

(d) In order to account for stresses due to impact in an accident, the design calculations for the cargo tank shell and heads must include the load resulting from the design pressure in combination with the dynamic pressure resulting from a longitudinal deceleration of "2g". For this loading condition the stress value used may not exceed the lesser of the yield strength or 75 percent of the ultimate tensile strength of the material of construction. For cargo tanks constructed of stainless steel the maximum design stress may not exceed 75 percent of the ultimate tensile strength of the type steel used.

(e) The minimum metal thickness for the shell and heads must be 4.75 mm (0.187 inch) for steel and 6.86 mm (0.270 inch) for aluminum, except for chlorine and sulfur dioxide tanks. For a cargo tank used in chlorine or sulfur dioxide service, the cargo tank must be made of steel. A corrosion allowance of 20 percent or 2.54 mm (0.10 inch), whichever is less, must be added to the thickness otherwise required for sulfur dioxide and chlorine tank material. In chlorine cargo tanks, the wall thickness must be at least 1.59 cm (0.625 inch), including corrosion allowance.

(f) Where a cargo tank support is attached to any part of the cargo tank wall, the stresses imposed on the cargo tank wall must meet the requirements in paragraph (a) of this section.

(g) The design, construction, and installation of an appurtenance to the cargo tank must be such that, in the event of its damage or failure, the lading retention integrity of the cargo tank will not be adversely affected.

(1) A lightweight attachment, such as a conduit clip, brakeline clip or placard holder, must be constructed of a material of lesser strength than the cargo tank wall material and may not be more than 72 percent of the thickness of the material to which it is attached. The attachment may be secured directly to the cargo tank wall if the device is designed and installed in such a manner that, if damaged, it will not affect the lading retention integrity of the cargo tank. The lightweight attachment must be secured to the cargo tank wall by continuous weld or in such a manner as to preclude forma-

tion of pockets, which may become sites for incipient corrosion. Attachments meeting the requirements of this paragraph are not authorized for cargo tanks constructed under part UHT of the ASME Code.

(2) Except as prescribed in §178.337-3(g)(1), the welding of any appurtenance of the cargo tank wall must be made by attachment of a mounting pad, so that there will be no adverse effect upon the lading retention integrity of the cargo tank if any force is applied to the appurtenance, from any direction. The thickness of the mounting pad may not be less than that of the shell or head to which it is attached, and not more than 1.5 times the shell or head thickness. However, a pad with a minimum thickness of 6.35 mm (0.250 inch) may be used when the shell or head thickness is over 6.35 mm (0.250 inch). If weep holes or tell-tale holes are used, the pad must be drilled or punched at its lowest point before it is welded. Each pad must:

(i) Extend at least 5.08 cm (2 inches) in each direction from any point of attachment of an appurtenance;

(ii) Have rounded corners, or otherwise be shaped in a manner to minimize stress concentrations on the shell or head; and

(iii) Be attached by a continuous weld around the pad, except for a small gap at the lowest point for draining, using filler material conforming to the recommendations of the manufacturer of the head or shell material.

[Amdt. 178-89, 55 FR 37056, Sept. 7, 1990, as amended by Amdt. 178-104, 59 FR 49135, Sept. 26, 1994; Amdt. 178-105, 60 FR 17401, Apr. 5, 1995; Amdt. 178-118, 61 FR 51340, Oct. 1, 1996; 65 FR 58631, Sept. 29, 2000]

#### § 178.337-4 Joints.

(a) Joints shall be as required by the ASME Code, with all undercutting in shell and head material repaired as specified therein.

(b) Welding procedure and welder performance must be in accordance with Section IX of the ASME Code. In addition to the essential variables named therein, the following must be considered as essential variables: Number of passes; thickness of plate; heat input

## § 178.337-5

per pass; and manufacturer's identification of rod and flux. When fabrication is done in accordance with part UHT of the ASME Code, filler material containing more than 0.08 percent vanadium must not be used. The number of passes, thickness of plate, and heat input per pass may not vary more than 25 percent from the procedure or welder qualifications. Records of the qualifications must be retained for at least 5 years by the cargo tank manufacturer and must be made available to duly identified representatives of the Department and the owner of the cargo tank.

(c) All longitudinal shell welds shall be located in the upper half of the cargo tank.

(d) Edge preparation of shell and head components may be by machine heat processes, provided such surfaces are remelted in the subsequent welding process. Where there will be no subsequent remelting of the prepared surface as in a tapered section, the final 0.050 inch of material shall be removed by mechanical means.

(e) The maximum tolerance for misalignment and butting up shall be in accordance with the ASME Code.

(f) Substructures shall be properly fitted before attachment, and the welding sequence shall be such as to minimize stresses due to shrinkage of welds.

[Order 59-B, 30 FR 580, Jan. 16, 1965. Redesignated at 32 FR 5606, Apr. 5, 1967]

EDITORIAL NOTE: For FEDERAL REGISTER citations affecting §178.337-4, see the List of CFR Sections Affected which appears in the Finding Aids section of the printed volume and on GPO Access.

## § 178.337-5 Bulkheads, baffles and ring stiffeners.

- (a) Not a specification requirement.
- (b) [Reserved]

[Order 59-B, 30 FR 580, Jan. 16, 1965. Redesignated at 32 FR 5606, Apr. 5, 1967]

## § 178.337-6 Closure for manhole.

(a) Each cargo tank marked or certified after April 21, 1994, must be provided with a manhole conforming to paragraph UG-46(g)(1) and other applicable requirements of the ASME Code, except that a cargo tank constructed of NQT steel having a capacity of 3500

## 49 CFR Ch. I (10-1-02 Edition)

water gallons or less may be provided with an inspection opening conforming to paragraph UG-46 and other applicable requirements of the ASME Code instead of a manhole.

(b) The manhole assembly of cargo tanks constructed after June 30, 1979, may not be located on the front head of the cargo tank.

[Amdt. 178-7, 34 FR 18250, Nov. 14, 1969, as amended by Amdt. 178-52, 43 FR 58820, Dec. 18, 1978; Amdt. 178-89, 54 FR 25017, June 12, 1989; 55 FR 21038, May 22, 1990; 56 FR 27876, June 17, 1991; 58 FR 12905, March 8, 1993; Amdt. 178-118, 61 FR 51340, Oct. 1, 1996]

## § 178.337-7 Overturn protection.

- (a) See §178.337-10.
- (b) [Reserved]

[Order 59-B, 30 FR 580, Jan. 16, 1965. Redesignated at 32 FR 5606, Apr. 5, 1967]

## § 178.337-8 Openings, inlets, and outlets.

(a) *General.* The requirements in this paragraph (a) apply to MC 331 cargo tanks except for those used to transport chlorine. The requirements for inlets and outlets on chlorine cargo tanks are in paragraph (b) of this section.

(1) An opening must be provided on each cargo tank used for the transportation of liquefied materials to permit complete drainage.

(2) Except for gauging devices, thermometer wells, pressure relief valves, manhole openings, product inlet openings, and product discharge openings, each opening in a cargo tank must be closed with a plug, cap, or bolted flange.

(3) Except as provided in paragraph (b) of this section, each product inlet opening, including vapor return lines, must be fitted with a back flow check valve or an internal self-closing stop valve located inside the cargo tank or inside a welded nozzle that is an integral part of the cargo tank. The valve seat must be located inside the cargo tank or within 2.54 cm (one inch) of the external face of the welded flange. Damage to parts exterior to the cargo tank or mating flange must not prevent effective seating of the valve. All parts of a valve inside a cargo tank or