II

(Acts whose publication is not obligatory)

COUNCIL

COUNCIL DIRECTIVE

of 17 September 1984

on the approximation of the laws of the Member States relating to seamless, steel gas cylinders

(84/525/EEC)

THE COUNCIL OF THE EUROPEAN COMMUNITIES,

Having regard to the Treaty establishing the European Economic Community, and in particular Article 100 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Parliament (1),

Having regard to the opinion of the Economic and Social Committee (2),

Whereas in the Member States the construction of gas cylinders and the relevant controls are subject to mandatory provisions varying from one Member State to another and consequently hinder the trade in such vessels; whereas it is therefore necessary to approximate these provisions;

Whereas Council Directive 76/767/EEC of 27 July 1976 on the approximation of the laws of the Member States relating to common provisions for pressure vessels and methods of inspecting them (3), as amended by the Act of Accession of 1979, lays down in particular the procedures of EEC pattern approval and verification for these vessels; whereas, according to that Directive, it is advisable to lay down the technical requirements to be complied with by EEC-type seamless, steel gas cylinders with a capacity of 0,5 to 150 litres in order to be importable, commercialized and used without restraint after having undergone inspection and bearing accordingly a mark and a symbol,

HAS ADOPTED THIS DIRECTIVE:

Article 1

1. This Directive shall apply to the steel pressure-resistant shells of seamless cylinders, i.e. formed from a single piece, capable of being refilled and transported, with a capacity of between 0,5 and 150 litres inclusive and designed to contain compressed, liquefied or dissolved gases. These gas cylinders are hereinafter referred to as 'cylinders'.

2. This Directive shall not apply to cylinders made of austenitic steel or to cylinders to which metal is added when the base is being sealed.

3. This Directive shall apply irrespective of the number of outlets the cylinder has (one or two).

(1) OJ No C 2, 9. 1. 1974, p. 64.
(2) OJ No C 101, 23. 11. 1973, p. 25.
(3) OJ No L 262, 27. 9. 1976, p. 153.

Article 2

For the purposes of this Directive, 'EEC-type cylinder' shall mean any cylinder designed and manufactured in such a way that it satisfies the requirements of this Directive and of Directive 76/767/EEC.

Article 3

No Member State may, on grounds relating to the construction or inspection of a cylinder within the meaning of Directive 76/767/EEC and this Directive, refuse, prohibit or restrict the marketing and placing in service of an EEC-type cylinder.

Article 4

All EEC-type cylinders shall be subject to EEC pattern approval.

All EEC-type cylinders shall be subject to EEC verification with the exception of cylinders with a hydraulic test pressure of 120 bars or less and with a capacity of not more than one litre.

Article 5

Any amendments necessary to adapt sections 2.1.3, 2.1.4, 2.3, 3.1.1.1, 3.4, 3.5, 3.6, 3.7, 4, 5 and 6 of Annex I and the other Annexes to this Directive to technical progress shall be adopted in accordance with the procedure laid down in Article 20 of Directive 76/767/EEC.

Article 6

The procedure laid down in Article 17 of Directive 76/767/EEC may apply to section 2.2 of Annex I to this Directive.

Article 7

1. Member States shall bring into force the laws, regulations and administrative provisions needed in order to comply with this Directive within 18 months of its notification (1) and shall forthwith inform the Commission thereof.

2. Member States shall ensure that the texts of the provisions of national law which they adopt in the field covered by this Directive are communicated to the Commission.

Article 8

This Directive is addressed to the Member States.

Done at Brussels, 17 September 1984.

For the Council

The President

P. BARRY

(1) This Directive has been notified to the Member States on 26 September 1984.

ANNEX I

1. DEFINITIONS OF, AND SYMBOLS FOR, THE TERMS USED IN THIS ANNEX

1.1. YIELD STRESS

For the purposes of this Directive, the yield stress values used in the calculation of the parts subjected to pressure shall be as follows:

— when a steel does not display a lower and an upper yield point, the minimum value of the conventional yield point $R_{p\,0,2}$ is to be taken;

— when a steel displays a lower and an upper yield point, the value to be taken is:

  — R_{eL},

  — $R_{eH} \times 0,92$, or

  — $R_{p\,0,2}$.

1.2. BURSTING PRESSURE

For the purposes of this Directive, 'bursting pressure' means the pressure at plastic instability, i.e. the maximum pressure obtained during a pressure bursting test.

1.3. SYMBOLS

The symbols used in this Annex have the following meanings:

P_h = hydraulic test pressure, in bars;

P_r = cylinder bursting pressure measured during the bursting test, in bars;

P_{rt} = calculated minimum theoretical bursting pressure, in bars;

R_e = value of the yield stress taken into account in accordance with 1.1 for the purpose of determining the value of R used in calculating the parts subjected to pressure, in N/mm^2;

R_{eL} = minimum value of the lower yield point, guaranteed by the cylinder manufacturer, in N/mm^2;

R_{eH} = minimum value of the upper yield point, guaranteed by the cylinder manufacturer, in N/mm^2;

$R_{p\,0,2}$ = conventional yield point 0,2 %, guaranteed by the manufacturer, in N/mm^2;

The conventional yield point is the value of the stress which gives rise to a non-proportional elongation equal to 0,2 % of the original gauge length.

R_m = minimum value of the tensile strength guaranteed by the cylinder manufacturer, in N/mm^2;

a = calculated minimum thickness of the cylindrical shell wall, in mm;

D = nominal outside diameter of the cylinder, in mm;

d = mandrel diameter for bend tests, in mm;

R_{mt} = actual tensile strength, in N/mm^2.

1.4. NORMALIZATION

The term 'normalization' is used in this Directive as defined in paragraph 68 of EURONORM 52-83.

Normalization may be followed by tempering at a uniform temperature below the lowest transformation point (Ac1) of the steel.

1.5. QUENCHING AND TEMPERING

The term 'quenching and tempering' relates to the heat treatment to which a completed cylinder is subjected, during which the cylinder is heated to a uniform temperature above the upper transformation

point (Ac3) of the steel. The cylinder is then cooled at a rate not exceeding 80 % of that obtained by cooling in water at 20 °C and subsequently tempered at a uniform temperature below the lowest transformation point (Ac1) of the steel.

The heat treatment must be such that it does not cause cracks in the cylinder. The cylinders must not be quenched in water without additives.

2. TECHNICAL REQUIREMENTS

2.1. STEELS USED

2.1.1. A steel shall be defined according to its method of manufacture, its chemical compositon and the heat treatment to which the finished cylinder is subjected, and its mechanical characteristics. The manufacturer shall give the corresponding information, taking account of the requirements listed below. Any change in such information shall be deemed to correspond to a change in the type of steel for the purposes of EEC pattern approval.

(a) *Method of manufacture*

The method of manufacture shall be defined by reference to the process used (for example open-hearth furnace, oxygen converter, electric furnace) and the killing method used.

(b) *Chemical composition*

The chemical composition must show at least:

— the maximum sulphur and phosphorous content in all cases,

— the carbon, manganese and silicon content in all cases,

— the nickel, chromium, molybdenum and vanadium content when such substances are deliberately introduced as alloying elements.

The carbon, manganese, silicon and, where appropriate, nickel, chromium, molybdenum and vanadium content must be given with tolerances such that the differences between the maximum and minimum values for each cast do not exceed:

— carbon:
  — 0,06 % when the maximum content is less than 0,30 %,
  — 0,07 % when the maximum content is 0,30 % or more;
— manganese and silicon:
  — 0,30 %;
— chromium:
  — 0,30 % when the maximum content is less than 1,5 %,
  — 0,50 % when the maximum content is 1,5 % or more;
— nickel:
  — 0,40 %;
— molybdenum:
  — 0,15 %;
— vanadium:
  — 0,10 %.

(c) *Heat treatment*

The heat treatment shall be defined in terms of the temperature, the length of time held at the temperature and the nature of the cooling fluid used for each stage of the treatment (normalization, whether or not followed by tempering, or quenching and tempering).

The austenitization temperature before quenching or normalization must be fixed with a margin of 35 °C either way.

The same applies to the tempering temperature.

2.1.2. **Conditions to be fulfilled**

The steel used must be killed steel and resistant to ageing. The whole of the finished cylinder must be subjected to heat treatment which may be either normalization, whether or not followed by tempering,

or quenching followed by tempering. The sulphur and phosphorus contents obtained for the cast sample should each be not more that 0,035 % and must not in total exceed 0,06 %. The sulphur and phosphorus contents obtained for the product must each be not more than 0,04 % and must not in total exceed 0,07 %.

2.1.3. A steel within the meaning of 2.1.1 may not be used by a manufacturer unless it is accepted by a Member State for the manufacture of seamless cylinders. Each Member State shall supply any other Member State on request with a list of the materials used on its territory for the manufacture of the cylinders covered by this Directive.

2.1.4. There must be an opportunity of making independent analyses, in particular for the purposes of checking that the sulphur and phosphorus contents correspond to the requirements of 2.1.2. These analyses must be carried out on either specimens taken from the semi-finished product as supplied to the cylinder manufacturer by the steelmaker or the finished cylinders.

When it is decided to take a specimen from a cylinder, it is permissible for the specimen to be taken from one of the cylinders previously chosen for the mechanical tests specified in 3.1 or for the pressure bursting test specified in 3.2.

2.2. CALCULATIONS FOR THE PRESSURE PARTS

2.2.1. The minimum wall thickness shall be at least equal to the greatest value given by the following:

— $a = \dfrac{P_h \cdot D}{\dfrac{20\,R}{4/3} + P_h}$ mm

where R is the smaller of the following two values:

(1) R_e;

(2) $0{,}75 \cdot R_m$, for normalized or normalized and tempered cylinders,
$0{,}85 \cdot R_m$, for quenched and tempered cylinders.

— $a = \dfrac{D}{250} + 1$ mm

— $a = 1{,}5$ mm.

2.2.2. If a convex end is obtained by forging from tube, the wall thickness measured at the centre of the shaped end shall be at least 1,5a.

2.2.3. The thickness of the concave base of cylinders must not be less than 2a within the diameter on which the cylinder stands.

2.2.4. In order to ensure satisfactory stress distribution, the thickness of the cylinder walls must increase progressively in the transition section between the cylindrical wall and the base.

2.3. CONSTRUCTION AND WORKMANSHIP

2.3.1. The thickness of each cylinder shall be checked and the condition of its internal and external surfaces inspected by the manufacturer in order to verify that:

— the wall thickness is at no point less than that specified on the drawing,

— the internal and external surfaces of the cylinder are free from defects which would adversely affect the operating safety of the cylinder.

2.3.2. The cut-of-roundness of the cylindrical shell must be limited to such a value that the difference between the maximum and minimum outside diameters in the same cross-section is not more than 1,5 % of the average of those diameters.

The maximum deviation of the cylindrical part of the shell from a straight line shall not exceed 3 mm per metre length.