New Hampshire

Department of Transportation

Standard Specifications 2016

SECTION 544 – REINFORCEMENT FOR CONCRETE

Description

1.1 This work shall consist of furnishing and placing reinforcement for concrete as shown on the plans or ordered.

1.1.1 Manufacturers of reinforcing steel must participate in, and maintain compliance with, the AASHTO National Transportation Product Evaluation Program (*www.ntpep.org*) that audits producers of reinforcing steel.

Materials

2.1 Bar reinforcement shall be Grade 420 (Grade 60) or as shown on the plans.

2.1.1 Billet-steel bars shall conform to AASHTO M 31.

2.1.2 Rail-steel bars shall conform to AASHTO M 322M.

2.2 Welded steel wire fabric shall conform to AASHTO M 55.

2.3 Bundled reinforcement shall be used only as shown on the plans or with written permission.

2.4 Epoxy Coated Reinforcing Steel.

2.4.1 Epoxy coated reinforcing steel shall meet the requirements of ASTM D3963.

2.4.2 A written certification by the manufacturer of the powdered epoxy resin attesting to the ASTM D3963 requirements shall be provided.

2.4.2.1 The certificate shall also contain the insignia or other similar statement that the plant is a currently approved fusion-bonded epoxy coating applicator, as defined by the Concrete Reinforcing Steel Institute (CRSI) Plant Certification Program.

2.4.3 The epoxy coating applied to the bars shall be uniform and smooth and shall provide a film thickness of 10 ± 2 mils after curing.

2.4.4 All chair and bar supports used for the installation of epoxy coated reinforcing bars shall be epoxy-coated, vinyl-coated, or plastic-coated wire bar supports. Plastic slab bolster bar supports may be utilized for installing epoxy coated reinforcing bars. Continuous plastic bar supports between the top and bottom mats are not acceptable.

2.5 Synthetic Fiber Reinforcement. Synthetic fiber reinforcement shall be a product as included on the Qualified Products List.

Construction Requirements

3.1 Bar list. The Department's bar list and bending schedule are made for the purpose of arriving at an estimate of quantities. The Contractor shall verify the quantity, size, and shape of the bar reinforcement against the structure drawings and make the necessary corrections, if any, before ordering. Errors in the bar list and bending schedule shall not be cause for adjustment of Contract unit price.

3.2 Surface condition of reinforcement. The reinforcing steel, at the time concrete is placed, shall be free of dirt, paint, oil, or other organic materials that may adversely affect or reduce bond. Metal reinforcement coated with firmly bonded rust, mill scale, or a combination of both shall be considered satisfactory provided the minimum dimensions and weight of a hand wire-brushed test specimen are not less than the applicable specification requirement. Rust or mill scale which is difficult to remove by vigorous scrubbing with a wire brush shall be considered firmly bonded to the steel.

3.3 Bending. Unless otherwise permitted, all reinforcing bars shall be bent cold. Bars partially embedded in concrete shall not be field bent except as shown on the plans or permitted. Only competent people shall be employed for cutting and bending, and proper appliances shall be provided for such work. Should the Engineer approve the application of heat for field bending reinforcing bars, precautions shall be taken to assure that the physical properties of the steel will not be materially altered.

3.4 Placing and fastening. Reinforcing steel shall be free from mortar and other objectionable substances, shall be accurately placed as shown or ordered, and shall be securely blocked and tied unless otherwise permitted. Blocking shall be by rust-resistant chairs unless otherwise permitted. Tack welding will be prohibited except upon special written approval of the Engineer. This provision also prohibits welding form ties to the reinforcement.

3.4.1 Reinforcing steel for bridge decks shall be epoxy coated unless otherwise shown on the plans. Bridge deck reinforcing steel shall be placed on epoxy or plastic-coated steel wire supports in accordance with 2.4 and the Concrete Reinforcing Steel Institute Manual of Standard Practice. The bottom reinforcing shall be supported on type SB supports with the end of the supporting wire lapped to lock the last legs of adjoining units. The top reinforcing shall be supported by type CHCU bar supports placed between the top and bottom mats. The ends of the top supporting wire shall be lapped. The supports shall be sized and spaced to allow for the minimum cover of the reinforcing bars called for on the plans. At least 50 percent of the junctions of the reinforcing mat shall be tied.

3.4.2 If plain reinforcing steel for the bridge deck is called for on the plans, then plastic protected or stainless steel protected supports may be used to support the bottom reinforcing mat and bright basic bar supports may be used between the top and bottom mats.

3.4.3 Concrete shall not be placed in any member until the placement of the reinforcing steel has been inspected and approved.

3.5 Splices. Reinforcing steel shall be furnished in the full lengths indicated on the plans unless otherwise permitted. Splices shall be made as shown on the plans or as permitted. No splices will be permitted at points where the section does not provide a minimum distance of 2" between the splices and the nearest adjacent bar or surface of the concrete. The bars shall be rigidly clamped or wired at all splices. Sheets of metal mesh shall overlap each other sufficiently to maintain uniform strength and shall be securely fastened at the ends and edges.

3.5.1 Splices made with mechanical connectors shall be as detailed on the plans or as permitted and shall develop an ultimate strength at least 125% of the specified yield strength of the reinforcing bar being spliced. The minimum concrete cover over the reinforcing steel as shown on the plans shall be maintained at the mechanical splice.

3.5.1.1 The Contractor shall submit two mechanical connectors connecting two 12" sections of reinforcing steel of each size per lot per project. Connector and reinforcing steel assemblies will be tested by the Department.

3.6 Handling, fabrication, and repair of epoxy coated reinforcing steel shall be in conformance with the applicable sections of ASTM D3963.

3.6.1 If stored outdoors, the bars shall be covered for protection against the elements and in such a manner that condensation does not form on the bars. The bars shall not be exposed to sunlight for periods exceeding two months.

3.7 Epoxy coated reinforcing steel which requires cutting shall be sawn. No flame-cutting will be allowed. Cut ends of bars shall be recoated with epoxy as soon as possible and before visible oxidation occurs.

3.8 Synthetic fiber dosage rate. The dosage rate shall be 7 lb/cy unless otherwise approved, in writing, by the Engineer.

Method of Measurement

4.1 Reinforcing steel of the type specified, except reinforcing steel (roadway), will not be measured, but shall be the pound final pay quantity in accordance with 109.11 for reinforcing steel required as shown on the plans. Reinforcing steel (roadway) will be measured by the pound of reinforcing steel placed as shown on the plans or ordered. The theoretical weight of reinforcing steel will be computed based on the following table:

Table 544-1 - Reinforcing Steel Weight - English

Size Bar #	3	4	5	6	7	8	9	10	11	14	18
Lb. per Linear Foot	0.376	0.668	1.043	1.502	2.044	2.670	3.400	4.303	5.313	7.65	13.60

4.2 Synthetic fiber reinforcement will not be measured but shall be the pound final pay quantity complete in accordance with 109.11 for the dosage rate specified.

Basis of Payment

5.1 Reinforcing steel of the type specified, except reinforcing steel (roadway), are final pay quantity items and will be paid for at the Contract unit price per pound complete in place in accordance with 109.11. The accepted quantity of reinforcing steel (roadway) will be paid for at the Contract unit price per pound complete in place. No allowance will be made for clips, wire or other material used for fastening reinforcement in place, and no allowance will be made for additional splices or permitted substitutions.

5.1.1 For mechanical splice bars no allowance will be made in excess of the length detailed on the plans for the additional weight required to manufacture and provide a mechanical splice to the plan specifications.