

## SECTION 709 - REINFORCING STEEL, WIRE ROPE AND PRESTRESSING STEEL

## 709.01 Reinforcing Steel.

(A) **Bar Reinforcement.** Bar reinforcement shall conform to ASTM A 615 with the following modifications:

- (1) Bars shall be of the deformed type.
- (2) Reinforcing bars shall be of Grade 40 or Grade 60. The Contractor shall use Grade 60 reinforcing bars when specified in the contract.
- (3) The Contractor shall make steel for bars by the open hearth or electric furnace process.
- (4) The Engineer will not permit the use of cold twisted bars.
- (5) The supplementary requirements specified in ASTM A 615 shall apply to bar designation numbers.

(B) **Steel Wire Reinforcement.** Steel wire for reinforcement shall conform to ASTM A 82.

(C) **Welded Wire Fabric Reinforcement.** Welded wire fabric reinforcement shall conform to:

- (1) ASTM A 185 if made of smooth wire or
- (2) ASTM A 497 if made of deformed wire.

The contract will provide the size of the wire.

(D) **Bar Mat Reinforcement.** Bar mat reinforcement shall conform to ASTM A 184. The bars used shall conform to Subsection 709.01(A) - Bar Reinforcement. Other details shall be as specified in the contract.

(E) **Dowels.** Plain or deformed bar dowels shall conform to ASTM A 615 Grade 40 or 60.

For plain dowels used at expansion joints and other locations shown in the contract and for dowels used as load transfer devices in portland cement concrete pavements, the Contractor shall paint half (1/2) the length of each dowel bar with one (1) coat of tar paint before delivery to the work site. The sleeves for dowel bars shall be metal or PVC of an accepted design to cover two (2) inches + one (1) inch of the dowel with a closed end and with a suitable stop to hold the end of the sleeve at least one (1) inch from the end of the dowel bar. Sleeves shall be of such design that the sleeves do not collapse during construction.

709.01

(F) Tie Bars. At the Contractor's option, tie bars for pavement joints shall be: \*|  
\*|

(1) reinforcing steel bars of either Grade 40 or Grade 60 conforming to ASTM A 615 or \*|  
\*|

(2) deformed reinforcing steel bars of the regular or special grades conforming to AASHTO M 42. \*|  
\*|

The Contractor shall not use rail steel (AASHTO M 42) or Grade 60 (ASTM A 615) reinforcing steel bars for the bars that the Contractor bends bent and re-straightens during construction. \*|  
\*|

709.02 Wire Rope or Wire Cable. The tension cables shall be: \*|

(1) three-fourths (3/4) of an inch preformed, six (6) by nineteen (19) wire strand core or independent wire rope core (IWRC), \*|  
\*|

(2) zinc-coated ASTM A 603, \*|

(3) Class A coating, \*|

(4) right regular lay, \*|

(5) made of improved plow steel, and \*|

(6) with a minimum breaking strength of twenty-three (23) tons. \*|

The Contractor shall furnish two (2) certified copies of mill test reports of each manufactured length of cable used to the Engineer. \*|  
\*|

The Contractor shall furnish one (1) sample of cable, three (3) feet long, to the Engineer for testing for each fifty (50) cable assemblies or fraction furnished. \*|  
\*|

Cable clips shall be commercial quality, drop forged, zinc-coated steel. |

The Contractor shall make steel cable clamps according to ASTM A 307. |

The steel for the U-bolts and plates shall conform to American Iron and Steel Institute C 1020, hot-rolled steel with a minimum tensile strength of fifty-five thousand (55,000) pounds per square inch. |

Nuts shall conform to ASTM A 307 for Grade B bolts. |

At the option of the Contractor, end turnbuckles shown in the contract may be steel pipe type or drop forged steel. Intermediate turnbuckles shall be steel pipe type.

Drop forged steel turnbuckles shall conform to Federal Specifications FF-T-791b. Steel pipe turnbuckle bodies shall conform to Federal Specifications FF-T-791 for Type II, Class 2. Pulls for the pipe type turnbuckle bodies shall be of steel conforming to American Iron and Steel Institute C 1035. The Contractor shall anneal zinc-coat the pulls suitable for cold swaging.

The Contractor shall zinc-coat the steel parts and cable assemblies according to Subsection 712.10 - Zinc-Coating.

**709.03 Prestressing Steel.** Prestressing steel shall be:

- (1) uncoated stress-relieved wire conforming to ASTM A 421, or
- (2) uncoated seven (7) wire stress relieved strand conforming to ASTM A 416 Grade 270, or
- (3) high-tensile alloy bars conforming to the requirements below.

The Contractor shall stress-relieve and then cold-stretch the high-tensile strength alloy bars to a minimum of one hundred thirty thousand (130,000) pounds per square inch. After cold stretching, the physical properties shall be as follows:

Ultimate tensile strength, psi (minimum)	145,000
Yield strength, measured by the 0.7 percent extension under load method, psi (minimum)	130,000
Modulus of elasticity (minimum)	25,000,000
Elongation in 20-bar diameters after rupture, percent (minimum)	4
Diameter tolerance, inch	+0.03,-0.01

The Contractor shall assign and tag the wire, strand, bars, or anchorage assemblies that the Contractor will ship to the site a lot number for identification purposes.

Samples furnished shall represent the lot. For wire or strand, the Contractor shall take from the same master roll.

The Contractor shall furnish the materials specified for testing at no cost to the State. The Contractor shall be responsible for delivering the materials in time for testing ahead of anticipated use.

The Contractor shall furnish following samples of material and tendons to the Engineer ahead of anticipated use:

**(A) Pretensioning Method.**

(1) The Contractor shall furnish three (3) samples, each three (3) \*|  
feet long, of each strand size. The Contractor shall take a sample \*|  
from each manufactured reel of prestressing steel strand. \*|

**(B) Post-Tensioning Method.** The Contractor shall furnish the samples of \*|  
the following lengths: \*|

(1) For wires requiring heading, five (5) feet long. |

(2) For wires not requiring heading, sufficient length to make up |  
one (1) parallel-lay cable five (5) feet long. |

(3) For strand with fittings, five (5) feet between near ends of |  
fittings. |

(4) For bars with threaded ends and nuts, five (5) feet long \*|  
between threads at ends. |

(5) **Anchorage assemblies.** The Contractor shall furnish two (2) \*|  
anchorage assemblies complete with distribution plates of each size \*|  
and type if the Contractor does not attach the anchorage assemblies \*|  
to reinforcement samples. \*|