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AMENDMENTS TO CHAPTERS 4.3, 6.7 AND 6.8 TO ACCOMMODATE THE PROVISIONS ADOPTED FOR CLASS 2 MEGCS IN THE UN MODEL REGULATIONS

Transmitted by the European Industrial Gases Association (EIGA) */

SUMMARY

Executive summary:	The proposal provides text which updates the general requirements for Class 2 MEGCs and Battery Vehicles and inserts the provisions for UN certified MEGCs, in accordance with the text adopted by the UN Experts Committee for the 12th Revision of the Model Regulations.
Action to be taken:	Amend Chapters 4.3, 6.7 and 6.8 as indicated below.
Relevant documents:	ST/SG/AC.10/27/Add.1.

Introduction

Much of the text adopted in the 12th Revision of the UN Model Regulations for Class 2 receptacles is based upon the RID/ADR. Some changes were made, however, to the general requirements for use and construction and consequential amendments are proposed below to Chapters 4.3 and 6.8 of the RID/ADR. A new sub chapter 6.7.5 is introduced to cover the additional

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requirements for MEGCs constructed for multimodal transport in which all provisions of the UN Model Regulations are applied. The most significant difference is that these MEGCs are constructed from elements which are UN certified receptacles. Accordingly, they are designated as UN Certified MEGCs.

Proposal

Amend **Chapter 4.3** as follows:
(Explanatory comments appear in parentheses in this format)

Add the following to 4.3.1.4

UN certified MEGCs shall conform to the design, construction, inspection and testing requirements detailed in 6.7.5.

Add the following UN based text after 4.3.2.2.4 and renumber 4.3.2.2.5 as 4.3.2.2.9

4.3.2.2.5 Prior to filling, the battery vehicle or MEGC shall be inspected to ensure that it is authorized for the gas to be transported ~~and that the applicable provisions of these Model Regulations have been met~~. Elements of battery vehicles and MEGCs shall be filled according to the working pressures, filling ratios and filling provisions specified in packing instruction P200 for the specific gas being filled into each element. In no case shall a Battery Vehicle MEGC or group of elements be filled as a unit in excess of the lowest working pressure of any given element.

4.3.2.2.6 Battery vehicles or MEGCs shall not be filled above their maximum permissible gross mass. Isolation valves shall be closed after filling and remain closed during transport. Toxic gases shall only be transported in multiple-element gas containers where each element is equipped with an isolation valve. The opening(s) for filling shall be closed by caps or plugs. The leakproofness of the closures and equipment shall be verified by the filler after filling.

4.3.2.2.7 Battery vehicles and MEGCs shall not be offered for filling:

(a) when damaged to such an extent that the integrity of the pressure receptacles or its structural or service equipment may be affected;

(b) unless the pressure receptacles and its structural and service equipment has been examined and found to be in good working order; and

(c) unless the required certification, retest, and filling markings are legible.

4.3.2.2.8 Charged battery vehicles and MEGCs shall not be offered for transport;

(a) when leaking;

(b) when damaged to such an extent that the integrity of the pressure receptacles or its structural or service equipment may be affected;

(c) unless the pressure receptacles and its structural and service equipment has been examined and found to be in good working order; and

(d) unless the required certification, retest, and filling markings are legible.

Amend **Chapter 6.7** *as follows:*

6.7 Add at the end in the title: "AND UN CERTIFIED MULTIPLE-ELEMENT GAS CONTAINERS (MEGCs)".

6.7.1.1 Amend the first sentence to read:

"The requirements of this Chapter apply to portable tanks intended for the transport of dangerous goods of Classes 2, 3, 4, 5, 6, 8 and 9, and to MEGCs intended for the transport of non-refrigerated gases of Class 2, by all modes of transport."

6.7.1.1 and 6.7.1.2 Insert "or MEGC" after "portable tank" in the second sentence and "or MEGCs" after "portable tanks" in the third.

6.7.5 Add a new section to read:

"**6.7.5 Requirements for the design, construction, inspection and testing of UN Certified multiple-element gas containers (MEGCs) intended for the transport of non-refrigerated gases**

In addition to the relevant requirements of 6.8.3, UN certified MEGCs shall conform to the requirements of this section.

6.7.5.1 ***Definitions***

For the purposes of this section:

*Element*s are restricted to cylinders, tubes or bundles of cylinders;

Leakproofness test means a test using gas subjecting the elements and the service equipment of the MEGC to an effective internal pressure of not less than 20% of the test pressure;

Manifold means an assembly of piping and valves connecting the filling and/or discharge openings of the elements;

Maximum permissible gross mass (MPGM) means the sum of the tare mass of the MEGC and the heaviest load authorized for transport;

Service equipment means measuring instruments and filling, discharge, venting and safety devices;

Structural equipment means the reinforcing, fastening, protective and stabilizing members external to the elements.

6.7.5.2 ***General design and construction requirements***

6.7.5.2.1 Elements of a MEGC shall be made of seamless steel and be constructed and tested according to Chapter 6.2.5. All of the elements in a MEGC shall be of the same design type.

6.7.5.2.2 Elements of MEGCs, fittings and pipework shall be:

(a) compatible with the substances intended to be transported (for gases see ISO 11114-1:1997 and ISO 11114 –2:2000); or

(b) properly passivated or neutralized by chemical reaction.

6.7.5.2.3 MEGCs shall be designed to withstand, without loss of contents, at least the internal pressure due to the contents, and the static, dynamic and thermal loads during normal conditions of handling and transport. The design shall demonstrate that the effects of fatigue, caused by repeated application of these loads through the expected life of the multiple-element gas container, have been taken into account.

6.7.5.2.4 Under the forces defined in 6.8.2.1.2., the stress at the most severely stressed point of the elements shall not exceed the values given in either the relevant standards of 6.2.5.2 or, if the elements are not designed, constructed and tested according to those standards, in 6.8.2.1.13.

6.7.5.3 ***Service equipment***

6.7.5.3.1 The filling and discharge devices (including flanges or threaded plugs) and any protective caps shall be capable of being secured against unintended opening.

6.7.5.3.2 Each element intended for the transport of toxic gases shall be fitted with a valve. For the transport of flammable gases, the elements shall be isolated by a valve into assemblies of not more than 3000 litres.

6.7.5.3.3 Each stop-valve or other means of closure shall be designed and constructed to withstand a pressure equal to or greater than 1.5 times the test pressure of the MEGC.

6.7.5.3.4 Joints in tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525 °C.

6.7.5.4 ***Pressure-relief devices***

6.7.5.4.1 One or more pressure relief devices shall be fitted on MEGCs used for the transport of UN 1013 carbon dioxide and UN 1070 nitrous oxide. Other MEGCs shall be fitted with pressure relief devices as specified by the competent authority for the country use.

6.7.5.4.2 When pressure relief devices are fitted, every element or group of elements of an MEGC that can be isolated shall then be fitted with one or more pressure relief devices. Pressure relief devices shall be of a type that will resist dynamic forces including liquid surge and shall be designed to prevent the entry of foreign matter, the leakage of gas and the development of any dangerous excess pressure.

6.7.5.4.3 MEGCs used for the transport of certain non-refrigerated gases identified in instruction T50 in 4.2.4.2.6 may have a pressure-relief device as required by the competent authority of the country of use. Unless an MEGC in dedicated service is fitted with an approved pressure relief device constructed of materials compatible with the load, such a device shall comprise a frangible disc preceding a spring-loaded device. The space between the frangible disc and the spring-loaded device may be equipped with a pressure gauge or a suitable telltale indicator. This arrangement permits the detection of disc rupture, pinholing or leakage which could cause a

malfunction of the pressure relief device. The frangible disc shall rupture at a nominal pressure 10% above the start-to-discharge pressure of the spring-loaded device.

6.7.5.4.4 In the case of multi-purpose MEGCs used for the transport of low-pressure liquefied gases, the pressure-relief devices shall open at a pressure as specified in 6.7.3.7.1 for the gas having the highest maximum allowable working pressure of the gases allowed to be transported in the MEGC.

6.7.5.5 ***Capacity of pressure relief devices***

6.7.5.5.1 The combined delivery capacity of the pressure relief devices when fitted shall be sufficient that, in the event of total fire engulfment, the pressure (including accumulation) inside the elements does not exceed 120% of the set pressure of the pressure relief device. The formula provided in CGA S-1.2-1995 shall be used to determine the minimum total flow capacity for the system of pressure relief devices. CGA S-1.1-1994 may be used to determine the relief capacity of individual elements. Spring-loaded pressure relief devices may be used to achieve the full relief capacity prescribed in the case of low pressure liquefied gases. In the case of multi-purpose MEGCs, the combined delivery capacity of the pressure-relief devices shall be taken for the gas which requires the highest delivery capacity of the gases allowed to be transported in the MEGC.

6.7.5.5.2 To determine the total required capacity of the pressure relief devices installed on the elements for the transport of liquefied gases, the thermodynamic properties of the gas shall be considered (see, for example, CGA S-1.2-1995 for low pressure liquefied gases and CGA S-1.1-1994 for high pressure liquefied gases).

6.7.5.6 ***Marking of pressure-relief devices***

6.7.5.6.1 Spring loaded pressure relief devices shall be clearly and permanently marked with the following:

(a) the pressure (in bar or kPa) at which it is set to discharge;

(b) the allowable tolerance at the discharge pressure;

(c) the rated flow capacity of the device in standard cubic metres of air per second (m^3/s);

When practicable, the following information shall also be shown:

(d) the manufacturer's name and relevant catalogue number.

6.7.5.6.2 The rated flow capacity marked on frangible discs shall be determined according to CGA S-1.1-1994.

6.7.5.6.3 The rated flow capacity marked on spring loaded pressure relief devices for low pressure liquefied gases shall be determined according to ISO 4126-1:1991.

6.7.5.7 ***Connections to pressure-relief devices***

6.7.5.7.1 Connections to pressure-relief devices shall be of sufficient size to enable the required discharge to pass unrestricted to the pressure relief device. No stop-valve shall be installed between the element and the pressure-relief devices, except when duplicate devices are provided for maintenance or other reasons, and the stop-valves serving the devices actually in use are locked open, or the stop-valves are interlocked

so that at least one of the duplicate devices is always operable and capable of meeting the requirements of 6.7.5.5. There shall be no obstruction in an opening leading to or leaving from a vent or pressure-relief device which might restrict or cut-off the flow from the element to that device. The opening through all piping and fittings shall have at least the same flow area as the inlet of the pressure relief device to which it is connected. The nominal size of the discharge piping shall be at least as large as that of the pressure relief device outlet. Vents from the pressure-relief devices, when used, shall deliver the relieved vapour or liquid to the atmosphere in conditions of minimum backpressure on the relieving device.

6.7.5.8 ***Siting of pressure-relief devices***

6.7.5.8.1 Each pressure relief device shall, under maximum filling conditions, be in communication with the vapour space of the elements for the transport of liquefied gases. The devices, when fitted, shall be so arranged as to ensure that the escaping vapour is discharged upwards and unrestrictedly as to prevent any impingement of escaping gas or liquid upon the MEGC, its elements or personnel. For flammable and oxidising gases, the escaping gas shall be directed away from the element in such a manner that it cannot impinge upon the other elements. Heat resistant protective devices which deflect the flow of gas are permissible provided the required pressure relief device capacity is not reduced.

6.7.5.8.2 Arrangements shall be made to prevent access to the pressure-relief devices by unauthorized persons and to protect the devices from damage caused by the MEGC overturning.

6.7.5.9 *Gauging devices*

6.7.5.9.1 The provisions of 6.8.3.2.29 shall apply

6.7.5.10 ***MEGC supports, frameworks, lifting and tie-down attachments***

6.7.5.10.1 MEGCs shall be designed and constructed with a support structure in accordance with the relevant requirements of 6.8.3.1. Skids, frameworks, cradles or other similar structures are acceptable.

6.7.5.10.2 When MEGCs are not protected during transport, according to 4.3.2.3.2, the elements and service equipment shall be protected against damage resulting from lateral or longitudinal impact or overturning. External fittings shall be protected so as to preclude the release of the elements' contents upon impact or overturning of the MEGC on its fittings. Particular attention shall be paid to the protection of the manifold. Examples of protection include:

(a) protection against lateral impact which may consist of longitudinal bars;

(b) protection against overturning which may consist of reinforcement rings or bars fixed across the frame;

(c) protection against rear impact which may consist of a bumper or frame;

(d) protection of the elements and service equipment against damage from impact or overturning by use of an ISO frame in accordance with the relevant provisions of ISO1496-3:1995.

6.7.5.11 ***Design approval***

6.7.5.11.1 The competent authority or its authorized body shall issue a design approval certificate for any new design of a MEGC. This certificate shall attest that the MEGC has been surveyed by that authority, is suitable for its intended purpose and meets the requirements of this Chapter, the applicable provisions for gases of Chapter 4.1 and of packing instruction P200. When a series of MEGCs are manufactured without change in the design, the certificate shall be valid for the entire series. The certificate shall refer to the prototype test report, the materials of construction of the manifold, the standards to which the elements are made and an approval number. The approval number shall consist of the distinguishing sign or mark of the country granting the approval, i.e. the distinguishing sign for use in international traffic, as prescribed by the Convention on Road Traffic, Vienna 1968, and a registration number. Any alternative arrangements according to 6.7.1.2 shall be indicated on the certificate. A design approval may serve for the approval of smaller MEGCs made of materials of the same type and thickness, by the same fabrication techniques and with identical supports, equivalent closures and other appurtenances.

6.7.5.11.2 The prototype test report for the design approval shall include at least the following:

(a) the results of the applicable framework test specified in ISO1496-3:1995;

(b) the results of the initial inspection and test specified in 6.7.5.12.3;

(c) the results of the impact test specified in 6.7.5.12.1; and

(d) certification documents verifying that the cylinders and tubes comply with the applicable standards.

6.7.5.12 ***Inspection and testing***

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

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

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

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

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

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

6.7.5.12.2 The elements and items of equipment of each MEGC shall be inspected and tested before being put into service for the first time (initial inspection and test). Thereafter, MEGCs shall be inspected at no more than five-year intervals (5 year periodic inspection). An exceptional inspection and test shall be performed, regardless of the last periodic inspection and test, when necessary according to 6.8.3.4.14.

6.7.5.12.3 The initial inspection and test, the 5 year periodic inspection and test and the exceptional inspection and test of an MEGC shall be in accordance with 6.8.3.4.10 to 6.8.3.4.15.

6.7.5.12.4 The inspections and tests in 6.7.5.12.1 and 6.7.5.12.3, shall be performed or witnessed by a body authorized by the competent authority. When the pressure test is a part of the inspection and test, the test pressure shall be the one indicated on the data plate of the MEGC. While under pressure, the MEGC shall be inspected for any leaks in the elements, piping or equipment.

6.7.5.12.5 When evidence of any unsafe condition is discovered, the MEGC shall not be returned to service until it has been corrected and the applicable tests and verifications are passed.

6.7.5.13 ***Marking***

6.7.5.13.1 Every MEGC shall be fitted with a corrosion resistant metal plate permanently attached to the MEGC in a conspicuous place readily accessible for inspection. The elements shall be marked in accordance with 6.2. At least the following information shall be marked on the plate by stamping or by any other similar method:

Country of manufacture

U N	Approval Country	Approval Number	For Alternative Arrangements (see 6.7.1.2): "AA"

Manufacturer's name or mark

Manufacturer's serial number

Authorized body for the design approval

Year of manufacture

Test pressure: _____bar gauge

Design temperature range_____ °C to _____°C

Number of elements_____

Total water capacity _____litres

Initial pressure test date and identification of the authorised body

Date and type of most recent periodic tests

Year_____ Month_____

Stamp of the authorised body who performed or witnessed the most recent test

***NOTE**: No metal plate may be fixed to the elements.*

6.7.5.13.2 The following information shall be marked on a metal plate firmly secured to the MEGC:

Name of the operator
Maximum permissible load mass _____kg
Working pressure at 15°C: _____bar gauge
Maximum permissible gross mass (MPGM)_____kg
Unladen (tare) mass _____kg"

Amend **Chapter 6.8** *as follows:*

Insert the following text which is UN based, except where indicated

"6.8.3.1.5 Battery vehicles and MEGCs shall be designed, manufactured and equipped in such a way as to withstand all conditions to which they will be subjected during normal conditions of handling and transport. The design shall take into account the effects of dynamic loading and fatigue.

6.8.3.1.6 Elements and their fastenings shall be capable of absorbing under the maximum permissible load the forces defined in 6.8.2.1.2. Under each force the stress at the most severely stressed point of the element and its fastenings shall not exceed the value defined in 6.2.3.1 for cylinders, tubes, pressure drums and bundles of cylinders and for tanks the value of σ defined in 6.8.2.1.16. ***(Existing text in ADR 6.8.3.1.5)***

The elements shall be secured in a manner that prevents undesired movement in relation to the structure and the concentration of harmful localized stresses

6.8.3.1.7 Battery vehicles and MEGCs shall be designed and fabricated with a support structure to provide a secure base during transport. The forces specified in 6.8.2.1.2 and the safety factor specified in 6.8.2.1.13 shall be considered in this aspect of the design.

In no case shall mountings or attachments be welded onto the elements.

In the design of supports and frameworks, the effects of environmental corrosion shall be taken into account.

6.8.3.1.8 MEGCs shall be designed and constructed with supports to provide a secure base during transport and with lifting and tie-down attachments which are adequate for lifting the MEGC including when loaded to its maximum permissible gross mass. The MEGC shall be designed to be loaded onto a transport unit or ship and shall be equipped with skids, mountings or accessories to facilitate mechanical handling.

6.8.3.1.9 The battery vehicle or MEGC shall be capable of being loaded and discharged without the removal of its structural equipment. MECGs shall possess

stabilizing members external to the elements to provide structural integrity for handling and transport.

6.8.3.1.10 Contact between dissimilar metals which could result in damage by galvanic action shall be avoided.

6.8.3.1.11 The materials of the battery vehicle and MEGC, including any devices, gaskets, and accessories, shall not adversely affect the gases intended for transport in the battery vehicles and MEGC.

6.8.3.1.12 Battery vehicles and MEGCs intended for the transport of flammable gases shall be capable of being electrically earthed."

Replace the text of 6.8.3.2.18 by the following text which is UN based except where indicated.

"6.8.3.2.18 The manifold shall be designed for service in a temperature range of -20° C to +50° C. ***(existing ADR text)***

Manifolds shall be configured or designed to prevent damage that could result in the release of the pressure receptacle contents during normal conditions of handling and transport. When the connection between the frame and the elements allows relative movement between the sub-assemblies, the manifolds shall be so fastened as to permit such movement without damage to working parts. The manifolds, the discharge fittings (pipe sockets, shut-off devices), and the stop-valves shall be protected from being wrenched off by external forces. Manifold piping leading to shut-off valves shall be sufficiently flexible to protect the valves and the piping from shearing, or releasing the pressure receptacle contents.

Welded pipe joints shall be used wherever possible. ***(existing ADR text)***

Joints in copper tubing shall be brazed or have an equally strong metal union. The melting point of brazing materials shall be no lower than 525ºC. The joints shall not decrease the strength of tubing as may happen when cutting threads. ***(existing ADR text)***

6.8.3.2.19 Piping shall be designed, constructed and installed so as to avoid damage due to expansion and contraction, mechanical shock and vibration. The rated pressure of the service equipment and of the manifold shall be not less than two thirds of the test pressure of the elements."

Renumber existing ADR text 6.8.3.2.19 to 6.8.3.2.26 as 6.8.3.2.20 to 6.8.3.2.27, modified to take account of acetylene, solvent free and new UN text inserted in 6.8.3.2.24.)

"6.8.3.2.20 Except for UN No.1001 acetylene, dissolved or UN No. 3374 acetylene, solvent free the permissible maximum stress σ of the manifolding arrangement at the test pressure of the receptacles shall not exceed 75% of the guaranteed yield stress of the material.

The necessary wall thickness of the manifolding arrangement for the carriage of UN No.1001 acetylene, dissolved or UN No. 3374 acetylene, solvent free shall be calculated according to an approved code of practice.

NOTE: *For the yield stress, see 6.8.2.1.11.*

The basic requirements of this paragraph shall be deemed to have been complied with if the following standards are applied: [reserved].

6.8.3.2.21 By derogation from the requirements of 6.8.3.2.3, 6.8.3.2.4 and 6.8.3.2.7, for cylinders, tubes, pressure drums and bundles of cylinders (frames) forming a battery-vehicle or MEGC, the required closing devices may be provided for within the manifolding arrangement.

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

6.8.3.2.23 The filling and discharge devices may be affixed to a manifold.

6.8.3.2.24 Each element, including each individual cylinder of a bundle, intended for the carriage of toxic gases, shall be capable of being isolated by a shut-off valve. The manifold for toxic liquefied gases shall be so designed that the elements can be filled separately and be kept isolated by a valve capable of being sealed. ***(Second sentence new UN text)***

6.8.3.2.25 If battery-vehicles or MEGCs intended for the carriage of toxic gases are fitted with safety valves, a bursting disc shall be placed before the valve. The arrangement of the bursting disc and safety valve shall be such as to satisfy the competent authority.

6.8.3.2.26 When battery-vehicles or MEGCs are intended for carriage by sea, the requirements of 6.8.3.2.25 shall not prohibit the fitting of safety valves conforming to the IMDG Code.

6.8.3.2.27 Receptacles which are elements of a battery-vehicle or MEGC intended for the carriage of flammable gases shall be combined in groups of not more than 5000 litres which are capable of being isolated by a shut-off valve.

Each element of a battery-vehicle or MEGC intended for the carriage of flammable gases, when consisting of tanks conforming to this Chapter, shall be capable of being isolated by a shut-off valve."

Insert the following text from UN

"6.8.3.2.28 For filling and discharge openings of the battery vehicle or MEGC, two valves in series shall be placed in an accessible position on each discharge and filling pipe. One of the valves may be a non-return valve. The filling and discharge devices may be fitted to a manifold. For sections of piping which can be closed at both ends and where a liquid product can be trapped, a pressure-relief valve shall be provided to prevent excessive pressure build-up. The main isolation valves on a battery vehicle or MEGC shall be clearly marked to indicate their directions of closure. All stop-valves with screwed spindles shall close by a clockwise motion of the handwheel. For other stop-valves, the position (open or closed) and direction of closure shall be clearly indicated. Ductile metals shall be used in the construction of valves or accessories.

All stop-valves on MEGCs shall be designed and positioned to prevent unintentional opening.

6.8.3.2.29 When a battery vehicles or MEGC is intended to be filled by mass, it shall be equipped with one or more gauging devices. Level-gauges made of glass or other fragile material shall not be used.”
