Multilateral Agreement M270
under section 1.5.1 of ADR, concerning the working pressure of composite cylinders intended for the carriage of hydrogen (UN 1049)

1. By derogation from the provisions of 6.2.5.5 of ADR, composite cylinders intended for the carriage of hydrogen which are approved for a working pressure of 525 bar can be filled and carried at a working pressure of 700 bar, provided the conditions in point 2 below are met.

2. This agreement only applies to fully wrapped carbon fiber cylinders complying with the following requirements:

   2.1. The cylinders shall be designed and manufactured in accordance with EN 12245 +A1:2011, fulfilling the tests as required in Annex.

   2.2. The cylinders shall be used in bundles to be protected from external impact by the bundle frame.

   2.3. The following marks shall be applied :

   - on each cylinder, the mark confirming the approval for PW = 525 bar,

   - on the bundle data plate, in addition to the PW = 525 bar marking, the indication of PW = 700 bar followed by M270 and the stamp and identification number of the inspection body approved by a competent authority which has signed this agreement.

   2.4. The bundles shall be equipped with a main valve designed, manufactured and tested for at least 700 bar service pressure.

   2.5. After 2,5 years from the date of signature of this multilateral agreement, an evaluation is performed to consider any operational issues such as defects during inspection at time of filling. In addition, a bursting test on a representative sample may be performed to assess the resistance of cylinders is not impaired by ageing.

3. This agreement shall be valid until 15 February 2019 for the carriage on the territories of the ADR Contracting Parties signatory to this Agreement. If it is revoked before that date by one of the signatories, it shall remain valid until the above mentioned date only for carriage on the territories of those ADR Contracting Parties signatory to this Agreement which have not revoked it.

Done in Paris, on 19 Feb [illegible]

Competent Authority for ADR in France

Pour le Ministre et par délégation,
L'ingénieur général des mines

Jérôme GOELLNER

Annex to Multilateral Agreement M270
Tests to be conducted

The procedure and criteria as specified in clause 5.2 Requirements and test methods of EN 12245+A1:2011 concerning Tests 1, 2, 16, 17, 18 and 19 are fulfilled.

The procedure and criteria as specified in clause 5.2 of EN 12245+A1:2011 concerning Tests 4, 5, 6, 8, 9, 10, 11, 12, 13 and 14, and the additional Tests A and B are fulfilled in the following conditions:

No	Test	Procedure according to	Criteria
4	Pressure test of finished cylinders at ambient temperature	5.2.4.1 hydraulic test pressure increased to 875 bar	as per EN 12245
5	Cylinder burst test	5.2.5.1	$p_b \geq$ 1575 bar
6	Resistance to pressure cycles at test pressure and ambient temperature	5.2.6.1 ≤ 5 cycles/min, Pmin ≤ 5 bar(*)	p_h = 875 bar, 15 000 cycles mini
8	Exposure to elevated temperature at test pressure	5.2.8.1 for 20 year lifetime, test at 875 bar and 70°C for 1000 h for more than 20 year lifetime, test at 875 bar and 70°C for 2000 h	$p_b \geq$ 1575 bar
9	Drop test	5.2.9.2 and 5 drops in different position at 1.8 m max height ≤ 5 cycles/min, Pmin ≤ 5 bar(*)	3000 cycles up to 700 bar without burst or leak 9000 cycles without burst
10	Flawed cylinder test	5.2.10.1 ≤ 5 cycles/min, Pmin ≤ 5 bar(*)	one cylinder, $p_b \geq$1168 bar and one cylinder cycling test at 700 bar for 5000 cycles (leak after 1000 cycles tolerated)
11	Extreme temperature cycle test	5.2.11.1	burst pressure after tests ≥ 1461 bar
12	Fire resistance test	5.2.12.1 test at 700 bar the cylinders are not fitted with a pressure relief device	4 min in a fire without burst
13	High velocity impact test	5.2.13.1 and one cylinder filled to 700 bar, impacted by a 7,62 mm (0.30 calibre) armour piercing projectile (of length between 37 mm and 51 mm) with a nominal speed of 850 m/s in the cylinder side wall at a nominal angle of 45° - 1 shot	as per EN 12245
14	Permeability test	5.2.14.1 and 2 cylinders filled at 700 bar with H2: one after proof test and 1000 cycles between 5 and 700 bar(*) and one after proof test, neck strength test and 1000 cycles between 5 and 700 bar(*)	Permeability rate ≤ 2 Ncm3/h/L-tank. Permeability rate measured by an appropriate mean, with hydrogen
A	Liner collapse test	filling-emptying cycle representative of operating conditions	no liner collapse
B	Slow burst test	2 cylinders are pressurized at a rate not exceeding 20 % of 875 bar/h	no criteria – to be eventually used as a reference

(*) : In case the equipment does not allow reaching 5 bar minimum pressure, a maximum pressure of 30 bar is allowed and a pressure difference of 870 bar (or 700 bar, depending on the test) shall be maintained during the cycling test between the highest and the lowest pressures in the cycle.