

SECTION 709—REINFORCEMENT STEEL

709.1 REINFORCEMENT BARS—As indicated, from a manufacturer listed in [Bulletin 15](#), and conforming to the following requirements:

(a) Billet-Steel Bars.

1. Deformed. AASHTO M 31M ([ASTM A 615M](#)), Grade 420 (Grade 60). Where AASHTO M 31M ([ASTM A 615M](#)), Grade 300 (Grade 40) is indicated (non-bridge items only), Grade 420 (Grade 60) may be substituted on a bar-to-bar basis at no additional cost to the Department. If using deformed bent tie bars in pavement structures, use only Grade 300 (Grade 40).

2. Plain. AASHTO M 227/M 227M ([ASTM A 663/A 663M](#)) or AASHTO M 255/M 255M ([ASTM A 675/A 675M](#)), Grade 485, 515, or 550 (Grade 70, 75, or 80). AASHTO M 31/M 31M ([ASTM A 615/A 615M](#)), Grades 300 or 420 (Grade 40 or 60).

(b) Rail-Steel Bars.

1. Deformed. AASHTO M 42/M 42M ([ASTM A 996/A 996M](#)), Grade 420 (Grade 60), including supplementary requirements. Do not weld or bend.

2. Plain. AASHTO M 42/M 42M ([ASTM A 996/A 996M](#)), Grades 350 or 420 (Grade 50 or 60), including supplementary requirements. Do not weld or bend.

(c) Epoxy Coating (Where Indicated).

1. Coating. Coat bars according to [ASTM A 775/A 775M](#), modified as follows:

- Section 5—Materials
Subsection 5.2. Revise completely to read: “Maintain the certification for the powder coating material at the applicator's site and provide a powder coating material meeting the requirements listed in Annex A1.”
- Section 8—Requirements for Coated Steel Reinforcing Bars.
Subsection 8.1.1. Revise the first sentence to read: “For acceptance purpose, provide a coating thickness after curing of $250 \pm 50 \mu\text{m}$ (10 ± 2 mils) on 90% of all recorded thickness measurements.”
- Coating Color—Provide only a light colored coating that will reveal rusted or undercoated areas of steel.

2. Fabrication.

2.a QC. [Section 106.03\(a\)2](#). Submit a QC Plan to the BOCM.

2.b Repair all sheared or cut ends and/or damaged areas with epoxy patching material according to the QC Plan and [ASTM D 3963/D 3963M](#), modified as follows:

- Section 3—Coating Repair Materials
Subsection 3.1. Add the following sentences: “Provide verification that the material has been tested and conforms to Annex 1. Certify each shipment of this material as specified in [Section 106.03\(b\)3](#).”

- Section 7- Repairs
Subsection 7.1.3. Add the following sentence: “Provide patch coating thickness after curing of 7 to 12 mils.”

Handle and store coated bars at the fabricator’s facility according to the requirements of [ASTM D 3963/D 3963M](#).

(d) Low-Alloy Steel Bars.

1. Deformed. [ASTM A 706/A 706M](#), Grade 420 (Grade 60).

(e) Galvanized Reinforcement Bars. Separate bundled pieces before pickling. Galvanize in accordance with [ASTM A 767/A 767M](#). Provide a Class 1 coating mass (weight) conforming to the requirements given in Table 1. Ensure that each piece is completely galvanized. During galvanization, do not handle entire bundles by picking them up at two or more points with a cinched chain or other device that may prevent complete galvanization of the reinforcement bars. Immediately quench the galvanized reinforcement bars in the chromate bath specified in [ASTM A 767/A 767M](#). Use equipment with protected contact areas for handling galvanized reinforcement bars. Test galvanized reinforcement bars for embrittlement after galvanizing by bend testing samples of the galvanized reinforcement bars in accordance with [ASTM A 615/A 615M](#). If bent bars are indicated, perform reverse bend testing to check for embrittlement in accordance with [ASTM A 143/A 143M](#). Reject any lots found to be embrittled. Require the fabricator and the galvanizer to witness testing with both parties retaining signed copies of test results.

709.2 BAR MATS—Steel Bars, [Section 709.1](#), assembled into mats, as shown on the [Standard Drawings](#), by rigidly welding or clipping the bars at joints or points of intersection.

(a) Clips. For mechanical assembly, use 3.8 mm (No. 9 gage) steel wire of sufficient ductility to prevent clip fracture in mat fabrication.

For manual assembly, use 0.74 mm (No. 12 gage) spring steel wire of high elastic limit, conforming to the following chemical analysis:

Element	Percent	
	Min.	Max.
Carbon	0.45	0.70
Manganese	0.90	1.20
Sulfur	0.00	0.045
Phosphorus	0.00	0.045
Silicon	0.08	0.12

(b) Method of Assembly (Using Clips). Hold the bars in close contact by clips designed to exert constant pressure. Assemble at the point of manufacture, using clips of acceptable design, and fasten by mechanical means.

Use double-latching type clips for manual assembly. Use some form of locking device on the clips' free or latching ends so that when the clips are latched in place, no creeping occurs that would allow the bars to be easily moved from their necessary positions.

Provide, approximately, a 25 mm (1-inch) spread of the clips at intersections for necessary leverage to hold bars at right angles. Latch each alternate clip at right angles to the adjacent clips, to ensure maximum rigidity. Use clips of a length so the material is not stressed beyond the elastic limit during the latching process. A minimum length of 100 mm (3 1/2 inches) is necessary for No. 10 to No. 35 (No. 3 to No. 10) bars.

Other types of clips that ensure equal rigidity may be submitted for acceptance.

(c) Acceptance of Design. Submit designs for acceptance, before use.

709.3 STEEL WELDED WIRE FABRIC—AASHTO M 55 ([ASTM A 185](#)). From a manufacturer listed in [Bulletin 15](#), rigidly welded at joints and points of intersection to form a fabric reinforcement, and as shown on the [Standard Drawings](#).

(a) **Epoxy Coating (Where Indicated)**. [ASTM A 884/A 884M](#), Type 1, Class A.

(b) **Galvanized Welded Wire Fabric**. [Section 709.1\(e\)](#). Galvanized Welded Wire Fabric may be substituted for Epoxy Coated Welded Wire Fabric. Galvanize according to [ASTM A123](#) coating Grade 35 – 35 µm (1.4 mils) minimum. Chromate in accordance with [ASTM A767, Section 4.3](#).

709.4 DEFORMED WELDED WIRE FABRIC—AASHTO M 221 ([ASTM A 497](#)). From a manufacturer listed in [Bulletin 15](#) and as shown on the [Standard Drawings](#).

(a) **Epoxy Coating (Where Indicated)**. [Section 709.3\(a\)](#).

(b) **Galvanized Welded Wire Fabric**. [Section 709.1\(e\)](#). Galvanized Deformed Wire Fabric may be substituted for Epoxy Coated Deformed Wire Fabric. Galvanize according to [ASTM A123](#) coating Grade 35 – 35 µm (1.4 mils) minimum. Chromate in accordance with [ASTM A767, Section 4.3](#).

709.5 CERTIFICATION—Certify as specified in [Section 106.03\(b\)3](#).

Identify the appropriate specification on the certification and include the grade of steel. Forward a copy to the project with the shipment of steel.