HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3009

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used as discs for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

A densely compressed asbestos sheet, impregnated with a synthetic resin binder, heat treated and ground to yield the desired frictional and physical properties.

Specific Gravity 1.61

B. Mechanical Qualities

Pressure	50# p.s.i.
Rubbing Speed	960 f.p.m.
Temperature (max.)	600°F - 350° Intermittent
Coef. of friction at 350°F	.45-50
Rate of wear at 350°F	.008 cu. in HP/hr.

C. Procurement

Thickness range	1/16 to 7/16
Outside Diameter	35" max.

TOLERANCES

Thickness	Diameter
Plus or minus .005	Plus or minus .010

3. Marking

The name and brand of the manufacturer shall legibly appear on each piec or at intervals in roll form in such a way as to be readily identified.

4. Inspection

Material furnished to this specification shall be subject to incoming inspection at any of the Harnischfeger Corporation plants who reserve the right to reject material which does not comply with this standard.

Purchasing Department

This specification applies to a Raybestos-Manhatten matl. No. 500-B.

12-8-55

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3009

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on discs for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

A rigid type facing made from asbestos millboard impregnated and die formed to size. Suitable for all service except extreme duty conditions.

Specific Gravity 1.31

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing Speed	5000 f.p.m.
Temperature (max.)	750°F. - Constant 500°F.
Coef. of friction at 350°F.	.35 ± .07 at 50 p.s.i.
Rate of wear at 350°F.	.0050 cu. in. Hp/Hr. at 50 p.s.i.

(c) Procurement

Thickness Range	1/8" to 1/2"
Diameter	Ground face to 36" O.D.

TOLERANCE

Thickness	Diameter	
Ground ± .010'	O.D. and I.D. to 12" O.D.	± 1/64
	Over 12" to 18" O.D.	± 1/16
	Over 18" to 22" O.D.	± 1/8
	Over 22" O.D.	± 1/4

3. Marking

The name and brand of the manufacturer shall legibly appear on each piece or at intervals in roll form in such a way as to be readily identified.

4. Inspection

Material furnished to this specification shall be subject to incoming inspection to any of the Harnischfeger Corporation plants who reserve the right to reject material which does not comply with this standard.

Purchasing Department

This specification applies to a Johns-Manville Material No. 751.

Original: 1-11-56 .. PAGE 1 OF 1

ME 0722

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3009

Friction Material

1.0 Scope

1.1 This specification covers the physical and mechanical qualities of a friction material used as ~~facings on discs load brakes~~ Piston Brake Discs with molded or cut internal splines operating ~~on wet and~~ dry surfaces of friction discs.

2.0 Physical Qualities

2.1 The construction shall consist of a high friction facing developed for usage where unit pressures are low, for use as molded or single plate type facings.

2.2 The specific gravity shall be 1.795 plus or minus .10. 1.86

3.0 Mechanical Qualities

3.1 The following are the maximum values for wet and dry surfaces:

Pressure	150 P.S.I.
Rubbing Speed	5000 F.P.M.
Operating Temperature	500° F.

3.2 When in wet operation the material shall conform to the following frictional test data at 100 P.S.I.

Coefficient of Friction	.087
Operating Temperature	350° F.
Rubbing Speed	1200 F.P.M.
Rate of Wear	.0018 Cubic Inches per Horsepower Hour

3.3 When in dry operation the material shall conform to the following frictional test data at 100 P.S.I.

Coefficient of Friction	.35
Operating Temperature	350° F.
Rubbing Speed	1200 F.P.M.
Rate of Wear	.0024 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range 1/8" to 1" Diameter Range 1" to 25"

4.2 Tolerances applicable shall be as follows:

Thickness Tolerance	Diameter Tolerance
1/8" to 1/4" plus or minus .005	0" to 7" plus or minus .015"
1/4" to 1" plus or minus .010	7" to 15" plus or minus .020"
	15" to 25" plus or minus .030"

5.0 Marking

5.1 The name and brand of the manufacturer shall legibly appear on each piece in such a way as to be readily identified.

6.0 Inspection

6.1 Material furnished to this specification shall be subject to incoming inspection at any of the Harnischfeger Corporation plants, who reserve the right to reject all material which does not comply with this standard.

Note: Purchasing Department
This specification applies to material number 3-M-211C manufactured by the Asbestos Manufacturing Company.

Original: 1-10-56
Revision No. 1 9- 3-59

HARNISCHFEGER P&H QUALITY & SERVICE SINCE 1884
Milwaukee, Wisconsin U.S.A.

MATERIAL SPECIFICATION P&H NO. 3009

ISSUE NO. 3, 10-68 Superseded by Issue # 4 ?

FRICTION MATERIAL - MOTOR BRAKE DISCS - WITH AND WITHOUT INTERNAL SPLINES

Revised sources, approved, names, Properties, etc.

1.0 SCOPE
- 1.1 This specification covers a type of friction material used by this Company as motor brake discs operating on dry surfaces of friction discs.
- 1.2 The material may be supplied as follows and so specified on the purchase order:
  - 1.2.1 With splines either molded or cut.
  - 1.2.2 Without internal splines. In this case, splines may be cut during the processing of the part by the purchaser.

2.0 PHYSICAL QUALITIES
- 2.1 The construction shall consist of a rigid molded friction compound developed for performance under low unit pressures which can be used as molded or single plate type facings.
- 2.2 Other physical qualities shall be as specified under Paragraph 7.0.

3.0 MECHANICAL QUALITIES
- 3.1 The mechanical qualities shall be as specified under Paragraph 7.0 for each particular product furnished under this specification.
- 3.2 These qualities are not a complete description of the product required and are stated only as reference material for descriptive purposes. Conformance shall not constitute the sole basis of acceptance. The material must be judged further on its ability to perform satisfactorily in the field on P&H equipment.

4.0 MANUFACTURING PRACTICES
- 4.1 The products furnished shall be produced to Harnischfeger Corporation detailed drawings. Identification or marking shall be as indicated on the detail drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply to thickness and diameter shall be as specified under Paragraph 7.0 for each particular vendor.
- 4.3 It is expected that the manufacturer will exercise inspection procedures to assure that the material is controlled within acceptable limits of Quality Control.

5.0 IDENTIFICATION
- 5.1 In addition to the Harnischfeger Corporation Part Number, the name and brand of the manufacturer shall legibly appear on each piece in such a way as to be readily identified.
- 5.2 Each package, container, bundle or lift shall be tagged or marked with the following information:
  - 5.2.1 Customer's Name and Purchase Order Number
  - 5.2.2 Supplier's Name
  - 5.2.3 Grade or Specification
  - 5.2.4 Size of Material

6.0 INSPECTION AT PURCHASER'S WORKS
- 6.1 Acceptance of material furnished under this specification shall be subject to confirmation by Customer's Materials Engineering and Quality Control Departments.
- 6.2 The Purchaser shall have the option of accepting or rejecting material that fails to meet any of the requirements of this specification.
- 6.3 In the event of rejection, the supplier will be granted a rehearing at his request.

7.0 APPROVED SOURCES, MECHANICAL AND PHYSICAL QUALITIES, SIZE RANGE AND TOLERANCES
- 7.1 H.K. Porter - Thermoid Division - Material Number 3-M-211C may be used for motor brake discs with or without internal splines.
  - 7.1.1 Mechanical and Physical Qualities

The following are maximum values for dry surfaces:

Pressure	150 P.S.I.
Rubbing Speed	7500 F.P.M.
Operating Temperature	1000°F

The following frictional data is related to tests at 100 P.S.I.

Coefficient of Friction	.45±.07 @ 300°F to 750°F
Operating Temperature	350°F Average
Rate of Wear at 350°F	0.0035 Cubic Inches Per Horsepower Hour
Compression Strength	8,200 Lbs./Sq. In.
Shear Strength	3,900 Lbs./Sq. In.
Tensile Strength	3,500 Lbs./Sq. In.
Specific Gravity	1.795 ±.10

Harnischfeger

P&H

milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3009

ISSUE NO. 4, 7–74

FRICTION MATERIAL — MOTOR BRAKE DISCS ; WITH AND WITHOUT INTERNAL SPLINES

1.0 SCOPE
- 1.1 This specification covers a type of friction material used by this Company as motor brake discs operating on dry surfaces of friction discs.
- 1.2 The material may be supplied as follows and so specified on the purchase order:
  - 1.2.1 With splines either molded or cut.
  - 1.2.2 Without internal splines. In this case, splines may be cut during the processing of the part by the purchaser.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a rigid molded friction compound developed for performance under low unit pressures which can be used as molded or single plate type facings.
- 2.2 The molded facings shall be suitable for performance in dry applications or in oil immersion.
- 2.3 The molded facings may be compounded with metal strands, flakes, or chopped wire to control rate of wear.
- 2.4 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 The dimensional stability of these molded facings shall remain constant under conditions of maximum load.
- 3.2 The mechanical qualities shall be as specified under Paragraph 7.0 for each particular product furnished under this specification.
- 3.3 These qualities are not a complete description of the product required and are stated only as reference material for descriptive purposes. Conformance shall not constitute the sole basis of acceptance. The material must be judged further on its ability to perform satisfactorily in the field on the P&H equipment.

4.0 MANUFACTURING PRACTICES
- 4.1 The products furnished shall be produced to Harnischfeger Corporation detailed drawings. Identification or marking shall be as indicated on the detail drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply to thickness and diameter shall be as specified under Paragraph 7.0 for each particular vendor.
- 4.3 It is expected that the manufacturer will exercise inspection procedures to assure that the material is controlled within acceptable limits of Quality Control.

5.0 IDENTIFICATION
- 5.1 In addition to the Harnischfeger Corporation Part Number, the name and brand of the manufacturer shall legibly appear on each piece in such a way as to be readily identified.
- 5.2 Each package, container, bundle or lift shall be tagged or marked with the following information:
  - 5.2.1 Harnischfeger Name or Trademark and Purchase Order Number
  - 5.2.2 Supplier's Name
  - 5.2.3 Grade or Specification
  - 5.2.4 Harnischfeger Part Number

6.0 INSPECTION AT PURCHASER'S WORKS
- 6.1 Acceptance of material furnished under this specification shall be subject to confirmation by Harnischfeger Materials Engineering and Quality Control Departments.
- 6.2 The Purchaser shall have the option of accepting or rejecting material that fails to meet any of the requirements of this specification.
- 6.3 In the event of rejection, the supplier will be granted a hearing at his request.

7.0 APPROVED SOURCES, MECHANICAL AND PHYSICAL PROPERTIES, SIZE RANGE AND TOLERANCES

7.1 H.K. Porter Company - Material Number 3M-211C

7.1.1 Mechanical and Physical Properties

Maximum Recommended Pressure (Dry)	150 P.S.I.
Maximum Rubbing Speed (Dry)	7,500 F.P.M.
Operating Temperature (Constant)	1000°F
Kinetic Coefficient of Friction @ 100 psi, 300-375°F	.38 ± .07 Dry
Static Coefficient of Friction	.35 to .37
Wear Rate @ 350°F, 100 psi (Cu. In./Hp. Hr.)	.0035
Compressive Strength	8,200 P.S.I.
Shear Strength	3,900 P.S.I.
Tensile Strength	3,500 P.S.I.
Specific Gravity	1.795 ± .10

7.5.2 Size Range
National Friction Products will quote sizes on specific parts.
7.5.3 Standard Tolerances
National Friction Products will set tolerances on specific parts.

7.6 Abex Corporation, American Brakeblok Div. - Material Number 693-499
For dry applications
7.6.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1300 F.P.M.	.42
Static Coefficient of Friction	.37
Operating Temperature (Constant)	600°F
Wear Rate 100 to 500°F (Cu. In./Hp. Hr.)	.002
500 to 700°F (Cu. In./Hp. Hr.)	.009

7.6.2 Size Range
Thickness: 3/16" to 3/4"
Width: 1" to 12"
Length: 140"
7.6.3 Standard Tolerances
Thickness: +.000" -.010"
Width: +.030" -.000"
Length: ● 1/32"

7.7 Abex Corporation, American Brakeblok Div. - Material Number 693-499-4H
For Oil Immersion Applications
7.7.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1300 F.P.M.	.11 Oil
Static Coefficient of Friction	.21 Oil
Operating Temperature (Constant)	600°F

7.7.2 Size Range
Thickness: 3/16" to 5/8"
Width: 1" to 12"
Length: 140"
7.7.3 Standard Tolerances
Thickness: +.000" -.010"
Width: +.030" -.000"
Length: ± 1/32"