

ENGINEERING SPECIFICATION

I. OBJECTIVE

To provide a carbon steel of structural quality which has 36,000 psi (250 MPa) minimum yield strength to be used for parts fabricated from plate, bar and structural shapes.

II. SPECIFICATION

Standard Grade

ASTM A36/A36M

Chemical Composition, (% Ladle Analysis)

	PLATES				
	To 3/4 (20) Incl.	Over 3/4 (20) To 1-1/2 (40) Incl.	Over 1-1/2 (40) To 2-1/2 (65) Incl.	Over 2-1/2 (65) To 4 (100) Incl.	Over 4 (100)
Carbon, max.	0.25	0.25	0.26	0.27	0.29
Manganese		0.80 - 1.20	0.80 - 1.20	0.85 - 1.20	0.85 - 1.20
Phosphorus, max.	0.040	0.040	0.040	0.040	0.040
Sulfur, max.	0.050	0.050	0.050	0.050	0.050
Silicon			0.15 - 0.40	0.15 - 0.40	0.15 - 0.40

	Shapes	Bars			
	All	To 3/4 (20) Incl.	Over 3/4 (20) To 1-1/2 (40)	Over 1-1/2 (40) To 4 (100) Incl.	Over 4 (100)
Carbon, max.	0.26	0.26	0.27	0.28	0.29
Manganese			0.60 - 0.90	0.60 - 0.90	0.60 - 0.90
Phosphorus, max.	0.040	0.040	0.040	0.040	0.040
Sulfur, max.	0.050	0.050	0.050	0.050	0.050

Mechanical Properties, minimum

Tensile Strength, psi (MPa) 58,000 (400)
Yield Strength, psi (MPa) 36,000 (250)
Elongation, in 8 in. % 20

Bend Test

Longitudinal bend test specimens shall withstand being cold formed through 180 degrees without cracking on the outside bent portion. The inside diameter is related to the specimen thickness as follows:

Thickness, inches (mm)	Ratio Bend Diameter/Thickness
3/4 (20) and under	1/2
Over 3/4 (20) through 1 (25)	1
Over 1 (25) through 1-1/2 (40)	1-1/2
Over 1-1/2 (40) through 2 (50)	2-1/2

The above ratios apply to a test specimen only. Plates bent in a fabricating operation require more liberal bending radii. See suggested bend radii under Engineering Information.

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Quality

Structural Shapes: Structural Quality, Semi-Killed

Plate: Structural Quality, 1-1/2 (40) and under: Semi-Killed

Over 1-1/2 (40): Killed

Bars: Under 40.8 lbs/ft.: Merchant Quality

Over 40.8 lbs/ft.: Special Quality, Fully Killed

Dimensional Tolerances

Shall conform with ASTM A6/A6M requirements.

Certification

The supplier shall include with each material in subcontracted lot shipped to Hyster Company a statement certifying compliance with HC-7 requirements signed by an authorized representative of the supplier. The following information will be reported for each heat of steel supplied to Hyster Company.

- (1) Mechanical Properties
- (2) Chemical Composition

III. ENGINEERING INFORMATION (Not Part of Requirements)

Material covered by this specification has good weldability and formability and is intended to be used for general structural applications where minimum mechanical properties are required.

Structural shapes, bars and plate is readily available from warehouses (stockholders) as well as mills.

The following bend radii recommendations should be used in the design of formed parts.

Preferred Minimum Radius	2.0T
Minimum Radius with grain	1.5T
across grain	1.0T

Method of Specifying

For Plates and bars, specify

HC-7

For Structural Shapes*, specify

HC-7 shape and size

* See Structural Shapes Method of Specifying Page F1.004.

Manufacturing

Recertification

Recertification of incoming material to a planned quality level will be performed, consistent with product classification, vendor performance and total quality cost.

Welding

Welding technique is of fundamental importance and it is assumed that welding procedures will be suitable for the steel and the intended service, and will meet the requirements of HC-704 Weld Quality Standard.

Processes

The material covered by this specification can be welded with all arc welding processes.

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Surface Condition

Welds shall be deposited under low hydrogen conditions. Weld joint surfaces shall be free of moisture, oil, paint, and other hydrogen sources. Normal mill scale can be tolerated on most welds, but shall be removed where the high quality welds are required.

Electrodes

Low hydrogen electrodes or processes shall be used for welding this material. Mild steel electrodes may be used when lower joint yield strength is specified on the fabrication drawing.

Reference Specifications

ASTM A36/36M	Standard Specification for Structural Steel
BS4360	Grade 43A Weldable Structural Steel
DIN 17100	Grade St44-2 Steels for General Structural Purposes
JIS G3101	Rolled Steel for General Structure, Grade Class 2 (5541)

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