

SCHEDULE 1

Essential Safety Requirements

PART 2

Vessel Design

11.—(1) A manufacturer must, when designing a vessel, define the use to which it will be put, and select—

- (a) the minimum working temperature T_{\min} ;
- (b) the maximum working temperature T_{\max} ; and
- (c) the maximum working pressure PS.

(2) Where a minimum working temperature exceeding -10°C is selected, the qualities required of the materials must be satisfied at -10°C .

12. A manufacturer must also take account of the following provisions—

- (a) it must be possible to inspect the inside of vessels;
- (b) it must be possible to drain the vessels;
- (c) the mechanical qualities must be maintained throughout the period of use of the vessel for the intended purpose;
- (d) the vessels must, bearing in mind their prescribed use, be adequately protected against corrosion.

13. A manufacturer must take account of the fact that under the conditions of use envisaged—

- (a) the vessels must not be subjected to stress likely to impair their safety in use;
- (b) internal pressure must not permanently exceed the maximum working pressure PS. However, it may momentarily do so by up to 10%.

14. Circumferential and longitudinal seams must be made using full penetration welds or welds of equivalent effectiveness and convex ends, other than hemispherical ones, must have a cylindrical edge.

Wall thickness

15.—(1) If the product of PS x V is not more than 3 000 bar.L, the manufacturer must select one of the methods described in paragraphs 16 (calculation method) and 17 (experimental method) for determining vessel wall thickness.

(2) If the product of PS x V is more than 3 000 bar.L, or if the maximum working temperature exceeds 100°C , such thickness must be determined by the method described in paragraph 16 (calculation method).

(3) The actual wall thickness of the cylindrical section and ends must, however, be not less than 2 mm in the case of steel vessels and not less than 3 mm in the case of aluminium or aluminium alloy vessels.

Calculation method

16.—(1) The minimum thickness of pressurised parts must be calculated having regard to the intensity of the stresses and to the following provisions—

Status: This is the original version (as it was originally made).

- (a) the calculation pressure to be taken into account must not be less than the maximum working pressure PS selected;
 - (b) the permissible general membrane stress must not exceed the lower of the values $0.6 R_{eT}$ or $0.3 R_m$ and the manufacturer must use the R_{eT} and R_m minimum values guaranteed by the producer of the material in order to determine the permissible stress.
- (2) Where the cylindrical portion of the vessel has one or more longitudinal welds made using a non-automatic welding process, the thickness calculated as referred to in sub-paragraph (1) must be multiplied by the coefficient 1.15.
- (3) In this paragraph—
- (a) “ R_{eT} ” means the yield strength in N/mm^2 , which is the value at the maximum working temperature T_{max} of any of the following—
 - (i) the upper yield point R_{eH} in N/mm^2 , for a material with both a lower and an upper yield point;
 - (ii) the 0.2% proof strength $R_{p0.2}$ in N/mm^2 ;
 - (iii) the 1.0% proof strength $R_{p1.0}$ in N/mm^2 , in the case of non-alloy aluminium;
 - (b) “ R_m ” means tensile strength in N/mm^2 .

Experimental method

17. Wall thickness must be so determined as to enable the vessels to resist at ambient temperature a pressure equal to at least five times the maximum working pressure, with a permanent circumferential deformation factor of no more than 1%.