

INTERNATIONAL TRUCK AND ENGINE CORPORATION		
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TITLE: Gray Cast Iron, Brake Drum		REVISION; E – 1
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1.0 APPLICATION

This specification covers a gray cast iron which is used in automotive brake drums or clutch plates, flywheels and similar applications requiring a high level of strength and resistance to thermal checking or cracking.

2.0 SCOPE

This specification covers the manufacture, chemical composition, mechanical properties, microstructure, quality, and qualification.

3.0 REFERENCE DOCUMENTS

Unless otherwise specified, the latest issue of all referenced standards shall apply. The following standards, specifications and regulations are referenced in this specification.

Quality System Standard QS-9000 (ISO 9001)	ASTM E 8
INTERNATIONAL IQR Quality Standard	ASTM A 247
INTERNATIONAL Manufacturing Standard D-13	INTERNATIONAL Drawing AD-3391
CFR Title 29, Part 1910	

4.0 REQUIREMENTS

4.1 Manufacture

The brake drums shall be cast from an electric furnace gray iron which has been inoculated during pouring to produce the required mechanical properties and microstructure. The mechanical properties and microstructure shall be the controlling characteristics.

4.2 Chemical Composition

The following chemical composition is recommended:

Total Carbon	3.40-3.80%
Silicon	1.50-2.00%
Manganese	0.60-0.90%
Phosphorus	0.15 max
Sulfur	0.12 max
Carbon Equivalent	3.90-4.30%

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4.2.1 Deviations from the recommended chemical composition shall be submitted to the using Plant Metallurgist. The deviation shall be approved if the castings are machinable and the required mechanical properties and microstructure are produced. See Qualification Procedure, 5.1.

4.3 Tensile Properties

The control of tensile properties shall be primarily by Brinell hardness on a statistical basis. The vendor is responsible for controlling his processing and sampling shipments of brake drums to assure the following hardness requirements on the braking surface:

	<u>$\pm 2\sigma$ Range</u>	<u>$\pm 3\sigma$ Range</u>
BHN (3000 kg)	207-255	187-269

4.3.1 If hardness is measured other than on the braking surface, correlation data shall be supplied to the using Navistar Plant so that the alternate site can be approved for production control. The Brinell hardness control, however, is not intended to circumvent the basic requirement of the drum, which is tensile strength. The tensile strength shall be determined on specimens cut from the braking surface cross section per ASTM E-8, Figure 16, Specimen 2 preferred. The centerline of the reduced section of the tensile bar shall be at or near the center of the braking surface width. (Sub-size and rectangular specimens may be taken by agreement with the International Plant.)

	<u>95% of Drums</u>	<u>100% of Drums</u>
Ultimate Tensile Strength, MPa	215 min	185 min
, psi	31 200 min	26 900 min

4.3.2 The BHN values should assure the minimum tensile strength values shown but tensile strength is the controlling or referee value. Vendors shall be required to tensile test drums frequently enough to prove the tensile-BHN relationship is valid for their foundry. If it is not, then separate correlation values will be established for their product. Records of all hardness-tensile data shall be made available to International personnel when requested. See General Information for further discussion.

4.4 Microstructure, Brake Drum Surface

4.4.1 Graphite**	Type A	90% min Size 3-5
	Type B, D, & E	10% max

** Type and size of graphite shall be evaluated using ASTM A-247 - Recommended Practice for Evaluating the Microstructure of Graphite in Cast Iron.

4.4.2 Matrix

Shall consist of lamellar pearlite with 1% max free ferrite and 5% max free carbides when viewed at a magnification of 100X.

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