

ITEM 707 STEEL AND ALUMINUM PIPE

707.00 Acceptance. Corrugated metal pipe conforming to 707.01, 707.02, 707.03, 707.04, 707.05, 707.07, 707.13, 707.14, 707.21, 707.22, and 707.23 may be accepted for shipment to and immediate use in construction projects when provided from suppliers certified by the City.

707.01 Metallic Coated Corrugated Steel Conduits and Underdrains. Provide conduits and underdrains with a corrugation depth of 1/2 or 1/4 inch (13 or 6.5 mm) and according to AASHTO M 36/M 36M, with the following modifications:

7.5 Either helical lock or continuous welded seams.

7.7.1 At least two annular corrugations at each end of each helical corrugated pipe, 12-inch (300 mm) diameter and larger pipe length.

8.1.2. Provide steel pipe and pipe-arches with the following minimum wall thicknesses (coated):

| Pipe | | Pipe-Arch | |
|------------------|------------------------|--------------|------------------------|
| Diameter (in) | Wall Thickness (in) | Size (in) | Wall Thickness (in) |
| 6 | 0.052 | | |
| 8 | 0.064 | | |
| 10 | 0.064 | | |
| 12 | 0.064 | | |
| 15 | 0.064 | 17 × 13 | 0.064 |
| 18 | 0.064 | 21 × 15 | 0.064 |
| 21 | 0.064 | 24 × 18 | 0.064 |
| 24 | 0.064 | 28 × 20 | 0.064 |
| 27 | 0.064 | | |
| 30 | 0.064 | 35 × 24 | 0.064 |
| 33 | 0.064 | | |
| 36 | 0.064 | 42 × 29 | 0.064 |
| 42 | 0.064 | 49 × 33 | 0.079 |
| 48 | 0.064 | 57 × 38 | 0.109 |
| 54 | 0.109 | 64 × 43 | 0.109 |
| 60 | 0.109 | 71 × 47 | 0.138 |
| 66 | 0.138 | 77 × 52 | 0.168 |
| 72 | 0.138 | 83 × 57 | 0.168 |
| 78 | 0.168 | | |
| 84 | 0.168 | | |

| Pipe | | Pipe-Arch | |
|------------------|------------------------|--------------|------------------------|
| Diameter (mm) | Wall Thickness (mm) | Size (mm) | Wall Thickness (mm) |
| 150 | 1.32 | | |
| 200 | 1.63 | | |
| 250 | 1.63 | | |
| 300 | 1.63 | | |
| 375 | 1.63 | 430 × 340 | 1.63 |
| 450 | 1.63 | 530 × 380 | 1.63 |
| 525 | 1.63 | 610 × 460 | 1.63 |
| 600 | 1.63 | 710 × 510 | 1.63 |
| 675 | 1.63 | | |
| 750 | 1.63 | 885 × 610 | 1.63 |
| 825 | 1.63 | | |
| 900 | 1.63 | 1060 × 740 | 1.63 |
| 1050 | 1.63 | 1240 × 840 | 2.01 |
| 1200 | 1.63 | 1440 × 970 | 2.77 |
| 1350 | 2.77 | 1620 × 1100 | 2.77 |
| 1500 | 2.77 | 1800 × 1200 | 3.51 |
| 1650 | 3.51 | 1950 × 1320 | 3.51 |
| 1800 | 3.51 | 2100 × 1450 | 4.27 |
| 1950 | 4.27 | | |
| 2100 | 4.27 | | |

Ensure that the minus tolerance conforms to AASHTO M 218, M 274, or M 289.

TABLE 707.01-1 PIPE REQUIREMENTS

| Nominal Inside Diameter | | Corrugation Depth Nominal | | Minimum Width of Lap | |
|-------------------------|------|---------------------------|------|----------------------|------|
| (in) | (mm) | (in) | (mm) | (in) | (mm) |
| 27 | 675 | 1/2 | 13 | 2 | 50 |
| 33 | 825 | 1/2 | 13 | 2 | 50 |

8.3.2.1 Ensure a minimum number of four longitudinal rows of perforations.

9.1 Coupling bands with annular corrugations.

9.2 Use coupling bands not more than two nominal sheet thicknesses thinner than the thickness of the connection pipe. For pipes 48-inch (1200 mm) diameter and smaller, use a coupling band no thinner than the 0.052-inch (1.32 mm) nominal sheet thickness. For pipes 54-inch (1350 mm) diameter through 84-inch (2100 mm) diameter, use a coupling band no thinner than the 0.064-inch (1.63 mm) nominal sheet thickness. For pipe diameters over 36 inches (900 mm), provide coupling bands with at least one annular corrugation that indexes into the inboard corrugation of each pipe section joined.

707.02 Metallic Coated Corrugated Steel Conduits [1-inch (25 mm) Corrugations]. Provide conduits according to AASHTO M 36/M 36M, with the following modifications:

7.5 Helical lock or continuous welded seams.

7.7.1 At least two annual corrugations at each end of each helical corrugated pipe length.

8.1.2 Minimum wall thickness (coated) of steel pipe and pipe-arches as follows:

| Pipe | | Pipe-Arch | |
|-----------------|-----------------------|------------------|-----------------------|
| Diameter | Wall Thickness | Size | Wall Thickness |
| (in) | (in) | (in) | (in) |
| 36 | 0.064 | 40 × 31 | 0.109 |
| 42 | 0.064 | 46 × 36 | 0.109 |
| 48 | 0.064 | 53 × 41 | 0.109 |
| 54 | 0.079 | 60 × 46 | 0.109 |
| 60 | 0.079 | 66 × 51 | 0.109 |
| 66 | 0.109 | 73 × 55 | 0.109 |
| 72 | 0.109 | 81 × 59 | 0.109 |
| 78 | 0.109 | 87 × 63 | 0.109 |
| 84 | 0.109 | 95 × 67 | 0.109 |
| 90 | 0.109 | 103 × 71 | 0.109 |
| 96 | 0.109 | 112 × 75 | 0.109 |
| 102 | 0.109 | 117 × 79 | 0.109 |
| 108 | 0.109 | 128 × 83 | 0.138 |
| 114 | 0.109 | 137 × 87 | 0.138 |
| 120 | 0.109 | 142 × 91 | 0.168 |

| Pipe | | Pipe-Arch | |
|-----------------|-----------------------|------------------|-----------------------|
| Diameter | Wall Thickness | Size | Wall Thickness |
| (mm) | (mm) | (mm) | (mm) |
| 900 | 1.63 | 1010 × 790 | 2.77 |
| 1050 | 1.63 | 1160 × 920 | 2.77 |
| 1200 | 1.63 | 1340 × 1050 | 2.77 |
| 1350 | 2.01 | 1520 × 1170 | 2.77 |
| 1500 | 2.01 | 1670 × 1300 | 2.77 |
| 1650 | 2.01 | 1850 × 1400 | 2.77 |
| 1800 | 2.77 | 2050 × 1500 | 2.77 |
| 1950 | 2.77 | 2200 × 1620 | 2.77 |
| 2100 | 2.77 | 2400 × 1720 | 2.77 |
| 2250 | 2.77 | 2600 × 1820 | 2.77 |
| 2400 | 2.77 | 2840 × 1920 | 2.77 |
| 2550 | 2.77 | 2970 × 2020 | 2.77 |
| 2700 | 2.77 | 3240 × 2120 | 3.51 |
| 2850 | 2.77 | 3470 × 2220 | 3.51 |
| 3000 | 2.77 | 3600 × 2320 | 4.27 |

Ensure that the minus tolerance conforms to AASHTO M 218, M 274, or M 289.

707.03

9.1 Provide coupling bands with a minimum wall thickness (coated) of 0.064 inch (1.63 mm) and with at least one annular corrugation that indexes into the inboard corrugations of each pipe section joined.

707.03 Structural Plate Corrugated Steel Structures. Provide structural plate pipe, pipe arch, and arch structures according to AASHTO M 167 (AASHTO M 167M), with the following modification:

5.4 Assembly bolts galvanized by an electrolytic process.

707.04 Precoated, Galvanized Steel Culverts. Provide conduits and coupling bands according to AASHTO M 245/M 245M, as modified by 707.01 and 707.02. Ensure that the precoated, galvanized steel sheets conform to AASHTO M 246/M 246M, Type B. Provide a polymeric coating of 10 mils (250 μm) on the interior and 10 mils (250 μm) on the exterior.

707.05 Bituminous Coated Corrugated Steel Pipe and Pipe Arches with Paved Invert [1/2-inch (13 mm) Corrugations]. Provide conduits and coupling bands according to 707.01 and to AASHTO M 190. Provide either Type B half bituminous coated pipe, or pipe arches with paved invert or Type C fully coated pipe, or pipe arches with paved invert.

707.07 Bituminous Coated Corrugated Steel Pipe and Pipe Arches with Paved Invert [1-inch (25 mm) Corrugations]. Provide conduits and coupling bands according to 707.02 and to AASHTO M 190. Provide either Type B half bituminous coated pipe, or pipe arches with paved invert or Type C fully coated pipe, or pipe arches with paved invert.

707.10 Square and Rectangular Steel Tubing. Provide square and rectangular steel tubing according to ASTM A 501 or ASTM A 500, Grade B, with the following modifications:

Galvanize the tubing according to 711.02.

Test the tubular steel from all heat numbers supplied for toughness according to ASTM E 436, except as modified herein. Take and test tubing test samples before delivery of the railing. Witness the taking of the test samples and use an independent test laboratory for testing. Submit certified test data for review and approval as specified in 501.06.

Perform testing on test specimens obtained from galvanized tubing with the same heat number as the tubing the Contractor plans to use. Conduct the testing at a temperature of 0 °F (-18 °C) on 2 × 9-inch (50 × 225 mm) specimens supported to provide a 7-inch (180 mm) clear span. Do not remove the galvanizing from the specimens. Cut three 2 × 9-inch (50 × 225 mm) test specimens from each of the unwelded sides for a total of nine specimens. If all three unwelded sides do not provide a large enough area to remove 2 × 9-inch (50 × 225 mm) specimens, then remove nine specimens from any unwelded side.

Disregard the three specimens from the side with the lowest average shear area when calculating the final average shear area. For specimens not removed from three unwelded sides, disregard the three specimens with the lowest average shear area. Calculate the final average shear area using the six remaining specimens. If the average

shear area falls below 50 percent, reject material from the heat represented by these tests. However, for an average shear area of 30 percent or greater, the City will allow one retest at a sampling frequency three times that of the first test, and with no samples excluded in calculating the average. Reject materials with less than a 50 percent average shear area upon retest.

Before galvanizing, ensure that the manufacturer of the tubing identifies the product with the steel heat number (or with some number traceable to the heat number) and with the manufacturer's unique identification code to facilitate acceptance or rejection of the material. Place the identification on only one face of the section and repeat at intervals no greater than 4 feet (1.2 m). Do not extend the identification into the curved surface of the tubing at the corners.

707.13 Bituminous Lined Corrugated Steel Pipe [1/2-inch (13 mm) Corrugations]. Provide pipe according to 707.01 and AASHTO M 190, Type D.

707.14 Bituminous Lined Corrugated Steel Pipe [1-inch (25 mm) Corrugations]. Provide pipe according to 707.02 and AASHTO M 190, Type D.

707.21 Corrugated Aluminum Alloy Conduits and Underdrains. Provide conduits and underdrains with a 1/4, 7/16, or 1/2-inch (6.5, 11, or 13 mm) corrugation depth and according to AASHTO M 196/M 196M, with the following modifications:

8.1 and 8.2 Provide helically corrugated pipe 12 inches (300 mm) in diameter and larger with at least two circumferential corrugations at each end of each pipe length.

8.1.2 Provide Corrugated Aluminum Alloy Conduits and Underdrains with minimum wall thicknesses as follows:

| Pipe | | Pipe-Arch | |
|------------------|------------------------|--------------|------------------------|
| Diameter (in) | Wall Thickness (in) | Size (in) | Wall Thickness (in) |
| 6 | 0.048 | | |
| 8 | 0.060 | | |
| 10 | 0.060 | | |
| 12 | 0.060 | | |
| 15 | 0.060 | 17 × 13 | 0.060 |
| 18 | 0.060 | 21 × 15 | 0.060 |
| 21 | 0.060 | 24 × 18 | 0.060 |
| 24 | 0.060 | 28 × 20 | 0.075 |
| 27 | 0.075 | | |
| 30 | 0.075 | 35 × 24 | 0.075 |
| 36 | 0.075 | 42 × 29 | 0.105 |
| 42 | 0.105 | 49 × 33 | 0.105 |
| 48 | 0.105 | 57 × 38 | 0.135 |
| 54 | 0.105 | 64 × 43 | 0.135 |
| 60 | 0.135 | 71 × 47 | 0.164 |
| 66 | 0.164 | | |
| 72 | 0.164 | | |

| Pipe | | Pipe-Arch | |
|------------------|------------------------|--------------|------------------------|
| Diameter (mm) | Wall Thickness (mm) | Size (mm) | Wall Thickness (mm) |
| 150 | 1.22 | | |
| 200 | 1.52 | | |
| 250 | 1.52 | | |
| 300 | 1.52 | | |
| 375 | 1.52 | 430 × 330 | 1.52 |
| 450 | 1.52 | 530 × 380 | 1.52 |
| 525 | 1.52 | 610 × 460 | 1.52 |
| 600 | 1.52 | 710 × 510 | 1.91 |
| 675 | 1.91 | | |
| 750 | 1.91 | 885 × 610 | 1.91 |
| 900 | 1.91 | 1060 × 740 | 2.67 |
| 1050 | 2.67 | 1240 × 840 | 2.67 |
| 1200 | 2.67 | 1440 × 970 | 3.43 |
| 1350 | 2.67 | 1620 × 1100 | 3.43 |
| 1500 | 3.43 | 1800 × 1200 | 4.17 |
| 1650 | 4.17 | | |
| 1800 | 4.17 | | |

Ensure that the minus tolerance conforms to AASHTO M 197/M 197M.

9.2 Provide coupling bands with a minimum wall thickness (coated) of 0.060 inch (1.52 mm). For pipe diameters 12 inches (300 mm) and larger, provide coupling bands with at least one circumferential corrugation that indexes into the inboard corrugations of each pipe section joined.

707.22 Corrugated Aluminum Alloy Conduits. Provide conduits with a 1-inch (25 mm) corrugation depth and according to AASHTO M 196/M 196M, with the following modifications:

8.1 and 8.2 Provide helically corrugated pipe with at least two circumferential corrugations at each end of each pipe length.

8.1.2 Provide **Corrugated Aluminum Alloy Conduits** with minimum wall thicknesses as follows:

Pipe

| Diameter (in) | Wall Thickness (in) | Diameter (mm) | Wall Thickness (mm) |
|------------------|---------------------------|------------------|---------------------------|
| 36 | 0.060 | 900 | 1.63 |
| 42 | 0.060 | 1050 | 1.63 |
| 48 | 0.060 | 1200 | 1.63 |
| 54 | 0.075 | 1350 | 1.91 |
| 60 | 0.105 | 1500 | 2.67 |
| 66 | 0.105 | 1650 | 2.67 |
| 72 | 0.105 | 1800 | 2.67 |
| 78 | 0.105 | 1950 | 2.67 |
| 84 | 0.105 | 2100 | 2.67 |
| 90 | 0.105 | 2250 | 2.67 |
| 96 | 0.105 | 2400 | 2.67 |
| 102 | 0.135 | 2550 | 3.43 |
| 108 | 0.135 | 2700 | 3.43 |
| 114 | 0.164 | 2850 | 4.17 |
| 120 | 0.164 | 3000 | 4.17 |

Ensure that the minus tolerance conforms to AASHTO M 197/M 197M.

9.2 Provide coupling bands no lighter than 0.060-inch (1.52 mm) nominal sheet thickness and with at least one circumferential corrugation that indexes into the inboard corrugations of each pipe section joined.

707.23 Aluminum Alloy Structural Plate Conduits. Provide aluminum alloy plates and fasteners for structural plate conduits according to AASHTO M 219/M 219M.**707.70 Welded and Seamless Steel Pipe.** Provide welded and seamless steel pipe according to ASTM A 53 or ASTM A 139/A 139M, Grade B, with the following modifications:

20.1 Perform inspection at the project site. Obtain random samples from material delivered to the project site or at other locations designated by the Laboratory.

Furnish materials according to the City's Approved Producers / Qualified Products List.