

ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

**STEEL (HSS) - LOW SULFUR HSLA, 60 KSI
(414 MPa) YIELD**

ESL-M1A261-A

1. SCOPE

The material defined by this specification is a fully killed, fine grain high strength low alloy steel containing columbium for strengthening. The material is produced using desulfurization processes to attain low levels of sulfur for improved formability. Inclusion shape control through the use of additions such as rare earths, zirconium, or titanium is not permitted.

2. APPLICATION

This material is intended for use in the manufacturing of light truck wheel rims and discs, but is also applicable to other structural components and is available in hot rolled gages of 0.071 in (1.8 mm) to 0.375 in (9.5 mm).

3. REQUIREMENTS

The following requirements must be substantiated with sample testing by the appropriate materials engineering department prior to supplier approval and, thereafter, as often as deemed necessary by the manufacturer.

3.1 STANDARD REQUIREMENTS FOR PRODUCTION MATERIALS

Material suppliers and part producers must conform to the Company's Standard Requirements For Production Materials (WSS-M99P1111-A).

3.2 CHEMICAL COMPOSITION (ASTM A 568 or SAE J409)

Ladle Analysis (Percent)

Carbon	0.10 max
Manganese	0.30/0.90
Phosphorus	0.025 max
Sulfur	0.010 max
Silicon	0.10-0.60
Columbium	0.12 max
Aluminum	0.020/0.085 (Aim Only)

Date	Action	Revisions
2002 07 19	Revised	Non-technical revisions, updated and renumbered R. Lord
1981 10 26		Released 7L2-012C-331

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Gages over 0.180 in (4.6 mm) may require additional chemistry. Suppliers desiring approval to this specification using micro-alloying elements other than columbium or additional chemistry must submit samples to the appropriate materials engineering department for consideration.

3.3 MECHANICAL PROPERTIES
(ASTM A 370)

Longitudinal Properties

Yield Strength (0.2% Offset), min 60 000 psi (414 MPa)

Tensile Strength, min 75 000 psi (518 MPa)

Elongation in 2 in (50 mm), min 22 %

3.4 FORMABILITY
(ASTM E 290)

Transverse test samples shall pass the above mentioned 180 degree bend test at room temperature, using a bend radius not exceeding 1/2 the thickness of the base material.

3.5 WELDABILITY

This material shall be weldable using any of the usual processes: shielded metal-arc, submerged-arc, flux-cored arc, gas metal-arc, or resistance welding. Approval for resistance spot weldability will be based on FLTM BA 13-4. Carbon, manganese, and silicon composition provided by the supplier should reflect the necessity for good weldability for the intended application.

4. GENERAL INFORMATION

The information given below is provided for clarification and assistance in meeting the requirements of this specification.

4.1 MICROSTRUCTURE

The microstructure should indicate a uniform ferritic grain size of 10 or finer. Since this material is produced using desulfurization processes, it shall show practically no evidence of stringer type inclusions.

4.2 HARDNESS

Rockwell B 80-90