**Section 178.321 Specification MC 300; Cargo Tanks Constructed of Mild (Open-Hearth or Blue Annealed) Steel, or Combination of Mild Steel with High-Tensile Steel, or Stainless Steel, Primarily For the Transportation of Flammable Liquids or Poisonous Liquids, Class B**

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.1 [178.321-1] General Requirements**

a) Spec. MC 300 cargo tanks constructed on or before September 1, 1967, for the bulk transportation of hazardous materials must meet all the requirements contained in this section.

b) Every cargo tank shall be designed and constructed in accordance with the best known and available practices in addition to the other applicable cargo tank specification requirements.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.2 [178.321-2] Material**

a) Properties of mild steel sheets. All mild steel sheets shall be of open-hearth steel or blue annealed steel meeting the following minimum requirements:

Yield point, minimum 25,000 p.s.i.

Ultimate strength, minimum 45,000 p.s.i.

Minimum elongation, standard 2-inch sample 20 percent

b) Properties of high-tensile steel sheets. All high-tensile steel sheets for such cargo tanks shall meet the following minimum requirements:

Yield point, minimum 45,000 p.s.i.

Ultimate strength, minimum 60,000 p.s.i.

Minimum elongation, standard 2-inch sample 25 percent

c) Properties of stainless steel sheets. All stainless steel sheets shall meet the following minimum requirements:

Yield point, minimum 32,000 p.s.i.

Ultimate strength, minimum 55,000 p.s.i.

Minimum elongation, standard 2-inch sample 20 percent

d) Cargo tanks constructed of a combination of mild and high-tensile steels or stainless steel. Mild steel sheets as specified in Section 178.321.0.3(a) may be used in combination with high-tensile steel sheets or stainless steel sheets as specified in Section 178.321.0.3(b) in the construction of a single tank, provided each material, where used, shall comply with the minimum requirements for the material used in the construction for that section of the tank. Whenever stainless steel sheets are used in combination with sheets of other types of steel, joints made by welding shall be formed by the use of stainless steel electrodes or filler rods on condition that the stainless steel electrodes or filler rods used in the welding be suitable for use with the grade of stainless steel concerned, according to the recommendations of the manufacturers of the stainless steel electrodes or filler rods.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.3 [178.321-3] Thickness**

a) Thickness of mild steel sheets. The minimum thickness of mild steel tank sheets shall be limited by the volume capacity of the tank expressed in terms of gallons per inch of length; and by the distance between bulkheads, baffles or other shall stiffeners, as well as by the radius of shell curvature in the case of shell sheets, as specified in Table I and Table II:

Table I – Minimum Thickness of Heads1, Bulkheads, Baffles

(Dished, Corrugated, Reinforced or Rolled) and Ring Stiffeners

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Volume capacity of tank in  gallons per inch of length | 10 or less | Over 10 to 14 | Over 14 to 18 | Over 18 |
| gauge number | 14 | 13 | 12 | 11 |

1 Thickness of exterior head sheets shall never be less than the minimum requirements for shell sheets in any specific unit.

Table II - Minimum Thickness of Shell Sheets Expressed

in United States Standard Gauge

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Volume capacity of tank in  gallons per inch of length | | | |
| Distance between attachments of bulkheads, baffles and other shell stiffeners | 10 or less | Over 10 to 14 | Over 14 to 18 | Over 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of less than  70 inches1 | | | |
| 36 inches or less | 14 | 14 | 14 | 13 |
| Over 36 inches to 54 inches | 14 | 14 | 13 | 12 |
| Over 54 inches to 60 inches | 14 | 13 | 12 | 11 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of 70 inches  or more but less than 90 inches1 | | | |
| 36 inches or less | 14 | 14 | 13 | 12 |
| Over 36 inches to 54 inches | 14 | 13 | 12 | 11 |
| Over 54 inches to 60 inches | 13 | 12 | 11 | 10 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of 90 inches or  more but less than 125 inches1 | | | |
| 36 inches or less | 14 | 13 | 12 | 11 |
| Over 36 inches to 54 inches | 13 | 12 | 11 | 10 |
| Over 54 inches to 60 inches | 12 | 11 | 10 | 9 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Shell radius of 125 inches or more1 | | | |
| 36 inches or less | 13 | 12 | 11 | 10 |
| Over 36 inches to 54 inches | 12 | 11 | 10 | 9 |
| Over 54 inches to 60 inches | 11 | 10 | 9 | 8 |

1 If other than circular cross-section, the radius used shall be the maximum for that portion of the cross-section under consideration.

b) Thickness of high-tensile and stainless steel sheets. The minimum thickness of high-tensile and stainless steel tank sheets shall be limited by the volume capacity of the tank expressed in terms of gallons per inch of length; and by the distance between bulkheads, baffles or other shell sheets; as specified in Table III and Table IV:

Table III – Minimum Thickness of Heads1, Bulkheads, Baffles

(Dished, Corrugated or Rolled) and Ring Stiffeners

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Volume capacity of tank in  gallons per inch of length | 10 or less | Over 10 to 14 | Over 14 to 18 | Over 18 |
| gauge number | 15 | 14 | 13 | 12 |

1 Thickness of exterior head sheets shall never be less than the minimum requirements for shell sheets in any specific unit.

Table IV – Minimum Thickness of Shell Sheets Expressed

in United States Standard Guage

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Volume capacity of tank in  gallons per inch of length | | | |
| Distance between attachments of bulkheads, baffles and other shell stiffeners | 10 or less | Over 10 to 14 | Over 14 to 18 | Over 18 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of less than  70 inches1 | | | |
| 36 inches or less | 16 | 16 | 15 | 14 |
| Over 36 inches to 54 inches | 16 | 15 | 14 | 13 |
| Over 54 inches to 60 inches | 15 | 14 | 13 | 12 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of 70 inches  or more but less than 90 inches1 | | | |
| 36 inches or less | 16 | 15 | 14 | 13 |
| Over 36 inches to 54 inches | 15 | 14 | 13 | 12 |
| Over 54 inches to 60 inches | 14 | 13 | 12 | 11 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Maximum shell radius of 90 inches or  more but less than 125 inches1 | | | |
| 36 inches or less | 15 | 14 | 13 | 12 |
| Over 36 inches to 54 inches | 14 | 13 | 12 | 12 |
| Over 54 inches to 60 inches | 13 | 12 | 11 | 10 |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Shell radius of 125 inches or more1 | | | |
| 36 inches or less | 14 | 13 | 12 | 11 |
| Over 36 inches to 54 inches | 13 | 12 | 11 | 10 |
| Over 54 inches to 60 inches | 12 | 11 | 10 | 9 |

1 If other than circular cross-section, the radius used shall be the maximum for that portion of the cross-section under consideration.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.4 [178.321-4] Joints**

a) Method of joining. Mild steel tank sheets, high-tensile steel tank sheets, or combination thereof and stainless steel tank sheets shall be joined by fusion welding.

b) Strength of joints. The tensile strength of each joint in a tank made of steel other than stainless steel shall be not less than 85 percent of that of the adjacent metal in the tank. The tensile strength of each joint in a stainless steel tank shall be not less than 60,000 psi. Compliance with either requirement shall be determined by preparing, from materials representative of those to be used in tanks subject to this specification and by the same technique of fabrication, 2 test specimens conforming to figure found in Appendix C and testing them to failure in tension. One pair of test specimens may represent all the tanks to be made of the same combination of materials, by the same technique of fabrication, and in the same shop, within 6 months after the tests on such samples have been completed.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.5 [178.321-5] Bulkheads, Baffles, and Ring Stiffeners**

a) When bulkheads not required. No bulkheads shall be required in any cargo tank, regardless of capacity, which is used in a service in which the entire tank is never loaded less than 80 percent full or in which no compartment of the tank is ever loaded less than 80 percent full, provided that the entire contents of the tank or of one or more compartments of the tank is discharged at each unloading point.

b) Number, dimensions and capacities of bulkheads, baffles, and ring stiffeners. Except as provided in paragraph (a) of this section, every cargo tank shall be divided into compartments and/or provided with baffles or ring stiffeners as follows:

1) Every cargo tank having a total capacity in excess of 3,000 gallons shall be divided by bulkheads into compartments, none of which shall exceed 2500 gallons.

2) Every cargo tank, and every compartment of a cargo tank over 90 inches in length, shall be provided with baffles or ring stiffeners, the number of which shall be such that the linear distance between any two adjacent baffles or ring stiffeners, or between any tank head or bulkhead and the baffle or ring stiffener nearest it, shall in no case exceed 60 inches.

3) Each bulkhead required by this paragraph shall have adequate strength to sustain without undue stress or any permanent set a horizontal force equal to the weight of so much of the contents of the tank as may come between it and any adjacent bulkhead or tank head, applied as a uniformly distributed load on the surface of the bulkhead or tank head. Flat bulkheads without reinforcement shall not be permitted.

4) Each baffle required by this paragraph shall have at least an area as great as 80 percent of the cross-sectional area of the tank.

5) If spaces are provided between compartments, such spaces shall be arranged for venting and for complete drainage at all times.

6) Ring stiffeners shall be continuous around the circumference of the tank shell, and shall have at least the section modulus required by the following table:

Minimum Section Modulus Required for Steel Ring Stiffeners

|  |  |
| --- | --- |
| Width of tank | Section modulus |
| 42 inches or less | 0.0104 L1 |
| Over 42 inches to 60 inches | 0.0162 L1 |
| Over 60 inches to 96 inches | 0.0234 L1 |

1 L is the maximum distance from midpoint of unsupported shell on one side of ring stiffener to the midpoint of unsupported shell on the opposite side of ring stiffener. See Section 178.321.0.3 for minimum thickness of ring stiffeners.

If a ring stiffener is welded to the shell, a portion of the shell may, for purposes of computing the section modulus, be considered as part of the ring section. If welded at one side of the ring stiffener only, such portion shall not exceed 20 times the shell thickness adjacent to the weld. If welded at both sides of the ring stiffener, such portion shall not exceed 40 times the shell thickness adjacent to the weld, or the width of the ring stiffener between welds plus 20 times the shell thickness adjacent to the welds, whichever is less.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.6 [178.321-6] Closures for Manholes**

No applicable provision.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.7 [178.321-7] Overturn Protection**

All closures for filling openings shall be protected from damage in the event of over-turning of the motor vehicle by being enclosed within the body of the tank or a dome attached thereto, or by the use of suitable metal guards securely attached to the tank or the frame of the motor vehicle.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.8 [178.321-8] Outlets**

Outlet fixtures shall be substantially made and attached to the tank in such a manner as to prevent breakage at the outlet point.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.0.9 [178.321-9] Vents, Valves, and Connections**

a) Tank vents. Each cargo tank or tank compartment shall be provided with a vacuum and pressure operated vent with a minimum effective opening of 0.44 square inch, and shall also be provided with an emergency venting facility so constructed as to provide a minimum free-venting opening having a net area in square inches equal to 1.25 plus 0.0025 times the capacity of the tank or compartment in gallons. If the emergency venting facility operates in response to elevated temperatures, the critical temperature for such operation shall not exceed 200° F.

b) Valve and faucet connections. All draw-off valves or faucets of tanks and compartments shall have discharge ends threaded, or be otherwise so designed as to insure in every instance a tight connection with the hose extending to the storage fill pipe.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.0 [178.321-10] Protection of Fittings**

Draw-off valves and faucets projecting beyond the frame, or if the vehicle be frameless, beyond the shell, at the rear, shall be adequately protected in the event of collision, by steel bumpers or other equally effective devices.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.1 [178.321-11] Emergency Discharge Control**

Each cargo tank or tank compartment of a bottom-discharge tank shall be equipped with a reliable and effective shut-off valve located inside the shell of the tank or tank compartment in the tank or compartment outlet; and the operating mechanism for such valve or valves shall be provided with a secondary closing mechanism remote from tank filling openings and discharge faucets, for operation in the event of fire or other accident. Such control mechanism shall be provided with a fusible section which will cause the valve to close automatically in case of fire, and the critical temperature for the fusing of such section shall not exceed 200°

.F.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.2 [178.321-12] Shear Section**

There shall be provided between each shut-off valve seat and discharge faucet a shear section which will break under strain, unless the discharge piping is so arranged as to afford equivalent protection, and leave the shut-off valve seat intact in case of accident to the discharge faucet or piping.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.3 [178.321-13] Anchoring of Tank**

No applicable provision.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.4 [178.321-14] Gauging Devices**

No applicable provision.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.5 [178.321-15] Pumps**

No applicable provision.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.6 [178.321-16] Testing Requirements**

a) Test for leaks. Before being certified in accordance with Section 178.321.1.8, every cargo tank shall be tested by a minimum air or hydrostatic pressure of 3 psig applied to the whole tank and dome if it be noncompartmented. If compartmented, each individual compartment shall be similarly tested with adjacent compartments empty and at atmospheric pressure. Air pressure, if used, shall be maintained for a period of at least five minutes during which the entire surface of all joints under pressure shall be coated with a solution of soap and water, heavy oil, or other material suitable for the purpose, foaming or bubbling of which indicates the presence of leaks. Hydrostatic pressure, if used, shall be done by using water or other liquid having a similar viscosity, the temperature of which shall not exceed 100~ F. during the test, and applying pressure as prescribed above, gauged at the top of the tank, at which time all joints under pressure shall be inspected for the issuance of liquid to indicate leaks. All closures shall be in place while test by either method is made. During these tests, operative relief devices shall be clamped, plugged, or otherwise rendered inoperative; such clamps, plugs, and similar devices shall be removed immediately after the test is finished. Any leakage discovered by either of the methods above described, or by any other method, shall be deemed evidence of failure to meet the requirements of this specification. Tanks failing to pass this test shall be suitably repaired, and the above described tests shall be continued until no leaks are discovered, before any cargo tank is put into service.

b) Test for distortion or failure. Before being certified in accordance with Section 178.321.1.8, every cargo tank to which this specification applies shall be tested by pressures prescribed in paragraph (a) of this section and shall withstand such pressure without undue distortion, evidence of impending failure, or failure. Failure to meet this requirement shall be deemed as sufficient cause for rejection under this specification. If there is undue distortion, or if failure impends or occurs, the cargo tank shall not be returned to service unless a suitable repair is made. The suitability of the repair shall be determined by the same method of test.

c) Retest requirements. Every cargo tank shall be retested in accordance with 92 Ill. Adm. Code 177.824.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.7 [178.321-17] Marking of Cargo Tanks**

a) Metal identification plate. There shall be on every cargo tank a metal plate located on the right side, near the front, in a place readily accessible for inspection. This plate shall be permanently affixed to the tank by means of soldering, brazing, welding, or other equally suitable means; and upon it shall be marked by stamping, embossing, or other means of forming letters into or on the metal of the plate itself, in the manner illustrated below, at least the information indicated below. The plate shall not be so painted as to obscure the markings thereon.

Carrier's Serial Number1

Manufacturer's Name2

Date of Manufacture2

ICC MC 3003

Nominal Tank Capacity \_\_\_\_\_\_\_ U.S. Gallons

1 Carriers are not required to number their tanks serially; any designation regularly used by the carrier to identify the tank may be put in this space.

2 In the event the identity of the tank manufacturer or the date of manufacture is not known and cannot be ascertained, the spaces indicated shall be marked "MAKE UNKNOWN" and/or "DATE OF MANUFACTURE UNKNOWN."

3 Cargo tanks manufactured of mild steel shall be marked MC 300MS and cargo tanks manufactured of mild steel in combination with high-tensile steel shall be marked MC 300MSHTS.

b) Test date markings. Every cargo tank constructed in accordance with this specification shall be marked with the test date as prescribed in 92 Ill. Adm. Code 177.824(h).

c) Additional markings. In addition to the above markings, cargo tanks must be marked as required by 92 Ill. Adm. Code 177.823.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)

**Section 178.321.1.8 [178.321-18] Certification**

A certificate from the manufacturer of the cargo tank, or from a competent testing agency, certifying that each such cargo tank is designed, constructed and tested in accordance with the requirements of the specification shall be procured, and such certificate shall be retained in the files of the carrier during the time that such cargo tank is employed by him. In lieu of the certificate, if the motor carrier himself elects to ascertain if any such tank fulfills the requirements of the specification by his own test, he shall similarly retain the test data.

(Source: Added at 5 Ill. Reg. 1715, effective February 9, 1981)