

ACCESSORY MATERIALS FOR  
CONCRETE PAVEMENT AND CONCRETE STRUCTURES

**SECTION 931**  
**METAL ACCESSORY MATERIALS FOR CONCRETE**  
**PAVEMENT AND CONCRETE STRUCTURES**

**931-1 Reinforcement Steel (for Pavement and Structures).**

**931-1.1 Steel Bars:**

**931-1.1.1 Carbon Steel Bars:** Carbon steel bars for concrete reinforcement shall conform to the requirements of ASTM A615 Grades 60 or 75 except that the process of manufacture will not be restricted. For processes not included in ASTM A615 the phosphorus content will be limited to 0.08%.

**931-1.1.2 Stainless Steel Bars:** Stainless steel bars for concrete reinforcement shall conform to the requirements of ASTM A955, Grades 60 or 75; or ASTM A276, UNS S31653 or S31803.

**931-1.1.3 Low-Carbon Chromium Steel Bars:** Low-carbon chromium steel bars for concrete reinforcement shall conform to the requirements of ASTM A1035 Grade 100.

**931-1.1.4 Special Requirements:** The following special requirements shall apply:

1. Unless otherwise specified or shown in the Plans all reinforcing bars No. 3 and larger shall be deformed bars.
2. Twisted bars shall not be used.
3. Wherever in the Specifications the word "purchaser" appears it shall be taken to mean the Department.

**931-1.1.5 Acceptance of Steel Bars:** Acceptance of reinforcing steel shall be based on the manufacturer being on the National Transportation Product Evaluation Program (NTPEP) list of compliant producers, samples taken by the Department, and manufacturer's certified mill analysis. The test results shall meet the specification limits of the ASTM or AASHTO designation for the particular size, grade and any additional requirements. The manufacturer's certified mill analysis for each heat, size, and grade per shipment of reinforcing steel shall be provided to the Engineer prior to use.

The Engineer will select samples representing each LOT of reinforcing steel. A sample is defined as the reinforcing steel and the certified mill analysis corresponding to the sample. A LOT is defined as the weight of all bars, regardless of size, grade or pay item in consecutive shipments of 100 tons or less. Samples shall be cut from bundled steel that is shipped to the jobsite.

Projects with less than two tons of bars do not require Department sampling.

**931-1.2 Wire Reinforcement:**

**931-1.2.1 Carbon Steel Wire Reinforcement:** Plain and deformed carbon steel wire reinforcement shall meet the requirements of ASTM A1064. Deformed carbon steel wire shall be Grade 75.

**931-1.2.2 Stainless Steel Wire Reinforcement:** Plain and deformed stainless steel wire reinforcement shall meet the requirements of ASTM A276, UNS S30400.

**931-1.2.3 Acceptance of Wire Reinforcement:** Acceptance of wire reinforcement shall be based on the manufacturer's certified mill analysis certifying that the test results meet the specification limits of the ASTM designation for the particular sizes and any additional requirements. Prior to use, submit to the Engineer the manufacturer's certified mill analysis for each heat and size per shipment.

**931-1.3 Carbon Steel Welded Wire Reinforcement:**

**931-1.3.1 Carbon Steel Welded Wire Reinforcement:** Welded wire reinforcing steel shall meet the requirements of ASTM A1064.

**931-1.2.2 Acceptance of Carbon Steel Welded Wire Reinforcement:**

Acceptance of welded wire reinforcement shall be based on the manufacturer's certified mill analysis certifying that the test results meet the specification limits of the ASTM designation for the particular sizes and any additional requirements. Prior to use, submit to the Engineer the manufacturer's certified mill analysis for each heat and size per shipment.

**931-1.4 Couplers for Steel Bars:**

**931-1.4.1 Approved Product List (APL):** The couplers used shall be a product included on the Department's APL.

Manufacturers seeking approval of their product shall demonstrate the performance of their product in accordance with the requirements in 931-1.4.2 through 931-1.4.4 as applicable and 931-1.4.5.

**931-1.4.2 Couplers for Carbon Steel Bars:** Couplers for use with carbon steel bars shall be fabricated from an alloy that is electrochemically compatible with bars that meet the requirements of 931-1.1.1.

**931-1.4.3 Couplers for Stainless Steel Bars:** Couplers for use with stainless steel bars shall be fabricated from an alloy that is electrochemically compatible with bars that meet the requirements of 931-1.1.2.

**931-1.4.4 Couplers for Low-Carbon Chromium Steel Bars:** Couplers for use with low-carbon chromium steel bars shall be fabricated from an alloy that is electrochemically compatible with bars that meet the requirements of 931-1.1.3.

**931-1.4.5 Special Requirements:** Couplers shall develop at least 125% of the specified yield strength of the bar being spliced.

**931-2 Metal Materials for Joints in Concrete Pavement.**

**931-2.1 Sheet Metal Bottom Strips:** The sheet metal strip for protecting the bottom and side edges of transverse expansion joints shall be composed of galvanized sheet metal of 0.0157 inches minimum thickness and shall conform to the requirements of ASTM A653. The sheets shall be furnished in accordance with the dimensions shown in the Plans. They may be in one continuous piece, or spliced. When splicing is used the metal shall be lapped not less than 3 inches and securely fastened, by welding or otherwise, in such manner as to leave the spelter undamaged and produce a smooth sliding surface in contact with the pavement slab. The splices shall be spaced not less than 10 feet apart and not less than 5 feet from either end. The complete sheet shall not vary from a straight line by more than 1 inch from end to end.

The Contractor shall submit to the Engineer a certified mill analysis from the manufacturer of the sheet metal bottom strips including test results for thickness, dimension, grade, length, size, and spacing. Each certified mill analysis shall cover only one type of metal material for joints.

**931-2.2 Bars and Chairs for Longitudinal Joints:** Transverse reinforcing steel across the joint shall be deformed steel bars conforming to the requirements of 931-1.1 except that the bars may be any grade shown in ASTM A615.

These bars, and the chairs to hold them in place, shall be of the type and spacing as indicated in the Plans.

**931-2.3 Dowel Bars:** Dowel bars shall be plain steel bars conforming to the requirements of ASTM A615 for any grade of steel shown. They shall be of the length, size and spacing as shown in the Plans.

The Contractor shall submit to the Engineer a certified test report from the manufacturer of the dowel bars confirming that the requirements of this Section are met. The certified test report shall conform to the requirements of Section 6 and include metallurgical mill analysis, grade, length and size. Each certification shall cover only one LOT for dowel bars.

**931-2.4 Chairs and Metal Expansion Caps:** The chairs and metal expansion caps shall be of an approved type as shown in the Plans.

Dowel bars for expansion joints shall have a metal cap on one end so placed to provide ample space for movement of the slab. Continuous sleeves covering one half of the length of the bar will not be permitted. Other fasteners may be approved. Dowel bars shall be coated with an approved material to break the bond.

### **931-3 Metal Dowel Bar Assemblies for Joints in Concrete Pavement.**

**931-3.1 Approved Product List (APL):** The dowel bar assembly used shall be a product included on the Department's APL.

Manufacturers or distributors seeking approval of their material in accordance with this specification shall demonstrate the performance of their products in accordance with the requirements in 931-3.2 thru 931-3.6.

**931-3.2 Rigidity:** The dowel bars shall be supported by an approved welded assembly possessing sufficient rigidity to hold the dowel bars in position to such accuracy that error or deviation from its required position in any bar in the entire installation after the pavement has been finished shall be no greater than 1/2 inch.

The assembly shall have continuous parallel spacer bars and two continuous parallel bearing members of no less than 1/4 inch diameter wire. One spacer bar shall be located at or near each end of the dowel. Alternate ends of dowels shall be welded to a spacer bar in such a manner as to maintain the dowels parallel to each other and permit sliding movement in the joint.

The free ends of each dowel shall be retained securely in place by means of wire loops or metal tubes welded to the other spacer bar. An expansion cap shall be installed on one end of each bar if the dowels are being used in an expansion joint.

Suitable struts or ties shall be provided to hold the assembly in correct position during installation.

The assembly shall have an upright support welded to the spacer bar and continuous bearing member at the end of each dowel and a continuous bearing member.

If the upright support consists of a single vertical wire, the support shall be no less than 5/16 inch diameter wire. Otherwise, the support shall be no less than 1/4 inches in diameter.

**931-3.3 Sand Plates:** Sand plates, if required, shall be made from no less than 3/8 inch sheet steel. Each plate shall have no less than 0.1 square feet of bearing area. The plates shall be

furnished in sufficient number to provide uniform support for the complete assembly. They may be furnished separate from the assembly units or attached thereto by welding, suitable clips, or other approved means.

**931-3.4 Welds:** The welds of the assembly shall be made securely. A broken weld will be cause for rejection of the length of section of the assembly where it occurs.

**931-3.5 Assembly Placement:** When the dowel bar assembly is in place, it shall act as a rigid unit with each component part securely held in position relative to the other member of the assembly.

The entire assembly shall be held securely in place during placing, consolidating, and finishing the concrete by means of metal pins. Pins used on granular subbase or cold mixed bituminous stabilized subbase shall penetrate at least 12 inches below the dowel bar assembly. The pins shall be of no less than 1/4 inch diameter wire and shall be provided with a hook or arm welded to the pin in such a manner that it shall secure the assembly in place.

Nail securing systems may be used as an anchoring device on hot bituminous stabilized subbase. The nail shall be no less than 1/8 inch in diameter, no less than 2 inches in length and the nail head or attached washer shall be not less than 1/2 inch outside diameter. The nail shall be driven through both ends of a metal strap after it has been placed around one of the lower transverse bars on the dowel bar assembly.

At least eight pins or nails shall be used for each 12 foot section (a lane width) of assembly. Sand plates, if required, shall be drilled to receive the pins.

The Contractor shall provide the equipment and personnel necessary to verify dowel bar location after the concrete is placed and has received the initial screeding.

**931-3.6 Materials:** The wire for the welded assembly shall be in accordance with all applicable requirements of ASTM A82.

After fabrication, apply one coat of alkyd primer meeting the material requirements of SSPC Paint 104. Apply the primer in accordance with the manufacturer's recommendations.

**931-4 Wire for Site Cage Machines:**

The wires for site cage machines shall meet the requirements of ASTM A1064 or ASTM A706.