SECTION 707 - METAL PIPE

707-01 (VACANT)

707-02 CORRUGATED STEEL PIPE

SCOPE. The material requirements of corrugated steel pipe with metallic, bituminous, portland cement concrete/or polymer coating intended for use in construction of culverts and drainage systems.

GENERAL. The corrugated steel pipe covered by this specification is classified as follows:

1. Type I. A full circular cross-section, with a single thickness of corrugated sheet.
2. Type IR. A full circular cross-section, with a single thickness of smooth sheet, fabricated with helical ribs projecting outwardly.
3. Type II. A Type I pipe which has been reformed into a pipe-arch, having an approximately flat bottom.
4. Type IIR. A Type IR pipe which has been reformed into a pipe-arch having an approximately flat bottom.
5. Type III. A Type I pipe which has been perforated to permit the in-flow or out-flow of water.

MATERIAL REQUIREMENTS. Apply the requirements of AASHTO M 36M Types I, IR, II, IIR, and III except as modified herein for all metallic coated corrugated steel pipe. Apply the requirements of AASHTO M 190M except as modified herein for all bituminous coated corrugated steel pipe. Apply the requirements of AASHTO M 245M Types I and II except as modified herein for all polymer coated steel pipe.

When Type IR or Type IIR corrugated steel pipe (spiral rib) is specified, the nominal dimension of the ribs shall be 19 mm by 19 mm at 90 mm pitch.

A. Coatings. Coat pipe with one of the following:

1. Metallic. The steel sheet will have a protective coating of zinc galvanizing (AASHTO M 218M) or of Aluminum-Coated (Type 2) (AASHTO M 274M).
2. Fully bituminous coated and paved invert (AASHTO M 190M, Type C). In addition to one of the metallic coatings, the pipe will be fully bituminous coated and have a bituminous paved invert.
3. Fully bituminous coated and 100 percent paved (AASHTO M 190M, Type D). In addition to one of the metallic coatings, the pipe will be fully bituminous coated and have a fully paved, smooth bituminous interior.
4. Polymer coated. The steel sheet will have a protective coating of zinc (galvanizing). In addition, the pipe will have a minimum interior polymer coating thickness of 0.25 mm and an optional exterior polymer coating. If an exterior polymer coating is applied, it will have a minimum thickness of 0.08 mm.
5. Polymer coated with a bituminous paved invert. In addition to the zinc and polymer coatings, the pipe will have a bituminous paved invert.
6. Portland Cement Concrete Lined. The steel sheet will be covered with dense, homogeneous, non-segregating concrete lining. The concrete will be a minimum thickness of 13 mm over the crest of the corrugations of the carrier pipe. In no case will the amount of portland cement, blended cement, or portland cement plus flyash be less than 275 kg/m³. Flyash in the mix may not exceed 20% by weight of the cementitious material. When type IP cement is used, no flyash will be added in batching. All concrete will have a water-cement ratio not exceeding 0.50 by weight. Cure the concrete lining prior to installation as per manufactures instructions.
§707-02

TABLE 707-2-1
SHEET GAGE NUMBERS AND THICKNESS OF UNCOATED METAL

<table>
<thead>
<tr>
<th>Manufacturer's Standard Gage Number</th>
<th>Thickness Equivalent(*) Millimeters</th>
<th>Manufacturer's Standard Gage Number</th>
<th>Thickness Equivalent(*) Millimeters</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>6.83</td>
<td>15</td>
<td>1.71</td>
</tr>
<tr>
<td>2</td>
<td>6.45</td>
<td>16</td>
<td>1.52</td>
</tr>
<tr>
<td>3</td>
<td>6.07</td>
<td>17</td>
<td>1.37</td>
</tr>
<tr>
<td>4</td>
<td>5.70</td>
<td>18</td>
<td>1.21</td>
</tr>
<tr>
<td>5</td>
<td>5.31</td>
<td>19</td>
<td>1.06</td>
</tr>
<tr>
<td>6</td>
<td>4.94</td>
<td>20</td>
<td>0.91</td>
</tr>
<tr>
<td>7</td>
<td>4.55</td>
<td>21</td>
<td>0.84</td>
</tr>
<tr>
<td>8</td>
<td>4.18</td>
<td>22</td>
<td>0.76</td>
</tr>
<tr>
<td>9</td>
<td>3.80</td>
<td>23</td>
<td>0.68</td>
</tr>
<tr>
<td>10</td>
<td>3.42</td>
<td>24</td>
<td>0.67</td>
</tr>
<tr>
<td>11</td>
<td>3.04</td>
<td>25</td>
<td>0.53</td>
</tr>
<tr>
<td>12</td>
<td>2.66</td>
<td>26</td>
<td>0.46</td>
</tr>
<tr>
<td>13</td>
<td>2.28</td>
<td>27</td>
<td>0.42</td>
</tr>
<tr>
<td>14</td>
<td>1.90</td>
<td>28</td>
<td>0.38</td>
</tr>
</tbody>
</table>

*NOTE: Minimum thickness shall conform to the appropriate AASHTO specifications.

The bituminous material for coating and/or paving will be homogeneous and have the following properties in addition to those specified by AASHTO M 190M:

Penetration at 25°C, 110 g, 5 seconds AASHTO T49 25-50
Penetration Ratio (4°C/25°C x 100) AASHTO T49 80-90
Softening Point ⁰C (Ball & Ring) AASHTO T53 88-110

Apply the requirements of AASHTO M 246M for polymer material. Polymer coating materials must appear on the Department's Approved List.

Apply the material requirements of §501-2.02 Materials for portland cement concrete liner material.

B. Gauge. The nominal metal thickness corresponding to any gauge is shown in Table 707-2-1.

C. End Finish. To facilitate field joining, reroll the ends of all helical corrugated steel pipe with diameters of 300 mm or greater to form a minimum of two annular corrugations of no less than 68 mm pitch by 13 mm depth. Reroll the ends of Type IR and IIR pipe to form only two corrugations.

D. Coupling Bands. Supply annular corrugated steel coupling bands for all round pipe sections (Types I, IR, and III) 300 mm or greater in diameter. The band corrugations will have the same dimensions as the pipe ends. Mesh the band with at least one full corrugation and lap it equally on each pipe end. The band width will be a minimum of 180 mm for pipe diameters up to and including 800 mm. The band width will be a minimum of 265 mm for pipe diameters greater than 800 mm. The thickness of the band cannot be less than 2 nominal sheet thicknesses thinner than the pipe and in no case thinner than 1.30 mm.

Pipe arches (Type II and IIR) may be joined by the annular corrugated bands described above or by special projection type coupling bands. The special projection bands will consist of two rows of projections at 75 mm center-to-center that will mesh with at least one full corrugation and will lap equally on each pipe end. The thickness of the special projection bands will not be less than 2 nominal sheet thicknesses thinner than the pipe and in no case thinner than 1.60 mm.

Regular projection type coupling bands (dimpled bands) will not be acceptable for 300 mm in...
diameter pipe and larger. Dimpled bands may be used on pipe diameters smaller than 300 mm, all sizes of perforated underdrain pipe (Type III), and for connecting pipe extensions to existing helical corrugated metal pipe without rerolled ends, unless otherwise shown on the plans.

Coupling bands may be one or two piece. Use two piece coupling bands on pipe 1200 mm or greater in diameter.

Use one of the following coupling band connectors:
- Galvanized steel angles, 50 mm x 50 mm x 5 mm
- Lug connectors
- Bar and strap connectors

Rivet, bolt, or weld these connectors to the coupling bands. Any evidence of loose bolts or rivets, bearing failure, or weld or band tearing are cause for rejection and replacement of that coupling band. As an alternate to the coupling band connectors stated above, a corrugated angle which conforms to an approved Materials Detail may be used.

Coat the steel sheet used for coupling bands with a polymer or metallic coating. If polymer or metallic coated corrugated steel pipe is being joined, the bands must have the same coating as the pipe.

Joints for concrete lined pipe will meet the requirements of §603-3.06 Joints.

E. Coating Repair. Repair damaged metallic, bituminous, portland cement concrete and/or polymer coating.

 Metallic coating field repairs will be allowed only when the total damaged area on each piece is less than 0.20 m² of coated surface, excluding aluminum coated rerolled ends. Any piece having damaged areas totaling more than 0.20 m², excluding aluminum coated rerolled ends, will be rejected.

Repair metallic coatings as follows:
- Power disk sand or mechanically wire brush areas of damaged coating to bright metal
- Remove oil, grease, and corrosion products from repair areas
- Spray or brush a zinc-rich paint on clean, dry repair areas. The paint brand must appear on the Department's Approved List, Materials for Use in Repairing Galvanized Surfaces §719-01. The dry film paint thickness shall be at least 0.13mm. Do not apply paint below 4C.

Repair aluminum coatings damaged during rerolling at the manufacturing location. The rerolled ends may be either spot repaired or completely painted to repair small areas of damaged coating. Make repairs to the rerolled ends of aluminum coated pipe as referenced above. These rerolled end repairs, when properly completed, will not be counted toward the 0.20 m² of allowable damaged coating described above.

Repair damaged interior bituminous coatings using the original material or a Corrugated Metal Pipe Bituminous Coating Repair Material appearing in the Department's Approved List. Exterior damage to a bituminous coated pipe requires repair to the metallic coating only.

Repair damaged interior polymer coatings using Polymer Repair Materials for Steel Sheet used for Corrugated Pipe appearing in the Department's Approved List. Exterior damage to a polymer coated pipe requires repair to the metallic coating only.

Repair damaged portland cement concrete linings with Item 701-08, vertical and overhead patching material. The lining will be free of cracks exceeding 1 mm in width or the pipe will be rejected.

F. Marking. Mark or tag each length of corrugated steel pipe over the coating as approved by the Department to properly cross-reference the supplier's certification.

G. Additional Defects. In addition to coating damage and other criteria established in Materials Bureau procedural directives, the following additional defects along with those listed in AASHTO will be cause for rejecting the pipe when inspected at the project:
- Variation from a straight centerline of more than 20 mm in 6 m.
- Any dents greater than 75 mm in diameter
- Any punctures
- Loosely formed or cracked lock seams
§707-02

- Cracks through the metal
- Sharp bends in pipe arches that are less than the specified minimum corner radius for that size.

**BASIS OF ACCEPTANCE.** Corrugated steel pipe will be accepted on the basis of certified documentation issued by a supplier appearing on the Department's Approved List. Certification will accompany all shipments arriving at the project in accordance with Materials Bureau procedural directives. Shipments arriving without certification, or with improper certification will be rejected.

The Engineer will measure gauge and coating thicknesses at the project. The pipe will be rejected if the metal and/or coating thickness is less than required or certified. The Contractor will supply equipment required to measure metal and coating thicknesses as detailed in §603-3.02H, Thickness Measuring Equipment.

Acceptance requirements including thickness measurements, visual inspection instructions, certification format, and fabrication shop approval will be in accordance with Materials Bureau procedural directives. At the option of the Department, this material may be subjected to shop inspection.

Polymer coatings, coating applicator facilities, and application methods are subject to Materials Bureau approval. Samples are required for laboratory and field testing. Field testing will be a minimum of two years duration. Upon approval, the brand of polymer coating and applicator will be placed on the Department's Approved List. Certifications for polymer coated pipe received at the project will include the brand and applicator of polymer coating, which must appear on the Department's Approved List.

Corrugated connecting angles will be accepted provided an approved Materials Detail appears on the Department's Approved List from that supplier.

### 707-03 DUCTILE IRON PIPE (NON-PRESSURE)

**SCOPE.** This specification covers the material and quality requirements for 350 mm to 1375 mm Ductile Iron Culvert Pipe.

**GENERAL.** Ductile Iron Pipe (Non-Pressure) shall be centrifugally cast iron pipe conforming to the requirements of ASTM A716, Ductile Iron Culvert Pipe.

**BASIS OF ACCEPTANCE.** Ductile Iron Pipe (Non-Pressure) shall be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the job site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.

### 707-04 DUCTILE IRON PIPE (PRESSURE)

**SCOPE.** This specification covers the material, and quality requirements for 75 mm to 1375 mm Ductile Iron Pipe (Pressure).

**GENERAL.** Ductile Iron Pipe (Pressure) shall be centrifugally cast iron pipe conforming to the requirements of ANSI A21.51., Ductile-Iron Pipe, Centrifugally Cast In Metal Molds or Sandline Molds, for Water or Other Liquids.

**BASIS OF ACCEPTANCE.** Ductile Iron Pipe (Pressure) shall be accepted on the basis of the Manufacturer's certification that the material conforms to this specification. The certification shall accompany the material delivered to the job site.

The Department reserves the right to sample and test this material subsequent to delivery at the project site.
707-05 TUNNEL LINER PLATE (relining)

SCOPE. This specification covers the material and fabrication requirements for tunnel liner plate.

MATERIAL REQUIREMENTS. Tunnel liner plate steel must conform to ASTM A569. Tunnel liner plate aluminum must conform to AASHTO M219 (ASTM B746). Before cold forming into tunnel liner plate the plates must conform to the following mechanical requirements:

<table>
<thead>
<tr>
<th>Material</th>
<th>Tensile Strength, MPa</th>
<th>Yield Point, MPa</th>
<th>Elongation in 50 mm, percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>290 min.</td>
<td>193 min.</td>
<td>30 min.</td>
</tr>
<tr>
<td></td>
<td>3.17-3.81 mm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aluminum</td>
<td>240 min.</td>
<td>165 min.</td>
<td>6 min.</td>
</tr>
<tr>
<td></td>
<td>(4.44-6.35 mm)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Prepare test specimens in accordance with ASTM A570 for steel sheets or ASTM A283 for steel plates and ASTM B209M for aluminum plates. Deliver the Mill test reports, for each heat and thickness to the Engineer with each shipment of liner plates.

Galvanizing. Galvanize steel plates in accordance with AASHTO M167 M. Galvanize after the plates are formed, punched and curved. Hot dip galvanize all bolts and nuts, when used with galvanized tunnel liner plate in accordance with ASTM A153.

Liner Plate. Punch all plate for bolting on both the longitudinal and circumferential seams or joints and fabricate so as to permit complete erection from the inside of the tunnel liner plate structure. The minimum edge distance from the center of a bolt hole to the edge of a plate will be in accordance with the manufacturer's standard spacing. Provide a sufficient number of plates with 50 mm, or larger, grouting holes with pipe plugs, and spaced so that when the plates are installed there will be one line of holes at the crown of the pipe and one line on each side at approximately the midpoint. The holes in each line will not be more than two (2) meters apart, and they will be staggered along the tunnel length.

Tunnel Liner Plate (Two-Flange). The minimum moment of inertia in mm$^4$ per mm of plate width, based on the average of one ring of plates is as follows:

<table>
<thead>
<tr>
<th>Uncoated Plate Thickness (mm)</th>
<th>Moment of Inertia (mm$^4$/mm)</th>
<th>STEEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.43</td>
<td>1049</td>
<td></td>
</tr>
<tr>
<td>4.17</td>
<td>1295</td>
<td></td>
</tr>
<tr>
<td>4.55</td>
<td>1426</td>
<td></td>
</tr>
<tr>
<td>5.31</td>
<td>1688</td>
<td></td>
</tr>
<tr>
<td>6.07</td>
<td>1934</td>
<td></td>
</tr>
</tbody>
</table>

The longitudinal seams will be of the lap type. The depth of the offset will be equal to the thickness of the metal for the full width of plate, including flanges. Fabricate the lap to allow the cross section of the plates to be continuous through the seam. The lapped longitudinal joints will contain at least five (5) bolts per 450 mm plate width, with bolts in ridges and valleys staggered. Circumferential bolt spacing will be in accordance with the manufacturer's standard spacing and will be a multiple of the plate length so that the plates having the same curvature are interchangeable. Bolts and nuts for liner plate assemblies will not be less than 16 mm in diameter. Circumferential (flange) seams will conform to ASTM A307, with chemical and mechanical requirements conforming to Grade A and dimensions conforming to Grade B. Bolts and nuts for longitudinal seams will have square heads with a square shoulder to engage the plate. Longitudinal seams of plates 2 mm to 4.5 mm thick, inclusive will conform to ASTM A307, with chemical and mechanical requirements conforming to Grade A. Bolts for longitudinal seams of plates 5.3 mm to 6.1 mm or thicker will conform to the chemical and mechanical requirements of ASTM A449. Nuts, for use on ASTM A449 bolts, will conform to ASTM A307, with chemical and mechanical requirements conforming to Grade A, and dimensions conforming to Grade B.
§707-05

Basis of Acceptance. Acceptance of this material will be based on the manufacturer’s name appearing on the Approved List.

707-06 THROUGH 707-08 (VACANT)

707-09 CORRUGATED STRUCTURAL STEEL PLATE FOR PIPE, PIPE ARCHES AND UNDERPASSES

SCOPE. This specification covers corrugated structural steel plates intended for use in the construction of pipe, pipe arches and underpasses.

MATERIAL REQUIREMENTS. Structural steel plate, nuts and bolts shall conform to the requirements of AASHTO M167 except as herein specified, and shall be of the thickness and shape shown of the plans. When a gauge number is specified in the contract documents it shall conform to Table 707-2-1.

Plates shall have approximately a 50 mm lip beyond each end crest, which will result in the actual length of a given structure being approximately 100 mm longer than the nominal length, except where skewed or beveled.

If directed by the Engineer, the Contractor shall, at its own expense, repair damaged spelter on plate items as directed under §719-01, Galvanized Coatings and Repair Methods.

This repair method shall be allowed only when it is in the best interest of the Department. All repairs shall be made at no cost to the State.

BASIS OF ACCEPTANCE. This material will be accepted on the basis of certified documentation issued by a fabrication shop appearing on the Department's Approved List. Certification format and fabrication shop approval shall be in accordance with procedural directives issued by the Materials Bureau. At the option of the Department, this material may be subjected to shop inspection.

707-10 GALVANIZED STEEL END SECTIONS

SCOPE. This specification covers galvanized steel end sections to be attached to the inlet and outlet ends of corrugated steel pipe.

MATERIAL REQUIREMENTS. Galvanized steel end sections shall be manufactured from material meeting the requirements of AASHTO M218. The units shall conform to the shape, dimensions, and thickness shown on the applicable standard sheet and/or contract plans. The nominal metal thickness corresponding to any gauge shall be as shown in Table 707-2-1. Marking and coating repair shall meet the requirements of §707-02, Corrugated Steel Pipe.

BASIS OF ACCEPTANCE. End sections will be accepted on the basis of certified documentation issued by a fabrication shop appearing on the Department’s Approved List. All shipments shall arrive at the project with certification prepared in accordance with Materials Bureau procedural directives. Shipments arriving without certification, or with improper certification, will be rejected.

Metal and coating thicknesses will be measured at the project by project inspectors. If the metal and/or coating thickness is less than required or certified, the material shall be rejected. Equipment required to measure metal and coating thickness shall be supplied by the contractor as detailed in §603-3.02G, Thickness Measuring Equipment.

Acceptance requirements including thickness measurements, visual inspection instructions, certification format, and fabrication shop approval shall be in accordance with Materials Bureau procedural directives. At the option of the Department, this material may be subjected to shop inspection.
707-11 ALUMINUM END SECTIONS

SCOPE. This specification covers aluminum end sections to be attached to the inlet and outlet ends of corrugated aluminum pipe.

MATERIAL REQUIREMENTS. Aluminum end sections shall be manufactured from material meeting the requirements of AASHTO M197M. The units shall conform to the shape, dimensions, and thickness shown on the standard sheet for galvanized steel end sections and/or contract plans. The nominal metal thickness corresponding to any gauge shall be as shown in Table 707-2-1. Marking shall meet the requirements of §707-13, Corrugated Aluminum Pipe.

BASIS OF ACCEPTANCE. End sections will be accepted on the basis of certified documentation issued by a fabrication shop appearing on the Department's Approved List. All shipments shall arrive at the project with a certification prepared in accordance with Materials Bureau procedural directives. Shipments arriving without certification, or with improper certification, will be rejected.

Metal thickness will be measured at the project by project inspectors. If the metal thickness is less than required or certified, the material shall be rejected. Equipment required to measure thickness shall be supplied by the contractor as detailed in §603-3.02H, Thickness Measuring Equipment.

Acceptance requirements including thickness measurements, visual inspection instructions, certification format, and fabrication shop approval shall be in accordance with Materials Bureau procedural directives. At the option of the Department, this material may be subjected to shop inspection.

707-12 (VACANT)

707-13 CORRUGATED ALUMINUM PIPE

SCOPE. This specification covers corrugated aluminum pipe intended for use in the construction of culverts and drainage systems. The corrugated aluminum pipe covered by this specification is classified as follows:

Type I. This pipe shall have a full circular cross-section with a single thickness of corrugated sheet fabricated with annular (circumferential) or helical corrugations.

Type IA. This pipe shall have a full circular cross-section with an outer shell of corrugated sheet fabricated with helical corrugations and an inner liner of smooth (uncorrugated) sheet attached to the shell at helical lock seams.

Type IR. This pipe shall have a full circular cross-section with a single thickness of smooth sheet fabricated with helical ribs projecting outwardly.

Type II. This pipe shall be a Type I pipe which has been reformed into a pipe-arch having an approximately flat bottom.

Type IIR. This pipe shall be a Type IR pipe which has been reformed into a pipe-arch having an approximately flat bottom.

Type III. This pipe, intended for use as underdrains or for underground disposal of water, shall be a Type I pipe which has been perforated to permit the in-flow or out-flow of water.

MATERIAL REQUIREMENTS. Corrugated aluminum pipe shall conform to the requirements of AASHTO M196M Types I, IA, IR, II, IIR, and III except as modified herein. When Type IR and Type IIR corrugated aluminum pipe (spiral rib) is specified, the nominal dimension of the ribs shall be 19 mm by 19 mm at 190 mm spacing.
§707-13

Gauge. The nominal metal thickness corresponding to any gauge shall be as shown in Table 707-2-1.

End Finish. To facilitate field joining, the ends of all helical corrugated aluminum pipe with 300 mm or greater diameters shall be rerolled to form a minimum of two annular corrugations of no less than 68 mm pitch by 13 mm depth. When the ends of Type IR or Type IIR pipe are rerolled, there shall be only two such corrugations. Rerolled pipe ends shall be uniquely and indelibly labeled so the pipe may be assembled in the field in the same order it was manufactured.

Coupling Bands. All round pipe sections (Types I, IA, IR, and III) 300 mm or greater in diameter shall be field joined with aluminum coupling bands. Helical corrugated pipe without rerolled ends may be joined with helical corrugated bands. Pipe with rerolled ends or annular corrugations shall be joined with annular corrugated coupling bands.

All bands shall have corrugations with the same dimensions as the pipe ends. Annular corrugated bands shall mesh with at least one full corrugation and shall lap equally on each pipe end. The band widths shall be a minimum of 180 mm for pipe diameters up to and including 800 mm. The band widths shall be a minimum of 265 mm for pipe diameters greater than 800 mm.

The bands shall not be more than 2 nominal sheet thicknesses thinner than the pipe and in no case thinner than 1.30 mm.

Pipe arches (Type II and Type IIIR) may be joined by the annular corrugated bands described above or by special projection type coupling bands. The special projection bands shall consist of two rows of projections at 75 mm center-to-center that will mesh with at least one full corrugation and will lap equally on each pipe end. The special projection bands shall not be more than 2 nominal sheet thicknesses thinner than the pipe and in no case thinner than 1.60 mm.

Regular projection type coupling bands (dimpled bands) will not be acceptable for pipe 300 mm in diameter and larger. Dimpled bands may be used on pipe smaller than 300 mm in diameter, all sizes of perforated underdrain pipe, and for connecting pipe extensions to existing helical corrugated pipe without rerolled ends, unless otherwise shown on the plans.

Coupling bands may be one or two piece. Two piece coupling bands shall be used on pipe 1200 mm or greater in diameter.

Coupling band connectors shall be one of the following types:
- Aluminum angles, 50 mm x 50 mm x 5 mm
- Aluminum lug connectors
- Aluminum bar and strap connectors.

These connectors shall be riveted, bolted, or welded to the coupling bands. Evidence of loose bolts or rivets, bearing failure, or weld or band tearing shall be cause for rejection and replacement of that coupling band. As an alternate to the coupling band connectors stated above, an aluminum corrugated angle which conforms to an approved Materials Detail may be used.

MARKING. Each length of corrugated aluminum pipe shall be marked or tagged as approved by the Department to properly cross-reference the supplier’s certification.

Additional Defects. In addition to criteria established in Materials Bureau procedural directives and defects listed in AASHTO, the following defects will be cause for rejecting the pipe when inspected at the project:
- Variation from a straight centerline of more than 20 mm in 6 m.
- Any dents greater than 75 mm in diameter
- Any punctures
- Loosely formed or cracked lock seams
- Cracks through the metal
- Sharp bends in pipe arches that are less than the specified minimum corner radius for that size.
§707-20

BASIS OF ACCEPTANCE. Corrugated aluminum pipe will be accepted on the basis of certified documentation issued by a supplier appearing on the Department’s Approved List. All shipments shall arrive at the project with certification prepared in accordance with Materials Bureau procedural directives. Shipments arriving without certification, or with improper certification, shall be rejected.

Gauge shall be measured at the project by project inspectors. If the gauge is less than required, the pipe shall be rejected. Equipment required to measure gauge shall be supplied by the contractor as detailed in §603-3.02H, Thickness Measuring Equipment.

Acceptance requirements including thickness measurements, visual inspection instructions, certification format, and fabrication shop approval shall be in accordance with Materials Bureau procedural directives. At the option of the Department, this material may be subjected to shop inspection.

Corrugated connecting angles will be accepted provided an approved Materials Detail appears on the Department's Approved List from that supplier.

707-14 CORRUGATED ALUMINUM STRUCTURAL PLATE FOR PIPE AND PIPE ARCHES

SCOPE. This specification covers corrugated aluminum structural plates for use in the construction of pipe and pipe arches.

MATERIAL REQUIREMENTS. Structural plate, nuts and bolts shall conform to the requirements of AASHTO M219 except as herein specified, and shall be of the thickness and shape shown on the plans. When a gauge number is specified in the contract documents, it shall conform to Table 707-2-1.

The corrugations shall run at right angles to the longitudinal axis of the structure. Plates shall have approximately a 45 mm lip beyond each end crest, which will result in the actual length of a given structure being approximately 90 mm longer than the nominal length, except where skewed or beveled.

All sections which are damaged from any cause, including handling, or where any dimension varies from that specified, shall be replaced at the Contractor’s expense in a manner approved by the Engineer.

BASIS OF ACCEPTANCE. This material will be accepted on the basis of certification by the fabricator. Each fabricator shall furnish upon request by the Materials Bureau a certified analysis and guarantee executed by the manufacturer of the base metal as described in AASHTO M219.

At the option of the Department, structural plates may be subjected to shop inspection or may be shipped to the project site accompanied by certified documentation executed in a form prescribed by the Department.

707-15 THROUGH 707-19 (VACANT)

707-20 ANCHOR BOLTS FOR CORRUGATED CULVERTS

SCOPE. This specification covers the material details and quality requirements for the anchorage system securing the ends of corrugated metal pipe, arch pipe, and structural plate to reinforced or plain concrete headwalls.

MATERIAL REQUIREMENTS. Anchor bolts shall be 19 mm diameter heavy hex bolts, ASTM A307. Grip shall be 140 mm threaded over at least first 63 mm. The bolts shall be fitted with two nuts, ASTM A563 heavy hex. Nuts shall be chamfered on at least one face using a 25 mm spherical radii. The nuts and bolts shall be so assembled that in the final assembly, the bolt and one of the nuts is embedded in concrete, that the chamfered faces of the nuts face each other, and secure the pipe between them. Nuts and bolts shall be galvanized as per ASTM A153 after all machining operations are completed. Following galvanization, threads shall be cleaned to produce a free running fit.

When 485 mm hook bolts are used as anchor bolts they shall be detailed on the plans and shall conform to the requirements of ASTM A36.

Anchor bolts shall be spaced around the periphery of the pipe at intervals not exceeding 460 mm. At least two anchor bolts shall be provided.
BASIS OF ACCEPTANCE. Anchor bolts and nuts for corrugated metal pipes, pipe arches, and structural plate pipe will be accepted on the Manufacturer's Certification that they conform with these specifications.

SECTION 708 - PAINTS

708-01 PAINTS - GENERAL

SCOPe. These specifications cover the materials, packaging, delivery and general specifications common to paints used on New York State highway structures.

Failure to comply with any of these requirements shall be cause for rejection.

The primary usage of each individual paint is given under its respective materials specifications number. Methods of applying paint and using painting materials are included in §740 of these specifications.

GENERAL. Unless otherwise specified, the materials used in the composition of the paints shall conform to the requirements of ASTM or Federal Specifications as applicable and covering such materials. Test methods specified by ASTM or Federal Government for identifying raw materials and paints are applicable except where noted.

The composition requirements and properties of raw material constituents used in the paints and not otherwise covered by ASTM or Federal Specifications are as follows:

A. Basic Lead Silico Chromate - ASTM D1648.

B. Siliceous Red Iron Oxide (85% Fe₂O₃). The pigment shall be a natural siliceous red iron oxide which, when used with other constituents of paint specified in §708-02, will impart a color to match the established reference standard.

<table>
<thead>
<tr>
<th>Properties</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total iron oxide, (Fe₂O₃)</td>
<td>70.00%</td>
<td>97.00%</td>
</tr>
<tr>
<td>Coarse particles (total residue retained on 45 μm sieve)</td>
<td>--</td>
<td>1.00%</td>
</tr>
<tr>
<td>CaO</td>
<td>--</td>
<td>2.00%</td>
</tr>
<tr>
<td>Moisture and other volatile matter</td>
<td>--</td>
<td>1.50%</td>
</tr>
<tr>
<td>Water soluble matter</td>
<td>16</td>
<td>--</td>
</tr>
<tr>
<td>Oil Absorption</td>
<td>Balance</td>
<td>--</td>
</tr>
<tr>
<td>Siliceous matter</td>
<td>--</td>
<td>nil</td>
</tr>
<tr>
<td>Organic colors</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The percentages noted relate to mixture by weight.

C. Basic Silicate White Lead 48% (PbO Type).

<table>
<thead>
<tr>
<th>Properties</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Monoxide (PbO)</td>
<td>46.80%</td>
<td>49.00%</td>
</tr>
<tr>
<td>Silicon Dioxide (SiO₂)</td>
<td>46.80%</td>
<td>48.60%</td>
</tr>
<tr>
<td>Sulfur Trioxide (SO₃)</td>
<td>4.00%</td>
<td>4.40%</td>
</tr>
<tr>
<td>Moisture (loss at 105°C)</td>
<td>--</td>
<td>0.20%</td>
</tr>
<tr>
<td>Coarse Particles</td>
<td>--</td>
<td>0.10%</td>
</tr>
<tr>
<td>Oil Absorption</td>
<td>14.0</td>
<td>18.0</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>3.9</td>
<td>4.10</td>
</tr>
</tbody>
</table>

The percentages noted relate to mixture by weight.

D. Zirconium Drier Catalyst. The Zirconium drier catalyst shall be a clear solution of a Zirconium organic complex containing 6% Zirconium metal. It shall be soluble in and compatible with the vehicle of which it is a component part.
Properties

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zirconium</td>
<td>5.9%</td>
<td>6.1%</td>
</tr>
<tr>
<td>Color (Gardner)</td>
<td>--</td>
<td>4</td>
</tr>
<tr>
<td>Viscosity at 25°C (Gardner-Holdt)</td>
<td>Less than A</td>
<td>--</td>
</tr>
<tr>
<td>Specific Gravity at 20°C</td>
<td>0.855</td>
<td>0.875</td>
</tr>
</tbody>
</table>

The percentages noted relate to mixture by weight.

E. Solvents. All solvents shall conform to Federal, State and Local air pollution regulations including those for the control (emission) of volatile organic compounds (VOC) as established by the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation.

MATERIAL REQUIREMENTS. The paints, consisting of ingredients meeting all specified requirements, shall be well ground, shall not settle badly or cake in the container, and shall be readily broken up with a paddle into a smooth, uniform product of good brushing consistency.

The uniformity of any one batch or lot of paint, with the exception of material specification §708-21, Textured Concrete Finish Paint, shall be determined by the following tests:

A. Weight per Liter. Variations exceeding 36 grams per liter between samples representing the same lot shall be cause for rejection.

B. Fineness of Grind. Variations exceeding 1.0 unit between samples representing the same lot shall be cause for rejection.

C. Viscosity. Variations exceeding 3.0 Krebs Units between samples representing the same lot shall be cause for rejection.

When applied as specified, the paint shall hide the under surface completely, and dry within the specified time without running, streaking, sagging, wrinkling, or exhibiting other film defects. The primer and undercoat shall dry with a dull gloss; the finish coat with a full gloss. For aesthetic purposes, the finish coat on certain exposed portions of individual structures shall be painted from a single batch of accepted paint, as indicated on the plans or directed by the Engineer. Should a bridge fascia beam or other exposed surface be of such length that it cannot be painted from a single batch, one or more additional batches may be used, providing the colors are matched as closely as possible to the established standard as determined by the Engineer. The hiding power shall be sufficient to obtain complete hiding when applied at normal spreading rates.

Containers. The furnished paint shall be shipped in strong substantial containers sealed in a manner approved by the Department. The containers shall be equipped with a bolt or lever type ring seal, designed to keep the top of the container securely closed, in accordance with Department directives unless specific exception has been made by the Materials Bureau. Each container shall be plainly marked with the following:

- Paint Name
- Item Number
- Name and Address of Manufacturer
- Weight of Paint (grams per liter)
- Volatile Organic Compound (VOC) Content (Expressed in grams per liter)
- Date of Manufacture
- Date of Acceptance
- Date of Expiration of Acceptance
- Lot Number
- Batch Number
- Test Number

All furnished paint shall be sampled in accordance with directives issued by the Materials Bureau.
§708-01

TEST. Paint samples will be tested in the Materials Bureau for conformance to physical properties, chemical formulation, and volatile organic compounds (VOC). Laboratory test methods for individual paints may be obtained from the Materials Bureau.

BASIS OF ACCEPTANCE. Individual manufacturer's batches of paint will be considered for acceptance in stock lot quantities at manufacturing locations, in accordance with procedural directive of Materials Bureau unless otherwise directed by the Department.

All acceptances shall, unless otherwise specified, expire eighteen (18) months after the date of manufacture.

Tamper-proof tags for installation on the ring seal shall be affixed by representatives of the Department in accordance with directives of the Materials Bureau. Any unauthorized tampering or breaking of tags on the container seals between the time of sealing and the time of application of the paint, shall be cause for rejection of the paint.

708-02 MAROON PRIMER

BASIS OF ACCEPTANCE. Whenever this material is specified, the primer paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, A. Primer Paint and Thinner.” Acceptance shall be based on the appearance of the primer paint on the Approved List.

708-03 DULL ORANGE PRIMER

BASIS OF ACCEPTANCE. Whenever this material is specified, the primer paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, A. Primer Paint and Thinner,” Acceptance shall be based on the appearance of the primer paint on the Approved List.

708-04 ZINC CHROMATE PRIMER

SCOPE. This paint is used as a prime coat on aluminum in contact with fresh concrete to reduce the effect of alkali attack.

GENERAL. The requirements of material specification §708-01, Paints - General, and Federal Specification TT-P-645, or later addenda, shall apply.

MATERIAL REQUIREMENTS. The composition of this paint shall be as shown in the following table using ingredients conforming to the requirements of the applicable specifications indicated.

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
<th>Grams Per Liter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zinc Yellow</td>
<td>(TT-P-465)</td>
<td>324</td>
</tr>
<tr>
<td>Titanium Dioxide, Rutile,</td>
<td>Chalk Resistant</td>
<td>90</td>
</tr>
<tr>
<td>Zinc Oxide (American Process Type)</td>
<td>(ASTM D79)</td>
<td>114</td>
</tr>
<tr>
<td>Sienna, Raw</td>
<td>(ASTM D765)</td>
<td>30</td>
</tr>
<tr>
<td>Magnesium Silicate</td>
<td>(ASTM D605)</td>
<td>90</td>
</tr>
<tr>
<td>Aluminum Stearate</td>
<td>(MIL-A-15206A)</td>
<td>7.2</td>
</tr>
<tr>
<td>Resin, alkyd Solution</td>
<td>(TT-R-266C, Type I)</td>
<td>413</td>
</tr>
<tr>
<td>Dipentine</td>
<td>(TT-D-376)</td>
<td>26.3</td>
</tr>
<tr>
<td>Petroleum Spirits</td>
<td>(TT-T-291, Type I, Grade A)</td>
<td>281.4</td>
</tr>
<tr>
<td>Lead Napthenate</td>
<td>(ASTM D600, Class B)</td>
<td>14.4</td>
</tr>
<tr>
<td>Cobalt Napthenate</td>
<td>(ASTM D600, Class B)</td>
<td>1.4</td>
</tr>
<tr>
<td>Magnesium Napthenate</td>
<td>(ASTM D600, Class B)</td>
<td>1.4</td>
</tr>
</tbody>
</table>
The quantitative requirements of zinc chromate primer shall be as follows:

<table>
<thead>
<tr>
<th></th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigment</td>
<td>45.0%</td>
<td>49.0%</td>
</tr>
<tr>
<td>Vehicle</td>
<td>51.0%</td>
<td>55.0%</td>
</tr>
<tr>
<td>Volatile by weight of paint</td>
<td>29.5%</td>
<td>33.5%</td>
</tr>
<tr>
<td>Weight (kg/L)</td>
<td>1.32</td>
<td>1.39</td>
</tr>
<tr>
<td>Water</td>
<td>-</td>
<td>0.5%</td>
</tr>
<tr>
<td>Coarse particles &amp; skins (total residue retained on 45 um sieve based on paint)</td>
<td>-</td>
<td>0.5%</td>
</tr>
<tr>
<td>Fineness of Grind (North Standard)</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Viscosity at 25°C (Stormer-Krebs Units)</td>
<td>62</td>
<td>82</td>
</tr>
<tr>
<td>Zinc oxide (ZnO), by weight of pigment</td>
<td>34.0%</td>
<td>39.0%</td>
</tr>
<tr>
<td>Titanium Dioxide (TiO₂), by weight of pigment</td>
<td>12.0%</td>
<td>14.5%</td>
</tr>
<tr>
<td>Chromium Trioxide (CrO₃), by weight of pigment</td>
<td>20.0%</td>
<td>-</td>
</tr>
<tr>
<td>Phthalic Anhydride, by weight of non-volatile</td>
<td>23.0%</td>
<td>-</td>
</tr>
<tr>
<td>Vehicle</td>
<td>30°C</td>
<td>-</td>
</tr>
<tr>
<td>Flash Point</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

The percentages noted relate to mixture by weight. The paint shall dry set to touch within two hours and dry hard within 6 hours. No resin and resin derivatives shall be present in the paint. The paint shall show no evidence of cracking when subjected to a 3 mm "mandrel flexibility test."

708-05 THROUGH 708-07 (VACANT)

708-08 READY MIXED ALUMINUM PAINT

SCOPE. The primary use of this paint is to preserve the original silver color of existing bridges. Also, it may be used as a prime coat for wood treated with creosote oil or oil borne wood preservative as specified in plans or proposals.

GENERAL. The requirements of material specification §708-01, Paints - General, shall apply.

Type I - First Field Coat. The first field coat of aluminum paint shall consist of 240 g of leaf-free aluminum paste of standard fineness per liter of long oil varnish suitable for making a ready-mixed aluminum paint. This paint shall be characterized by its ability to show distinct contrast with the Second Field Coat to ensure adequate coverage, but it shall not contain any added coloring materials for this purpose.

Type II - Second Field Coat. The second or final field coat of aluminum paint shall consist of 240 g of leafing aluminum paste of standard fineness per liter of long oil varnish suitable for making a ready-mixed aluminum paint.

The aluminum paints shall be manufactured as closely as possible to the application period, but in no case shall the lapse between manufacture and usage exceed six months.

The two types shall be distinguished as follows:

A. Type I. Standard Leaf-Free Aluminum Paste meeting the following requirements, as evaluated according to ASTM D480.

B. Type II. This pigment shall consist entirely of finely divided, polished aluminum flakes in paste form, and shall meet the minimum requirements of Federal Specification TT-P-320C, Type II, Class B, or latest revision thereof, or ASTM D962, Type II, Class B.
§708-08

<table>
<thead>
<tr>
<th>Property</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Matter not volatile at 105°-110°C (Essentially aluminum flakes)</td>
<td>65.0%</td>
<td>--</td>
</tr>
<tr>
<td>Fatty or oil matter</td>
<td>--</td>
<td>1.50%</td>
</tr>
<tr>
<td>Total impurities (other than fatty matter)</td>
<td>--</td>
<td>0.80%</td>
</tr>
<tr>
<td>Mica, fillers and other adulterants</td>
<td>--</td>
<td>None</td>
</tr>
<tr>
<td>Coarse particles retained on 45 µm sieve</td>
<td>--</td>
<td>1.50%</td>
</tr>
</tbody>
</table>

**Liquid.** The liquid for both Type I and II shall be a long oil varnish suitable for making a ready-mixed aluminum paint, volatile solvent and driers, and shall meet the following requirements:

<table>
<thead>
<tr>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-volatile matter</td>
<td>50.0%</td>
</tr>
<tr>
<td>Volatile thinner and drier</td>
<td>50.0%</td>
</tr>
</tbody>
</table>

The varnish shall conform to the type described in Federal Specification TT-V-81F, Type II, Class 2 dated February 10, 1949 or latest revision thereof, with certain modifications as given below. The varnish shall be clear and shall contain no limed resin.

<table>
<thead>
<tr>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Viscosity (Pa s at 25°C)</td>
<td>0.085 - 0.125</td>
</tr>
<tr>
<td>Acid Number (Of non-volatile)</td>
<td>-- - 7</td>
</tr>
<tr>
<td>Non-volatile</td>
<td>50.0% - --</td>
</tr>
<tr>
<td>Kauri Reduction</td>
<td>75.0% - --</td>
</tr>
</tbody>
</table>
| Drying Time  | Set to touch (hrs.) - 2 - 4
|              | Dry hard (hrs.) - 18 |

**MATERIAL REQUIREMENTS**

**Pigment.** The pigments shall be aluminum pastes of two types. They shall consist of commercially pure aluminum in the form of fine flakes compounded with a volatile paint thinner and a suitable fatty lubricant to form a paste suitable for use as a paint pigment. The paste shall show no skinning or caking in the containers. There shall be no appreciable settling out of the metallic portion of the paste in the container, i.e., no free liquid shall be present.

**Paint.** The paint, as received, shall show no more than slight settling, shall be readily mixed to a smooth, uniform appearance, free from skins or coarse particles and shall be suitable for application by brush or spray.

The paint shall be packed in containers of not more than 19 L.

The paint shall be carefully mixed in such a manner as to avoid excessive agitation, entrapped air, and absorption of moisture. It should not be stored under excessively high temperature. Type I and II paints shall have the following compositions:
### Composition

<table>
<thead>
<tr>
<th>Composition</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pigment</td>
<td>14.0%</td>
<td>--</td>
</tr>
<tr>
<td>Total impurities (mica, filler or other adulterants)</td>
<td>--</td>
<td>0.0%</td>
</tr>
<tr>
<td>Coarse particles (Retained on 45 µm sieve. Calculated on paint basis)</td>
<td>--</td>
<td>0.1%</td>
</tr>
<tr>
<td>Vehicle</td>
<td>--</td>
<td>86.0%</td>
</tr>
<tr>
<td>Non-volatile in vehicle</td>
<td>45.6%</td>
<td>--</td>
</tr>
<tr>
<td>Moisture content (calculated on paint basis)</td>
<td>--</td>
<td>0.1%</td>
</tr>
<tr>
<td>Weight (kg/L)</td>
<td>0.96</td>
<td>--</td>
</tr>
</tbody>
</table>

### Physical Properties

<table>
<thead>
<tr>
<th>Physical Properties</th>
<th>Min.</th>
<th>Max.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drying Time</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Set to touch (hrs.)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Dry hard (hrs.)</td>
<td>--</td>
<td>24</td>
</tr>
<tr>
<td>Viscosity, seconds using No. 4 Ford Cup at 25°C</td>
<td>25</td>
<td>65</td>
</tr>
<tr>
<td>Paint flexibility (based on vehicle's solids - not paint solids), Kauri Reduction</td>
<td>60.0%</td>
<td>--</td>
</tr>
</tbody>
</table>

The percentages noted relate to mixture by weight.

**TEST.** The Type II paint when flowed on a clean glass panel, supported at an angle of 45°, and then allowed to dry, protected from all drafts, for 24 hours at room temperature (20-30°C), shall produce a film comparable in smoothness, color, luster, and capacity to that of a similar film applied at the same time and in the same manner, using a standard comparison paint. The comparison standard shall be prepared by freshly mixing 118 Ml of aluminum paste meeting ASTM D962, Type II, Class B, with 473 Ml of spar varnish meeting Federal Specification TT-V-81F, Type II, Class 2.

The test paints, set aside in a full, tightly closed container for 30 days, at room temperature, shall show no gas pressure when opened. The Type II paint, after this aging period, shall also pass the leaching test.

**SPECIAL METHOD OF TEST**

**Pigment Content.** Pigment content shall be determined as follows: Transfer about 3 grams of sample into a weighed 100 Ml beaker and reweigh as rapidly as possible. Add 50 Ml of benzol, stir, and filter through a weighted, medium porosity sintered glass crucible. Wash the beaker with acetone and police to insure transeral of all insoluble. Wash the insoluble 6 to 8 times with acetone, dry at 105°C, cool and weigh.

\[
\text{Weight Insoluble Pigment, Percent} = \frac{\text{Weight sample}}{x 100}
\]

**Vehicle Non-Volatile.** To determine vehicle non-volatile, first determine the total solids in the paint by the method described under Non-Volatile Matter: ASTM D154 or Federal Test Method Standard No 141a, Method 4053. The vehicle non-volatile can then be calculated as follows:

\[
\text{Non-Volatile Vehicle, Percent} = \frac{\text{(% total solids - % pigment)}}{100 - \% \text{pigment}}
\]

**Total Impurities.** Using the pigment in the pigment content test, determine total impurities by the methods described in ASTM D480, paragraph 3.

**A. Coarse Particles.** Determine the coarse particles in the mixed paint (using a 35 gram sample of paint) by the method described in ASTM D185, §6, or Federal Test Method Standard No. 141a, Method 4091. Coarse particles in the pigment can then be calculated as follows:
Weight of residue
Coarse Particles in pigment, Percent = \(35 \times \% \text{ pigment} \times 100\)

**B. Toughness of Flexibility.** Determine the ability of the mixed paint (not the clear vehicle) to withstand a 60 percent Kauri Reduction test using the method described in ASTM D154 or Federal Test Method Standard No. 141a, Method 4151. As the pigment in the paint tends to obscure the cracks, it will be necessary to examine the bent panel with a 10X glass (or higher magnification) to positively identify them.

**C. Moisture Content.** Determine the amount of moisture in paint using the method described in ASTM D95 or Federal Test Method Standard No. 141a, Method 4082.1 modified as follows: When distillation is complete, a special policeman consisting of rubber disc attached to a heavy wire of sufficient length to permit policing the entire bore of the condenser should be employed. The diameter of the disc should be about 2/3 that of the bore of the condenser. With the policeman and a stream of dry mineral spirits from a wash bottle, carefully police all moisture from the condenser tube into the trap. Disconnect the trap and with a small policeman police all moisture to the bottom. These operations shall be done with great care and attention to detail as the entire success of the test depends on them.

Any required tests with the exception of those detailed above should be run according to applicable ASTM or Federal Specification methods.

**BASIS OF ACCEPTANCE.** Individual Manufacturer's batches of paint will be considered for acceptance in stock lot quantities at manufacturing locations, in accordance with procedural directives of the Materials Bureau, unless otherwise directed by the Department.

All acceptances shall, unless otherwise specified, expire six (6) months after the date of manufacture. Tamper-proof tags for installation on the ring seal shall be affixed by Department representatives in accordance with directives of the Materials Bureau.

Any unauthorized tampering or breaking of tags on the container seals between the time of sealing and the time of application of the paint will be cause for rejection of the paint.

**708-09 BLASTED SURFACE PRIMER**

**BASIS OF ACCEPTANCE.** Whenever this material is specified, the primer paint supplied shall be one of the products on the Department's Approved List entitled "Paints for Structural Steel, A. Primer Paint and Thinners." Acceptance shall be based on the appearance of the primer paint on the Approved List.

**708-10 GRAY PAINT**

**BASIS OF ACCEPTANCE.** Whenever this material is specified, the intermediate paint supplied shall be one of the products on the Department's Approved List entitled "Paints for Structural Steel, B. Intermediate Paint and Thinners." Acceptance shall be based on the appearance of the finish paint on the Approved List.

**708-11 SAGE GREEN PAINT**

**BASIS OF ACCEPTANCE.** Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled "Paints for Structural Steel, C. Finish Paint and Thinners." Acceptance shall be based on the appearance of the finish paint on the Approved List.

**708-12 LIGHT GRAY PAINT**

**BASIS OF ACCEPTANCE.** Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled "Paints for Structural Steel, C. Finish Paint and Thinners." Acceptance shall be based on the appearance of the finish paint on the Approved List.
§708-23

708-13 (VACANT)
708-14 BLACK PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-15 BLUE PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-16 BROWN PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-17 BROWN-GRAY PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-18 DARK GRAY PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-19 DARK BLUE PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-20 STAIN RESISTANT WHITE PAINT

BASIS OF ACCEPTANCE. Whenever this paint is specified, the Contractor shall supply an acrylic waterborne paint specifically intended for exterior use and for use on wood surfaces. The paint shall be approved by the Engineer prior to use.

708-21 (VACANT)
708-22 WHITE CURB PAINT

BASIS OF ACCEPTANCE. Whenever this paint is specified, the material shall conform to the requirements of Section 640.

708-23 WHITE GUIDE RAIL PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled “Paints for Structural Steel, C. Finish Paint and Thinners.” Acceptance shall be based on the appearance of the finish paint on the Approved List.
§708-24

708-24 WEATHERED BROWN GUIDE RAIL PAINT

BASIS OF ACCEPTANCE. Whenever this material is specified, the finish paint supplied shall be one of the products on the Department's Approved List entitled "Paints for Structural Steel, C. Finish Paint and Thinners." Acceptance shall be based on the appearance of the finish paint on the Approved List.

708-25 THROUGH 708-29 (VACANT)

708-30 WOOD PRESERVATIVE - CREOSOTE OIL

SCOPE. These specifications cover creosote used in the treatment of piles, timber and lumber.

MATERIAL REQUIREMENTS. The requirements of American Wood Preservers' Association Standards shall apply except as modified herein.

Creosote used in the treatment of piles, timber and lumber shall conform to the requirements of the following American Wood Preservers' Association Standards:

<table>
<thead>
<tr>
<th>Type of Preservative</th>
<th>AWPA Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coal-Tar Creosote</td>
<td>P 1 Land &amp; Fresh Water</td>
</tr>
<tr>
<td></td>
<td>P13 Marine (Coastal Water)</td>
</tr>
<tr>
<td>Creosote-Coal Tar Solution</td>
<td>P 2 Standard Creosote-Coal Tar-Grade C</td>
</tr>
<tr>
<td></td>
<td>P12 Marine (Coastal Waters) Piles and Timber</td>
</tr>
</tbody>
</table>

Method of application shall be in conformance with American Wood Preservers' Association Standards C1, C2, C3, C4, C5, C14 and C18. Minimum net retention shall be as required for material in contact with soil.

BASIS OF ACCEPTANCE. Acceptance of this material shall be in accordance with procedural directives of the Department.

708-31 WOOD PRESERVATIVE - WATER BORNE

SCOPE. These specifications cover water-borne wood preservatives used in the treatment of piles, timber and lumber.

MATERIAL REQUIREMENTS. Water-borne wood preservatives shall be Ammoniacal Copper Arsenite or Chromated Copper Arsenate conforming to the requirements of American Wood-Preservers' Association Standard P5.

Water-borne wood preservatives shall be applied in conformance with American Wood Preservers' Association Standards C1, C2, C3, C4, C5, C14 and C18. Minimum net retention shall be as required for material in contact with soil.

BASIS OF ACCEPTANCE. Acceptance of this material shall be in accordance with procedural directives of the Department.

708-32 WOOD PRESERVATIVE - OIL BORNE

SCOPE. These specifications cover oil-borne wood preservative used in the treatment of timber and lumber.

MATERIAL REQUIREMENTS. Pentachlorophenol for pressure treatment shall conform to American Wood-Preservers' Association Standard P8.

Oil-borne wood preservative shall be applied in conformance with American Wood-Preservers' Association Standards C1, C2, C5 and C14. The net retention of pentachlorophenol shall be as required for material in contact with soil.

BASIS OF ACCEPTANCE. Acceptance of this material shall be in accordance with procedural directives of the Department.