

## **SECTION 933 PRESTRESSING STEEL**

### **933-1 Strands for Prestressing.**

The strands for prestressing concrete members shall be Grade 270, low-relaxation strand and shall conform to the requirements of ASTM A416.

### **933-2 Bars for Prestressing.**

The bars for prestressing concrete members shall conform to the requirements of ASTM A722, Type II.

### **933-3 Parallel Wire Assemblies for Prestressing.**

The wire assemblies for prestressing concrete members shall consist of parallel wires of the number and size shown in the Plans and shall conform to the requirements of ASTM A421.

### **933-4 Anchorages for Prestressing.**

**933-4.1 For Strands and Bars:** Meet the requirements of Section 960.

**933-4.2 For Parallel Wire Assemblies:** Anchorage for parallel wire assemblies may be provided by Type BA (Button Anchorages) cold-end deformation of the wires bearing against suitable anchorage plates, or by Type WA (Wedge-type Anchorages) without cold end deformations, of the sandwich-plate or conical type. The anchorage device shall be capable of developing at least 90% of the specified ultimate strength of the total number of wires anchored.

Conical type anchorages shall be embedded within the ends of the concrete members unless otherwise specified. Anchorages shall generally bear against embedded grids of reinforcing steel of approved type.

Alternate type anchorages will be considered if proposed by the Contractor. Any alternate anchorage will be required to develop the full specified ultimate strength for bars or at least 90% of the specified ultimate strength for parallel wire assemblies.

### **933-5 Required Tests for Prestressing Steel.**

**933-5.1 General:** Tests shall be performed to determine the physical characteristics of prestressing reinforcement. For tests specified to be made by the manufacturer, certified copies of all test results shall be submitted to the Engineer prior to use.

**933-5.2 Strands:** Acceptance of prestressing strands shall be based on samples taken by the Department and the manufacturer's certified mill analysis certifying that the test results meet the specification limits of ASTM or AASHTO as specifically designated. Prior to use, submit to the Engineer the manufacturer's certified mill analysis for each heat or production LOT per shipment of strand.

Certifications for prestressing strand shall contain, for each heat number or production LOT, all test results required by ASTM A416 and the modulus of elasticity expressed in psi or the stress-strain curve with units identified.

The Engineer will select samples and certified mill analysis representing each shipment at a frequency of one sample per manufacturer, per size of strand, per shipment.

**933-5.3 Bars:** Acceptance of prestressing bar shall be based on samples taken by the Department and the manufacturer's certified mill analysis certifying that the test results meet specification limits of the ASTM or AASHTO as specifically designated. Prior to use, submit to the Engineer the manufacturer's certified mill analysis for each heat or production LOT and size

per shipment of bars. Certifications of prestressing bar shall contain, for each heat number or production LOT, all test results required by ASTM A722 and the modulus of elasticity expressed in psi or the stress-strain curve with units identified.

The Engineer will select samples and certified mill analysis representing each shipment at a frequency of one sample per heat or production LOT, per size of bar, per shipment.

**933-5.4 Wires:** Acceptance of wires shall be based on the manufacturer's certified mill analysis of test results meeting the specification limits of the ASTM or AASHTO as specifically designated. Prior to use, submit to the Engineer the manufacturer's certified mill analysis for each heat or production LOT per shipment of wire. Certifications of prestressing wire shall contain, for each heat number or production LOT, all test results required by ASTM A421.