

NAVISTAR, INC.		
CEMS (CORPORATE ENGINEERING MATERIAL SPECIFICATION)		NUMBER: CEMS D-18
TITLE: Gasketing Materials		CURRENT ISSUE DATE: April 2009
WRITTEN/REVIEWED BY: Materials Engineering	APPROVED BY: Materials Engineering	SUPERSEDES ISSUE OF: December 2001
PRINTED COPIES OF THIS DOCUMENT MUST BE VERIFIED FOR CURRENT REVISION		
<i>This specification may involve hazardous materials, equipment, and procedures. This specification does not purport to address all of the safety issues associated with its use. The user is responsible to consult appropriate safety and health practices and to determine the applicability of regulatory limits prior to use.</i>		
Change Notice: Replaced "International Truck and Engine Corporation" with "Navistar, Inc." per corporate directive; added CEMS B-50 requirement; editorial changes.		

1.0 SCOPE

This specification covers requirements for nonmetallic, non-asbestos gasketing materials used in products manufactured by the Company. Rubber gasket materials are also specified in Engine Material Specification (EMS) D15-5010.

2.0 INTRODUCTION

Materials covered by this specification are intended for use with coolants, fuel, lubricating oil, hydraulic fluid, brake fluid, refrigerants and air.

2.1 Restricted Chemical Substances

Effective January 1, 2007, all product supplied to the requirements of this specification must comply with the requirements of the CEMS B-50 specification.

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4.0 REFERENCE DOCUMENTS

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

Quality System Standard ISO 9001 or TS-16949	Engine Material Specification D15-5010
NAVISTAR Manufacturing Standard MS-D-13	Engine Material Specification D15-5011
NAVISTAR Engineering Design Standard A-16	Engine Material Specification D18-5008
CFR Title 29, Part 1910	ASTM F104
NAVISTAR CEMS B-50	

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5.0 CLASSIFICATION AND CONSTRUCTION

Gaskets are classified by grade as shown in Table 1 below. The last digit of the grade indicates the recommended upper temperature limits (Example 203 = 300°F[150°C], 206 = 600°F[315°C]). Many factors influence a material's temperature resistance in an application. Engine Material Specification D18-5007 converts directly to this specification.

Table 1 - Grade Classification

GRADE	OBSOLETE NAVISTAR GRADE	MATERIAL DESCRIPTION	RECOMMENDED UPPER TEMPERATURE LIMIT °C [°F]
102	10	Cork and Rubber	100 [212]
(1)	11	Rubber	100 [212]
122	12 or 10	Cork and Rubber	100 [212]
203	20	Non-metallic, non-asbestos	150 [302]
206	20	Non-metallic, non-asbestos	315 [600]
303	30	Non-metallic, non-asbestos	150 [302]
306	30	Non-metallic, non-asbestos	315 [600]
406	40	Non-metallic, non-asbestos	315 [600]
413	41	Non-metallic, non-asbestos	150 [302]
416	41	Non-metallic, non-asbestos	315 [600]

(1) Contact Materials Engineering for appropriate replacement product.

6.0 GENERAL REQUIREMENTS

The requirements are based on sheets of material and/or sheets coated with specific release coatings. Product supplied will meet requirements for the grade specified as shown in Table 2.

6.1 Lamination

Lamination is permitted only when the process has the approval of Materials Engineering and only for combining two thicknesses to produce a sheet greater than the un laminated thickness. Approval of the lamination process is based on the combined sheet meeting all of the following requirements:

6.1.1 Must have same physical strength characteristics as the single thickness sheet.

6.1.2 Must have the same fluid resistance as single thickness sheet.

6.1.3 Must have same aging characteristics as single thickness sheet.

6.1.4 Must not delaminate at the bond line.

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Table 2 - Gasket Properties

GRADE	102	122	133	203	203
Supplier Code			3	1	1
Material Code			E	B	B
Gasket Thickness mm(in.)			1.6(.062)	.25(.010)	.79(.031)
(1) Compressibility, %	30-55	30-50	40-60	15-25	14-24
(1) Recovery, % min.	75	75	15	30	30
(1) Density, kg/m ³ (lb/ft ³), min.	497(31)	513(32)	609(38)	1280(80)	1250(78)
(1) Tensile Strength, MPa (psi), min.	.96(140)	1.4(200)	1.5(220)	6.9(1000)	6.9(1000)
(2) Creep Relaxation, % max.	-	-	-	15	30
Immersion Change in Volume, %					
(1) ASTM Fuel A	-2 to +15	-2 to +10	-	0 to +15	0 to +15
(2) ASTM #1 Oil	±10	±10	-	0 to +10	0 to +10
(1) ASTM #3 Oil (IRM903)	0 to +45	0 to +30	0 to +45	0 to +15	0 to +15
(2) Distilled Water (by weight) max.	--	--	40	0 to +25	0 to +25
Distilled Water/ Ethylene Glycol (1:1 By Volume)	--	--	--	0 to +30	0 to +30
(2) Sealability, ml/h, max.	--	--	--	-	-
(2) Flexibility - No cracks, breaks or separations	Pass	Pass	Pass	Pass	Pass
(2) Adhesion	--	--	--	--	--
(2) Dimensional Stability	--	--	--	--	--
(2) Crush Extrusion	--	--	--	--	--
Comments				To be used with EMS D15-5011	To be used with EMS D15-5011

- (1) Properties to be used for batch certification.
(2) Properties to be used for periodic re-certification (annually or better).

6.2 Release Coatings

6.2.1 Material supplied to this specification may require a release coating in order to meet the adhesion requirement.

6.2.2 The release coating must not cause corrosion on flanges.

6.3 Mechanical and Physical Properties

See the appropriate table for each grade. Material supplied to this specification may require a release coating in order to meet the adhesion requirement. Some properties are designated as typical values. Material will not be rejected on typical properties. The NAVISTAR receiving plant's quality department will request the supplier to furnish data on typical properties within one year of furnishing material. Data is to be forwarded to Materials Engineering for incorporation into this specification.

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Table 2 - Gasket Properties - Continued

GRADE	203	203	203	203	203	203
Supplier Code	1	1	2	2	2	2
Material Code	A	F	A	A	A	A
Gasket Thickness mm(in.)	.79(.031)	.38(.015)	.41(.016)	.79(.031)	1.2(.047)	1.6(.062)
(1) Compressibility, %	15-25	10-20 (3)	15-25	15-25	15-25	15-25
(1) Recovery, % min.	35	30	35	35	35	35
(1) Density, kg/m ³ (lb/ft ³), min.	1300(81)	1120(70)	1200(75)	1200(75)	1200(75)	1200(75)
Tensile Strength, MPa(psi), min.	6.9(1000)	5.2 (750)	9.6(1400)	9.6(1400)	9.6(1400)	9.6(1400)
(2) Creep Relaxation, % max.	30	16	20	35	40	50
Immersion Change in Thickness, %						
(2) ASTM Fuel B	0 to +15	0 to +10	0 to +15	0 to +15	0 to +15	0 to +15
(2) ASTM #1 Oil	0 to +10	0 to +10	1.0*	1.0*	1.0*	1.0*
(1) ASTM #3 Oil (IRM903)	0 to +15	0 to +10	0 to +15	0 to +15	0 to +15	0 to +15
(2) Distilled Water	0 to +15	0 to +15	+7.3*	+7.3*	+7.3*	+7.3*
Distilled Water/ Ethylene Glycol(1:1 By Volume)	0 to +15	0 to +15	+7.7*	+7.7*	+7.7*	+7.7*
(2) Sealability, ml/h, max.	-	-	-	-	-	-
(2)Flexibility - No cracks, breaks, or separations	Pass	Pass	Pass	Pass	Pass	Pass
(2) Adhesion	Pass	--	Pass	Pass	Pass	Pass
(2) Dimensional Stability	-	-	-	-	-	-
(2) Crush Extrusion	-	-	-	-	-	-
Comments		To Be Used with Grade 1 EMS D18- 5008	*Typical Results	*Typical Results	*Typical Results	*Typical Results

- (1) Properties to be used for batch certification.
(2) Properties to be used for periodic re-certification (annually or better).
(3) 17 MPa (2500 psi)

6.4 Dimensional Tolerances

Material supplied to this specification shall meet the following thickness tolerances unless otherwise specified on the drawing.

NOMINAL THICKNESS mm(inches)	TOLERANCE mm(inches)
.25(.010)	+.025/-.025(+.001/-.001)
.38(.015)	+.05/-.05(+.002/-.002)
.51(.020)	+.05/-.05(+.002/-.002)
.79(.031)	+.13/-.13(+.005/-.005)
1.2(.047)	+.13/-.13(+.005/-.005)
1.6(.062)	+.2/-.2(+.008/-.008)

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Table 2 - Gasket Properties - Continued

GRADE	203	203	206	303	303	303
Supplier Code	3	6	3	1	1	1
Material Code	A	A	H	D	D	D
Gasket Thickness mm(in.)	.79(.031)	.79(.031)	.79(.031)	.38(.015)	.51(.020)	.79(.031)
(1) Compressibility, %	15-30	15-25	15-30	7-17	7-17	7-17
(1) Recovery, % min.	35	35	25	40	40	40
(1) Density, kg/m ³ (lb/ft ³), min.	1200(75)	1200(75)	1280(80)	1400(88)	1400(88)	1400(88)
Tensile Strength, MPa(psi), min.	11(1600)	12(1800)	1.0(1500)	13.8(2000)	13.8(2000)	13.8(2000)
(2) Creep Relaxation, % max.	40	35	45	25	30	35
Immersion Change in Thickness, %						
(2) ASTM Fuel B	0 to +10	0 to +15	0 to +20	0 to +15	0 to +15	0 to +15
(2) ASTM #1 Oil		0 to +5	0 to +15	0 to +10	0 to +10	0 to +10
(1) ASTM #3 Oil (IRM903)	0 to +15	0 to +10	0 to +20	0 to +13	0 to +13	0 to +13
(2) Distilled Water	0 to +20	0 to +20	0 to +10	0 to +25	0 to +25	0 to +25
Distilled Water/Ethylene Glycol (1:1 By Volume)	0 to +30	10 to +20	0 to +35	0 to +30	0 to +30	0 to +30
(2) Sealability, ml/h, max.	-	-	--	--	--	--
(2) Flexibility - No cracks, breaks or Separations	Pass	Pass	Pass	Pass	Pass	Pass
(2) Adhesion	Pass	Pass	Pass (100)	--	--	--
(2) Dimensional Stability	-	-	--	--	--	--
(2) Crush Extrusion	-	-	--	--	--	--
Comments				To be used with EMS D18-5011	To be used with EMS D18-5011	To be used with Grade 2 EMS D18-5008

(1) Properties to be used for batch certification.

(2) Properties to be used for periodic re-certification (annually or better).

6.5 Lot Definition

Properties are to be used for qualification of material as well as for certification of each batch of incoming material. A batch is defined as all parts made from material formulated at one time. Shipping containers are to show batch numbers. Batches shall not be mixed in any one box, but a lot may contain more than one batch.

7.0 QUALITY

All material and workmanship shall be in accordance with good commercial practice and the resulting product shall be free from defects detrimental to fabrication or use. Suppliers shall furnish infrared spectra for the sheet material used in the manufacture of qualification samples.

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