

SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15		New York State Department of Transportation ENGINEERING INSTRUCTION	EI 97-011
Title: REINFORCING STEEL, METRIC MARKINGS, AND YIELD STRENGTH			
SUPERSEDED BY EB 15-031 EFFECTIVE 9/28/15	Approved: irs (33) ants (34) tors (39) _____ ()  P.J. Clark, Deputy Chief Engineer Design Division <u>5/1/97</u> Date		

Administrative Information. This engineering instruction will become effective for the letting of 09/11/97. It issues a note replacing the note issued with EB 95-34 dealing with metric reinforcing bars. It also issues a note replacing the shelf note entitled "Epoxy-Coated Bar Reinforcement, Grade 60" which has been in use since the letting of 5-6-93.

Purposes. The purposes of this instruction are:

1. To explain the numbering system manufacturers plan to use, starting in early 1997, to identify and mark the different bar sizes of reinforcing steel.
2. To issue notes modifying our Metric Standard Specifications and Standard Sheets to reflect the July 10, 1996 revision to ASTM A615(M). It is believed the english unit notes will not be necessary because of the language in the April 1997 Approved List.
3. To issue a policy statement regarding the acceptability of reinforcing steel with newer markings on older contracts and older markings on newer contracts.
4. To issue a design policy regarding which re-bar yield strength to assume for design purposes.

Background.

Reinforcing Bar Sizes and Markings. The 1995 Standard Specifications contain bar sizes and grades based on American Society for Testing and Material A615M-93. This specification is a hard conversion. That is, it is a genuine metric specification containing bars based on convenient metric cross sectional areas of 100, 200, 300, 500, etc mm.² In 1995, reinforcing steel manufacturers, however, and the Concrete Reinforcing Steel Institute approached the Department and requested that they not be held to this genuine metric standard. Instead, they proposed retaining the traditional bar sizes familiar to nearly everyone in the construction industry. This department and most transportation departments around the country granted this request because it would enable the suppliers of rebar to maintain just a single inventory of bars which could be used in either metric or customary unit contracts.

ASTM A615M-93, the genuine metric rebar specification, was replaced by the metric portion of a combined English/metric ASTM specification, ASTM A615/615M-96a dated 7-10-96. This industry standard essentially uses two sets of numbers to describe a single set of sizes. That is, for example, a 5/8 inch rebar could be referred to under the new ASTM 615/615M specification as a number 5 bar if manufactured to the english unit portion of the specification and number 16 if manufactured to the metric leg of the specification. The designation "16" corresponds to the 15.9 mm diameter that would be possessed by a round bar of mass equal to that of a number 16 bar. Table 1 of the ASTM, included below, lists the example bar as 5[16] and for that bar lists the weight or mass of the bar as 1.043[1.552]pounds/linear foot[kilograms/meter.]

The manufacturers indicate that while the bars are dual marked in the table, they plan to mark the bars, however, with only the metric designation, and manufacture to the 1996 metric standard starting in early 1997. Therefore, in the upcoming season, we may be seeing both English marked bars and metric marked bars on construction contracts.

Grades of Reinforcing Steel. Grades are listed in the Standard Specifications as grade 300 for §709-03 and grade 400 for §709-04. This corresponds, loosely, to the old 40,000 and 60,000 psi. yield strengths, respectively. Under the new ASTM 615/615M specification, however, these strengths are to be designated as Grades 300 and 420. These grades, if soft converted to english units, correspond to 43,510 psi and 60,914 psi., respectively. Thus, bars produced to the new metric standard will be slightly stronger, theoretically, than similar bars produced to the older specification.

Design Policy. Starting with the mentioned letting date, designers should call out bar sizes using the new metric bar numbering sizes. However, until further notice, designers should continue to use 60,000 psi as the yield strength of a grade 420 bar when calculating in the inch pound system, or, if calculating in metric units, use 410 MPa instead of the higher yield stress indicated by the grade of the steel.

Similarly, for the grade 300 bars, continue to use 40,000 psi or 275 M Pa, when doing calculations.

Acceptability of Bars on Contracts. Regardless of whether marked in the english sizes (3,4,5...11,14,18) or the metric sizes (10, 13,16,19, 22, 25, 29, 32, 36, 43, or 57), bars which are in conformance with ASTM A615/615M-96a or the earlier industry standard are acceptable on department english unit contracts or on metric unit contracts. Sizes and properties of the bars must be based on the Table given below. This table has been taken from ASTM A 615/615M-96a.

Table 1. Mass, Diameter, Cross Sectional Areas, and Perimeters of Bars.

BAR DESIGNATION	Nominal Weight or Mass lbs/foot or [kg/m]	Nominal Diameters inches or [millimeters]	Cross Sectional Areas sq. inches or [millimeters ²]	Perimeter of bar inches or [millimeters]
3[10]	0.378 [0.580]	0.375 [9.5]	0.11 [71]	1.178 [29.9]
4[13]	0.668 [0.994]	0.500 [12.7]	0.20 [129]	1.571 [39.9]
5[16]	1.043 [1.552]	0.625 [15.9]	0.31 [199]	1.963 [49.9]
6[19]	1.502 [2.235]	0.750 [19.1]	0.44 [284]	2.356 [59.8]
7[22]	2.044 [3.042]	0.875 [22.2]	0.60 [387]	2.749 [69.8]
8[25]	2.670 [3.973]	1.000 [25.4]	0.79 [510]	3.142 [79.8]
9[29]	3.400 [5.060]	1.128 [28.7]	1.00 [645]	3.544 [90.0]
10[32]	4.303 [6.404]	1.270 [32.3]	1.27 [819]	3.990 [101.3]
11[36]	5.313 [7.907]	1.410 [35.8]	1.56 [1006]	4.430 [112.5]
14[43]	7.65 [11.38]	1.693 [43.0]	2.25 [1452]	5.32 [135.1]
18[57]	13.60 [20.24]	2.257 [57.3]	4.00 [2581]	7.09 [180.1]

Note. The numbers in brackets are metric markings or properties.

Contact Persons. Structures Division, Anil Desai (518) 457-2595 or Larry Brown of the Design Quality Assurance Bureau at (518) 457-4093.

METRIC BAR REINFORCEMENT

Make the following changes to the Standard Specifications of January 2, 1995:

Page vi

Under §709-01, **replace** "400" with " 420."

Under §709-04, **replace** "400" with " 420."

Page 5-33, Line 18, **replace** "400" with " 420."

Page 5-48, Line 41, **replace** "400" with " 420."

Page 5-64, Line 8, **replace** "400" with " 420."

Page 5-66, Lines 3 and 5, **replace** "35" with "36."

Page 5-67, Line 15, **replace** "Table 556-1" with the following.

TABLE 556-1
UNIT MASS OF DEFORMED BARS

Bar Number	10 (3)	13 (4)	16 (5)	19 (6)	22 (7)	25 (8)	29 (9)	32 (10)	36 (11)	43 (14)	57 (18)
Mass (kg/m)	0.580	0.994	1.552	2.235	3.041	3.973	5.060	6.404	7.907	11.38	20.24

Note. Numbers in parenthesis are bar sizes in numbers of eighths of inches.

Page 5-78, Line 16, **replace** "400" with " 420."

Page 5-91, Line 28, **replace** "400" with " 420."

Page 6-11, Line 45, **replace** "400" with " 420."

Page 6-20, Line 16, **replace** "400" with " 420."

Page 6-112, Line 28, **replace** "400" with " 420"

Page 6-112, Line 30, **replace** "400" with " 420."

Page 6-178, Line 25, **replace** "400" with " 420."

Page 7-27, Lines 9 and 11, **replace** "400" with " 420."

Page 7-33, Line 36, **replace** "400" with " 420."

Page 7-48, Line 37, **replace** "400" with " 420."

METRIC BAR REINFORCEMENT

Page 7-57, Line 5, *replace* "400" with " 420."

Page 7-57, Line 10, *replace* "400" with " 420."

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Page 7-64, Line 1, *replace* "400" with " 420."

Page 7-64, Line 12, *replace* "400" with " 420."

Page 7-92, Line 20, *replace* "400" with " 420."

Page 7-92, Line 26, *replace* "400" with " 420" and *replace* "A615M" with "A615."

Page 7-92, Line 27, *replace* "400" with " 420" and *replace* "A616M" with "A616."

Page 7-92, Line 29, *replace* "400" with " 420" and *replace* "A615M" with "A615."

Page 7-93, Lines 17 and 18, *replace* "A615M" with "A615."

Page 7-93, Line 23, *replace* "400" with " 420."

Page 7-93, Line 28, *replace* "400" with " 420."

Page 7-95, Lines 19 thru 24, *replace* Table 709-01 with the following

**TABLE 709-01
BEND TEST REQUIREMENTS**

Bar Number	10 (3)	13 (4)	16 (5)	19 (6)	22 (7)	25 (8)	29 (9)	32 (10)	36 (11)	43 (14)	57 (18)
Mandrel Diam. (mm)	76	102	127	152	178	203	229	254	279	432	584

Note: Numbers in parenthesis are bar sizes marked in eighths of inches

Page 7-96, Line 38, *replace* "400" with " 420."

Page 7-97, Line 25, *replace* "400" with " 420" "

Page 7-97, Line 29, *replace* "400" with " 420."

Page 7-98, Line 42, *replace* "400" with " 420" and *replace* "#15" with "#16."

Page 7-100, Line 15, *replace* "400" with " 420."

Page 7-147, Line 36, *replace* "400" with " 420."

Page 7-150, Line 10, *replace* "400" with " 420."

Page 7-197, Line 26, *replace* "400" with " 420."