

**COMMITTEE OF EXPERTS ON THE
TRANSPORT OF DANGEROUS GOODS**

INF.17

**Sub-Committee of Experts on the
Transport of Dangerous Goods**

**(Seventeenth session,
Geneva, 5-16 July 1999,
agenda item 2(a))**

**MISCELLANEOUS DRAFT AMENDMENTS TO THE MODEL REGULATIONS
ON THE TRANSPORT OF DANGEROUS GOODS**

**Gas Receptacles and
Multiple Elements Gas Containers (MEGCs)**

Submitted by the Expert from the United States of America

Since the last meeting of the working group the expert from the United States has reviewed the text provided in the report of the working group (ST/SG/AC.10/C.3/32/Add.1). The following proposals relative to the requirements for pressure receptacles and Multiple Elements Gas Containers (MEGCs) are provided for consideration by the working group during the seventeenth session of the Sub-Committee.

Comments relative to Proposal 1:

Several of the definitions refer to “capacity”. We propose that the words “total water capacity” be consistently used in the definitions for cryogenic receptacles, pressure drums and tubes to express volumetric capacity.

We can agree to the term “Pressure drum”.

In the definition of MEGCs we suggest that the sentence “They are used for the transport of gases of Class 2.” be deleted. This sentence is not necessary. The US believes that the words “with overall dimensions in accordance with ISO 668 and corner fitting in accordance with ISO 11161” should be more appropriately included in section 6.7.5.10. The working group should also consider whether section 6.7.5.10 should include additional requirements applicable to the framework. For instance the working group should consider adopting a more mandatory reference to ISO 1496-3:1995.

In the definition for filling ratio we believe that ISO 11622 should be the correct reference.

We suggest that the words “is an all encompassing term which includes” be inserted after the words “Pressure receptacles” in the definition of Pressure receptacles.

We suggest that a definition of “change of service” should be considered consistent with the definition in ISO 10286 and CGA Pamphlet C-10.

Comments relative to Proposal 2:

We agree with the requirements in proposal 2.

Comments relative to Proposal 3:

The bracketed text in 4.1.6.1.2 should be “The requirements in ISO 11621; 1997 or CGA Pamphlet C-10; 1999 which specify the procedures for change of service shall be met.” We also suggest that the following requirement be added: “A pressure receptacle that previously contained a Class 8 (corrosive) substance shall not be used to transport a Class 2 gas unless the pressure receptacle is inspected and tested in accordance with ISO 6406 and found to be acceptable for transport. A pressure receptacle requalified for Class 2 gas service may have its next retest and inspection scheduled from the new date of the inspection and retest. If decontamination cannot remove all significant residue or impregnation by the Class 8 material, the cylinder may not be used for transport of a Class 2 gas.”

The US proposes that a more specific references to ISO 11114-1:1997 and ISO 11114-2:1997 be incorporated in paragraph 4.1.6.1.2. The requirements should indicate: “Prior to filling the requirements in ISO 11114; 1997 and ISO 11114-2:1997 which specify the procedures for compatibility of each gas with the pressure receptacle and its service equipment including all piping, valves, closures and relief devices shall be met.”

In 4.1.6.1.4 the words “be considered” in the last sentence should be changed to “met”. Requiring that the standard be considered is not acceptable from a regulatory and enforcement perspective.

In 4.1.6.1.5 a sentence indicating that “The plugs or cap nuts shall have at least the same test pressure rating as the pressure receptacle should be added.

In 4.1.6.1.6 delete the words “for purposes of undergoing the inspection.”

Delete paragraph 4.1.6.1.8. It is not necessary since the standards are specifically referenced elsewhere in the regulations.

A new paragraph 4.1.6.1.8 should be added as follows:

“A pressure receptacle that leaks, is bulged, has defective valves or safety devices, bears evidence of physical abuse, fire or heat damage, or detrimental rusting or corrosion, shall not be used unless it is properly repaired and requalified as specified in this Model Regulation.”

The working group should consider whether it is necessary to include text specifying what properly repaired and requalified means in the above sentence and whether further detail is needed. For instance, 49 CFR 173.34(j) indicates “Repair of non-pressure attachments by welding or brazing without affecting a pressure part of the cylinder is authorized provided it is followed by visual examination for weld quality. US 49 CFR 173.34 provides requirements for cylinder repair (see Annex 1).

The working group should consider including text indicating the types of repairs that may not be made under any circumstances. For instance non-refillable cylinders may not be repaired. Repair of weld defects which have any cracking is not permitted. Cracks in cylinder walls may not be repaired. Cylinder walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (xx) of this section.

In 4.1.6.1.4 the word “storage” should be deleted. This is a transport regulation.

A new paragraph 4.1.6.1.9 should be added as follows:

“Cylinder marking. Each required marking on a pressure receptacle shall be maintained so that it is legible. Retest markings and original markings which are becoming illegible may be reproduced by stamping on a metal plate which shall be permanently secured to the pressure receptacle.”

The working group should consider what requirements are necessary for liquids or solids which are transported in pressure receptacles. The working group should review paragraph 4.1.3.6 and make necessary amendments. Particularly the terms “gas cylinders” and “receptacles” need to be revised. It is also necessary to indicate that if pressure receptacles are used for the transport of liquids or solids the applicable requirements for pressure receptacles shall be met.

P200

The following comments pertain to P200:

200(a) The US has not finalized its position with respect to pressure relief devices and expects that this will take some time. The US plans to develop a risk analysis to study the use of pressure relief devices (PRDs) on pressure receptacles. However, it is proposed that the following be considered in the interim:

The working group should consider referencing CGA Pamphlet S-1.1 for sizing and selecting the type, location, and testing of PRDs (compliance with paragraph 9.1.1.1 of CGA Pamphlet S-1.1 is not required).

PRDs are designed to meet fire test performance standards. On this basis the US proposes to add: “The pressure relief device system must be capable of preventing rupture of the normally charged cylinder when subjected to a fire test conducted in accordance with CGA Pamphlet C-14, or in the case of an acetylene cylinder, CGA Pamphlet C-12.” We could consider comparable ISO or CEN standards for incorporation if they exist.

Part 4 should include the following: “Safety relief devices must be tested for leaks before a filled pressure receptacle is transported. It is forbidden to repair leaking fuse plug devices, where the leak is through the fusible metal or between the fusible metal and the opening in the plug body, except by removal of the device and replacement of the fusible metal by a qualified technician.”

200(e) These formulas are under review in the US. We will provide comments when our review is complete.

200(f) We suggest that the factor of 0.95 be applied to toxic gases only and that all other gases should be required to have a filling factor of 0.98 times the density of the liquid phase at 50 °C. The word “absolute” should be inserted after “vapour pressure” in the second sentence.

200(j) This paragraph can be deleted. The 5 year rest period should be inserted in the table for the applicable gases on the basis of technical justifications provided by the US.

Special Provisions:

The words “see also ISO 11114-1” in special provisions (a), (b), (c) and (o) should be revised and the special provisions should be amended to include a more obligatory requirement.

200(l) We have not yet studied the special provisions in detail . However, we have some comments:

With respect to special provision (h), in the US we currently condemn any acetylene cylinder with any non-monolithic porous mass other than balsa wood at the time of retest. Balsa wood has fewer tendencies to produce excess clearances than other monolithic masses. We also propose the following for acetylene cylinders “If a cylinder valve is replaced, a cylinder valve of the same weight shall be used or the tare weight of the cylinder shall be adjusted to compensate for valve weight differential.” *The working group should consider if this should be a general requirement for all pressure receptacles.*

A new special provision should added in P200 or special provision (h) should be amended to indicate that:

“All manifolded acetylene cylinders shall be transported in a vertical position. For the checking of tare weights or for replacement of solvent the cylinder shall be removed from the manifold. This requirement is not intended to prohibit the filling of the acetylene cylinders while manifolded.”

Special provision k should be amended by adding the words “that have been subjected to stress corrosion testing as specified in ISO 7866. This was agreed to at the last meeting (see paragraph 18 on page 3 of the report) but the text does not appear in special provision k.

Special provision z should be amended to add the words “and the outlet manifold valve shall be plugged” after the word transport in the last sentence of sub-paragraph (5). This was agreed to at the last meeting but does not appear in the report.

Also a special provision should be added in P200 stating: For the following gases: 1,1-Difluoroethylene, ethane, ethylene, hydrogen chloride, liquefied hydrocarbon gas, liquefied petroleum gas and propylene each pressure receptacle in a bundle shall be separately filled and means shall be provided to insure that no interchange of cylinder contents can occur during transportation. (*see 49 CFR 173.301(d)(3)*).

Consistent with the issue raised under paragraph 15 of the report of the last meeting, a new special provision should be added for toxic gases as follows:

“Toxic gases with an LC50 less than or equal to 200 ppm shall:

- (1) be transported in pressure receptacles with a minimum test pressure of 200 bar; or
- (2) be overpacked in a rigid packaging with cushioning material which provides protection of the pressure receptacle and its service equipment against puncture. The outer packaging shall conform to the construction and performance test requirements specified in Chapter 6.1 of these Regulations at the PG I performance level.

Table - The US has not reviewed the Table in P200 in detail. The US has some reservations regarding column 3, “Receptacles”. The use of “(1)” for all cylinders may be overly simplified. This may need to be further divided into seamless and welded cylinders and dependant on the material (aluminium or steel). Although it may be possible to handle these issues with special provisions.

P203

There are references to ADR gas groupings (e.g. 3⁰F) which should be removed. US DOT 4L cryogenic cylinders are not required to be periodically retested (see previous comments). The working group should consider ICAO packing instruction 202 which has more pertinent safety requirements.

Need for other packing instructions

The US believes that other packing instructions may be necessary for gases such as ethylene oxide, ethylene chloride and other gases which are allowed to be transported in small glass ampoules or packagings other than cylinders.

Comments relative to Proposal 4:

6.2.1 The title of this section should not be “General Requirements”. We recommend “**Requirements for the Design, Construction, Inspection, Testing and Certification of Pressure Receptacles**”

6.2.1.1 should be titled “**Application and General Requirements**”. The text for this section should be:

“In recognition of scientific and technological advances, and recognizing that pressure receptacles other than those that are marked with a UN certification marking may be used on a national or regional basis, pressure receptacles conforming to requirements other than those specified in these Model Regulations may be used if approved by the competent authority and provided that the competent authority determines that the alternative requirements provide at least the same level of safety as if the pressure receptacle were designed in accordance with the requirements of this Chapter. Pressure receptacles designed, constructed, inspected, tested and approved to requirements other than those specified in these Model Regulations shall not be marked with the UN certification markings specified in this Chapter. For international transport, pressure receptacles approved under the provisions of this paragraph shall also be approved by the applicable competent authorities of the countries where the pressure receptacles will be used and transported.

***NOTE:** The competent authorities granting such approvals should take action to amend the Model Regulations to include the provisions covered by the approval as appropriate.”*

Paragraph 6.2.1.1.1 should be maintained but paragraphs 6.2.1.1.2 through 6.2.1.1.8 should be deleted . A new section 6.2.1.2 should be added and entitled: “Design and Construction Requirements”. The sub-paragraphs under this section should include text referencing the applicable design standards for each cylinder type (e.g. ISO 9809-1, ISO 7806, etc.). In addition any other regulatory requirements over and beyond the design standard requirements or requirements which alter the design standard requirements should be included. For example,

6.2.1.2 Design and Construction Requirements

6.2.1.2.1 Refillable seamless steel cylinders with a maximum tensile strength of less than or equal to 1100 MPa shall be designed, constructed and tested in accordance with ISO 9809-1:1999.

6.2.1.2.2 Refillable seamless steel cylinders with a maximum tensile strength of less than or equal to 1100 MPa shall be designed, constructed and tested in accordance with ISO 9809-2:1999.

6.2.1.2.3 Refillable seamless aluminium alloy cylinders shall be designed, constructed and tested in accordance with ISO 7866:1999.

6.2.1.2.4 Refillable seamless steel tubes shall be designed, constructed and tested in accordance with ISO 11120:1999.

6.2.1.2.5 The US could agree to reference ISO 4706 if certain exceptions/amendments to the standard can be adopted (see US DOT comments on proposed ISO standards).

6.2.1.2.6 Non-refillable gas cylinders designed, constructed and tested in accordance with ISO 11118:1999.

The US is not prepared to incorporate references to standards for cryogenic, composite, acetylene or large welded cylinders at this time (see US DOT comments concerning ISO 11119 for composite cylinders)

Initial inspection and tests

The text in section 6.2.1.4 should be replaced with the following:

“Initial inspection and tests shall be conducted consistent with the requirements of the applicable design standard specified in 6.2.1.1.”

The text in paragraph 6.2.1.2 entitled “Materials of pressure receptacles” can be deleted. This is covered in the applicable design standards.

6.2.1.3 Service equipment

We suggest that the first sentence of 6.2.1.3.1 be revised to take into account equipment such as regulators or pressure gauges. We also believe that additional requirements applicable to manifolding (branch lines) needs to

be included. We propose the following text applicable to manifolding:

“Pressure receptacles that are connected by manifolding shall be supported and held together as a unit by structurally adequate means in accordance with [CEN 23069]. Safety relief devices on manifolded horizontal pressure receptacles filled with flammable gas shall be arranged to discharge upward and unobstructed to the open air in such a manner as to prevent any impingement of escaping gas upon the containers. Individual pressure receptacles shall be equipped with approved pressure relief devices as required by 4.1.4.1 (P200). Unless otherwise specified, each pressure receptacle shall be equipped with an individual shut-off valve that must be tightly closed while in transport. Manifold branch lines of these individual shut-off valves shall be sufficiently flexible to prevent damage to the valves which otherwise might result from the use of rigid branch lines. A temperature measuring device may be inserted in one pressure receptacle of a manifold assembly in place of the shut-off valve.”

6.2.1.5 Periodic inspection

6.2.1.5.1 Refillable pressure receptacles, with the exception of cryogenic receptacles, shall be subjected to periodic inspections in accordance with following ISO standards:

ISO 6406: 1992 Periodic inspection and testing of seamless steel gas cylinders, Steel cylinders with tensile strength equal to or greater than 1100 MPa shall be inspected by ultrasonic examination.

ISO 10460:1993 Welded carbon steel gas cylinders - Periodic inspection and testing

ISO 10461:1993 Seamless aluminium - alloy gas cylinders - Periodic inspection and testing

ISO 10462:1993 Cylinders for dissolved acetylene - Periodic inspection and testing

ISO 10464:1993 Liquefied petroleum gas cylinders - Periodic inspection and testing

In 6.2.1.5.2 we propose that the words in parenthesis be amended to: (excessive clearances, degradation, loosening, settlement, etc.).

With respect to 6.2.1.5.3 we do not agree that a leak test is necessary. For instance on a DOT 4L (cryogenic cylinder), we consider every shipment to be a leak test. We could add provisions for cryogenic cylinders as this work progresses through ISO. We believe cryogenic cylinders should be excepted from retesting requirements.

UT testing: The US requests that the working group consider requiring 100% UT for requalification of pressure receptacles that are required to be UT tested at the time of manufacture. This would apply to those cylinders which are required to be UT tested at the time of manufacture. The hydraulic test at the periodic retest interval has minimal benefit as compared to UT testing for pressure receptacles that are UT tested at the time of manufacture.

The working group should address the address the inspection body responsibilities and reference ISO TR 14600 under this section.

The US suggests that the following sentences be added: “Any pressure receptacle not exceeding 50 mm outside diameter and less than 600 mm in length is excepted from the hydrostatic retest requirement. Non-refillable cylinders are not subject to periodic retest requirements. Unless otherwise specified each pressure receptacle that is required to be retested shall be marked with a test date and a periodic retester identification number identifying the retester.

The US supports including requirements for retester marks in order to standardize them internationally (e.g. placement, content, identification of the retester, etc.). The working group should consider whether requirements for specifying retester marks should be added here (e.g. “Each cylinder passing retest must be marked with the retester's identification number..., in characters not less than 3mm high. Markings of previous tests may not be removed.”). We believe that a database should be maintained by an international body to include all approved inspection bodies and retesters. This should be made available through the Internet for the use of manufacturers, users and regulatory bodies.

We also suggest that the following text covering marking be added: “Each pressure receptacle that has been periodically retested in accordance with these Model Regulations with acceptable results shall be marked as specified in this section. The periodic retest markings shall not be altered or removed once they are marked on the pressure receptacle. Markings shall be legibly and permanently marked into the material of the cylinder as specified in the applicable test and inspection standard (see 6.2.1.5.1). The depth of markings may be no greater than that specified in the applicable standard and shall be such that the minimum wall thickness is not compromised and no harmful stress concentrations result. Markings that have become illegible may be remarked on the pressure receptacle as provided in the original standard. The markings may be placed on any portion of the upper end of the pressure receptacle excluding the sidewall. Unless authorized by the standard, marking on the sidewall is prohibited. When the space originally provided for dates of subsequent retests becomes filled, the stamping of additional test dates into the external surface of the foot ring of a pressure receptacle is authorized.”

Retest of pressure receptacles when suspected of being damaged

The US proposes that requirements for retesting pressure receptacles which show evidence of dented, corroded, cracked or abraded areas, leakage, thermal damage or any other condition that might render it unsafe for use in transport. The US proposes that following:

“6.2.1.5.x *Conditions requiring test and inspection of cylinders.* Without regard to any other periodic requalification requirements, a cylinder shall be tested and inspected in accordance with this section prior to further use if:

- (a) The cylinder shows evidence of dented, corroded, cracked or abraded areas, leakage, thermal damage or any other condition that might render it unsafe for use in transport;
- (b) The cylinder has been in an accident and has been damaged to an extent that may adversely affect its ability to retain dangerous goods;
- (c) The cylinder has been over-heated or over-pressurized;
- (d) The competent authority determines that the cylinder may be in an unsafe condition.”

Approval of retesters

The US also suggests the following: Each retester shall be approved by the competent authority consistent with the requirements of ISO TR 14600. With the exception of visual inspections, all periodic retest functions under this section shall be performed or supervised by the approved retester. We may need to consider additional text relevant to retesters in 6.2.4.

The working group should consider whether it is necessary to add visual inspection requirements and whether this is adequately covered by reference to the ISO standards listed above. We are concerned that the ISO standards only apply to periodic inspection whereas visual inspection should be performed more frequently (i.e. prior to transport). This should actually be included in Part 4.

The working group should consider adding a sentence consistent with the provisions of ISO 6406 concerning the condemnation of pressure receptacles when they are found to be unsafe. We believe this is important to ensure that unsafe pressure receptacles are removed from service and not reintroduced into other countries where the requirements for condemnation may not be so apparent (i.e. developing countries). The following text should be added under the section on periodic inspection:

“During the periodic inspection process or any time a pressure receptacle is found to be unsafe for transport, the requirements applicable to rejection of pressure receptacles and rendering them unserviceable according to ISO 6406 shall apply.”

The US requests that the working group consider whether requirements for reheat treatment and repair requirements should be included in the UN Recommendations and whether appropriate standards are available and can be referenced. 49 CFR includes specific requirements in this regard (see 173.34(g) - (j)).

6.2.1.6 Markings. The US points out that the text in ST/SG/AC.10/C.3/32/Add.1 does not correspond with what was agreed to at the previous meeting.

We believe that text should be developed as an introduction to the marking section. This text should indicate:

“Pressure receptacles which conform to the requirements of these Model Regulations may bear the UN certification markings provided in 6.2.1.6.1 and 6.2.1.6.3 accordingly. These marks indicate that the pressure receptacles have been designed, constructed, inspected, tested and approved in accordance with the quality conformance system specified in these Model Regulations. In itself, the mark does not necessarily confirm that the pressure receptacle may be used for particular dangerous goods, this is covered in Part 4 of these Regulations. The marks facilitate the free and unrestricted transport of the pressure receptacles in that they can be readily recognized by consignors, transporters and competent authorities. Additional markings such as those prescribed in ISO 13769 Gas cylinders - Stamp marking, may be included on the pressure receptacle provided they are made in low stress areas other than the side wall, are not of a size and depth that will create harmful stress concentrations, such marks shall not conflict with required markings.

The US believes that the pressure receptacle certification mark is an important element of developing

internationally acceptable pressure receptacle requirements. We believe that the certification marking should be limited to essential information primarily of interest to the regulatory authorities and that other information critical to users (tare weight, working pressure, etc.) should also be marked on the pressure receptacle but not in the certification marking. We propose the following:

Proposed Cylinder Certification Markings

(a) UN mark;



(b) the number of the ISO technical standard (e.g. ISO 9809-1:1999) to which the pressure receptacle is designed, constructed and tested;

(c) country authorizing the mark in upper case letters in accordance with ISO 3166; xxxx;

(d) the registered mark of the manufacturer* (the manufacturer's mark shall be registered with competent authority)

(e) the identifying mark or stamp of the authorized independent inspection body who carried out the tests and inspections* (The independent inspection body's mark shall be registered with competent authority of the country of manufacture);

(f) test pressure in bar preceded by the letters "TP" and followed by the letters "BAR";

(g) date (year (last two figures) and month (two figures)) of the initial inspection and tests.

**The US believes that it would be desirable to clearly specify the alpha-numeric content of the manufacturers and the independent inspection body's marks. This would be useful since numerous competent authorities will be registering and issuing marks. ISO 13769 does not provide sufficient guidance on the content of the manufacturer's mark (i.e. it shows it as a two digit mark) or the inspection body's stamp. As indicated elsewhere the US believes that an international marking scheme should be developed. The working group should develop marks that can account for all the manufacturer's and inspection bodies worldwide. Competent authorities would be required to issue marks consistent with the international system. Since each manufacturing facility will need a specific mark regardless of whether it is the same company, perhaps the mark should have a country designation also)*

Other Essential Markings which are required but not in the certification marking (These would be required on the cylinder but not as part of the certification marking):

(a) working pressure in bar preceded by "WP" and followed by the letters "BAR" for permanent gases and acetylene (not required for liquefied gases);

- (b) the tare of the pressure receptacle in kilograms preceded by the letters “TARE” and followed by the letters “KG” (for acetylene cylinders, the tare shall include the mass of the porous material, the solvent, and saturation gas);
- (c) the water capacity in litres followed by the letter “L”;
- (d) maximum permissible filling weight for liquefied and permanent gases filled by weight followed by the letters “KG” ;
- (d) the serial number of the pressure receptacle provided by the manufacturer preceded by the letters “SN”;
- (e) the date (year (last two figures) and month (two figures)) of the retest and inspection;
- (f) stamp for non-destructive testing (e.g. UT, MT, PT, etc.), if applicable;
- (g) Minimum guaranteed wall thickness in mm of the pressure receptacle shell followed by the letters “mm” (not required for composite cylinders and pressure receptacles with a water capacity less than 1 litre).

We believe an additional mark on seamless cylinders designed to ISO 9809 which have a tensile strength greater than 950 Mpa and for certain composite cylinders with steel liners is necessary to indicate that they are suitable for the transport of hydrogen gases (e.g. Hydrogen chloride). These aggressive gases can cause hydrogen embrittlement. We agree with the markings proposed in ISO 13769 and propose the marks: **H** and **HG** to identify steel compatibility.

The US generally agrees with the additional markings for acetylene cylinders in ISO 13769. We propose that acetylene cylinder markings be covered in a separate paragraph.

General marking requirements:

“Each pressure receptacle that meets the requirements of this Chapter shall be marked as specified in this section. The markings shall be legible and permanently stamped, engraved or etched on the pressure receptacle as specified in the applicable design standard and ISO 13769: xxxx. For composite cylinders the markings may be applied using a label which is permanently embedded under the resin of the composite material as long as it is clearly visible. Markings shall not be altered or removed once they are marked on the pressure receptacle. The depth of markings may be no greater than that specified in the applicable standard and shall be such that the minimum wall thickness is not compromised and no harmful stress concentrations result. Markings may be placed on any portion of the upper end of the pressure receptacle excluding the sidewall. Unless authorized by the standard, marking on the sidewall is prohibited. The markings shall be on the shoulder, top head or neck of the pressure receptacle or on a permanently affixed component of the pressure receptacle (e.g. welded collar). Markings that have become illegible may be remarked on the pressure receptacle as provided in the original standard. Other markings are allowed provided they are made in low stress areas other than the side wall and are not of a size and depth that will create harmful stress concentrations. Such marks shall not conflict with required markings.

6.2.1.6.4 should be deleted and the UN mark should be incorporated as the first mark in the sequence of markings prescribed in 6.2.1.6.1 and 6.2.1.6.3. We do not believe that this text was agreed to by the working group.

6.2.4 Approval of pressure receptacles - The US believes this section needs significant revision and will propose revised text at a later date. The outcome of progress in developing ISO 14600 will need to be considered.

Comments on Proposal 5:

We agree with the requirements in proposal 5.

Comments on Proposal 6:

There are two major issues in proposal 6 for which the US has concern. Our concern relates to paragraphs 6.7.5.3.2 and 6.7.5.3.4.

In 6.7.5.3.2 the US can not agree to the text in square brackets. The US believes each element intended for the transport of flammable gas should be fitted with an isolation valve.

In 6.7.5.3.4 the US can not agree to the text in square brackets. The US requests that EIGA provide more information on the quick closing safety device which closes automatically in the event of a fire or movement of the vehicle.

The US believes that the words "with overall dimensions in accordance with ISO 668 and corner fitting in accordance with ISO 11161" in the definition of the term MEGC should be more appropriately included in section 6.7.5.10. The working group should also consider whether section 6.7.5.10 should include additional requirements applicable to the framework. For instance the working group should consider adopting a more mandatory reference to ISO 1496-3:1995.

Annex 1

Cylinders subjected to the action of fire. A cylinder which has been subjected to the action of fire must not again be placed in service until it has been properly reconditioned as follows:

- (1) A cylinder made of plain carbon steel with not over 0.25 percent carbon nor over 0.90 manganese need not be reheat-treated but must pass the periodic retest requirements as specified in paragraph (e) of this section.
- (2) DOT 8 and 8AL cylinders made entirely of carbon steel with 0.25 percent or less carbon and with 0.90 percent or less manganese, must be reinspected to determine the condition of the cylinder and the porous filler, as prescribed in CGA Pamphlet C-13. If the cylinder has been damaged, the porous filler must be removed and the cylinder must be heat treated and retested. The porous filler must be replaced in accordance with the specification to which the cylinder was made. A cylinder may be returned to service without reheat treatment or retest if the cylinder has no fire or mechanical damage and the porous filler is unchanged and intact.
- (3) The inner cylinders made under specification DOT-4L (§178.57 of this chapter) may be used after again passing the original hydrostatic test.
- (4) DOT 3AL and DOT 4E aluminum cylinders may not be reheat treated and must be removed from service.
- (5) Other cylinders must be reheat treated and reconditioned as specified in paragraph (g) of this section.

(h) Repair by welding or brazing of specifications DOT-3A, 3AA, 3B, 3C cylinders. Repair of specifications DOT-3A, 3AA, 3B or 3C (§§178.36(e), 178.37(e), 178.38(e), and 178.40(e) of this subchapter) cylinders by welding or brazing authorized, but only for the removal and replacement of neckrings and footrings attached to cylinders originally manufactured to conform to §§178.36-9(a), 178.37-9(a), 178.38-9(a), and 178.40-9(a) of this subchapter. Removal and replacement must be done by a regular manufacturer of this type of cylinder. After removal and before replacement of such parts, cylinders must be inspected, and defective ones rejected. Cylinders, neckrings, footrings, and method of replacement must conform to §178.36(e), 178.37(e), 178.38(e), or 178.40(e) of this subchapter whichever applies. Replacement must be followed by reheat treating, testing, inspection, and supervised and reported as prescribed by the specification covering their original manufacture. Inspector's reports must conform with that required by the specification covering original manufacture with the word "repaired" substituted for "manufactured." Show original markings and the new additional markings added, and statement: "Cylinders were carefully inspected for defects after removal of neckrings and footrings and after replacement, which replacement was made by process of (Welding-brazing)."

173.34(i)

(i) Repair by welding or brazing of DOT-4 series and DOT-8, welded or brazed cylinders. Repairs on DOT-4 series and DOT-8 series welded or brazed cylinders are authorized to be made by welding or brazing. Such repairs must be made by a manufacturer of these types of DOT cylinders or by a repair facility approved by the competent authority and by a process similar to that used in its manufacture and under the following specific requirements:

- (1) Cylinders with injurious defects in welded joints in or on pressure parts must be repaired by completely removing the defect prior to rewelding.
- (2) Cylinders with injurious defects in brazed joints in or on pressure parts must be repaired by rebrazing.

(3) Cylinders during welding must be free of materials in contact with the welded joint that may impair the serviceability of the metal in or adjacent to the weld. (Precautions must be taken to prevent acetylene cylinder steels from picking up carbon during repair.)

(4) Neckrings, footrings, or other nonpressure attachments authorized by the specification may be replaced or repaired. Repair or replacement of footrings, neckrings, or other nonpressure attachments authorized by the specification for DOT-4BA and 8AL (§§178.51 and 178.60 of this subchapter) cylinders may be made without conforming to the requirements of paragraph (i)(6) of this section provided the following requirements are met:

(i) Must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety.

(ii) The welder shall have available to him information as to the procedure equipment, and rod used during manufacture and shall use a similar method for repair.

(iii) Repairs must be by metal arc welding only. Welds shall be 3 inches maximum length and spaced at least 3 inches apart.

(iv) Welds shall not be made on or near a brazed joint (to prevent the possibility of copper penetration).

(v) After repair the welds are to be inspected visually for weld quality.

(vi) After repair the weld area is to be leak tested at the service pressure of the cylinder.

(5) After removal, and before replacement of attachments, cylinders must be inspected and defective ones rejected, repaired or rebuilt.

(6) After repair, cylinders must be reheat-treated, tested, inspected and reported when and as prescribed by the specification covering their original manufacture when welding or brazing seams in a pressure part of a cylinder; or when welding or brazing on pressure parts of cylinders of plain carbon steels with carbon over 0.25 percent or manganese over 1.00 percent or of alloy steels except as provided in §173.34(i)(7).

Note 1: Heat-treatment is not required after welding or brazing weldable low carbon parts to attachments of similar material which has been previously welded or brazed to the top or bottom of cylinders and properly heat-treated, provided such subsequent welding or brazing does not produce a temperature in excess of 400° F. in any part of the top or bottom material.

(7) Repair of cylinders must be followed by a proof pressure leakage test at prescribed test pressure and visual examination for weld quality when welding on pressure parts of cylinders of plain carbon 0.25 percent or less and manganese 1.00 percent or less, or when repairing steel types 1315, NAX and GLX by the following procedure:

(i) Leakage through the welding metal may be repaired without subsequent reheat treatment of the cylinder.

(ii) Repair permitted only by either the metal arc or tungsten inert gas shielded arc process. E7015, 7016, or 7018 electrodes not larger than $\frac{1}{8}$ inch diameter shall be used for the metal arc process.

(iii) Weld defects must be removed by grinding or chipping before repair by the metal arc process. The tungsten inert gas shielded arc process may be used for repair only when such repair can be made by puddling. Repair weld shall not exceed 1 inch in length nor be closer than 3 inches to the next repair area.

(iv) Repair of weld defects which have any cracking is not permitted.

(j) Repair of non-pressure attachments. Repair of non-pressure attachments by welding or brazing without affecting a pressure part of the cylinder must be followed by visual examination for weld quality.

(k) Prohibited repairs. Walls, heads or bottoms of cylinders with injurious defects or leaks in base metal shall not be repaired, but may be replaced as provided for in paragraph (l) of this section.

(l) Rebuilding of DOT-4 series and DOT-8, welded or brazed cylinders. Rebuilding of DOT-4 series and DOT-8 series, welded or brazed cylinders is authorized. Such rebuilding must be done by a manufacturer of these types of DOT cylinders or by a repair facility approved by the Associate Administrator for Hazardous Materials Safety and by a process similar to that used in its original manufacture and under the following specific requirements:

(1) The replacement of a pressure part such as wall, heads, or bottoms of cylinders or the replacement of the porous filling material, shall be considered as rebuilding.

(2) Rebuilt cylinders shall be considered as new cylinders and shall conform to all the requirements of the specifications applying, including verification of material, examination, inspection, etc., and the rendering of the proper reports to the purchaser, cylinder rebuilder, and the Associate Administrator for Hazardous Materials Safety. Report must show that cylinders were rebuilt.

(a) General requirements for repair and rebuilding. Any repair or rebuilding of a DOT 4B, 4BA or 4BW cylinder must be performed by a person holding an approval. A person performing a rebuild function shall be considered a manufacturer subject to the requirements. The person performing a repair, rebuild, or reheat treatment must record the test results as specified in Sec. 180.215. Each cylinder that is successfully repaired or rebuilt must be marked in accordance with Sec. 180.213.

(b) General repair requirements. Any repair of a cylinder must be made in accordance with the following:

(1) The repair and the inspection of the work performed must be made in accordance with the requirements of the cylinder specification.

(2) The person performing the repair shall use the procedure, equipment, and filler metal or brazing material as authorized by the approval issued under Sec. 107.805 of this chapter.

(3) Welding and brazing shall be performed on an area free from contaminants.

(4) A weld defect, such as porosity in a pressure retaining seam, shall be completely removed before rewelding. Puddling may be used to remove a weld defect only by the tungsten inert gas shielded arc process.

(5) After removal of a non-pressure attachment and before its replacement, the cylinder shall be given a visual inspection in accordance with Sec. 180.205(f).

(6) Reheat treatment of DOT-4B, 4BA or 4BW specification cylinders after replacement of non-pressure attachments is not required when the total weld material does not exceed 8 inches. Individual welds must be at

least three inches apart.

(7) After repair of a DOT 4B, 4BA or 4BW cylinder, the weld area is to be leak tested at the service pressure of the cylinder.

(8) Repair of weld defects must be free of cracks.

(9) When a non-pressure attachment with the original cylinder specification markings is replaced, all markings must be transferred to the attachment on the repaired cylinder.

(10) Walls, heads or bottoms of cylinders with defects or leaks in base metal may not be repaired, but may be replaced as provided for in paragraph (d) of this section.