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ECONOMIC COMMISSION FOR EUROPE

INLAND TRANSPORT COMMITTEE

Working Party on the Transport of Dangerous Goods

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF
DANGEROUS GOODS BY ROAD (ADR)**

Draft amendments to annexes A and B of ADR

Addendum

Note by the secretariat

This document contains an additional list of amendments to annexes A and B of ADR adopted by the Working Party at its eighty-fourth session (5-8 May 2008) for submission to Contracting Parties to ADR for acceptance and for entry into force on 1 January 2009 (see ECE/TRANS/WP.15/194, par. 64).

Part 1

Chapter 1.1

1.1.3.6.2 Amend the first indent to read as follows:

"- Chapter 1.10, except for Class 1 explosives of Division 1.4 of UN Nos. 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456 and 0500;"

Chapter 1.2

1.2.1 Definition of "*Capacity of shell or shell compartment*":

In the French text, in the first sentence, replace "de la citerne ou du compartiment de la citerne" par "du réservoir ou du compartiment de réservoir".

Definition of "*Composite IBC with plastics inner receptacle*":

In the French text, replace "entourant un récipient intérieur en plastique" with "entourant un récipient intérieur en matière plastique".

Add the following new definitions:

"*MEMU*", see "*Mobile explosives manufacturing unit*";

"*Mobile explosives manufacturing unit*" (*MEMU*) means a unit, or a vehicle mounted with a unit, for manufacturing and charging explosives from dangerous goods that are not explosives. The unit consists of various tanks and bulk containers and process equipment as well as pumps and related equipment. The *MEMU* may have special compartments for packaged explosives;

NOTE: *Even though the definition of MEMU includes the expression "manufacturing and charging explosives" the requirements for MEMUs apply only to carriage and not to manufacturing and charging of explosives."*

Chapitre 1.4

1.4.3.4 (b) In the French text, replace "citernes" with "réservoirs".

Chapter 1.6

1.6.2 Add the following new transitional measure:

"1.6.2.7 Contracting Parties may continue to apply the requirements of 6.2.1.4.1 to 6.2.1.4.4 applicable until 31 December 2008 instead of those of 1.8.6, 1.8.7, 6.2.2.9, 6.2.3.6 to 6.2.3.8 until 30 June 2011."

- 1.6.3.20 Replace "and special provision TE15 of 6.8.4 (b) applicable as from 1 January 2003" with "applicable as from 1 January 2003 and special provision TE15 of 6.8.4 (b) applicable from 1 January 2003 to 31 December 2006".
- 1.6.3 Add the following new transitional measure:
- "1.6.3.35 Contracting Parties need not apply the requirements of 1.8.6, 1.8.7 and 6.8.4 TA4 and TT9 before 1 July 2011."
- 1.6.4 Add the following new transitional measure:
- "1.6.4.34 Contracting Parties need not apply the requirements of 1.8.6, 1.8.7 and 6.8.4 TA4 and TT9 before 1 July 2011."
- 1.6.5.10 Amend to read as follows:
- "1.6.5.10 Certificates of approval which conform to the model shown in 9.1.3.5 applicable up to 31 December 2006 and those which conform to the model shown in 9.1.3.5 applicable from 1 January 2007 to 31 December 2008 may continue to be used."
- 1.6.5 Add the following new transitional measure:
- "1.6.5.11 MEMUs which have been constructed and approved before 1 January 2009 in accordance with the provisions of national law but which do not, however, conform to the construction and approval requirements applicable as from 1 January 2009 may be used with the approval of the competent authorities in the countries of use."

Chapter 1.7

- 1.7.1.1 In the last sentence, insert "on the 1996 edition of TS-R-1" after "Explanatory material".

Chapter 1.8

- 1.8.3.13 In the fifth indent, replace "and 1223" with ", 1223, 3475, and aviation fuel classified under UN Nos. 1268 or 1863".

At the end, add a new paragraph to read as follows:

"Certificates of training as safety advisers issued before 1 January 2009 for UN Nos. 1202, 1203 and 1223 are also valid for UN No. 3475 and aviation fuel classified under UN Nos. 1268 or 1863."

Chapter 1.10

1.10.4 Amend the first sentence to read as follows:

"In accordance with the provisions of 1.1.3.6, the requirements of 1.10.1, 1.10.2, 1.10.3 and 8.1.2.1 (d) do not apply when the quantities carried in packages on a transport unit do not exceed those referred to in 1.1.3.6.3, except for UN Nos. 0104, 0237, 0255, 0267, 0289, 0361, 0365, 0366, 0440, 0441, 0455, 0456 and 0500 (see first indent of 1.1.3.6.2)."

Part 3

Chapter 3.3

3.3.1 **SP188** (b) as amended in ECE/TRANS/WP.15/195:

At the end of the second sentence, after "case", add the following text:

", except those manufactured before 1 January 2009 which may be carried in accordance with this special provision and without this marking until 31 December 2010".

Part 4

Chapter 4.1

4.1.3.6.4 At the end, replace "4.1.6.8 (a) to (f)" with "4.1.6.8 (a) to (e)".

4.1.6.14 In the table, replace "EN 13152:2001" with "EN 13152:2001 + A1:2003" and "EN 13153:2001" with "EN 13153:2001 + A1:2003".

Chapter 4.6

Add a new Chapter 4.6 to read as follows:

"CHAPTER 4.6

(Reserved)".

Chapter 4.7

Add a new Chapter 4.7 to read as follows:

"CHAPTER 4.7

USE OF MOBILE EXPLOSIVES MANUFACTURING UNITS (MEMUs)

NOTE 1: *For packagings, see Chapter 4.1; for portable tanks, see Chapter 4.2; for fixed tanks (tank vehicles), demountable tanks, tank-containers and tank swap bodies with shells made of metallic materials, see Chapter 4.3; for fibre-reinforced plastics (FRP) tanks, see Chapter 4.4; for vacuum operated waste tanks, see Chapter 4.5.*

NOTE 2: *For requirements concerning construction, equipment, type approval, tests and marking, see Chapters 6.7, 6.8, 6.9, 6.11 and 6.12.*

4.7.1 Use

4.7.1.1 Substances of Classes 3, 5.1, 6.1 and 8 may be carried on MEMUs conforming to Chapter 6.12, in portable tanks if their carriage is permitted according to Chapter 4.2; or in fixed tanks, demountable tanks, tank containers or tank swap bodies if their carriage is permitted according to Chapter 4.3; or in fibre-reinforced plastics (FRP) tanks if their carriage is permitted according to Chapter 4.4; or in bulk containers, if their carriage is permitted according to Chapter 7.3.

4.7.1.2 Subject to the approval of the competent authority (see 7.5.5.2.3) explosive substances or articles of Class 1 may be carried in packages, in special compartments conforming to section 6.12.5, if their packaging is permitted according to Chapter 4.1 and their carriage is permitted according to Chapter 7.2 and 7.5.

4.7.2 Operation

4.7.2.1 The following provisions apply for operation of tanks according to Chapter 6.12:

(a) For tanks with a capacity of 1 000 litres or more, the provisions of Chapter 4.2, Chapter 4.3, except 4.3.1.4, 4.3.2.3.1, 4.3.3 and 4.3.4, or Chapter 4.4 apply to the carriage on MEMUs, and are supplemented by the provisions of 4.7.2.2, 4.7.2.3 and 4.7.2.4 below.

(b) For tanks with a capacity of less than 1 000 litres, the provisions of Chapter 4.2, Chapter 4.3, except 4.3.1.4, 4.3.2.1, 4.3.2.3.1, 4.3.3 and 4.3.4, or Chapter 4.4 apply to the carriage on MEMUs, and are supplemented by the provisions of 4.7.2.2, 4.7.2.3 and 4.7.2.4 below.

4.7.2.2 The thickness of the walls of the shell shall not, throughout its use, fall below the minimum figure prescribed in the appropriate construction requirements.

4.7.2.3 Flexible discharge pipes, whether permanently connected or not, and hoppers shall be empty of mixed or sensitised explosive substances during carriage.

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

4.7.2.5 Operators shall ensure that the locks specified in 9.8.9 are used during carriage."

Part 5

Chapter 5.1

5.1.3 Insert "MEMUs, " after "tanks,".

5.1.3.1 In the text in parenthesis, insert ", MEMUs" after "MEGCs".

Chapter 5.3

In the heading of the Chapter, insert "MEMUs," after "MEGCs,".

5.3.1.1.1 In the first sentence, insert "MEMUs," after "MEGCs,". In the second sentence, insert "MEMU," after "MEGC,".

5.3.1.1.2 Amend the first and second sentences to read as follows:

"For Class 1, compatibility groups shall not be indicated on placards if the vehicle, container or special compartments of MEMUs are carrying substances or articles belonging to two or more compatibility groups. Vehicles, containers or special compartments of MEMUs carrying substances or articles of different divisions shall bear only placards conforming to the model of the most dangerous division in the order:

1.1 (most dangerous), 1.5, 1.2, 1.3, 1.6, 1.4 (least dangerous).".

5.3.1.1.4 Insert "MEMUs," after "MEGCs,".

5.3.1.4 In the heading, replace "battery vehicles" with "battery-vehicles, MEMUs".

Renumber the existing text after the heading, including the note, as 5.3.1.4.1.

After the note, add new paragraphs 5.3.1.4.2 and 5.3.1.4.3 to read as follows:

"5.3.1.4.2 MEMUs with tanks and bulk containers shall be placarded in accordance with 5.3.1.4.1 for the substances contained therein. For tanks with a capacity of less than 1 000 litres placards may be replaced by labels conforming to 5.2.2.2.

5.3.1.4.3 For MEMUs carrying packages containing substances or articles of Class 1 (other than of Division 1.4, Compatibility group S), placards shall be affixed to both sides and at the rear of the MEMU.

Special compartments for explosives shall be placarded in accordance with the provisions of 5.3.1.1.2. The last sentence of 5.3.1.1.2 does not apply."

5.3.1.6 Insert "MEMUs," after "MEGCs,".

5.3.1.6.1 Insert "MEMUs," after "MEGCs,".

5.3.2.1.2 Add a new last sentence to read as follows:

"For MEMUs these requirements shall only apply to tanks with a capacity of 1 000 litres or more and bulk containers.".

5.3.2.1.7 Insert ", MEMUs, uncleaned" before "as well as".

Chapter 5.4

5.4.1.1.6.2.2 Insert " "EMPTY MEMU", " after " "EMPTY MEGC", ".

Part 6

Chapter 6.2

6.2.1 as amended in ECE/TRANS/WP.15/195:

In the Note, replace "are subject only to the requirements of 6.2.6" with "are not subject to the requirements of 6.2.1 to 6.2.5".

6.2.3.6.2 Add a new paragraph 6.2.3.6.2 to read as follows:

"6.2.3.6.2 If the country of approval is not a Contracting Party to ADR, the competent authority mentioned in 6.2.1.7.2 shall be the competent authority of a Contracting Party to ADR.".

6.2.3.9.6 as amended in ECE/TRANS/WP.15/195:

At the beginning, replace "The date of the most recent periodic inspection and the stamp of the inspection body" with "The marks in accordance with 6.2.2.7.6".

6.2.4 as amended in ECE/TRANS/WP.15/195:

In the table, under "for marking" and "for design and construction", replace "EN 1442:1998" with "EN 1442:1998 + AC:1999". Under "for closures", replace the entries for EN 13152:2001 and EN 13153:2001 with the following entries:

(1)	(2)	(3)	(4)	(5)
EN 13152:2001	Specifications and testing of LPG – cylinder valves – Self closing	6.2.3.3		Between 1 July 2005 and 31 December 2010
EN 13152:2001 + A1:2003	Specifications and testing of LPG – cylinder valves – Self closing	6.2.3.3	As from 1 January 2011	Before 1 January 2011

(1)	(2)	(3)	(4)	(5)
EN 13153:2001	Specifications and testing of LPG – cylinder valves – Manually operated	6.2.3.3		Between 1 July 2005 and 31 December 2010
EN 13153:2001 + A1:2003	Specifications and testing of LPG – cylinder valves – Manually operated	6.2.3.3	As from 1 January 2011	Before 1 January 2011

Chapter 6.8

6.8.2.6 as amended in ECE/TRANS/WP.15/195:

In the table, under "For all tanks", replace the entry for EN 14025:2003 with the two following entries:

(1)	(2)	(3)	(4)	(5)
6.8.2.1	EN 14025:2003 + AC:2005	Tanks for the transport of dangerous goods - Metallic pressure tanks - Design and construction		Between 1 January 2005 and 30 June 2009
6.8.2.1	EN 14025:2008	Tanks for the transport of dangerous goods - Metallic pressure tanks - Design and construction	As from 1 July 2009	Before 1 July 2009

6.8.3.2.3 In ECE/TRANS/WP.15/195, delete the following amendment:

"At the end, add the following sub-paragraph:

"A non-return valve does not fulfil the provisions of this paragraph."."

Chapter 6.12

Add a new Chapter 6.12 to read as follows:

"CHAPTER 6.12

REQUIREMENTS FOR THE CONSTRUCTION, EQUIPMENT, TYPE APPROVAL, INSPECTIONS AND TESTS, AND MARKING OF TANKS, BULK CONTAINERS AND SPECIAL COMPARTMENTS FOR EXPLOSIVES OF MOBILE EXPLOSIVE MANUFACTURING UNITS (MEMUs)

NOTE 1: *For portable tanks, see Chapter 6.7; for fixed tanks (tank-vehicles), demountable tanks, tank-containers and tank swap bodies, with shells made of metallic materials, see Chapter 6.8; for fibre-reinforced plastics tanks see Chapter 6.9; for vacuum operated waste tanks see Chapter 6.10; for bulk containers see Chapter 6.11.*

NOTE 2: *This Chapter applies to fixed tanks, demountable tanks, tank-containers, tank swap bodies, which do not comply with all requirements of the Chapters mentioned in Note 1 as well as bulk containers and special compartments for explosives.*

6.12.1 Scope

The requirements of this Chapter are applicable to tanks, bulk containers and special compartments intended for the carriage of dangerous goods on MEMUs.

6.12.2 General provisions

6.12.2.1 Tanks shall meet the requirements of Chapter 6.8, notwithstanding the minimum capacity defined in section 1.2.1 for fixed tanks, as modified by the special provisions of this Chapter.

6.12.2.2 Bulk containers intended for the carriage of dangerous goods on MEMUs shall comply with the requirements for bulk containers of type BK2.

6.12.2.3 Where a single tank or bulk container contains more than one substance each substance shall be separated by at least two walls with drained air space between.

6.12.3 Tanks**6.12.3.1 *Tanks with a capacity of 1 000 litres or more***

6.12.3.1.1 These tanks shall meet the requirements of section 6.8.2.

6.12.3.1.2 Where a safety valve is required by the provisions of section 6.8.2, a tank shall also have a bursting disc, or other suitable means of pressure relief, approved by the competent authority.

6.12.3.1.3 For shells not of a circular cross-section, for example box-shaped or elliptical shells, which cannot be calculated according to 6.8.2.1.4 and standards or technical code mentioned therein, the ability to withstand the permissible stress may be demonstrated by a pressure test specified by the competent authority.

These tanks shall meet the requirements of sub-section 6.8.2.1 other than 6.8.2.1.3, 6.8.2.1.4 and 6.8.2.1.13 to 6.8.2.1.22.

The thickness of these shells shall not be less than the values given in the table below:

Material	Minimum thickness
Stainless austenitic steels	2.5 mm
Other steels	3 mm
Aluminium alloys	4 mm
Pure aluminium of 99.80%	6 mm

Protection of the tank against damage through lateral impact or overturning shall be provided. Protection shall be provided according to 6.8.2.1.20 or the competent authority shall approve alternative protection measures.

6.12.3.1.4 By derogation from the requirements of 6.8.2.5.2 tanks do not need to be marked with the tank code and the special provisions, as applicable.

6.12.3.2 *Tanks with a capacity of less than 1 000 litres*

6.12.3.2.1 The construction of these tanks shall meet the requirements of sub-section 6.8.2.1 other than 6.8.2.1.3, 6.8.2.1.4, 6.8.2.1.6, 6.8.2.1.10 to 6.8.2.1.23 and 6.8.2.1.28.

6.12.3.2.2 The equipment of these tanks shall meet the requirements of 6.8.2.2.1. Where a safety valve is required by the provisions of 6.8.2, a tank shall also have a bursting disc, or other suitable means of pressure relief, approved by the competent authority.

6.12.3.2.3 The thickness of these shells shall not be less than the values given in the table below:

Material	Minimum thickness
Stainless austenitic steels	2.5 mm
Other steels	3 mm
Aluminium alloys	4 mm
Pure aluminium of 99.80%	6 mm

6.12.3.2.4 Tanks may have constructional parts that are without a radius of convexity. Alternative supportive measures may be curved walls, corrugated walls or ribs. In at least one direction the distance between parallel supports on each side of the tank shall not be greater than 100 times the wall thickness.

6.12.3.2.5 Welds shall be skilfully made and shall afford the fullest safety. Welding shall be performed by skilled welders using a welding process whose effectiveness (including any heat treatments required) has been demonstrated by test.

6.12.3.2.6 The requirements of 6.8.2.4 do not apply. However, the initial and periodic inspections of these tanks shall be carried out under the responsibility of the user or owner of the MEMU. Shells and their equipment shall be subject to visual examination of their external and internal condition and a leakproofness test to the satisfaction of the competent authority at least every three years.

6.12.3.2.7 The requirements for type approval of 6.8.2.3 and for marking of 6.8.2.5 do not apply.

6.12.4 Items of equipment

- 6.12.4.1 Tanks with bottom discharge for UN 1942 and UN 3375 shall have at least two closures. One of these closures may be the product mixing or discharge pump or auger.
- 6.12.4.2 Any piping after the first closure shall be of a fusible material (i.e. rubber hose) or have fusible elements.
- 6.12.4.3 In order to avoid any loss of contents in the event of damage to the external pumps and discharge fittings (pipes), the first closure and its seatings shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to withstand them. The filling and discharge devices (including flanges or threaded plugs) and protective caps (if any) shall be capable of being secured against any unintended opening.
- 6.12.4.4 Venting systems in accordance with 6.8.2.2.6 on tanks for UN 3375 may be substituted by "goose necks". Such equipment shall be protected against the danger of being wrenched off by external stresses or shall be so designed as to withstand them.

6.12.5 Special compartments for explosives

Compartments for packages of explosives containing detonators and/or detonator assemblies and those containing substances or articles of compatibility group D shall be designed to provide effective segregation such that there is no danger of transmission of detonation from the detonators and/or detonator assemblies to the substances or articles of compatibility group D. Segregation shall be achieved by the use of separate compartments or by placing one of the two types of explosive in a special containment system. Either method of segregation shall be approved by the competent authority. If the material used for the compartment is metal, the complete inside of the compartment shall be covered with materials providing suitable fire resistance. The explosives compartments shall be located where they are protected from impact and from damage on rough terrain and dangerous interaction with other dangerous goods on board and from ignition sources on the vehicle e.g. exhausts etc.

NOTE: Materials classified as class B-s3-d2 according to standard EN 13501-1:2002 are deemed to fulfil the fire resistance requirement."

Part 7

Chapter 7.5

Add a new paragraph 7.5.5.2.3 to read as follows:

"7.5.5.2.3 *Carriage of explosives on MEMUs*

Carriage of explosives on MEMUs is only permitted subject to the following conditions:

- (a) The competent authority shall authorize the transport operation within its territory;
- (b) The type and quantity of packaged explosives carried shall be limited to those necessary for the quantity of material to be manufactured on the MEMU, and in any case shall not exceed:
 - 200 kg of explosives of compatibility group D; and
 - a total of 400 units of detonators or detonator assemblies, or a mixture of both,

unless otherwise approved by the competent authority;

- (c) Packaged explosives shall only be carried in compartments that meet the requirements of 6.12.5;
- (d) No other dangerous goods may be carried in the same compartment as the packaged explosives;
- (e) Packaged explosives shall only be loaded onto the MEMU once the loading of other dangerous goods has been completed and immediately prior to carriage;
- (f) When mixed loading is permitted between explosives and substances of Class 5.1 (UN 1942 and UN 3375) the aggregate is treated as blasting explosives under Class 1 for the purposes of segregation, stowage and maximum permissible load."

7.5.7.1 At the end, add a reference to a new footnote 1. The corresponding footnote reads as follows:

"¹ Guidance on the stowage of dangerous goods can be found in the European Best Practice Guidelines on Cargo Securing for Road Transport published by the European Commission. Other guidance is also available from competent authorities and industry bodies."

Part 8

Chapter 8.2

8.2.1.3 Insert "or MEMUs" after "drivers of vehicles" (twice).

8.2.1.4 Amend to read as follows:

"8.2.1.4 Drivers of vehicles carrying substances or articles of Class 1, other than substances and articles of Division 1.4, compatibility group S (see additional requirement S1 in Chapter 8.5), drivers of MEMU carrying mixed loads of substances or articles of Class 1 and substances of Class 5.1 (see 7.5.5.2.3) and drivers of vehicles carrying certain radioactive material (see special provisions S11 and S12 in Chapter 8.5) shall attend specialization training courses covering at least the subjects defined in 8.2.2.3.4 or 8.2.2.3.5."

Chapter 8.4

Renumber the existing text after the heading as 8.4.1.

Add a new paragraph 8.4.2 to read as follows:

"8.4.2 Loaded MEMUs shall be supervised or alternatively may be parked, unsupervised, in a secure depot or secure factory premises. Empty uncleaned MEMUs are exempted from this requirement."

Part 9

Chapter 9.1

9.1.1.2 Add the following new definition:

"*MEMU*" means a vehicle meeting the definition of Mobile explosives manufacturing unit in 1.2.1."

9.1.2 In the heading and in the note, add "and MEMUs" after "and AT vehicles".

9.1.2.1 In the first sentence, add "and MEMUs" after "and AT vehicles"..

In the second paragraph, replace "Chapters 9.2 to 9.7" with "Chapters 9.2 to 9.8".

9.1.2.2 At the end of the first paragraph, add the following two sentences:

"In the case of MEMUs, the type approval mark affixed in accordance with ECE Regulation No. 105 may identify the vehicle as either MEMU or EX/III. MEMUs need only be identified as such on the certificate of approval issued in accordance with 9.1.3."

9.1.2.3 Add "and MEMUs" after "and AT vehicles".

9.1.3.1 Add "and MEMUs" after "and AT vehicles".

- 9.1.3.5 In the model for certificate of approval for vehicles carrying certain dangerous goods, under number 7, add "MEMU" at the end of the row.

Chapter 9.2

Add the following heading:

"9.2.1 Compliance with the requirements of this Chapter".

Renumber the existing 9.2.1 as 9.2.1.1.

- 9.2.1 (renumbered 9.2.1.1) In the table, against the entries for "9.2.4.7.1 9.2.4.7.2 9.2.4.7.5" and "9.2.4.7.3 9.2.4.7.4", add the following sentence at the end of comment ^e: "If the date of equipping is not available the date of first registration of the vehicle shall be used instead."

Add a new paragraph 9.2.1.2 to read as follows:

- "9.2.1.2 MEMUs shall comply with the requirements of this Chapter applicable to EX/III-vehicles."

Chapter 9.7

- 9.7.5.1 In the french text, at the end of the first sentence, replace "en charge des véhicules-citernes" par "des véhicules-citernes en charge".

Chapter 9.8

Add a new Chapter 9.8 to read as follows:

"CHAPTER 9.8

ADDITIONAL REQUIREMENTS CONCERNING COMPLETE AND COMPLETED MEMUs

9.8.1 General provisions

In addition to the vehicle proper, or the units of running gear used in its stead, a MEMU comprises one or more tanks and bulk containers, their items of equipment and the fittings for attaching them to the vehicle or to the running-gear units.

9.8.2 Requirements concerning tanks and bulk containers

Tanks, bulk containers and special compartments for packages of explosives of MEMUs shall meet the requirements of Chapter 6.12.

9.8.3 Earthing of MEMUs

Tanks, bulk containers and special compartments for packages of explosives made of metal or of fibre-reinforced plastics material shall be linked to the chassis by means of at least one good electrical connection. Any metal contact capable of causing electro-chemical corrosion or reacting with the dangerous goods carried in the tanks and bulk containers shall be avoided.

9.8.4 Stability of MEMUs

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% of the height of the centre of gravity of the laden vehicle. In an articulated vehicle the mass on the axles of the load-carrying unit of the laden semi-trailer shall not exceed 60% of the nominal total laden mass of the complete articulated vehicle.

9.8.5 Rear protection of MEMUs

A bumper sufficiently resistant to rear impact 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 protecting fittings or accessories in contact with the substance being carried). Vehicles with a tilting shell with rear discharge do not require a bumper if the rear fittings of the shell are provided with a means of protection which protects the shell in the same way as a bumper.

NOTE: This provision does not apply to MEMUs where the tanks are protected adequately against rear impact by other means, e.g. machinery or piping not containing dangerous goods.

9.8.6 Combustion heaters

9.8.6.1 Combustion heaters shall meet the requirements of 9.2.4.7.1, 9.2.4.7.2, 9.2.4.7.5, 9.2.4.7.6 and the following:

- (a) the switch may be installed outside the driver's cab;
- (b) the device shall be switched off from outside the MEMU compartment; and
- (c) it is not necessary to prove that the heat exchanger is resistant to the reduced afterrunning cycle.

9.8.6.2 No fuel tanks, power sources, combustion air or heating air intakes as well as exhaust tube outlets required for the operation of the combustion heater shall be installed in the load compartments containing tanks. It shall be ensured that the

heating air outlet cannot be blocked. The temperature to which any equipment is heated shall not exceed 50 °C. Heating devices installed inside the compartments shall be designed so as to prevent the ignition of any explosive atmosphere under operating conditions.

9.8.7 Additional safety requirements

9.8.7.1 MEMUs shall be equipped with automatic fire extinguisher systems for the engine compartment.

9.8.7.2 Protection of the load by metal thermal shields against tyre fire shall be provided.

9.8.8 Additional security requirements

Process equipment and special compartments in MEMUs shall be fitted with locks."
