

BRIDGE DESIGN STANDARD PRACTICES

The following standard practice has been established by the Bridge Design Standard Practices Committee.

METRIC REINFORCING BARS

The Department has been and will continue to develop plans, specifications and estimates in the metric system of measurement. The conversion process to metric involves both "Hard" and "Soft" metric conversions. In a "hard" metric conversion, the actual physical size of the item is changed and its size is defined in metric dimensions. In a "soft" metric conversion, the actual physical size of the item, in Customary U.S. units, is mathematically converted to its metric equivalent.

The details and specifications on many projects show "hard" conversion metric reinforcing bars. This was based on the initial intentions of the reinforcing bar industry to convert to a "hard" metric standard. Recently, the American Society for Testing and Materials (ASTM) approved several changes in the national standards for reinforcing bars. The previous specification for "hard" metric sized bars was eliminated and replaced with a new specification that uses "soft" conversion metric reinforcing bars. These bars are the same reinforcing bars that we have been using on non-metric projects with new designations based on the diameter of the bar in millimeters. The change in the ASTM A615M specification will make "hard" metric reinforcing bars difficult to specify and obtain.

The Department is changing over to the "soft" metric reinforcing bar specification. All projects shall be designed using the "soft" metric reinforcing bars. Table 'B' shows the designations and section properties of these new "soft" metric bars.

In addition, projects designed using the "hard" metric bars were designed for and specified to be Grade 400 material. The new "soft" converted bars are available in Grade 420. The minimum design yield strength of Grade 400 reinforcing bars is 400 MPa and for Grade 420 bars it is 414 MPa. The design of all structures should reflect these changes in both bar designations and yield strength.

There are many projects that are designed and detailed with the "hard" metric reinforcing bar sizes. In the interim, the Department will allow the substitution of "soft" metric reinforcing bars for the "hard" metric bars based on substitutions listed in Table 'A' for projects that are too far along in the design process to allow for the redesign using "soft" metric bars. Table 'A' should be placed on the General Plan sheet for all structures that are detailed with "hard" metric bars. This should be done, when necessary, prior to the plan going out to bid. For projects that have already been advertised and/or awarded, this table should be placed on the plans by construction order.

The "soft" metric bars can be substituted by the Contractor, however no change in bar spacing, the number of bars, or the length of lap splices will be allowed. As stated in the Standard Specifications (Form 815), Article 1.09.03, payment for this item will be based on the actual mass of reinforcing bars installed and accepted.

The following note shall also be placed on the plans in conjunction with Table 'A':

METRIC REINFORCEMENT

These plans are detailed with "hard" metric reinforcing bars. "Soft" metric reinforcing bars may be substituted based on Table 'A'. The soft metric bars can be substituted, however no change in bar spacing, the number of bars, or the length of lap splices will be allowed.

TABLE 'A'		
Hard Metric Bars (Shown on Plans)	Soft Metric Bars (Substitution)	Equivalent U.S. Customary Bar
#10M	#13M	#4
#15M	#16M	#5
#20M	#22M	#7
#25M	#25M	#8
#30M	#32M	#10
#35M	#36M	#11
#45M	#43M	#14
#55M	#57M	#18

Note: The "soft" metric bars and the U.S. Customary bars are the same bars with different designations.

TABLE 'B' - ASTM STANDARD METRIC REINFORCING BARS			
BAR SIZE DESIGNATION	NOMINAL DIMENSIONS		
	DIAMETER (mm)	AREA (mm²)	MASS (kg/m)
#10M	9.5	71	0.560
#13M	12.7	129	0.994
#16M	15.9	199	1.552
#19M	19.1	284	2.235
#22M	22.2	387	3.042
#25M	25.4	510	3.973
#29M	28.7	645	5.060
#32M	32.3	819	6.404
#36M	35.8	1006	7.907
#43M	43.0	1452	11.38
#57M	57.3	2581	20.24

1. ASTM A615M Grade 300 is limited to sizes #10M through #19M.
2. Check availability with local supplier for #43M and #57M