2009
Oklahoma Department of Transportation
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The Department will pay for drilled shafts and piling required by the Contract in accordance with Section 516, "Drilled Shaft Foundations," and Section 514, "Driven Foundation Piles," respectively.

SECTION 511
REINFORCING STEEL FOR STRUCTURES

511.01 DESCRIPTION

This work consists of providing and placing reinforcing steel.

511.02 MATERIALS

A. General

Provide reinforcing steel consisting of deformed bars, epoxy-coated deformed bars, and cold-drawn wire mesh. Provide reinforcing steel in accordance with Section 723, "Reinforcing Steel." Ensure the strength requirements are in accordance with Grade 60 (420), unless otherwise required by the Contract. Provide cold-drawn wire for spiral ties and other reinforcing designated in W (wire) sizes.

B. Bar Lists and Bending Diagrams

Use the bar list and bending diagrams in the Contract to estimate quantities. Ensure bent bars are dimensioned out-to-out. Before ordering, verify and correct the quantity, size, and shape of the bar reinforcement.

If the bar list and bending diagram are not included in the Plans, create and submit them for the Engineer's approval in accordance with Subsection 105.02, "Plans and Working Drawings." Obtain the Engineer's approval before constructing vertical reinforcement in columns, walls, and piers.

C. Fabrication

(1)Bending

Fabricate reinforcing bars in accordance with ACI 318 (318M). Cold-bend reinforcing bars unless otherwise required by the Contract. If the Engineer allows heating for field bending reinforcing bars, ensure the physical properties of the steel remain unaltered. Do not bend bars partially embedded in concrete unless otherwise required by the Contract.

(2)Hook and Bend Dimensions

If the hook dimensions or the bend diameters are not shown on the Plans, provide hooks in accordance with ACI 318 (318M).

(3)Identification

Ship bar reinforcement in standard bundles, tagged and marked in accordance with CRSI *Manual of Standard Practice*.

511.03 EQUIPMENT — VACANT

511.04 CONSTRUCTION METHODS

A. Protection of Material

(1)General

Store reinforcing steel on platforms or skids. Protect steel from damage.

Use clean reinforcing steel meeting the minimum dimensions, cross-sectional area, and tensile properties in accordance with the Contract required steel size and grade. Use reinforcing steel that is not cracked, laminated, or contaminated with deleterious material. Leave thin, powdery rust and tight rust that does not affect the cross section.

(2)Epoxy Coated Reinforcing

Support coated bars on pads. Pad bundled bands. Lift bars using a strong back, multiple supports, or a platform bridge. Prevent bar-to-bar abrasion. Avoid dropping or dragging bundles.

Before placement, inspect the bars for coating damage. Clean damaged areas by removing contaminants and damaged coating. Remove rust by blast-cleaning or power-tool-cleaning. Roughen the areas, then patch the defects with prequalified patching, or repair in accordance with AASHTO M 284. After placement, clean and patch new damage.

Treat the damaged bars as specified by the resin manufacturer, before oxidation occurs. Overlap the original coating with the patching material by 2 in [50 mm], or as recommended by the manufacturer. Provide a dry film thickness at least 8 mil [200 mm] thick on the patched areas.

Replace bars with severely damaged coatings. The Department considers severely damaged coating as a coating with damage to at least 18 in [450 mm] of the bar length and 5 percent of the surface area. Coat mechanical splices after splice installation in accordance with AASHTO M 284 for patching damaged epoxy coatings.

B. Placing and Fastening

(1)General

Place reinforcing steel in the positions required by the Contract. While placing concrete, use supports to firmly hold the reinforcing steel in place. The Department will not allow spot-welding of reinforcing steel.

Measure the spacing of parallel bars from center to center. For circular cages, measure along the curve. For concrete clearance, measure the distance from the concrete face to reinforcing steel.

Space parallel bars, center to center, from two and one-half times the bar diameter to one and one-half times the maximum nominal size of the concrete coarse aggregate plus one bar diameter.

For bridge decks, place reinforcing steel within ¼ in [6 mm] of the location shown on the Plans. For slabs and walls less than 12 in [300 mm] thick, place reinforcing steel within ½ in [12 mm] of the location shown on the Plans. Provide 2 in [50 mm] of clear cover, measured perpendicular to the nearest concrete

surface, for reinforcement unless otherwise specified in the Contract. For structure elements in direct contact with the ground, such as footings, abutments, retaining walls, and piers, provide 3 in [75 mm] of clear cover.

Space parallel bars within 1½ in [40 mm] of the Contract required spacing. The Engineer will not accept cumulated spacing variations. Ensure the average of the spaces between two adjacent spaces does not exceed the Contract required spacing.

For mats and cages, tie reinforcing bars at intersections. If spacing is less than 12 in [300 mm] in both directions, tie alternate intersections. Tie intersections around the perimeter of a mat. Tie intersections of the last stirrup, hoop, or complete turn of a spiral at both ends of a cage.

Tie bundle bars together at intervals no greater than 6 ft [2 m]. Bundle bars only if the location and splice details are required in the Contract. Use plastic-coated ties to tie epoxy-coated bars.

Obtain Engineer approval before placing concrete reinforcement.

(2)Support System

Support reinforcing steel with mortar blocks, wire bar supports, supplementary bars, or other approved devices. Use enough supports to maintain the bar position within tolerances. Space slab bar supports no more than 4 ft [1.2 m] apart, transversely or longitudinally. The Department will not allow the use of reinforcing steel or bar supports to carry equipment and platforms for workers.

(3)Mortar Blocks

Use mortar blocks with the same color and texture as the poured concrete encasing the mortar block. Provide mortar blocks with a compressive strength equal to or greater than that of the poured concrete encasing the mortar block. For blocks in contact with the forms, make the face of the blocks no bigger than 2 in × 2 in [50 mm × 50 mm]. Attach concrete block supports to the bar with 14 gauge [2 mm] wire cast in the center of each block. If supporting epoxy-coated reinforcing, use plastic or epoxy-coated wire.

(4)Wire Supports

If using wire supports, use ferrous metal chairs and bolsters in accordance with the CRSI *Manual of Standard Practice*. Use Class 1 plastic-protected, Class 1 Type A epoxy-coated, or Class 2 Type B stainless-steel-protected metal supports in contact with exposed concrete surfaces and metal deck forms. Use stainless steel supports in accordance with ASTM A 493, Type 430. Use a dielectric material to coat chairs, tie-wires, and other devices that support, position, or fasten epoxy-coated reinforcement. Use plastic supports only for prestressed concrete bridge members.

C. Splices

(1)General

Provide reinforcing steel in lengths required by the Contract. Unless otherwise required by the Contract, obtain written approval by the Engineer before splicing, except for splices of No. 4 [No. 13] or smaller bars.