

ENGINEERING MATERIAL SPECIFICATION

Material Name

Specification Number

**STEEL BARS, PRODUCED FROM CONTINUOUSLY
CAST BLOOMS OR BILLETS, CERAMIC SHROUD
PROTECTION**

ESL-M1A289-A

1. SCOPE

The material defined by this specification is a fully killed, aluminum fine grain, forging quality steel produced using a continuously cast straight or curved mold process.

2. APPLICATION

This specification was released originally for light truck components manufactured from steel bars produced by the continuously cast steelmaking process with the purpose of defining and controlling steelmaking parameters and quality. It is intended to be used where aluminum fine grain steel is a necessity. The casting process requires maximum molten stream protection for improved steel cleanliness.

The chemical grade will be specified on the engineering drawing.

Any variances shown on the engineering drawing supersede this specification.

3. REQUIREMENTS

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 GENERAL REQUIREMENTS

3.2.1 Deoxidation and Grain Refinement

All steel shall be grain refined using aluminum as a ladle addition. Wire feeding of aluminum or other chemical additions directly into individual strand molds is prohibited.

3.2.2 Ladle Temperature Uniformity

An appropriate method of molten steel agitation in the ladle (such as argon bubbling or electro-magnetic stirring) shall be used to obtain ladle temperature uniformity. The use of coolant scrap in the ladle shall be kept to a minimum.

3.2.3 Stream Protection

Date	Action	Revisions
2002 09 30	Revised	Updated and renumbered
1992 02 03	NL00E00893603	3.2.1 & 3.2.2, 3.2.3 & 5. Revised CAM
1985 11 06	TQ2-017B-143	Released

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The molten streams must be protected from reoxidation using ceramic shrouds from tundish-to-mold and an effective shroud system from ladle-to-tundish. A suitable mold powder shall be used to cover and lubricate the liquid meniscus in each individual mold. The use of lubricating oils is prohibited.

3.2.4 Casting Temperature

Tundish temperatures shall be measured and recorded during the casting process and at least once during the beginning, middle, and end of each heat. Temperatures in terms of degrees over the liquidus for the grade of steel being cast shall be recorded, charted, and reviewed on a regular basis. Heats which are cast too hot and evidenced by heavy dendritic structure (paras 3.2.2.2 and 3.2.3.2) shall not be applied to this specification.

3.3 QUALITY TEST PROCEDURES

3.3.1 Macroetch Testing
(ASTM E 381)

Although both transverse and longitudinal sectioning is preferred, only transverse as-cast sections are required and shall be taken from the front and back of each strand for each individual heat of steel. An additional section from the middle of each strand is preferred but not required and shall be taken when casting parameters are in question.

When sequence casting multiple heats of the same grade, a reduced sampling frequency is allowed such that the front and back of each strand in the sequence and only the middle from each strand for each heat in the sequence is tested. Should casting parameters be in question, sampling shall be as specified above for an individual heat.

Sulphur print testing or an alternative macroetch testing procedure may be used to evaluate internal quality, providing suitable reference photographs comparing the alternative procedure to the standard reference photographs are submitted and approved.

Sampling after the first breakdown stage of the cast bloom is allowed for large cast sections (645 cm² or larger) only after prior approval of the standard photographs.

All macroetches and sulphur prints shall be rated and recorded for future reference.

Suppliers who demonstrate the ability to detect all defects using non-destructive testing may request a waiver of the above testing.