shield are manufactured from carbon

thickness differences.

to be considered when calculating
allowances for heads are not required
increased by a factor of 1.157. Forming

81,000 p.s.i., the thickness to be added
with a minimum tensile strength of
thickness calculation is based on steel

p.s.i., but the required minimum plate
tension strength from 70,000 p.s.i. to 80,000
specified in §179.100–6 of this sub-

native tank car jacket and head shield must be

81,000 p.s.i., the thickness to be added
to the jacket and head shield must be
increased by a factor of 1.157. Forming
allowances for heads are not required
to be considered when calculating

thickness differences.

The tank car jacket and head
shield are manufactured from carbon


device having a start-to-discharge pressure of 15.51 Bar (225
psig). Restenciling to a lower test pressure is not authorized.

device having a start-to-discharge pressure of 10.34 Bar (150
psig). Restenciling to a lower test pressure is not authorized.

Note 2: Each tank car must have a reclosing pressure relief
device having a start-to-discharge pressure of 15.51 Bar (225
psig). Restenciling to a lower test pressure is not authorized.

(iii) The difference between the alter-
native and the required minimum plate
thicknesses, based on the calculation
prescribed in §179.100–6 of this sub-
chapter, must be added to the alter-
native tank car jacket and head shield.

Thickness calculation is based on steel
with a minimum tensile strength of
81,000 p.s.i., the thickness to be added
to the jacket and head shield must be
increased by a factor of 1.157. Forming
allowances for heads are not required
to be considered when calculating

thickness differences.

The tank car jacket and head
shield are manufactured from carbon

steelpate as prescribed in §179.100–7(a)
of this subchapter.

(b) Cargo tanks: Specifications MC 330
and MC 331 cargo tank motor vehicles
and, except for Division 4.2 materials,
MC 312 and DOT 412 cargo tank motor
vehicles.

(c) Portable tanks: DOT 51 portable

tanks and UN portable tanks that meet
the requirements of this subchapter,
when a T code is specified in Column
(7) of the §172.101 Table of this sub-
chapter for the specific hazardous ma-
terial, are authorized. Additionally, a
DOT 51 or UN portable tank used for
Division 6.1 liquids, Hazard Zone A or
B, must be certified and stamped to the
ASME Code as specified in §178.273(b)(6)
of this subchapter.

§ 173.247 Bulk packaging for certain
elevated temperature materials.

When §172.101 of this subchapter
specifies that a hazardous material be
packaged under this section, only the
following bulk packagings are author-
ized, subject to the requirements of
subparts A and B of part 173 of this sub-
chapter and the special provisions spec-
ified in column 7 of the §172.101 table.

(a) Tank car tanks and multi-unit
tank car tanks, when approved by the
Associate Administrator.

(b) Cargo tank motor vehicles and
portable tanks, when approved by the
Associate Administrator.

§ 173.245 Bulk packaging for extremely
hazardous materials such as poi-
sonous gases (Division 2.3).

When §172.101 of this subchapter
specifies that a hazardous material be
packaged under this section, only the
following bulk packagings are author-
ized, subject to the requirements of
subparts A and B of part 173 of this sub-
chapter and the special provisions spec-
ified in column 7 of the §172.101 table.

(a) Tank car tanks and multi-unit
tank car tanks, when approved by the
Associate Administrator.

(b) Cargo tank motor vehicles and
portable tanks, when approved by the
Associate Administrator.

[Am. 173–224, 55 FR 52663, Dec. 21, 1990, as
amended at 56 FR 66275, Dec. 20, 1991; 57 FR
45463, Oct. 1, 1992; Amdt. 173–232, 61 FR 28676,
paragraph (g) of this section, unless otherwise excepted.

(a) Rail cars: Class DOT 103, 104, 105, 109, 111, 112, 114, 115, or 120 tank car tanks; Class DOT 106, 110 multi-unit tank car tanks; AAR Class 203W, 206W, 211W tank car tanks; and non-DOT specification tank car tanks equivalent in structural design and accident damage resistance to specification packagings.

(b) Cargo tanks: Specification MC 300, MC 301, MC 302, MC 303, MC 304, MC 305, MC 306, MC 307, MC 310, MC 311, MC 312, MC 330, MC 331 cargo tank motor vehicles; DOT 406, DOT 407, DOT 412 cargo tank motor vehicles; and non-DOT specification cargo tank motor vehicles equivalent in structural design and accident damage resistance to specification packagings. A non-DOT specification cargo tank motor vehicle constructed of carbon steel which is in elevated temperature material service is excepted from §178.345–7(d)(5) of this subchapter.

(c) Portable tanks. DOT Specification 51, 56, 57 and 60 portable tanks; IM 101 and IM 102 portable tanks; UN portable tanks; marine portable tanks conforming to 46 CFR part 64; metal IBCs and non-specification portable tanks equivalent in structural design and accident damage resistance to specification packagings are authorized.

(d) Crucibles: Nonspecification crucibles designed and constructed such that the stress in the packaging does not exceed one fourth (0.25) of the ultimate strength of the packaging material at any temperature within the design temperature range. Stress is determined under a load equal to the sum of the static or working pressure in combination with the loads developed from accelerations and decelerations incident to normal transportation. For highway transportation, these forces are assumed to be “1.7g” vertical, “0.75g” longitudinal, and “0.4g” transverse, in reference to the axes of the transport vehicle. Each accelerative or decelerative load may be considered separately.

(e) Kettles: A kettle, for the purpose of this section, is a bulk packaging (portable tank or cargo tank) having a capacity not greater than 5678 L (1500 gallons) with an integral heating apparatus used for melting various bituminous products such as asphalt. Kettles used for the transport of asphalt or bitumen are subject to the following requirements:

(i) Low stability kettles. Kettles with a ratio of track-width to fully loaded center of gravity (CG) height less than 2.5 must meet all requirements of paragraph (g) of this section (track-width is the distance measured between the outer edge of the kettle tires; CG height is measured perpendicular from the road surface).

(ii) High stability kettles. (i) Kettles with a total capacity of less than 2650 L (700 gallons) and a ratio of track-width to fully loaded CG height of 2.5 or more are excepted from all requirements of paragraph (g)(2) of this section and the rollover protection requirements of paragraph (g)(6) of this section if closures meet the requirements of paragraph (e)(2)(iii) of this section.

(iii) Closures must be securely closed during transportation. Closures also must be designed to prevent opening and the expulsion of lading in a rollover accident.

(f) Other bulk packagings: Bulk packagings, other than those specified in paragraphs (a) through (e) of this section, which are used for the transport of elevated temperature materials, must conform to all requirements of paragraph (g) of this section on or after October 1, 1993.

(g) General requirements. Bulk packagings authorized or used for transport of elevated temperature materials must conform to the following requirements:

(i) Pressure and vacuum control equipment. When pressure or vacuum control equipment is required on a packaging authorized in this section, such equipment must be of a self-reclosing design,
must prevent package rupture or collapse due to pressure, must prevent significant release of lading due to packaging overturn or splashing or surging during normal transport conditions, and may be external to the packaging.

(i) Pressure control equipment is not required if pressure in the packaging would increase less than 10 percent as a result of heating the lading from the lowest design operating temperature to a temperature likely to be encountered if the packaging were engulfed in a fire. When pressure control equipment is required, it must prevent rupture of the packaging from heating, including fire engulfment.

(ii) Vacuum control equipment is not required if the packaging is designed to withstand an external pressure of 100 kPa (14.5 psig) or if pressure in the packaging would decrease less than 10 percent as a result of the lading cooling from the highest design operating temperature to the lowest temperature incurred in transport. When vacuum control equipment is required, it must prevent collapse of the packaging from a cooling-induced pressure differential.

(iii) When the regulations require a reclosing pressure relief device, the lading must not render the devices inoperable (i.e., from clogging, freezing, or fouling). If the lading affects the proper operation of the device, the packaging must have:

(A) A safety relief device incorporating a frangible disc or a permanent opening, each having a maximum effective area of 22 cm² (3.4 in²), for transportation by highway;

(B) For transportation of asphalt by highway, a safety relief device incorporating a frangible disc or a permanent opening, each having a maximum effective area of 48 cm² (7.4 in²); or

(C) For transportation by rail, a non-reclosing pressure relief device incorporating a rupture disc conforming to the requirements of §179.15 of this subchapter.

(iv) Reclosing pressure relief devices, rupture discs or permanent openings must not allow the release of lading during normal transportation conditions (i.e., due to splashing or surging).

(2) Closures. All openings, except permanent vent openings authorized in paragraph (g)(1)(iii) of this section, must be securely closed during transportation. Packagings must be substantially leak-tight so as not to allow any more than dripping or trickling of a non-continuous flow when overturned. Closures must be designed and constructed to withstand, without exceeding the yield strength of the packaging, twice the static loading produced by the lading in any packaging orientation and at all operating temperatures.

(3) Strength. Each packaging must be designed and constructed to withstand, without exceeding the yield strength of the packaging, twice the static loading produced by the lading in any orientation and at all operating temperatures.

(4) Compatibility. The packaging and lading must be compatible over the entire operating temperature range.

(5) Markings. In addition to any other markings required by this subchapter, each packaging must be durably marked in a place readily accessible for inspection in characters at least 4.8 mm (3/16 inch) with the manufacturer’s name, date of manufacture, design temperature range, and maximum product weight (or “load limit” for tank cars) or volumetric capacity.

(6) Accident damage protection. For transportation by highway, external loading and unloading valves and closures must be protected from impact damage resulting from collision or overturn. Spraying equipment and the road oil application portion of a packaging are excepted from this requirement.

(7) New construction. Specification packagings that are being manufactured for the transport of elevated temperature materials must be authorized for current construction.

(h) Exceptions—(1) General. Packagings manufactured for elevated temperature materials service prior to October 1, 1993, which are not in full compliance with the requirements in paragraph (g) of this section, may continue in service if they meet the applicable requirements of subparts A and B of this part and meet the closure requirements in paragraph (g)(2) of this section by March 30, 1995.

(2) Kettles. Kettles in service prior to October 1, 1993, which are used to
§ 173.249 Bromine.

When § 172.101 of this subchapter specifies that a hazardous material be packaged under this section, only the following bulk packagings are authorized, subject to the requirements of subparts A and B of part 173 of this subchapter and the special provisions specified in column 7 of the § 172.101 table.

(a) Class DOT 105A300W or 105A500W tank cars. Class 105A500W tank cars may be equipped with manway cover plates, pressure relief valves, vent valves, and loading/unloading valves that are required on Class 105A-300W tank cars. Tank cars must conform to the requirements in paragraphs (a) through (g) of this section.

(b) Specification MC 310, MC 311, MC 312 or DOT 412 cargo tank motor vehicles conforming with paragraphs (d) through (f) of this section. Except when transported as a residue, the total quantity in one tank may not be less than 88 percent or more than 96 percent of the volume of the tank. Cargo tanks in bromine service built prior to August 31, 1991, may continue in service under the requirements contained in § 173.252(a)(4) of this part in effect on September 30, 1991.

(c) UN portable tanks conforming to tank code T22 (see § 172.102 of this subchapter) or specification IM 101 portable tanks conforming with paragraphs (d) through (f) of this section. Except when transported as a residue, the total quantity in one tank may not be less than 88% nor more than 92% of the volume of the tank.

(d) The tank must be made from nickel-clad or lead-lined steel plate. Nickel cladding or lead lining must be on the inside of the tank. Nickel cladding must comprise at least 20 percent of the required minimum total thickness. Nickel cladding must conform to ASTM B 162 (IBR, see § 171.7 of this subchapter). Lead lining must be at least 4.763 mm (0.188 inch) thick. All tank equipment and appurtenances in contact with the lading must be lined or made from metal not subject to deterioration by contact with lading.

(e) Maximum filling density is 300 percent of the tank’s water capacity. Minimum filling density is 287 percent of the tank’s water capacity. Maximum water capacity is 9,253 kg (20,400 pounds) for DOT 105A-300W tank cars. Maximum quantity of lading in DOT 105A 300W tank cars is 27,216 kg (60,000 pounds). Maximum water capacity is 16,964 kg (37,400 pounds) for DOT 105A 500W tank cars and DOT 105A-500W tank cars equipped as described in paragraph (a) of this section. Maximum