

E = 1.0 welded joint efficiency; except for heads with seams = 0.9;

P = Minimum required bursting pressure in p.s.i.;

S = Minimum tensile strength of plate material in p.s.i., as prescribed in § 179.100-7;

t = Minimum thickness of plate in inches after forming.

(b) If plates are clad with material having tensile strength properties at least equal to the base plate, the cladding may be considered a part of the base plate when determining thickness. If cladding material does not have tensile strength at least equal to the base plate, the base plate alone shall meet the thickness requirement.

(c) When aluminum plate is used, the minimum width of bottom sheet of tank shall be 60 inches, measured on the arc, but in all cases the width shall be sufficient to bring the entire width of the longitudinal welded joint, including welds, above the bolster.

[29 FR 18995, Dec. 29, 1964. Redesignated at 32 FR 5606, Apr. 5, 1967, and amended by Amdt. 179-10, 36 FR 21344, Nov. 6, 1971]

§ 179.100-7 Materials.

(a) *Steel plate*: Steel plate materials used to fabricate tank shell and manway nozzle must comply with one of the following specifications with the indicated minimum tensile strength and elongation in the welded condition. The maximum allowable carbon content must be 0.31 percent when the individual specification allows carbon greater than this amount. The plates may be clad with other approved materials.

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) welded condition (longitudinal)
AAR TC 128, Gr. B	81,000	19
ASTM A 302 ² , Gr. B	80,000	20
ASTM A 516 ²	70,000	20
ASTM A 537 ² , Class 1	70,000	23

¹ Maximum stresses to be used in calculations.

² These specifications are incorporated by reference (IBR, see § 171.7 of this subchapter).

(b) *Aluminum alloy plate*: Aluminum alloy plate material used to fabricate tank shell and manway nozzle must be suitable for fusion welding and must comply with one of the following specifications (IBR, see § 171.7 of this subchapter) with its indicated minimum

tensile strength and elongation in the welded condition. * * *

Specifications	Minimum tensile strength (p.s.i.) 0 temper, welded condition ^{3,4}	Minimum elongation in 2 inches (percent) 0 temper, welded condition (longitudinal)
ASTM B 209, Alloy 5052 ¹	25,000	18
ASTM B 209, Alloy 5083 ²	38,000	16
ASTM B 209, Alloy 5086 ¹	35,000	14
ASTM B 209, Alloy 5154 ¹	30,000	18
ASTM B 209, Alloy 5254 ¹	30,000	18
ASTM B 209, Alloy 5454 ¹	31,000	18
ASTM B 209, Alloy 5652 ¹	25,000	18

¹ For fabrication, the parent plate material may be 0, H112, or H32 temper, but design calculations must be based on minimum tensile strength shown.

² 0 temper only.

³ Weld filler metal 5556 must not be used.

⁴ Maximum stress to be used in calculations.

(c) *High alloy steel plate*. (1) High alloy steel plate must conform to the following specifications:

Specifications	Minimum tensile strength (p.s.i.) welded condition ¹	Minimum elongation in 2 inches (percent) weld metal (longitudinal)
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 304L	70,000	30
ASTM A 240/A 240M (incorporated by reference; see § 171.7 of this subchapter), Type 316L	70,000	30

¹ Maximum stresses to be used in calculations.

(2)(i) High alloy steels used to fabricate tank must be tested in accordance with the following procedures in ASTM A 262, "Standard Practices for Detecting Susceptibility to Intergranular Attack in Austenitic Stainless Steel" (IBR, see § 171.7 of this subchapter), and must exhibit corrosion rates not exceeding the following: * * *

Test procedures	Material	Corrosion rate i.p.m.
Practice B	Types 304L and 316L ..	0.0040
Practice C	Type 304L	0.0020

(ii) Type 304L and 316L test specimens must be given a sensitizing treatment prior to testing.

(d) All attachments welded to tank shell must be of approved material

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which is suitable for welding to the tank.

[Amdt. 179-10, 36 FR 21344, Nov. 6, 1971, as amended by Amdt. 179-32, 48 FR 27707, June 16, 1983; Amdt. 179-47, 58 FR 50237, Sept. 24, 1993; Amdt. 179-52, 61 FR 28679, June 5, 1996; Amdt. 179-52, 61 FR 50255, Sept. 25, 1996; 66 FR 45186, Aug. 28, 2001; 67 FR 51660, Aug. 8, 2002; 68 FR 75759, Dec. 31, 2003]

§ 179.100-8 Tank heads.

(a) The tank head shape shall be an ellipsoid of revolution in which the major axis shall equal the diameter of the shell adjacent to the head and the minor axis shall be one-half the major axis.

(b) Each tank head made from steel which is required to be "fine grain" by the material specification, which is hot formed at a temperature exceeding 1700 °F., must be normalized after forming by heating to a temperature between 1550° and 1700 °F., by holding at that temperature for at least 1 hour per inch of thickness (30-minute minimum), and then by cooling in air. If the material specification requires quenching and tempering, the treatment specified in that specification must be used instead of the one specified above.

[29 FR 18995, Dec. 29, 1964. Redesignated, 32 FR 5606, Apr. 5, 1967 and amended by Amdt. 179-12, 39 FR 15038, Apr. 30, 1974]

§ 179.100-9 Welding.

(a) All joints shall be fusion-welded in compliance with the requirements of AAR Specifications for Tank Cars, appendix W (IBR, see §171.7 of this subchapter). Welding procedures, welders and fabricators shall be approved.

(b) [Reserved]

[29 FR 18995, Dec. 29, 1964, as amended at 65 FR 58632, Sept. 29, 2000; 68 FR 75759, Dec. 31, 2003]

§ 179.100-10 Postweld heat treatment.

(a) After welding is complete, steel tanks and all attachments welded thereto must be postweld heat treated as a unit in compliance with the requirements of AAR Specifications for Tank Cars, appendix W (IBR, see §171.7 of this subchapter).

(b) For aluminum tanks, postweld heat treatment is prohibited.

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(c) Tank and welded attachments, fabricated from ASTM A 240/A 240M (IBR, see §171.7 of this subchapter), Type 304L or Type 316L materials do not require postweld heat treatment, but these materials do require a corrosion resistance test as specified in §179.100-7(c)(2).

[Amdt. 179-10, 36 FR 21345, Nov. 6, 1971, as amended by Amdt. 179-47, 58 FR 50238, Sept. 24, 1993; Amdt. 179-52, 61 FR 28679, June 5, 1996; 67 FR 51660, Aug. 8, 2002; 68 FR 75758, 75759, Dec. 31, 2003]

§ 179.100-12 Manway nozzle, cover and protective housing.

(a) Manway nozzles must be of approved design of forged or rolled steel for steel tanks or of fabricated aluminum alloy for aluminum tanks, with an access opening of at least 18 inches inside diameter, or at least 14 inches by 18 inches around or oval. Each nozzle must be welded to the tank and the opening reinforced in an approved manner in compliance with the requirements of AAR Specifications for Tank Cars, appendix E, Figure E10 (IBR, see §171.7 of this subchapter).

(b) Manway cover shall be machined to approved dimensions and be of forged or rolled carbon or alloy steel, rolled aluminum alloy or nickel when required by the lading. Minimum thickness is listed in §179.101. Manway cover shall be attached to manway nozzle by through or stud bolts not entering tank, except as provided in §179.103-2(a).

(c) Except as provided in §179.103, protective housing of cast, forged or fabricated approved materials must be bolted to manway cover with not less than twenty ¾-inch studs. The shearing value of the bolts attaching protective housing to manway cover must not exceed 70 percent of the shearing value of bolts attaching manway cover to manway nozzle. Housing must have steel sidewalls not less than three-fourths inch in thickness and must be equipped with a metal cover not less than one-fourth inch in thickness that can be securely closed. Housing cover must have suitable stop to prevent cover striking loading and unloading connections and be hinged on one side only with approved riveted pin or rod with nuts and cotters. Openings in wall