

FORMULA FOR U.S. STANDARD
UNITS

$$e_1 = \frac{21.4 \times e_0}{\sqrt[3]{(Rm_1 \times A_1)/145}}$$

where:

e_1 = required equivalent wall thickness of the metal to be used (in mm or if e_0 is in inches, use formula for U.S. Standard units).

e_0 = required minimum wall thickness for the reference steel (in mm or if e_0 is in inches, use formula for U.S. Standard units).

Rm_1 = guaranteed minimum tensile strength of the metal to be used (in N/mm² or for U.S. Standard units, use psi).

A_1 = minimum elongation (as a percentage) of the metal to be used on fracture under tensile stress (see paragraph (c)(1) of this section).

(C) For purposes of the calculation described in paragraph (c)(1)(iv)(B) of this section, the guaranteed minimum tensile strength of the metal to be used (Rm_1) must be the minimum value according to material standards. However, for austenitic (stainless) steels, the specified minimum value for Rm , according to the material standards, may be increased by up to 15% when a greater value is provided in the material inspection certificate. When no material standard exists for the material in question, the value of Rm must be the minimum value indicated in the material inspection certificate.

(2) *Pressure relief.* The following pressure relief requirements apply to IBCs intended for liquids:

(i) IBCs must be capable of releasing a sufficient amount of vapor in the event of fire engulfment to ensure that no rupture of the body will occur due to pressure build-up. This can be achieved by spring-loaded or non-reclosing pressure relief devices or by other means of construction.

(ii) The start-to-discharge pressure may not be higher than 65 kPa (9 psig) and no lower than the vapor pressure of the hazardous material plus the partial pressure of the air or other inert gases, measured in the IBC at 55 °C (131 °F), determined on the basis of a maximum degree of filling as specified in §173.35(d) of this subchapter. This does not apply to fusible devices unless such

devices are the only source of pressure relief for the IBC. Pressure relief devices must be fitted in the vapor space.

(d) Metal IBCs may not have a volumetric capacity greater than 3,000 L (793 gallons) or less than 450 L (119 gallons).

[Amdt. 178-103, 59 FR 38068, July 26, 1994, as amended by Amdt. 178-108, 60 FR 40038, Aug. 4, 1995; Amdt. 178-117, 61 FR 50629, Sept. 26, 1996; 66 FR 33452, June 21, 2001; 66 FR 45386, 45387, Aug. 28, 2001; 68 FR 45041, July 31, 2003; 75 FR 5396, Feb. 2, 2010]

§ 178.706 Standards for rigid plastic
IBCs.

(a) The provisions in this section apply to rigid plastic IBCs intended to contain solids or liquids. Rigid plastic IBC types are designated:

(1) 11H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are loaded or discharged by gravity.

(2) 11H2 freestanding, for solids which are loaded or discharged by gravity.

(3) 21H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for solids which are loaded or discharged under pressure.

(4) 21H2 freestanding, for solids which are loaded or discharged under pressure.

(5) 31H1 fitted with structural equipment designed to withstand the whole load when IBCs are stacked, for liquids.

(6) 31H2 freestanding, for liquids.

(b) Rigid plastic IBCs consist of a rigid plastic body, which may have structural equipment, together with appropriate service equipment.

(c) Rigid plastic IBCs must be manufactured from plastic material of known specifications and be of a strength relative to its capacity and to the service it is required to perform. In addition to conformance to §173.24 of this subchapter, plastic materials must be resistant to aging and to degradation caused by ultraviolet radiation.

(1) If protection against ultraviolet radiation is necessary, it must be provided by the addition of a pigment or inhibitor such as carbon black. These additives must be compatible with the contents and remain effective throughout the life of the IBC body. Where use

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is made of carbon black, pigments or inhibitors, other than those used in the manufacture of the tested design type, retesting may be omitted if changes in the carbon black content, the pigment content or the inhibitor content do not adversely affect the physical properties of the material of construction.

(2) Additives may be included in the composition of the plastic material to improve the resistance to aging or to serve other purposes, provided they do not adversely affect the physical or chemical properties of the material of construction.

(3) No used material other than production residues or regrind from the same manufacturing process may be used in the manufacture of rigid plastic IBCs.

(4) Rigid plastic IBCs intended for the transportation of liquids must be capable of releasing a sufficient amount of vapor to prevent the body of the IBC from rupturing if it is subjected to an internal pressure in excess of that for which it was hydraulically tested. This may be achieved by spring-loaded or non-reclosing pressure relief devices or by other means of construction.

(d) Rigid plastic IBCs may not have a volumetric capacity greater than 3,000 L (793 gallons) or less than 450 L (119 gallons).

[Amdt. 178–103, 59 FR 38068, July 26, 1994, as amended at 66 FR 45386, 45387, Aug. 28, 2001; 75 FR 5396, Feb. 2, 2010]

§ 178.707 Standards for composite IBCs.

(a) The provisions in this section apply to composite IBCs intended to contain solids and liquids. To complete the marking codes listed below, the letter “Z” must be replaced by a capital letter in accordance with § 178.702(a)(2) to indicate the material used for the outer packaging. Composite IBC types are designated:

(1) 11HZ1 Composite IBCs with a rigid plastic inner receptacle for solids loaded or discharged by gravity.

(2) 11HZ2 Composite IBCs with a flexible plastic inner receptacle for solids loaded or discharged by gravity.

(3) 21HZ1 Composite IBCs with a rigid plastic inner receptacle for solids loaded or discharged under pressure.

(4) 21HZ2 Composite IBCs with a flexible plastic inner receptacle for solids loaded or discharged under pressure.

(5) 31HZ1 Composite IBCs with a rigid plastic inner receptacle for liquids.

(6) 31HZ2 Composite IBCs with a flexible plastic inner receptacle for liquids.

(b) Definitions for composite IBC types:

(1) A *composite IBC* is an IBC which consists of a rigid outer packaging enclosing a plastic inner receptacle together with any service or other structural equipment. The outer packaging of a composite IBC is designed to bear the entire stacking load. The inner receptacle and outer packaging form an integral packaging and are filled, stored, transported, and emptied as a unit.

(2) The term plastic means polymeric materials (i.e., plastic or rubber).

(3) A “rigid” inner receptacle is an inner receptacle which retains its general shape when empty without closures in place and without benefit of the outer casing. Any inner receptacle that is not “rigid” is considered to be “flexible.”

(c) Construction requirements for composite IBCs with plastic inner receptacles are as follows:

(1) The outer packaging must consist of rigid material formed so as to protect the inner receptacle from physical damage during handling and transportation, but is not required to perform the secondary containment function. It includes the base pallet where appropriate. The inner receptacle is not intended to perform a containment function without the outer packaging.

(2) A composite IBC with a fully enclosing outer packaging must be designed to permit assessment of the integrity of the inner container following the leakproofness and hydraulic tests. The outer packaging of 31HZ2 composite IBCs must enclose the inner receptacles on all sides.

(3) The inner receptacle must be manufactured from plastic material of known specifications and be of a strength relative to its capacity and to the service it is required to perform. In