

**PHYSICAL REQUIREMENTS
FOR 1984 STANDARD ASTM
DEFORMED REINFORCING BARS (a)**

Type of Steel and ASTM Specification No.	Size Nos. Inclusive	Grade	Tensile Strength Min., psi	Yield Min., psi (b)
Billet-Steel A 615	#3-#6	40	70,000	40,000
	#3-#11 #14, #18	60	90,000	60,000
Rail-Steel A 616	#3-#11	50	80,000	50,000
	#3-#11	60	90,000	60,000
Axle-Steel A 617	#3-#11	40	70,000	40,000
	#3-#11	60	90,000	60,000
Low-Alloy Steel A 706	#3-#11 #14, #18	60	80,000 (c)	60,000 (d)

- (a) For more detail refer to the current CRSI *Manual of Standard Practice*.
- (b) Yield strength. See ASTM specifications.
- (c) Tensile strength shall not be less than 1.25 times the actual yield strength (A 706 only).
- (d) Maximum yield strength 78,000 psi (A 706 only).

Other useful references:

- *Placing Reinforcing Bars*, 4th Edition, 1981 - CRSI
- *Reinforcement Anchorages and Splices*, 2nd Edition, 1984 - CRSI
- "Bend Tests of Grade 60 Reinforcing Bars" by Kudder and Gustafson, *Journal of the American Concrete Institute*, May/June 1983.
- "Bending and Straightening of Grade 60 Reinforcing Bars" by Stecich, Hanson and Rice, *Concrete International: Design & Construction*, August 1984.

IDENTIFICATION MARKS - ASTM STANDARD BARS

The ASTM specifications for billet-steel, rail-steel, axle-steel and low-alloy steel reinforcing bars (A 615, A 616, A 617, and A 706 respectively) require identification marks to be rolled into the surface of one side of the bar to denote the producer's mill designation, bar size, type of steel and minimum yield designation. Grade 60 bars show these marks in the following order:

- 1st - Producing Mill (usually a letter)
- 2nd - Bar Size Number (#3 through #18)
- 3rd - Type Steel: **S** for Billet meeting (A 615)

- R** for Rail meeting ASTM A 617, Grade 60 bend test requirement (A 616) [per ACI 318-83]
- I** for Rail (A 616)
- A** for Axle (A 617)
- W** for Low-Alloy (A 706)

4th - Minimum Yield Designation

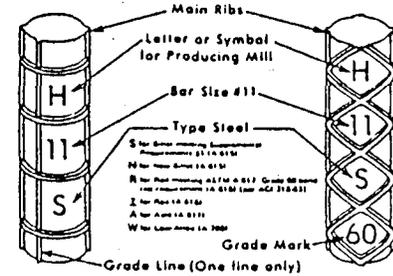
Minimum yield designation is used for Grade 60 bars only and can either be one (1) single longitudinal line (grade line) or the number 60 (grade mark).

A grade line is smaller and between the two main ribs which are on opposite sides of all U.S. made bars. A grade line must be continued at least 5 deformation spaces. A grade mark is the 4th mark on a bar.

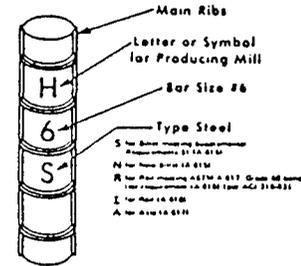
Grade 40 and 50 bars are required to have only the first three identification marks (no minimum yield designation).

VARIATIONS: Bar identification marks may be oriented as illustrated or rotated 90°. Grade mark numbers may be placed within separate consecutive deformation spaces. Grade line may be placed on the side opposite the bar marks.

BAR IDENTIFICATION MARKS



GRADE 60



GRADE 40 AND 50

ASTM STANDARD REINFORCING BARS

BAR SIZE	NOMINAL AREA (sq. inches)	WEIGHT (pounds per ft.)	NOMINAL DIAMETER (inches)
# 3	0.11	0.376	0.375
# 4	0.20	0.668	0.500
# 5	0.31	1.043	0.625
# 6	0.44	1.502	0.750
# 7	0.60	2.044	0.875
# 8	0.79	2.670	1.000
# 9	1.00	3.400	1.128
#10	1.27	4.303	1.270
#11	1.56	5.313	1.410
#14	2.25	7.650	1.693
#18	4.00	13.600	2.257