valve of an approved type and the second that of a sluice-valve fitted at the end of the discharge pipe-socket. A blank flange or some other equally reliable device shall also be fitted to the outlet of each external sluice-valve.

211 833 Shells and their service equipment intended for the carriage of hypochlorite solutions (37°) and of aqueous solutions of hydrogen peroxide (41°) shall be so designed as to prevent the entry of foreign matter, the leakage of liquid, and any build-up of dangerous excess pressure inside the shell.

Section 4. TYPE APPROVAL

211 840-
211 849 (No special requirements.)

Section 5. TESTS

211 850 Shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] and of aqueous solutions of hydrofluoric acid [6° (b)] shall undergo the initial pressure test and the periodic tests at a pressure of 10 kg/cm² (gauge pressure), and those intended for the carriage of the other substances referred to in marginal 81 121, if those substances are carried in the liquid phase, at a pressure of 4 kg/cm² (gauge pressure).

211 851 The pressure test of shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] and of aqueous solutions of hydrofluoric acid

[6° (b)] shall be repeated every six years and shall be accompanied by an internal inspection of the shells and a check of their items of equipment. In addition, every two years the resistance of the shells to corrosion shall be checked by means of suitable instruments (e.g. by ultrasound) and the condition of the equipment verified.

211 852 The pressure test of shells intended for the carriage of stabilized sulphur trioxide (9°) shall be repeated every three years.

211 853 The condition of the lining of shells intended for the carriage of bromine (14°) shall be checked every year by an approved expert, who shall inspect the inside of the shell.

211 854-
211 859

Section 6. MARKING

211 860 Shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], of aqueous solutions of hydrofluoric acid [6° (b)], or of bromine (14°), shall bear, in addition to the particulars already prescribed in marginals 211 160 and 211 161, an indication of the permissible maximum net load in kilogrammes and the date (month, year) of the most recent internal inspection of the shell.

211 861-
211 869

Section 7. OPERATION

211 870 Shells intended for the carriage of sulphuric acid [1° (c)] shall be filled to not more than 95 per cent of their capacity, those intended for the carriage of stabilized sulphur trioxide (9°) to not more than 88 per cent, and those intended for the carriage of bromine (14°) to not less than 88 per cent and not more than 92 per cent or to the extent of 2.86 kg per litre of capacity. Shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] or of aqueous solutions of hydrofluoric acid [6° (b)] shall not be filled to the extent of more than 0.84 kg per litre of capacity.

211 871-
212 099''

APPENDIX B.1b

PROVISIONS CONCERNING TANK-CONTAINERS (DESIGN AND TESTING)

Text of the existing appendix B.1b with the following amendments:

Renumber the marginals as follows:

Chapter I (No change)

<i>Existing numbering</i>	<i>New numbering</i>
212 100	212 100
to	to
212 102	212 102
212 103-	212 103-
212 199	212 119

<i>Existing numbering</i>	<i>New numbering</i>
212 200	212 120
to	to
212 208	212 128
212 209-	212 129
212 299	
212 300	212 130
to	to
212 306	212 136
212 307-	212 137-
212 399	212 139
212 400	212 140
212 401-	212 141-
212 499	212 149
212 500	212 150
to	to
212 502	212 152
212 503-	212 153-
212 599	212 159
212 600	212 160
and	and
212 601	212 161
212 602-	212 162-
212 699	212 169
212 700	212 170
to	to
212 707	212 177
212 708-	212 178-
212 799	212 179
212 800	212 180
212 801-	212 181-
213 099	212 199

Amendments to renumbered marginals

- 212 121 Replace “212 201” by “212 121”.
- 212 127 (3) Replace “212 205” by “212 125”.
- 212 128 Replace “212 207 (1)” by “212 127 (1)”.
- 212 130 Replace “212 301” by “212 131”.
- 212 133 Replace “212 304” and “212 305” by “212 134” and “212 135”.
- 212 134 Replace “212 305” by “212 135”.
- 212 151 Replace “212 500” by “212 150”.
- 212 172 (3) Replace “212 702 (1)” by “212 172 (1)”.

Chapter II

Class 2

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
213 100-	212 200-
213 199	212 219

<i>Existing numbering</i>	<i>New numbering</i>
213 200	212 220
to	and
213 202	212 221
213 203-	212 222-
213 299	212 229
213 300	213 230
to	to
213 305	212 235
213 306-	212 236-
213 399	212 239
213 400-	212 240-
213 499	212 249
213 500	212 250
to	to
213 507	212 257
213 508-	212 258-
213 599	212 259
213 600	212 260
and	and
213 601	212 261
213 602-	212 262-
213 699	212 269
213 700	212 270
to	to
213 708	212 278
213 709-	212 279
213 799	
213 800-	212 280-
214 099	212 299

Amendments to renumbered marginals

- 212 220 Replace “1° to 10° and 14°” by “1° to 6° and 9°”.
- 212 221 Replace “marginals 211 050 to 211 086” by “Appendix B.1d, marginals 214 250 to 214 285,” and replace “11° to 13°” by “7° and 8°”.
- 212 222 Delete the text of the existing marginal.
- 212 230 Replace “213 301” by “212 131”.
- 212 232 (1) Replace “1° to 10° and 14°” by “1° to 6° and 9°”.
- Replace “1° to 14°” by “1° to 9°”.
- Amend footnote 10 to read as follows:
- “¹⁰Gases identified by the letter ‘t’ in the list of substances are deemed to be gases harmful to the respiratory organs or entailing a poison risk”.
- (2) Replace “11°” by “7° (a) and 8° (a)”.
- Replace “12° and 13°” by “7° (b) and 8° (b)”.
- (3) Replace “11° to 13°” by “7° and 8°”.
- Reword the end of the second sentence and the beginning of the third sentence as follows:
- “... faultlessly even at their lowest working temperature. The reliability of their operation at that temperature shall be . . .”.
- 212 234 (1) Replace “4° to 8°” by “3° and 4°”.

- (2) Read:
 “(2) The shells of tank-containers intended for the carriage of 1,3-butadiene [3° (c)], or of methyl vinyl ether, trifluorochloroethylene or vinyl bromide [3° (c t)], shall be protected by a sun-shield as defined above”.
- (3) Replace “11° to 13°” by “7° and 8°”.
- (4) Read:
 “(4) The shells of tank-containers intended for the carriage of oxygen [7° (a)], or of air or mixtures of oxygen with nitrogen [8° (a)], shall not include any combustible material either in the thermal insulation or in the means of attachment to the frame”.
- 212 235 (3) After “compressed gases”, insert “of 1° and 2°”.
 Replace “11” by “10” and delete the footnote.
- (4) After “liquefied gases”, insert “of 3° to 6°”.
 Replace “12” by “10” and delete the footnote.
 At the end, replace “a sealed valve” by “a valve capable of being sealed”.
- 212 250 Replace “11° to 13°” by “7° and 8°” and “marginals 211 075 to 211 086” by “appendix B.1d, marginals 214 250 to 214 285”.
- 212 251 (1) Replace “1° to 3°” by “1° and 2°”.
 (2) Replace “4° to 8°” by “3° and 4°” and “210 201 (2) (b)” by “211 251 (2) (b)”.
- (3) Replace “9° and 10°” by “5° and 6°” and “210 201 (3) (b)” by “211 251 (3)”.
- (4) Replace “(14°)” by “[9° (a t)]” and “210 201 (6)” by “211 251 (4)”.
- (5)(a) Replace “11° to 13°” by “7° and 8°”.
 (b) Replace “11°” by “7° (a) and 8° (a)”.
- 212 253 Replace “4° to 8° and 14°” by “3°, 4° or 9°” and “210 201 (5)” by “211 251 (3)”.
- 212 255 Replace “212 500 and 212 501” by “212 150 and 212 151”.
- (1) Read:
 “(1) Every two and one-half years in the case of tank-containers intended for the carriage of boron trifluoride [1° (a t)], town gas [2° (b t)], chlorine, hydrogen bromide, nitrogen dioxide, phosgene or sulphur dioxide [3° (a t)], hydrogen sulphide [3° (b t)] or hydrogen chloride [5° (a t)];”.
- (2) Replace “11°” by “7° (a) and 8° (a)”.
- (3) Replace the end of the first sentence and the beginning of the second by “for the carriage of gases of 7° (a) and 8° (a) and of tank-containers intended for the carriage of gases of 7° (b) and 8° (b). A leakproofness check . . .”.
- 212 256 and
 212 257 Replace “11° to 13°” by “7° and 8°”.
- 212 260 Read:
 “. . . the plate described in marginal 212 160 or directly . . .”.
- (1) Replace “1° to 3°” by “1° and 2°”; “4° to 13°” by “3° to 8°”; and “14°” by “9° (a t)”.
- (3) Read:
 “(3) On tank-containers equipped with safety valves and intended for the carriage of gases of 7° (a) and 8° (a), and on tank-containers intended for the carriage of gases of 7° (b) and 8° (b): the working pressure”.

212 270

Read:

“A tank-container assigned at different times to the carriage of different liquefied gases of 3° to 8° (multi-purpose tank-containers) may not carry substances other than those listed in one, and one only, of the following groups:

- Group 1, halogenated hydrocarbons of 3° (a) and 4° (a);
- Group 2, hydrocarbons of 3° (b) and 4° (b);
- Group 3, ammonia [3° (a t)]; dimethyl ether, dimethylamine, ethylamine, methylamine and trimethylamine [3° (b t)]; and vinyl chloride [3° (c)];
- Group 4, methyl bromide [3° (a t)]; ethyl chloride and methyl chloride [3° (b t)];
- Group 5, mixtures of ethylene oxide with carbon dioxide and of ethylene oxide with nitrogen [4° (c t)];
- Group 6, gases of 7° (a) and mixtures of gases of 8° (a);
- Group 7, ethane, ethylene and methane [7° (b)]; and mixtures of ethane with methane, also when they contain propane or butane [8° (b)]”.

212 271

Read:

“Tank-containers which have been filled with a substance of group 1 or group 2 shall be emptied of liquefied gas before being loaded with another substance belonging to the same group. Tank-containers which have been filled with a substance of one of the groups 3 to 5 shall be completely emptied of liquefied gas and blown down before being loaded with another substance belonging to the same group”.

212 274

Text of the existing marginal 213 704, but with the words “under marginal 211 161” inserted, in the second line, between “applicable” and “to the”.

212 275

Replace “13” by “10” and delete the footnote.

212 276

Replace “212 201 (3) (b) and (6)” by “211 251 (2), (3) and (4)”.

212 278

Amend the beginning to read:

“On the shells of tank-containers intended for the carriage of oxygen [7° (a)], or of air or mixtures of oxygen with nitrogen [8° (a)], substances containing . . .”.

Class 3

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
214 100-	212 300-
214 199	212 319
214 200	212 320
214 201-	212 321-
214 299	212 329
214 300	212 330
and	and
214 301	212 331
214 302-	212 332-
214 399	212 339
214 400-	212 340-
214 499	212 349
214 500-	212 350-
214 599	212 359
214 600-	212 360-
214 699	212 369

<i>Existing numbering</i>	<i>New numbering</i>
214 700	212 370
to	to
214 703	212 373
214 704-	212 374-
214 799	212 379
214 800-	212 380-
215 099	212 399

Amendments to renumbered marginals

212 372 Replace “212 303” by “212 133”.

Classes 4.1, 4.2 and 4.3

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
215 100-	212 400-
215 199	212 419
215 200	212 420
215 201-	212 421-
215 299	212 429
215 300	212 430
to	to
215 302	212 432
215 303-	212 433-
215 399	212 439
215 400-	212 440-
215 499	212 449
215 500	212 450
215 501-	212 451-
215 599	212 459
215 600-	212 460-
215 699	212 469
215 700	212 470
to	to
215 704	212 474
215 705-	212 475-
215 799	212 479
215 800-	212 480-
216 099	212 499

Amendments to renumbered marginals

212 421 (new) The shells of tank-containers intended for the carriage of aluminium alkyls, and of halides and hydrides of aluminium alkyls, of marginal 2431, 3°, shall be designed for a pressure of not less than 21 kg/cm² (gauge pressure).

212 422-
212 429

212 433 (new) The shells of tank-containers intended for the carriage of aluminium alkyls, and of halides and hydrides of aluminium alkyls, of marginal 2431, 3°, shall not have openings or connexions, even if closable, below the surface level of the liquid. Openings, including their fittings and accessories, in the upper part of the shell shall be capable of being protected by a protective cap.

212 434-
212 439

212 451 (new) The shells of tank-containers intended for the carriage of aluminium alkyls, and of halides and hydrides of aluminium alkyls, of marginal 2431, 3°, shall undergo an initial pressure test, and periodic tests every five years, performed at a pressure of 10 kg/cm² (gauge pressure) with a liquid which does not react with the substance to be carried.

212 452-

212 459

212 472 Replace "215 302" by "212 432".

Classes 5.1 and 5.2

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
216 100-	212 500-
216 199	212 519
216 200	212 520
216 201-	212 521-
216 299	212 529
216 300	212 530
to	to
216 303	212 533
216 304-	212 534-
216 339	212 539
216 400-	212 540-
216 499	212 549
216 500	212 550
216 501-	212 551-
216 599	212 559
216 600-	212 560-
216 999	212 569
216 700	212 570
and	and
216 701	212 571
216 702-	212 572-
216 799	212 579
216 800-	212 580-
217 099	212 599

Amendments to renumbered marginals

212 533 Replace "213 304 (1)" by "212 234 (1)".

Class 6.1

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
217 100-	212 600-
217 199	212 619
217 200	212 620
and	and
217 201	212 621
217 202-	212 622-
217 299	212 629
217 300	212 630

<i>Existing numbering</i>	<i>New numbering</i>
217 301-	212 631-
217 399	212 639
217 400-	212 640-
217 499	212 649
217 500	212 650
217 507-	212 651-
217 599	212 659
217 600-	212 660-
217 699	212 669
217 700	212 670
and	and
217 701	212 671
217 702-	212 672-
217 799	212 679
217 800-	212 680-
218 009	212 699

Amendments to renumbered marginals

212 621 Replace “217 200” by “212 620”.

Class 7

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
218 010-	212 700-
218 019	212 719
218 020	212 720
218 021-	212 721-
218 029	212 729
218 030	212 730
218 031-	212 731-
218 039	212 739
218 040	212 740
218 041-	212 741-
218 049	212 749
218 050	212 750
218 051-	212 751-
218 059	212 759
218 060-	212 760-
218 069	212 769
218 070	212 770
218 071-	212 771-
218 079	212 779
218 080-	212 780-
218 099	212 799

Amendments to renumbered marginals

212 730 Replace “14” by “9” and delete the footnote.

212 750 Replace “212 500” by “212 150”.

Class 8

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
218 100-	212 800-
218 199	212 819
218 200	212 820
to	to
218 203	212 823
218 204-	212 824-
218 299	212 829
218 300	212 830
to	to
218 302	212 832
218 303-	212 833-
218 399	212 839
218 400-	212 840-
218 499	212 849
218 500	212 850
to	to
218 502	212 853
218 503-	212 854-
218 599	212 859
218 600	212 860
218 601-	212 861-
218 699	212 869
218 700	212 870
218 701-	212 871-
218 799	212 879
218 800-	212 880-
218 999	213 099

Amendments to renumbered marginals

212 820 Read:

“The shells of tank-containers intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], of aqueous solutions of hydrofluoric acid [6° (b)], or of bromine (14°), shall be designed for a pressure of not less than 21 kg/cm² (gauge pressure)”.

212 821 Read:

“The shells of tank-containers intended for the carriage of substances of 1°, (a) and (b); 2°, (a) and (b); 6° (c); 7° to 9°; 21° (a); and 23°, shall be designed for a pressure of not less than 10 kg/cm² (gauge pressure)”.

212 830 Amend the first sentence to read as follows:

“All openings in the shells of tank-containers intended for the carriage of substances of 6° or of bromine (14°) shall be above the surface level of the liquid”.

212 850 Read:

“The shells of tank-containers intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], or of aqueous solutions of hydrofluoric acid of 6° (b), shall undergo the initial pressure test and the periodic tests at a pressure of 10 kg/cm² (gauge pressure), and those intended for the carriage of the other substances referred to in marginal 81 121 (2), at a pressure of 4 kg/cm² (gauge pressure)”.

212 853 Insert the new marginal:

(new)

“In addition to the tests prescribed in Section 5, the corrosion resistance of tank-containers intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], or of aqueous solutions of hydrofluoric acid of 6° (b), shall be checked by means of suitable instruments (e.g. by ultrasound methods); and the condition of the items of equipment verified, every two and one-half years”.

212 860 Amend the beginning of the marginal to read:

“In addition to the particulars prescribed in marginals 212 160 and 212 161, the following particulars shall be marked on tank-containers intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)], of aqueous solutions of hydrofluoric acid of 6° (b), or of bromine (14°): . . .”.

212 870 Read:

“The shells of tank-containers intended for the carriage of sulphuric acid [1° (c)] shall be filled to not more than 95 per cent of their capacity, those intended for the carriage of stabilized sulphur trioxide (9°) to not more than 88 per cent, and those intended for the carriage of bromine (14°) to not less than 88 per cent and not more than 92 per cent or to the extent of 2.86 kg per litre of capacity. Shells intended for the carriage of hydrogen fluoride (anhydrous hydrofluoric acid) [6° (a)] and of aqueous solutions of hydrofluoric acid [6° (b)] shall not be filled to the extent of more than 0.84 kg per litre of capacity”.

APPENDIX B.1c

PROVISIONS CONCERNING FIXED TANKS AND DEMOUNTABLE TANKS IN REINFORCED PLASTICS

Text of the existing appendix B.1c with the following amendments:

Renumber the marginals as follows:

<i>Existing numbering</i>	<i>New numbering</i>
219 000	213 100
to	to
219 003	213 103
219 004-	213 104-
219 199	213 119
219 200	213 120
219 201-	213 121-
219 299	213 129
219 300	213 130
to	to
219 304	213 134
219 305-	213 135-
219 399	213 139
219 400	213 140
to	to
219 403	213 143
219 404-	213 144-
219 499	213 149
219 500	213 150
to	to
219 508	213 158
219 509-	213 159-
219 999	213 999

Amendments to renumbered marginals

- 213 100 Read:
- “The tanks must satisfy the following requirements of appendix B.1a:
- (1) General provisions applicable to tanks used for carriage of substances of all classes: marginals 211 120, (4), (5) and (6); 211 121, (1) and (2); 211 122; 211 124; 211 126; 211 127, (5); 211 128; 211 130; 211 132; 211 137; 211 140; 211 150 to 211 153; 211 160 and 211 161; 211 171; 211 172, (1) and (2); and 211 173 to 211 178;
 - (2) Provisions applicable to tanks used for carriage of substances of class 3: marginal 211 330; the leakproofness test and the internal inspection shall be performed every three years;
 - (3) Special provisions applicable to tanks used for carriage of substances of class 8: marginal 211 833”.
- 213 120 Replace “15” by “1”.
- and footnote
- 213 132 Replace “219 400 (6) and 219 402 (2)” by “213 140 (6) and 213 142 (2)”.
- 213 133 Replace “219 400 (3)” by “213 140 (3)”.
- 213 140 (3) Replace “16” and “17” by “2” and “3” respectively.
- and footnotes
- 213 141 Replace “219 400 (4)” by “213 140 (4)”.
- 213 142 (1) Replace “219 400” by “213 140” in each case.
- and (3)
- (2) Replace “18” by “4” and renumber the footnote itself as “4”.
- 213 143 Replace “210 021, paragraph (2), (e)” by “211 150 and 211 151”.
- 213 153 Replace “219 504” by “213 154”.
- 213 154 Replace “219 505” by “213 155”.
- 213 157 Replace “219 506” by “213 156”.
- Table 1 and diagrams 1, 2 and 3 are maintained as they stand.

APPENDIX B.1d

REQUIREMENTS CONCERNING THE MATERIALS AND CONSTRUCTION OF RECEPTACLES, OF FIXED TANKS, OF DEMOUNTABLE TANKS, AND OF SHELLS OF TANK-CONTAINERS, INTENDED FOR THE CARRIAGE OF DEEPLY-REFRIGERATED LIQUEFIED GASES OF CLASS 2

214 000-

214 249

214 250 (1) Receptacles, tanks and shells shall be made of steel, aluminium, aluminium alloy, copper or copper alloy, e.g. brass. However, receptacles, tanks and shells made of copper or copper alloy shall be allowed only for gases containing no acetylene; ethylene may however contain not more than 0.005 per cent acetylene.

(2) Only materials appropriate to the lowest working temperature of the receptacles, tanks and shells and of their fittings and accessories may be used.

214 251 The following materials shall be allowed for the manufacture of receptacles, tanks and shells:

(a) Steels not subject to brittle fracture at the lowest working temperature (see marginal 214 265); the following may be used:

1. Fine-grained unalloyed steels, down to a temperature of -60°C ;

2. Nickel steels (with a nickel content of 0.5 to 9 per cent), down to a temperature of -196°C , depending on the nickel content;
3. Austenitic chrome-nickel steels, down to a temperature of -270°C ;
- (b) Aluminium not less than 99.5 per cent pure, or aluminium alloys (see marginal 214 266);
- (c) Deoxidized copper not less than 99.9 per cent pure, or copper alloys having a copper content of over 56 per cent (see marginal 214 267).
- 214 252 (1) Receptacles, tanks and shells shall be either seamless or welded.
(2) Receptacles under marginal 2207 made of austenitic steel, of copper or of copper alloy may alternatively be hard-soldered.
- 214 253 The fittings and accessories may either be screwed to the receptacles, tanks and shells or be secured thereto as follows:
(a) Receptacles, tanks and shells made of steel, aluminium or aluminium alloy: by welding;
(b) Receptacles, tanks and shells made of austenitic steel, of copper or of copper alloy: by welding or hard-soldering.
- 214 254 The construction of receptacles, tanks and shells and their attachment to the vehicle, to the underframe or in the container frame shall be such as to preclude with certainty any such reduction in the temperature of the load-bearing components as would be likely to render them brittle. The means of attachment of receptacles, tanks and shells shall themselves be so designed that even when the receptacle, tank or shell is at its lowest working temperature they still possess the necessary mechanical properties.
- 214 255-
214 264

1. *Materials, receptacles, tanks and shells*
(a) *Steel receptacles, tanks and shells*

- 214 265 The materials used for the manufacture of receptacles, tanks and shells, and the weld beads, shall at their lowest working temperature meet at least the following requirements as to impact strength.
The tests may be conducted with test-pieces having either a U-shaped or a V-shaped notch.

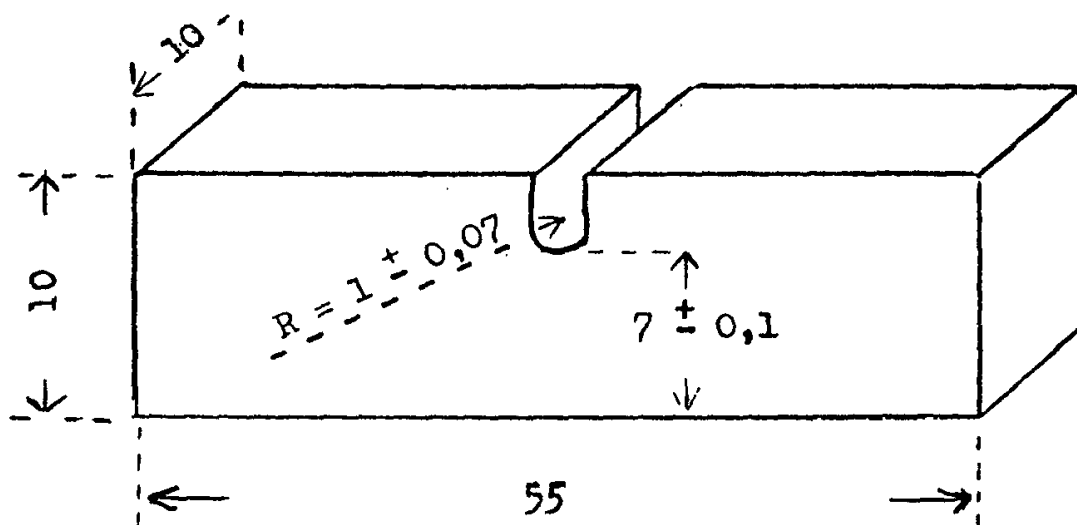
Material	Impact strength ^{(1) (2)} of sheet metal and weld beads at lowest working temperature	
	kgm/cm ²⁽³⁾	kgm/cm ²⁽⁴⁾
Unalloyed killed steel	3.5	2.8
Ferritic alloy steel Ni < 5%	3.5	2.2
Ferritic alloy steel 5% ≤ Ni ≤ 9%	4.5	3.5
Austenitic Cr-Ni steel	4.0	3.2

⁽¹⁾ Impact strengths determined with different test-pieces are not mutually comparable.

⁽²⁾ See marginals 214 275 to 214 277.

⁽³⁾ The values relate to test-pieces with a U-shaped notch as illustrated below.

⁽⁴⁾ The values relate to test-pieces with a V-shaped notch conforming to ISO R 148.



In the case of austenitic steels, only the weld bead need be subjected to an impact-strength test.

For working temperatures below -196°C the impact-strength test is not performed at the lowest working temperature, but at -196°C .

(b) *Receptacles, tanks and shells made of aluminium or aluminium alloy*

214 266

The seams of receptacles, tanks and shells shall at ambient temperature meet the following requirements as to bending coefficient:

Thickness of sheet <i>e</i> in mm	Bending coefficient $k^{(1)}$ for the seam	
	Root in compression zone	Root in tension zone
≤ 12	≥ 15	≥ 12
> 12 to 20	≥ 12	≥ 10
> 20	≥ 9	≥ 8

⁽¹⁾ See marginal 214 285.

(c) *Receptacles, tanks and shells made of copper or copper alloy*

214 267

It is not necessary to carry out tests to determine whether the impact strength is adequate.

214 268-
214 274

2. *Tests*

(a) *Impact-strength tests*

214 275

The impact strengths indicated in marginal 214 265 relate to test-pieces measuring 10×10 mm and having a U-shaped or a V-shaped notch.

NOTES. 1. With regard to the shape of the test-piece, see marginal 214 265 (table), footnotes 3 and 4.

2. For sheets less than 10 mm but not less than 5 mm thick, test-pieces with a cross-section of $10 \times e$ mm, where "e" represents the thickness of the sheet, shall be used. Such impact-strength tests generally yield higher values than do such tests on standard test-pieces.

3. No impact-strength test shall be carried out on sheets less than 5 mm thick, or on their seams.

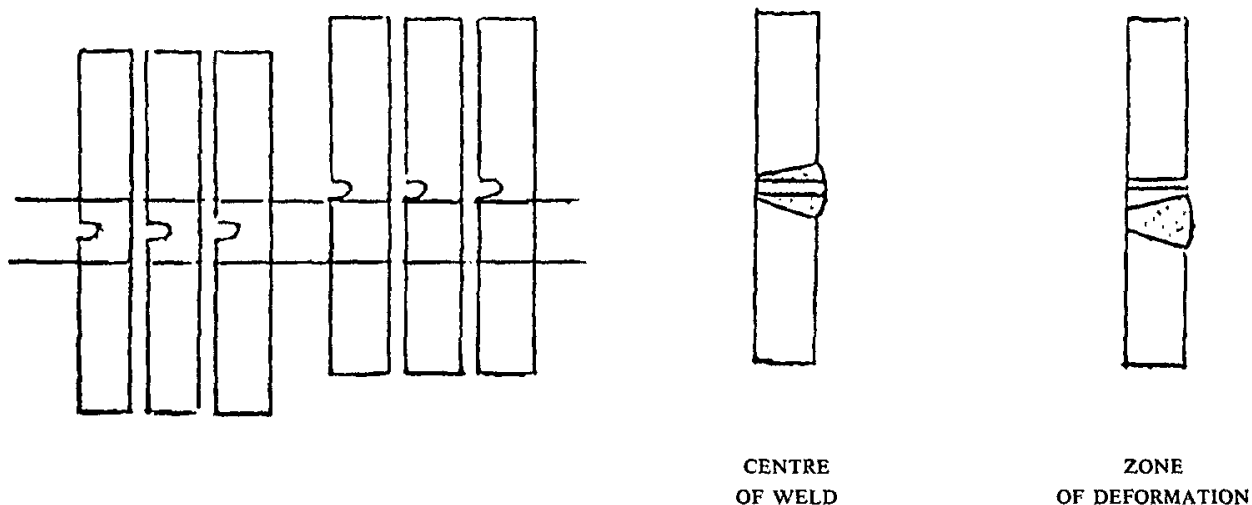
214 276

(1) For testing sheets the impact strength shall be determined on three test-pieces. Test-pieces with a U-shaped notch shall be taken at right angles to the direction of rolling and test-pieces with a V-shaped notch in the direction of rolling.

(2) For testing seams the test-pieces shall be taken as follows:

$e \leq 10$

- Three test-pieces from the centre of the weld;
- Three test-pieces from the zone of deformation created by the weld (the notch shall be completely outside the melted area but as near to it as possible);

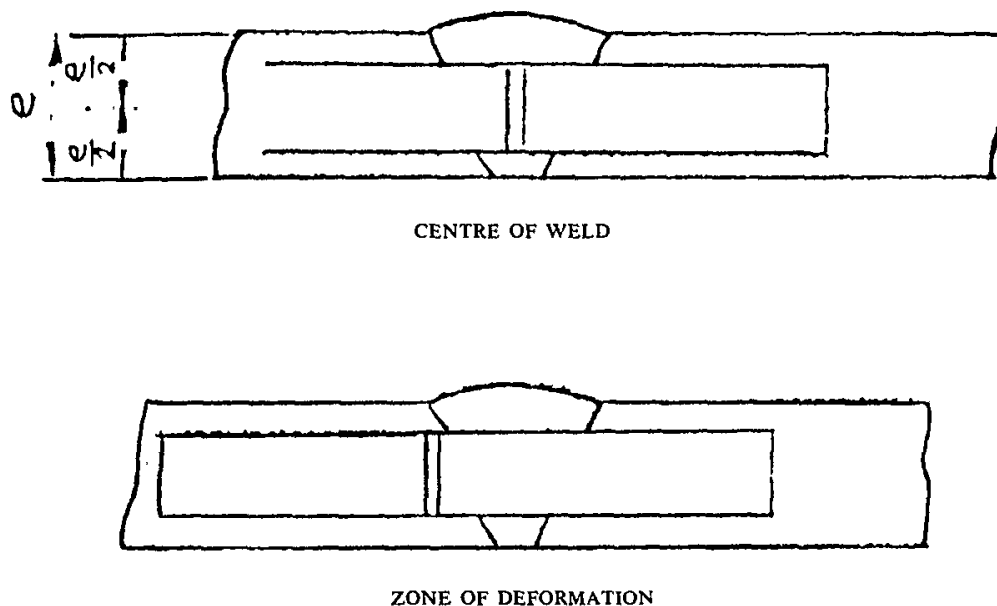


- i.e. six test-pieces in all.

The test pieces shall be so machined as to have the maximum possible thickness.

$10 < e \leq 20$

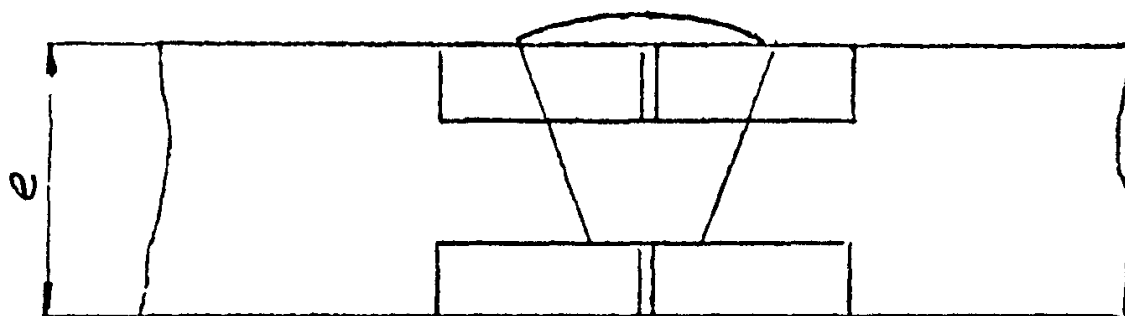
- Three test-pieces from the centre of the weld;
- Three test-pieces from the zone of deformation;



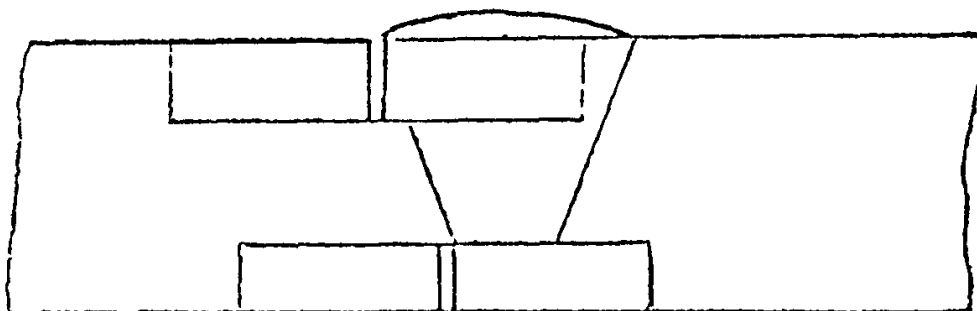
— i.e. six test-pieces in all.

$e > 20$

— Two sets of three test-pieces (one set on the upper face, one set on the lower face) at each of the points indicated below:



CENTRE OF WELD



ZONE OF DEFORMATION

— i.e. twelve test-pieces in all.

214 277

(1) For sheets, the average of the three tests shall meet the minimum values indicated in marginal 214 265; none of the values may be more than 30 per cent below the minimum shown.

(2) For welds, the average values obtained from the test-pieces taken at the different points, centre of weld and zone of deformation, shall correspond to the minimum values indicated. None of the values may be more than 30 per cent below the minimum indicated.

214 278-

214 284

(b) *Determination of bending coefficient*

214 285

(1) The bending coefficient k referred to in marginal 214 266 is defined as follows:

$$k = 50 \frac{e}{r},$$

where e = thickness of the sheet in mm

r = mean radius of curvature in mm of the test-piece when the first crack appears in the tension zone.

(2) The bending coefficient k shall be determined for the seam. The width of the test-piece shall be equal to $3e$.

(3) Four tests shall be performed on the seam, two with the root in the compression zone (figure 1) and two with the root in the tension zone (figure 2); all individual values obtained shall meet the minimum-value requirements of marginal 214 266.

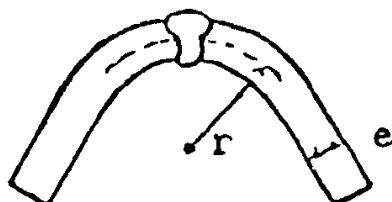


FIGURE 1

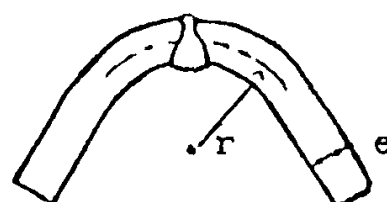


FIGURE 2

214 286-
219 999''

APPENDIX B.2

ELECTRICAL EQUIPMENT

Replace marginal 220 002 by the following:

“220 002

The inflammable gases and articles of class 2 whose carriage is not exempted by the provisions of marginal 21 251 from the application of the requirements of marginal 220 000 are the following:

- | | |
|--------------------------------|--|
| (a) <i>Compressed gases</i> | — Methylamine [3° (b t)] |
| — Hydrogen [1° (b)] | — Methyl mercaptan [3° (b t)] |
| — Methane [1° (b)] | — Trimethylamine [3° (b t)] |
| — Carbon monoxide [1° (b t)] | — Butadiene [3° (c)] |
| — Mixtures of gases of 2° (b) | — Vinyl chloride [3° (c)] |
| — Synthetic gases [2° (b t)] | — Vinyl bromide [3° (c t)] |
| — Town gas [2° (b t)] | — Cyanogen chloride [3° (c t)] |
| — Water gas [2° (b t)] | — Ethylene oxide [3° (c t)] |
| (b) <i>Liquefied gases</i> | — Gaseous mixtures A, A0, A1, B or C [4° (b)] |
| — Butane [3° (b)] | — Ethane [5° (b)] |
| — Butylene [3° (b)] | — Ethylene [5° (b)] |
| — Cyclopropane [3° (b)] | |
| — Isobutane [3° (b)] | (c) <i>Deeply-refrigerated liquefied gases</i> |
| — Isobutylene [3° (b)] | — The gases of 7° (b) and 8° (b) |
| — Propane [3° (b)] | |
| — Propylene [3° (b)] | (d) <i>Gases dissolved under pressure</i> |
| — Ethyl chloride [3° (b t)] | — Acetylene [9° (c)] |
| — Methyl chloride [3° (b t)] | |
| — Dimethyl ether [3° (b t)] | (e) <i>Articles containing gas</i> |
| — Ethylamine [3° (b t)] | — Aerosol dispensers of 10°, (b) and (b t) |
| — Hydrogen sulphide [3° (b t)] | |

220 003-
229 999''

APPENDIX B.5

LIST OF SUBSTANCES REFERRED TO UNDER MARGINAL 10 500 (2)

250 000

Amend the items concerning hydrofluoric acid (hydrogen fluoride) and replace the class 2 items, as follows:

	(a)	(b)	(c)	(d)
"A				
Air		2, 8° (a)	22	1003
Ammonia		2, 3° (a t)	268	1005
Ammonia dissolved in water, with more than 35% but not more than 40% ammonia by weight		2, 9° (a t)	268	2073
Ammonia dissolved in water, with more than 40% but not more than 50% ammonia by weight		2, 9° (a t)	268	2073
Argon (refrigerated)		2, 7° (a)	22	1951
B				
1,3-Butadiene		2, 3° (c)	239	1010
Butane		2, 3° (b)	23	1011
1-Butylene		2, 3° (b)	23	1012
C				
Carbon dioxide		2, 5° (a)	20	1013
Carbon dioxide, liquid (refrigerated)		2, 7° (a)	22	2187
Chlorine		2, 3° (a t)	266	1017
Chlorodifluoromethane (R.22)		2, 3° (a)	20	1018
Chlorotrifluoromethane (R.13)		2, 5° (a)	20	1022
Cyclopropane		2, 3° (b)	23	1027
D				
Dichlorodifluoromethane (R.12)		2, 3° (a)	20	1028
Dichlorofluoromethane (R.21)		2, 3° (a)	20	1029
1,2-Dichloro-1, 1,2,2-tetrafluoroethane (R.114)		2, 3° (a)	20	1958
Dimethyl ether		2, 3° (b t)	23	1033
E				
Ethyl chloride		2, 3° (b t)	23	1037
Ethylene		2, 5° (b)	23	1962
Ethylene (refrigerated)		2, 7° (b)	223	1038
H				
Hydrocarbon gas mixtures A, A0, A1, B and C (liquefied) ...		2, 4° (b)	23	1965
Hydrogen bromide		2, 3° (a t)	286	1048
Hydrogen chloride		2, 5° (a t)	286	1050
Hydrogen fluoride (anhydrous hydrofluoric acid)		8, 6° (a)	886	1052
Hydrofluoric acid, aqueous solutions containing more than 85 per cent pure acid		8, 6° (b)	886	1790
Hydrofluoric acid, aqueous solutions containing more than 60 per cent but not more than 85 per cent pure acid		8, 6° (c)		
Hydrofluoric acid, aqueous solutions containing not more than 60 per cent pure acid		8, 6° (d)		
I				
Isobutane		2, 3° (b)	23	1069
Isobutylene		2, 3° (b)	23	1055

	(a)	(b)	(c)	(d)
<i>M</i>				
Methane (refrigerated)		2, 7° (b)	223	1972
Methylamine		2, 3° (b t)	263	1061
Methyl bromide (bromomethane)		2, 3° (a t)	263	1062
Methyl chloride (chloromethane)		2, 3° (b t)	236	1063
Methyl vinyl ether		2, 3° (c t)	239	1087
<i>N</i>				
Natural gas (refrigerated)		2, 8° (b)	223	2043
Nitrogen (refrigerated)		2, 7° (a)	22	1977
Nitrogen dioxide NO ₂ (nitrogen peroxide, nitrogen tetroxide N ₂ O ₄)		2, 3° (a t)	265	1067
Nitrous oxide N ₂ O		2, 5° (a)	25	1070
<i>O</i>				
Oxygen (refrigerated)		2, 7° (a)	225	1073
<i>P</i>				
Phosgene		2, 3° (a t)	266	1076
Propane		2, 3° (b)	23	1978
Propylene		2, 3° (b)	23	1077
<i>S</i>				
Sulphur dioxide		2, 3° (a t)	26	1079
<i>T</i>				
Trimethylamine		2, 3° (b t)	236	1083
<i>V</i>				
Vinyl chloride		2, 3° (c)	239	1086 „

Authentic text of the amendments: French.

Registered ex officio on 1 October 1978.