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Item 5 (a) of the provisional agenda
Proposals for amendments to RID/ADR/ADN: pending issues

Test periods for battery-wagons/battery-vehicles filled in accordance with packing instruction P200

Transmitted by the European Industrial Gases Association (EIGA)[*, **]

Introduction

1. The 2015 edition of RID/ADR was amended to permit certain gases of packing instruction P200 to have their test periods extended from ten to fifteen years. This was aimed for individual cylinders and also cylinders mounted in bundles of cylinders.

2. Extensive work was carried out by an informal intersessional working group of the Joint Meeting to arrive at the final proposal, see working document ECE/TRANS/WP.15/AC.1/2013/42 and supporting informal documents.

3. At the time of the proposal in document ECE/TRANS/WP.15/AC.1/2013/42 it was decided not to extend the work to cover the elements in battery-wagons/battery-vehicles until experience had been gained with single cylinders and bundles of cylinders.

4. Since the 2015 edition of RID/ADR has come into effect, the extended test regime for both single cylinders and bundles of cylinders has been adopted in many countries. EIGA has so far not received any reports of cylinders or bundles of cylinders being rejected due to operation issues after the extension to a fifteen-year test interval has been introduced.

5. For current application, EIGA members have investigated retest data of 300 type 1 battery-vehicles with 60.000 type 1 receptacles, with the following documented facts:

- No rejection of tubes due to operation issue. Only one manufacturing defect was found during an acoustic emission test after more than 30 years.
- The battery-vehicles with type 1 cylinders as elements, had zero reject rate, except for the specific battery-vehicle design which caused external element corrosion during

[*] A/78/6 (Sect.20), table 20.5.
[**] Circulated by the Intergovernmental Organisation for International Carriage by Rail (OTIF) under the symbol OTIF/RID/RC/2024/33.

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use and these designs were detected within the first 10 years of service and stopped. Still, only 43 of 56.000 cylinders were rejected. The reject criterium was in all cases problems with the neck ring and collar as result of the dismounting process.

- It was demonstrated that for battery-vehicle design for which external corrosion was detected or suspected, that the corresponding elements were removed from service during the first 10 years in use.

6. Due to the fact that all battery-vehicles are assembled by a few manufacturers these figures can be seen as a good overview of the type 1 battery-vehicles in service.

7. A good and acceptable battery-vehicle design take in consideration the risk of external corrosion of the elements and the other accessories.

8. A bad design results in external corrosion, which will be detected during the first 10 years in service.

9. Based on these positive results of investigation, EIGA proposes that the fifteen-year test interval is extended to include battery-wagons/battery-vehicles constructed with either seamless steel cylinders or seamless steel tubes, and containing only either UN 1046 HELIUM, COMPRESSED or UN 1049 HYDROGEN, COMPRESSED.

10. EIGA invites the delegates for comments during this session of the Joint Meeting.

I. Overview of battery-wagons/battery-vehicles

11. A battery-wagon/battery-vehicle is defined as:

"*"Battery-wagon/Battery-vehicle"* means a wagon/vehicle containing elements which are linked to each other by a manifold and permanently fixed to this wagon/vehicle. The following elements are considered to be elements of a battery-wagon/battery-vehicle: cylinders, tubes, bundles of cylinders (also known as frames), pressure drums as well as tanks destined for the carriage of gases as defined in 2.2.2.1.1 with a capacity of more than 450 litres;".

12. Battery-wagons/battery-vehicles are a well-established means of carrying large volumes of certain compressed gases that are generally not as convenient to be transported as a refrigerated liquefied gas. Typically, the gases transported in battery-vehicles are UN 1046 HELIUM, COMPRESSED and UN 1049, HYDROGEN, COMPRESSED. The main reason UN 1046 and UN 1049 are carried as a compressed gas is that their liquefaction temperature is very close to absolute zero and thus requires special equipment to handle these very low temperatures.

13. Examples of battery-vehicles are shown in Annex. Battery-vehicles can typically contain 400 type 1 cylinders or 10 type 1 tubes. The method of construction is that the elements (cylinders or tubes) are secured to the chassis of the semi-trailer and the elements connected by manifold piping. Depending on the configuration there could be individual valves on each element or valves to isolate a bank of cylinders or tubes.

14. The mode of operation of a battery-vehicle is that they are filled at an increasing, but limited number of dedicated specialist filling centres, driven to the point of use and connected to a process and remain in-situ until the product has been used. These filling centres can be easily detected and certified for filling battery vehicles.

15. There is always a residual pressure left in the battery-vehicle due to a number of factors. One is that the process a battery-vehicle is connected to requires a pressure greater than atmospheric pressure, and by maintaining a positive pressure so that product purity is ensured. Battery-vehicles usually do not have residual pressure valves as these can impede the flow in case of high-volume applications, but if there is a risk of contamination from a customer process safeguards will be put in place on the installation to which the battery-vehicle is connected to. Such process could include a gas product analysis before each filling. It should be noted that under 1.4.3.7.1 (d) (ii) of the RID/ADR there is a requirement for the unloader “Immediately following the unloading of the tank, vehicle or container; Ensure the

closure of valves and inspection openings." This is an additional safeguard to ensure a residual pressure. Battery-vehicles almost always remain in one product service.

II. Principles

16. The principles for extending the retest period from ten to fifteen years are based upon those that are used for individual cylinders and bundles of cylinder. These are summarised in the following paragraphs.

17. The proposed increase in periodicity only applies to UN 1046 HELIUM, COMPRESSED and UN 1049, HYDROGEN, COMPRESSED. These gases have been selected due to the following:

(a) The vast majority of products transported in battery-vehicles are either UN 1046 or UN 1049.

(b) The applications that require UN 1046 and UN 1049 are almost always of very high purity, well in excess of the requirements of 2.4 of packing instruction P200 (13). The applications include electronics component production, medical and food processing. Consequently, analysis of the contents of the battery-vehicle prior to filling is usually carried out to ensure product purity.

18. Facilities that fill battery-vehicles will apply a documented and certified quality system which will be monitored by the competent authority. Filling shall only be carried out by these approved facilities.

19. All battery-vehicles operating under a fifteen-year inspection regime will be checked before filling for a positive pressure.

20. The owner of battery-vehicles that are eligible for a fifteen-year inspection regime shall establish procedures to ensure that the battery-vehicles are only filled in approved filling centres.

21. Battery-wagons/Battery-vehicles constructed with composite elements are excluded from this proposal.

III. Pre-fill inspection and monitoring of battery-vehicles

22. Battery-vehicles are subject to pre-fill inspections. See section "X. Proposal". These checks are in addition to the inspections required for the automotive components.

23. Due to the nature of battery-vehicles, their location is always known, that is either being loaded or in transit or being unloaded.

IV. Risk analysis consideration

24. EIGA members have considered if there are increased risks in extending the test interval from ten to fifteen years for battery-vehicles and their conclusions are that subject to the pre-fill inspection being carried out there is no increased risk.

25. The reason for this conclusion is that the following requirements will be carried out under an approved quality system:

(a) The prefill check on the external condition of the battery-vehicle remains a critical part of the overall filling process to ensure the safety of the battery-vehicle.

(i) This is important as battery-vehicles are filled a number of times between the periodic inspections.

(ii) The majority of damage to battery-vehicles is from external influences.

(iii) The most hazardous part of a battery-vehicles life is during filling, when it is subjected to the highest stress due to internal pressure.

(b) The presence of a positive pressure is checked prior to every fill thereby ensuring that outside contamination will not have entered into the battery-vehicle during customer use.

(c) The above points will be reinforced by only allowing the filling of battery-vehicles at filling locations that have been approved to fill battery-vehicles with the extended test interval.

26. As mentioned above in 11 (b) the purity requirements for the products are very stringent.

V. Retest procedures for battery-vehicles with type I elements

27. The EIGA members are not seeing any missing standards for retesting of such battery vehicles. The battery vehicles will be disassembled, and the elements follow a retest procedure as defined and standardised for cylinders / tubes. The valves and fitting will be checked by following the valve refurbishment standards and the manifold will be checked by following the procedure as defined in the bundle retest standard.

VI. Methodology of how to extend 10 to 15 years

28. As battery-vehicles are subject to detailed inspections including the requirements of standard EN 13385 and monitored for the residual product and gas quality and as there are quality systems in place the test intervals may be extended. Based on this, it would appear to be appropriate to implement the extended test interval for battery-vehicles from the date of the last periodic inspection, if the requirements for the extended period have already been met since then. In this case it should not be necessary to wait for the next periodic inspection; the next inspection is due 15 years after the last inspection, even if it was done prior to the new regulation.

VII. Safety

29. No safety issues are foreseen as the battery-vehicles will continue to be subject to the prefill inspection requirements as mentioned in revised 4.3.3.2.5 and new 6.8.3.4.15.

VIII. Enforceability

30. Enforceability is not considered to present any obstacles due to the close monitoring of battery-vehicles during loading, unloading and carriage.

IX. Proposal

Changes to packing instruction P200

31. Packing instruction P200 already has provision covering cylinders and bundles of cylinders. EIGA proposes to add provisions for tubes. In this proposal new text is shown underlined and deleted text is shown with a strikethrough:

(i) **4.1.4.1, P200**

In paragraph (10), after special packing provision va, insert the following new special packing provisions:

"vb: The interval between inspections for seamless steel tubes for carriage of UN Nos. 1046 and 1049, may be extended to 15 years:

(a) with the agreement of the competent authority (authorities) of the country (countries) where the periodic inspection and the carriage take place; and

(b) in accordance with the requirements of a technical code or a standard recognised by the competent authority."

(ii) Amend paragraph (13) to read as follows:

P200	**PACKING INSTRUCTION *(cont'd)***	**P200**

(13) An interval of 15 years for the periodic inspection of seamless steel and aluminium alloy cylinders, ~~and~~ bundles of such cylinders and seamless steel tubes may be granted in accordance with special packing provisions ua, ~~or~~ va or vb of paragraph (10), if the following provisions are applied:

1. General provisions

1.1 For the application of this paragraph, the competent authority shall not delegate its tasks and duties to Xb bodies (inspection bodies of type B) or IS (in-house inspection services) (for the definitions of Xb and IS, see 6.2.3.6.1).

1.2 The owner of the cylinders, ~~or~~ bundles of cylinders or seamless steel tube shall apply to the competent authority for granting the 15 year interval, and shall demonstrate that the requirements of sub-paragraphs 2, 3 and 4 are met.

1.3 Cylinders manufactured since 1 January 1999 shall have been manufactured in conformity with one of the following standards:

- EN 1964-1 or EN 1964-2; or
- EN 1975; or
- EN ISO 9809-1 or EN ISO 9809-2; or
- EN ISO 7866; or
- EN ISO 11120; or
- Annex I, parts 1 to 3 to Council Directive 84/525/EEC[b] and 84/526/EEC[c]

as applicable at the time of manufacture (see also the table in 6.2.4.1).

Other cylinders or seamless steel tubes manufactured before 1 January 2009 in conformity with RID/ADR in accordance with a technical code accepted by the national competent authority may be accepted for a 15 year interval for periodic inspection, if they are of equivalent safety to the provisions of RID/ADR as applicable at the time of application.

NOTE: *This provision is considered to be fulfilled if the cylinder has been reassessed according to the procedure for the reassessment of conformity described in Annex III of Directive 2010/35/EU of 16 June 2010 or Annex IV, Part II, of Directive 1999/36/EC of 29 April 1999.*

Cylinders, ~~and~~ bundles of cylinders and seamless steel tubes marked with the United Nations packaging symbol specified in 6.2.2.7.2 (a) shall not be granted a 15 year interval for periodic inspection.

P200	PACKING INSTRUCTION *(cont'd)*	P200

1.4 Bundles of cylinders shall be constructed such that contact between cylinders along the longitudinal axis of the cylinders does not result in external corrosion. The supports and restraining straps shall be such as to minimise the risk of corrosion to the cylinders. Shock absorbent materials used in supports shall only be allowed if they have been treated to eliminate water absorption. Examples of suitable materials are water resistant belting and rubber.

1.5 The owner shall submit documentary evidence to the competent authority demonstrating that the cylinders and seamless steel tubes comply with the provisions of sub-paragraph 1.3. The competent authority shall verify that these conditions are met.

1.6 The competent authority shall check whether the provisions of sub-paragraphs 2 and 3 are fulfilled and correctly applied. If all provisions are fulfilled, it shall authorise the 15 year interval for periodic inspection for the cylinders, ~~or~~ bundles of cylinders or seamless steel tubes. In this authorisation a group of cylinders or tubes (see NOTE below) covered shall be clearly identified. The authorisation shall be delivered to the owner; the competent authority shall keep a copy. The owner shall keep the documents for as long as the cylinders or seamless steel tubes are authorised for a 15 year interval.

NOTE: *A group of cylinders or seamless steel tubes is defined by the production dates of identical cylinders or tubes for a period, during which the applicable provisions of RID/ADR and of the technical code accepted by the competent authority have not changed in their technical content. Example: Cylinders of identical design and volume having been manufactured according to the provisions of RID/ADR applicable between 1 January 1985 and 31 December 1988 in combination with a technical code accepted by the competent authority applicable for the same period form one group in terms of the provisions of this paragraph.*

1.7 The owner shall ensure compliance with the provisions of RID/ADR and the authorisation given as appropriate and shall demonstrate this to the competent authority on request but at least every three years or when significant changes to the procedures are introduced.

2. Operational provisions

2.1 Cylinders, ~~or~~ bundles of cylinders or seamless steel tubes having been granted a 15 year interval for periodic inspection shall only be filled in filling centres applying a documented and certified quality system to ensure that all the provisions of paragraph (7) of this packing instruction and the requirements and responsibilities of EN ISO 24431:2016 or EN 13365:2002 as applicable are fulfilled and correctly applied. The quality system, according to the ISO 9000 (series) or equivalent, shall be certified by an accredited independent body recognized by the competent authority. This includes procedures for pre- and post-fill inspections and the filling process for cylinders, bundles of cylinders, tubes and valves.

2.2 Aluminium alloy cylinders and bundles of such cylinders without RPVs having been granted a 15 year interval for periodic inspection shall be checked prior to every fill in accordance with a documented procedure which shall at least include the following:

(a) Open the cylinder valve or the main valve of the bundle of cylinders to check for residual pressure;

(b) If gas is emitted, the cylinder or bundle of cylinders may be filled;

(c) If no gas is emitted, the internal condition of the cylinder or bundle of cylinders shall be checked for contamination;

(d) If no contamination is detected, the cylinder or bundle of cylinders may be filled.

(e) If contamination is detected corrective action is to be carried out.

2.3 Seamless steel cylinders fitted with RPVs and bundles of seamless steel cylinders equipped with main valve(s) with a residual pressure device having been granted a 15 year interval for periodic inspection shall be checked prior to every fill in accordance with a documented procedure which shall at least include the following:

(a) Open the cylinder valve or bundle of cylinders main valve to check for residual pressure;

(b) If gas is emitted, the cylinder or bundle of cylinders may be filled;

(c) If no gas is emitted the functioning of the residual pressure device shall be checked;

(d) If the check shows that the residual pressure device has retained pressure the cylinder or bundle of cylinders may be filled;

(e) If the check shows that the residual pressure device has not retained pressure, the internal condition of the cylinder or bundle of cylinders shall be checked for contamination:

P200	PACKING INSTRUCTION *(cont'd)*	P200

(i) If no contamination is detected, the cylinder or bundle of cylinders may be filled following repair or replacement of the residual pressure device;

(ii) If contamination is detected, a corrective action shall be carried out.

2.4 To prevent internal corrosion, only gases of high quality with very low potential contamination shall be filled into cylinders, or bundles of cylinders. This is deemed to be fulfilled, if the compatibility of gases/material is acceptable in accordance with EN ISO 11114-1:2020 + A1:2023 and EN ISO 11114-2:2021, and the gas quality meets the specifications in EN ISO 14175:2008 or, for gases not covered in the standard, a minimum purity of 99.5 % by volume and a maximum moisture content of 40 ml/m³(ppm). For nitrous oxide the values shall be a minimum purity of 98 % by volume and a maximum moisture content of 70 ml/m³ (ppm).

2.5 The owner shall ensure that the requirements of 2.1 to 2.4 are fulfilled and provide documentary evidence of this to the competent authority on request, but at least every three years or when significant changes to the procedures are introduced.

2.6 If a filling centre is situated in a different RID Contracting State/Contracting Party to ADR, the owner shall provide to the competent authority, on request, additional documentary evidence that the filling centre is monitored accordingly by the competent authority of that RID Contracting State/Contracting Party to ADR. See also 1.2.

3. Provisions for qualification and periodic inspection

3.1 Cylinders, and bundles of cylinders and seamless steel tubes already in use, for which the conditions of sub-paragraph 2 have been met from the date of the last periodic inspection to the satisfaction of the competent authority, may have their inspection period extended to 15 years from the date of the last periodic inspection. Otherwise the change of test period from ten to fifteen years shall be made at the time of periodic inspection. The periodic inspection report shall indicate that this cylinder, ~~or~~ bundle of cylinders or seamless steel tube shall be fitted with a residual pressure device as appropriate. Other documentary evidence may be accepted by the competent authority.

3.2 If a cylinder or seamless steel tube with a 15 year interval fails the pressure test by bursting or leakage or if a severe defect is detected by a non-destructive test (NDT) during a periodic inspection the owner shall investigate and produce a report on the cause of the failure and if other cylinders (e.g. of the same type or group) are affected. In the latter case, the owner shall inform the competent authority. The competent authority shall then decide on appropriate measures and inform the competent authorities of all other RID Contracting States/Contracting Parties to ADR accordingly.

3.3 If internal corrosion and other defects as defined in the periodic inspection standards referenced in 6.2.4 have been detected, the cylinder shall be withdrawn from use and shall not be granted any further period for filling and carriage.

3.4 Cylinders, ~~or~~ bundles of cylinders and seamless steel tubes having been granted a 15 year interval for periodic inspection shall only be fitted with valves designed and tested according to EN 849 or EN ISO 10297 as applicable at the time of manufacture (see also the table in 6.2.4.1). After a periodic inspection a new valve shall be fitted, except that valves which have been refurbished or inspected according to EN ISO 22434:2022 may be re-fitted.

4. Marking

Cylinders, ~~and~~ bundles of cylinders and seamless steel tubes having been granted a 15 year interval for periodic inspection in accordance with this paragraph shall have the date (year) of the next periodic inspection as required in section 5.2.1.6 (c) and at the same time additionally be marked clearly and legibly with "P15Y". This mark shall be removed if the cylinder ~~or~~ , bundle of cylinders or seamless steel tube is no longer authorised for a 15 year interval for periodic inspection."

[b] *Council Directive on the approximation of the laws of the Member States relating to seamless, steel gas cylinders, published in the Official Journal of the European Communities No. L 300 of 19.11.1984.*

[c] *Council Directive on the approximation of the laws of the Member States relating to seamless, unalloyed aluminium and aluminium alloy gas cylinders, published in the Official Journal of the European Communities No. L 300 of 19.11.1984.*

(iii) In Table 2, for UN numbers 1046 and 1049, in the last column, add:", vb".

X. Additional requirements for battery-wagons/battery-vehicles, which are not covered by packing instruction P200, but need to be added to 4.3.3.2.5, 6.8.3.1.4, 6.8.3.5.11, 6.8.3.4.15 and 6.8.3.4.16

(i) Modify 4.3.3.2.5 (in the agreed 2027 version) as follows:

"4.3.3.2.5 Prior to filling, the battery-wagons/battery-vehicles and MEGCs shall be inspected to ensure they are authorized for the gas to be carried and that the applicable provisions of RID/ADR have been met. The elements of battery-wagons/battery-vehicles or MEGCs that are pressure receptacles shall be filled according to the working pressures, filling ratios and filling provisions specified in packing instruction P 200 of 4.1.4.1 for the specific gas being filled into each element. When battery-wagons/battery-vehicles and MEGCs are filled as a whole or groups of their elements are filled simultaneously, the filling pressure or the load shall not exceed the lowest maximum filling pressure or the lowest maximum load of any single element. Battery-wagons/battery-vehicles and MEGCs shall not be filled above the applicable permissible masses.

Prior to filling of battery-wagons/battery-vehicles, the elements of which have been granted a 15 year interval for periodic inspection in accordance with paragraph (13) of packing instruction P200 of 4.1.4.1, it shall be verified by visual examination that:

– The element supports or bundle frames are free from damage which may affect the mechanical integrity of the battery-wagon/battery-vehicle.

– The restraining systems that prevent the elements from moving are secure.

– The visible surfaces of elements are free of signs of dents, cuts, gouges, fire damage or any other signs of major damage. Rejection criteria shall be applied in accordance with EN ISO 18119. Where rejection criteria are met the elements shall be revalidated or rejected from use.

– The main outlet connection is correct for the substance to be carried, free from contamination and is undamaged.

– There is residual pressure in all elements. In case lack of residual pressure and contamination in the elements is detected, corrective actions shall be taken after which lack of contamination shall be proven."

(ii) Modify the left-hand column of 6.8.3.5.11 as follows:

"The following particulars shall be inscribed on the battery-vehicle itself or on a plate[15]:

- names of owner or of operator;
- number of elements;
- total capacity of elements;

~~and~~ for battery-vehicles filled by mass:

- unladen mass;
- maximum permissible mass~~.~~;

and for battery-wagons/battery-vehicles, which have been granted a 15 year interval for periodic inspection in accordance with paragraph (13) of packing instruction P200 of 4.1.4.1[*]:

- "P15Y";

- date (month and year) of the next periodic inspection of the elements.

[*] These marks shall be removed if the battery-wagon/battery-vehicle is no longer authorised for a 15 year interval for periodic inspection."

(iii) 6.8.3.1.4 Amend to read as follows:

"6.8.3.1.4 Cylinders, tubes, pressure drums and bundles of cylinders, as elements of a battery-wagon/battery-vehicle or MEGC, shall be constructed in accordance with Chapter 6.2.

Battery-wagons/battery-vehicles composed of cylinders or seamless steel tubes extended to a 15 year test period shall be constructed such that contact between cylinders or tubes along the longitudinal axis of the cylinders or tubes does not result in external corrosion. The supports and restraining straps shall be such as to minimise the risk of corrosion to the cylinders or tubes. Shock absorbent materials used in supports shall only be allowed if they have been treated to eliminate water absorption. Examples of suitable materials are water resistant belting and rubber.

NOTE 1: *Bundles of cylinders which are not elements of a battery-wagon/battery-vehicle or of a MEGC shall be subject to the requirements of Chapter 6.2.*

NOTE 2: *Tanks as elements of battery-wagon/battery-vehicles and MEGCs shall be constructed in accordance with 6.8.2.1 and 6.8.3.1.*

NOTE 3: *Demountable tanks[16] are not to be considered elements of battery-wagon/battery-vehicles or MEGCs."*

(iv) Insert the following 6.8.3.4.15 and 6.8.3.4.16:

"6.8.3.4.15 Battery-wagons/battery-vehicles with seamless steel cylinders, bundles of seamless steel cylinders or seamless steel tubes used in UN 1049 Hydrogen, compressed and UN 1046 Helium, compressed service having been granted a 15-year interval for periodic inspection shall be checked prior to every fill in accordance with a documented procedure which shall at least include a procedure or device to check for residual pressure using a pressure sensor or pressure gauge.

(a) If residual pressure is confirmed the battery-wagon/battery-vehicle may be filled

(b) If no residual pressure is confirmed check for contamination (no moisture, no oxygen):

– If no contamination is detected, the battery-wagon/battery-vehicle may be filled following repair or replacement of the residual pressure device, if applicable;

– If contamination is detected, a corrective action shall be carried out after which lack of contamination shall be proven.

6.8.3.4.16 To prevent internal corrosion, only gases of high quality with very low potential contamination shall be filled into battery-wagons/battery vehicles fitted with seamless steel cylinders, bundles of seamless steel cylinders or seamless steel tubes. This is deemed to be fulfilled, if the compatibility of gases and material is acceptable in accordance with EN ISO 11114-1:2020 and EN ISO 11114-2:2013, and the gas quality meets the specifications in EN ISO 14175:2008 or, for gases not covered in the standard, a minimum purity of 99.5 % by volume and a maximum moisture content of 40 ml/m³(ppm)."

Annex

Examples of Battery-Vehicles
(EIGA has copyright for both pictures)

I. Battery-vehicle constructed with seamless steel tubes

II. Battery-vehicle constructed with seamless steel cylinders