



## SECTION 706

### REINFORCING STEEL FOR CONCRETE STRUCTURES

**706.1 Description.** This work shall consist of furnishing and placing reinforcing steel of the designated shape, size and grade as shown on the plans.

#### **706.2 Material.**

**706.2.1** All material shall be in accordance with Division 1000, Material Details, and specifically as follows:

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**706.2.2** Reinforcing steel shall be accurately cut and bent to the dimensions and shapes shown on the plans. Cutting and bending tolerances for reinforcing steel shall be in accordance with the Concrete Reinforcing Steel Institute's *Manual of Standard Practice*. Flame-cutting of uncoated reinforcing steel will be permitted.

#### **706.3 Construction Requirements.**

**706.3.1** Reinforcing steel shall be protected from damage at all times. When placed in the work and before concrete is placed, reinforcing steel shall be free from dirt, oil, paint, grease, loose mill scale, thick rust, any dried mortar and other foreign substances. A thin layer of powdery rust may remain. All reinforcing steel required for superstructure concrete, such as slabs, girders and beams and top slabs of culverts with more than a 4-foot span, shall be held securely in correct position with approved metal or plastic bar supports and ties. Reinforcing bars shall be positively secured against displacement. For bridge decks and top slabs of culverts, bars in the top mat shall be tied at all intersections except where spacing is less than or equal to 12 inches in each direction, in which case alternate intersections shall be tied. At other locations, the bars shall be firmly tied at alternate crossings or closer. The steel shall be tied in the correct position with proper clearance maintained between the forms and the reinforcement. The contractor shall construct the unit as shown on the plans. Measurements to reinforcing steel will be made to the centerline of bar, except where the clear distance from face of concrete is shown on the plans.

**706.3.2** Bars shall not be spliced, except as shown on the plans or as directed by the engineer.

**706.3.3** Mechanical bar splice systems, as shown on the plans, shall be capable of developing 125 percent of the specified yield strength of the bar being spliced and shall be installed in accordance with the manufacturer's recommendations and as modified herein.

**706.3.3.1** The contractor shall furnish to the engineer a manufacturer's certification stating that the mechanical bar splice systems are in accordance with this specification. The certification shall include or have attached specific results of tests showing yield and ultimate tensile load capacities.

**706.3.3.2** The splicing system may attach directly to the bars being coupled or may be of a type that provides reinforcing bars of like size that lap with the bars being joined. A threaded-

type splice system will be required where clearance considerations require the splicing device to be placed flush to the face of the construction joint for the initial concrete placement.

**706.3.3.3** Regardless of the type of splicing system that will be used, the total bar lengths for bars indicated in the bill of reinforcing steel are determined based on the end of the bars being located flush to the face of the construction joint. No additional payment will be made for any additional bar lengths required for the mechanical bar splices. Reinforcing bar lengths shown in the bill of reinforcing steel may require modification to accommodate the specific mechanical bar splice system that will be used. The contractor shall determine the actual reinforcing bar lengths to accommodate the manufacturer's recommendations for installation of the mechanical bar splices.

**706.3.3.4** For mechanical bar splice systems that require laps with the reinforcement, the minimum lap length on each side of the joint shall be as shown in the tables below. Mechanical bar splice systems that require laps with the reinforcement shall not be used for voided slab and solid slab bridges. Systems that require laps shall be Grade 60 deformed bars in accordance with [Sec 1036](#). Epoxy-coated bars shall have epoxy-coated mechanical bar splices.

<b>Required Lap Length – Top Bars</b>				
<b>Equal or greater than 12 in. (300 mm) of concrete below bar</b>				
<b>Bar Size</b>	<b>Plain Reinforcing</b>		<b>Epoxy Coated Reinforcing</b>	
	Bar Spacing Less Than 6 in. on Center	Bar Spacing More Than or Equal to 6 in. on Center	Bar Spacing Less Than 6 in. on Center	Bar Spacing More Than or Equal to 6 in. on Center
	Inches	Inches	Inches	Inches
<b>f'c = 3 ksi</b>				
4	29	23	35	28
5	36	29	44	35
6	47	37	56	45
7	63	51	77	61
8	82	66	100	80
9	105	84	127	102
10	133	106	161	129
11	163	131	198	159
<b>f'c = 4 ksi</b>				
4	29	23	35	28
5	36	29	44	35
6	43	35	53	42
7	55	44	66	53
8	71	57	87	69
9	91	73	110	88
10	115	92	139	112
11	142	113	172	137

Bar Size	Required Lap Length – Other than Top Bars less than 12 in. of concrete below bar			
	Plain Reinforcing		Epoxy Coated Reinforcing	
	Bar Spacing Less Than 6 in. on Center	Bar Spacing More Than or Equal to 6 in. on Center	Bar Spacing Less Than 6 in. on Center	Bar Spacing More Than or Equal to 6 in. on Center
	Inches	Inches	Inches	Inches
<b>f'c = 3 ksi</b>				
4	21	17	31	25
5	26	21	39	31
6	33	27	50	40
7	45	36	68	54
8	59	47	88	71
9	75	60	112	90
10	95	76	142	114
11	117	94	175	140
<b>f'c = 4 ksi</b>				
4	21	17	31	25
5	26	21	39	31
6	31	25	46	37
7	39	32	59	47
8	51	41	76	61
9	65	52	97	78
10	82	66	123	99
11	101	81	152	121

**706.4 Method of Measurement.** Final measurement will not be made except for authorized changes during construction or where appreciable errors are found in the contract quantity. Where required, measurement of reinforcing steel will be made to the nearest 10 pounds for each structure. The weight will be the plan weight of uncoated bars, and will not include mechanical bar splice systems, clips, wire, supports, spacers or other fastening devices for holding the reinforcement in place. Allowances will not be made for an overrun in scale weights of bars. The revision or correction will be computed and added to or deducted from the contract quantity. Mechanical bar splice systems will be measured per each.

**706.5 Basis of Payment.** The accepted quantity of reinforcing steel including any approved mechanical bar splice systems, complete in place, will be paid for at the contract unit price.