HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3001

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

Semi-flexible made by folding, compressing and vulcanizing a woven brass wire inserted asbestos yarn cloth compounded with a friction controlled thermo-setting binder.

Specific Gravity 2.00

(b) Mechanical Qualities

Pressure (max.)	100 p.s.i.
Rubbing Speed (max.)	3000 ft./min.
Temperature (max.)	500°F. (350°F. constant)
Coef. of friction at 350°F.	50 p.s.i. .45 ± .07
Rate of wear at 350°F.	50 p.s.i. .002 cu. in. Hp/Hr.

(c) Procurement

Thickness Range	1/8" to 1" incl.
Width Range	1" to 24" incl.
Length Range	to 1/2" thk. & 2-1/2" wide in 48' rolls
	1/2" & up thk. All widths to 24" in 24' rolls

TOLERANCE

Thickness	Width & Length
to 1/4" thick incl. (ground + .010" -.015"	12" wide and 3/8" thick 1/16" to 12" wide - over 3/8" thick + 3/32, -1/16
5/16" thick and over (ground) + .015" -.030"	over 12" wide all thickness ± 5/16"

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 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 Johns-Manville Material No. 600 F&C Lining

Original: 1-11-56 PAGE 1 OF 1

Harnischfeger

milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3001

ISSUE NO. 2, 9-74

FRICTION MATERIAL— REINFORCED WOVEN; CLUTCH SHOES & BRAKE BANDS

1.0 SCOPE

1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for use on dry contact with friction drums.

1.2 Common product applications include crane motor brakes, excavator boom hoist and digging planetary brakes, propel brakes; auxiliary hoist and digging clutches.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a semi-flexible woven lining of wire reinforced asbestos yarn cloth and special thermosetting resins. The material may be of folded and compressed construction.

2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

3.1 The mechanical properties of the woven and metal inserted material shall be as specified under Paragraph 7.0 for each product furnished under this specification.

3.2 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.

4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 or at intervals in roll from 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 Raybestos-Manhattan - Material Number G-1500 Folded And Compressed (Substitute for JM900)

7.1.1 Mechanical and Physical Properties

Coefficient of Friction .47

7.1.2 Size Range

Thickness: 1/8" to 2"

Width: 1" to 24"

7.1.3 Standard Tolerances

Thickness: 5%

Width: 3%

7.2 Raybestos-Manhattan - Material Number G-1000 Folded And Compressed (Substitute for JM600)

7.2.1 Mechanical and Physical Properties

Coefficient of Friction .33

7.2.2 Size Range

Thickness: 1/8" to 2"

Width: 1" to 24"

7.2.3 Standard Tolerances

Thickness: 5%

Width: 3%

CONFIDENTIAL and PROPRIETARY

Harnischfeger

milwaukee, wisconsin, 53201

MATERIAL SPECIFICATION P&H NO. 3001

ISSUE NO. 3, 10-80

Discontinued & Superseded by P&H 3024 Issue No. 2 4/86

FRICTION MATERIAL — REINFORCED WOVEN; CLUTCH SHOES & BRAKE BANDS

1.0 SCOPE

1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for use on dry contact with friction drums.

1.2 Common product applications include crane motor brakes, excavator boom hoist and digging planetary brakes, propel brakes; auxiliary hoist and digging clutches.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a semi-flexible woven lining of wire reinforced asbestos yarn cloth and special thermosetting resins. The material may be of folded and compressed construction.

2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

3.1 The mechanical properties of the woven and metal inserted material shall be as specified under Paragraph 7.0 for each product furnished under this specification.

3.2 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.

4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 or at intervals in roll form 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 Raybestos-Manhattan - Material Number G-1500 Folded And Compressed (Substitute for JM900)

7.1.1 Mechanical and Physical Properties

Coefficient of Friction .47

7.1.2 Size Range

Thickness: 1/8" to 2"

Width: 1" to 24"

7.2 Raybestos-Manhattan - Material Number G-1000 Folded And Compressed (Substitute for JM600)

7.2.1 Mechanical and Physical Properties

Coefficient of Friction .33

7.2.2 Size Range

Thickness: 1/8" to 2"

Width: 1" to 24"

7.2.3 Standard Tolerances

Thickness: 5%

Width: 3%

CONFIDENTIAL and PROPRIETARY

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3002

SUPERSEDED BY P&H 3001

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

Semi-flexible type made by thermally curing and compacting a woven brass wire inserted asbestos yarn tape impregnated with a special heat resistant compound which reduces smoking and dusting to the minimum.

Specific Gravity 1.97

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing speed	7500 f.p.m.
Temperature (max.)	750°F - Constant 500°F
Coefficient of friction at 350°F	.45 ± .07 at 50 p.s.i.
Rate of wear at 350°F	.0090 cu. in./hp. hr. at 50 p.s.i.

(c) Procurement

Thickness range	3/8" - 1-1/8"
Width range	2" - 12"
Roll Length	To 1/2" thk. 6" wide & less 50' Over 1/2" thick 25'

TOLERANCE

Thickness	Width
3/8-5/8" +.031"-.010"	To 12" to 3/8 thick ± 1/16"
over 5/8 ±1/16"	To 12" over 3/8 thk. +3/32", -1/16"

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 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 Johns-Manville material, No. 400

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

SUPERSEDED BY P&H 3001

P&H NO. 3003

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

Flexible type lining made by impregnating, thermally curing and compacting woven brass wire inserted asbestos yarn tape with a friction controlled binder.

Specific Gravity 1.90

(b) Mechanical Qualities

Pressure	50# p.s.i.
Rubbing speed	5000 f.p.m.
Temperature (max.)	500°F - Constant 250°F
Coefficient of friction at 350°F	.40 ± .07
Rate of wear at 400°F	.011 cu. in./HP. HR.

(c) Procurement

Thickness Range	1/8" to 5/16"
Width Range	1" to 24"
Roll Length	25' - 50'

TOLERANCE

Thickness	Width
Plus or minus 10%	To 12" plus or minus 1/16" Over 12" plus or minus 5/16"

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 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 Johns-Manville material, No. 300

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3004

SUPERSEDED BY P&H 3003 3001

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

A semi-flexible type, developed by utilizing a single-ply fabric construction for all thicknesses, into which a high temperature resistant friction compound is uniformly introduced throughout the structure providing maximum duty rating.

Specific Gravity - 2.40

(b) Mechanical Qualities:

Pressure	100# p.s.i.
Rubbing speed	5000 f.p.m.
Temperature (max.)	750°F - Constant 500°F
Coefficient of friction at 350°	.45 ± .07 at 50 p.s.i.
Rate of wear at 350°	.0018 cu. in./ hp. hr. at 50 p.s.i.

(c) Procurement

Thickness Range	1/4" to 1/2" (less than 2" wide max. 1/4" thick)
Width Range	1/4" to 12"
Roll Length	Up to 6" wide 24' & 48' Over 6" wide 24' only

TOLERANCE

Thickness	Width
To 1/4" thk. +.010" -.015"	To 3/8" thk. ± 1/16"
5/16" thk. & over +015" -.030"	Over 3/8" thk. +3/32" -1/16"

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 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 Johns-Manville material, No. 900

Original: 1-11-56

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3005

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces and wet contact with friction drums.

2. Physical Characteristics

(a) Construction

Semi-flexible facing made by impregnating and chemically curing woven brass wire inserted asbestos yarn cloth with an inorganic compound unaffected by oil. Specifically designed for wet operation.

Specific Gravity - 1.97

(b) Mechanical Qualities

Pressure (max.)	50 p.s.i.
Rubbing Speed (max.)	3000 ft./min.
Temperature (max.)	750° (500°F Constant)
Coef. of friction	.20 ± .07 in oil
Rate of wear	Negligible (limited by oil)

(c) Procurement

Thickness Range	1/8" to 5/16" incl.
Diameters	1/8" to 1/4" thick - 23" max.
"	5/16" thick - 15" max.

TOLERANCE

Thickness	Width
Plus or minus .015"	Up to 12" O.D. ± 1/64" 12" to 18" O.D. ± 1/16" 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 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 Johns-Manville Material No. 354

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3005 **Addendum #1** This book only

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 for transferring frictional forces on wet surfaces of friction discs.

2.0 Physical Qualities

2.1 The construction shall consist of heat and pressure molded dry mix material.

2.2 The specific gravity shall be 2.00 plus or minus .05.

3.0 Mechanical Qualities

3.1 The following are the maximum values:

Pressure	900 P.S.I.
Rubbing Speed	5000 F.P.M.
Operating Temperature	350° F.

3.2 When in operation the material shall conform to the following frictional test data at 150 P.S.I.

Coefficient of Friction	.10 at 200° F. Oil Temp.
Operating Temperature	200° F. Constant
Rubbing Speed	1000-6000 F.P.M.
Rate of Wear	.00025 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range	1/4" thru 1/2" plus or minus .005"
Diameter Range	per detailed drawing

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 specification.

ORIGINAL: 9-3-59 Sheet 1 of 2

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Note: Purchasing Department
This specification applied to material number 693-499-4H manufactured by the American Brakebloc Company.

Original: 9-3-59

CONFIDENTIAL and PROPRIETARY

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3005 **Addendum #2** THIS BOOK ONLY

FRICTION MATERIAL

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

2. Physical Characteristics

(a) Construction

Endless Vee-Lok construction facing coataining brass wire inserted yarns. V shaped asbestos fabric and special compounds compressed under heat and hydraulic pressure in molds of specified diameters. Ground on both surfaces. For heavy duty service, dry or operating in oil.

Specific Gravity 2.18

(b) Mechanical Qualities

Pressure (max.)	150# p.s.i.
Rubbing Speed (max.)	7500 f.p.m.
Temperature (max.)	500°F - Constant 350°F
Coef. of friction at 350°F	0.09
Rate of wear at 350°F	.001" cu. in. Hp/Hr.

(c) Procurement

Thickness range	1/8 to 1/4
O.D. Range	3" to 24"
I.D. Range	1-1/8" to 16"

TOLERANCES

Thickness	Diameters
Plus or minus .003	Plus or minus 1/64

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 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-Manhattan material No. US-969-X.

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Harnischfeger
P&H
milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3005

ISSUE NO. 2, 9–74

FRICTION MATERIAL—WOVEN DISCS; WET APPLICATION

1.0 SCOPE
- 1.1 This specification covers the characteristics of a friction material used for transferring frictional forces in oil immersion contact applications.
- 1.2 Common product applications include load brakes (stationary discs) for cranes and hoists.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a semi-flexible facing made by impregnating and chemically curing woven, brass wire inserted, asbestos yarn cloth with an inorganic compound unaffected by oil.
- 2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 It is mandatory that this material exhibit exceptional heavy-duty service in oil immersion applications. Load brake applications require continuous contact of friction surfaces under all conditions of hook descent. Friction surface pressures are regulated by hook load, and all material acceptable to this specification must withstand pressures at the upper limits demanded by full rated load of the hoist.
- 3.2 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.
- 3.3 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply shall be as specified under Paragraph 7.0 for each 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 Fenner America Ltd., Type 333
  - 7.1.1 Mechanical and Physical Properties:

Coefficient of Friction at 250°F	.24 in oil
Oil Displacement Rate	1.54 cc/sec.
Cavity Volume/Fiber Volume	2/2
Life Factor With JM 354 = 100.00	91.00

  - 7.1.2 Size Limitations:
    - Thickness: 3/4" Max.
    - Diameter: 12" Max.
  - 7.1.3 Standard Tolerances:
    - Thickness: ± 1/32
    - Diameter: ± 1/32

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7.2 Standco T-354

7.2.1 Mechanical and Physical Properties:

Coefficient of Friction at 250°F	.28 in oil
Oil Displacement Rate	1.69 cc/sec.
Cavity Volume/Fiber Volume	2/2
Life Factor With JM 354 = 100.00	100.00

7.2.2 Size Limitations:

Thickness: 1/8" to 5/16"
Diameters: O.D. 3" to 24"
I.D. 1-1/8" to 16"

7.2.3 Standard Tolerances:

Thickness: ± .015"
Diameter: O.D. Up to 18" ± .015"
18" to 24" ± .025"

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

PAH NO. 3006

SUPERSEDED BY PEH3009

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) Endless Vee-Lok construction facing containing copper wire inserted yarns. V shaped asbestos fabric and special compounds compressed under heat and hydraulic pressure in molds of specified diameter. Ground on both surfaces. For extra heavy duty service where high friction is required.

Specific Gravity 2.60

(b) Mechanical Qualities

Pressure (max.)	100# p.s.i.
Rubbing Speed (max.)	7500 f.p.m.
Temperature (max.)	500°F - Constant 350°F
Coef. of friction at 350°F	0.32 - Dry
Rate of wear at 350°F	.003 cu. in Hp/Hr.

(c) Procurement

Thickness range	0.125/0.250
O.D. Range	3" - 24"
I.D. Range	1-1/8" - 16"

TOLERANCES

Thickness	Diameters
Plus or minus .003	Plus or minus 1/64

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 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-Manhattan, Inc. material, NO. US-3150.

Original: 12-12-55

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3007

SUPERSEDED BY P&H3005

FRICTION MATERIAL

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

2. Physical Characteristics

(a) A brass wire inserted tape woven lining, semi-rigid designed for higher friction value

Specific Gravity 1.810 ±.10

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing Speed	7500 f.p.m.
Temperature (max.)	500°F
Coef. of friction at 350°F	.09
Rate of wear	.0019 cu. in. Hp/Hr.

(c) Procurement

		Tolerance
Thickness Range	5/32 to 1-1/4"	±.010
Width Range	1" to 12"	±1/32
Length Range	25 to 50 ft.	

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 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 Asbestos Manufacturing Co. Material No. B&T-7

Original: 1-10-56

CONFIDENTIAL and PROPRIETARY

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3008

OBSOLETED

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) A scientifically treated high quality brass wire inserted yarn in a high friction, heat resisting compound, mold cured to required size.

Specific Gravity 2.510 ± .10

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing speed	7000 f.p.m.
Temperature (max.)	500°F
Coef. of friction at 350°F	.35
Rate of wear at 350°F	.0023

(c) Procurement

Thickness range	1/8" to 1/2"
O.D. range	4" to 18"

TOLERANCES

Thickness	Diameter
Plus or minus .005	Plus or minus 1/64

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 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 anAsbestos Mfg. Co. material, No. 1792-RW.

Original: 12-14-55

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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 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 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

CONFIDENTIAL and PROPRIETARY

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.	.0060 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

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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~~ Power BRAKE D.S.E.S. 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. 1.85

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"

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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

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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 approved sources, Properties, notes, 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

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7.1.2 Size Range

Thickness	Diameter
3/8" To 2"	1" To 38"

7.1.3 Tolerances

Thickness	Diameter
3/8" To 1/2" ±.005	0" To 7" ±.015"
1/2" To 1" ±.010	7" To 15" ±.020"
1" To 2" ±.010	15" To 25" ±.030"

7.2 Raybestos-Manhattan - Material Number R500-B may be used for motor brake discs with or without internal splines.

7.2.1 Mechanical and Physical Qualities.
The following are typical values for dry surfaces:

Pressure	50 P.S.I.
Rubbing Speed	960 F.P.M.
Operating Temperature	600°F-350° Intermittent
Coefficient of Friction	.45-.50 @ 350°F
Specific Gravity	1.61 ±10

7.2.2 Size Range

Thickness	Diameter
1/16" To 1/4"	35" Maximum

7.2.3 Tolerances

Thickness	Diameter
± .005	±.010

7.3 Johns-Manville - Material Number 150 may be used for motor brake discs with or without internal splines.

7.3.1 Mechanical and Physical Qualities.
The following are typical values for dry surfaces:

Pressure	150 P.S.I. Maximum
Rubbing Speed	7500 F.P.M. Maximum
Operating Temperature	750°F Maximum (Constant Operation)
Coefficient of Friction	.45 ± .07 @ 350° F, 50 P.S.I., 10.5/Sec.
Specific Gravity	2.15 ±.10

7.3.2 Size Range

Thickness	Diameter
1/4" To 1/2" Incl.	Up To 38" O.D. (Full Molded Type)
Up To 2-1/2"	Up To 24" O.D. (Saw Cut From Slag Stock)

7.3.3 Tolerances

Thickness	Diameter
Under 9-1/4" I.D. ±1/32"	O.D. ±1/16"
Over 9-1/4" I.D. & Under 37" O.D. ±.010"	I.D. ±1/16" -0.00"

7.4 Johns-Manville - Material Number 751 may be used ONLY if the motor brake discs will not be subjected to cutting of internal splines prior to its end use.

7.4.1 Mechanical and Physical Qualities.
The following are typical values for dry surfaces:

Pressure	100 P.S.I. Maximum
Rubbing Speed	5000 F.P.M. Maximum
Operating Temperature	500°F Maximum (Constant Operation)
Coefficient of Friction	.35 ±.07 @ 350°F, 5 P.S.I., 10.5/Sec.
Specific Gravity	1.31 ±.10

7.4.2 Size Range

Thickness	Diameter
1/8" To 1/2" Incl.	Ground Face Up To 36" O.D. (When Width of Flange is Under 10")

7.4.3 Tolerances

Thickness	Diameter
To 12" O.D. Ground ±.005"	I.D. ±1/32"
Over 12" O.D. Ground ±.010"	O.D. To 12" Incl. ±1/32
	O.D. Over 12" to 18" Incl. ±1/16"
	O.D. Over 18" to 22" Incl. ±1/8"
	O.D. Over 22" ±1/4"

(a) Flanges over 10" width cannot be ground and have a tolerance of ±.020".

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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

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7.1.2 Size Range
Diameter: 30" Max.
Thickness: 3/16" to 3/4"
7.1.3 Standard Tolerance
Thickness: ± .010"
Diameters: ± .020"

7.2 H.K. Porter Company - Material Number D-596-A
7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 100 psi, 1200 F.P.M., 350°F	.40 Dry
Static Coefficient of Friction	.38 to .44
Wear @ 100 to 600°F	.0008"

7.2.2 Size Range
Diameter: 24" Max.
Thickness: 3/16" to 1/2"
7.2.3 Standard Tolerances
Thickness: ± .010"
Diameters: ± .030"

7.3 Gatke Corporation - Material Number 3853
7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M.	.45 Dry
Static Coefficient of Friction	.49 Dry
Kinetic Coefficient of Friction	.12 Oil
Static Coefficient of Friction	.17 Oil
Wear Rate (Cu. In./Hp. Hr.)	.002
Recommended Maximum Pressure	150 P.S.I.
Maximum Rubbing Speed (Not At Max. Pressure)	5,000 F.P.M.
Energy Absorption (Hp/In.)	3.80
Compressive Strength	26,000 P.S.I.
Flexural Strength	9,800 P.S.I.
Impact Strength (IZOD)	1.37 P.S.I.
Hardness (Rockwell M)	98
Density (Oz./Cu. In.)	1.20

7.3.2 Size Range
Thickness: 3/16" to 4"
Width: 1" to 24"
Length: 20" Max.
7.3.3 Standard Tolerances
Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.4 Raybestos Manhattan - Material Number R-500-B
7.4.1 Mechanical and Physical Properties
The following are typical for dry applications:

Pressure	50 P.S.I.
Rubbing Speed	960 F.P.M.
Operating Temperature (Constant)	350°F
Kinetic Coefficient of Friction @ 350°F	.45 to .50
Specific Gravity	1.61 ± .10

7.4.2 Size Range
Thickness: 1/16" to 1/4"
Diameter: 35" Maximum
7.4.3 Standard Tolerances
Thickness: ± .005"
Diameter: ± .010"

7.5 National Friction Products Corporation - Material Number NF-301
7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 150 psi	.35 to .42 Dry
Kinetic Coefficient of Friction	.06 to .09 Oil
Maximum Recommended Rubbing Speed	7,500 F.P.M.
Operating Temperature (Constant)	400°F
Wear Rate (Cu. In./Hp. Hr.)	.004
Tensile Strength	4,500 P.S.I.
Specific Gravity	1.78 ± .06

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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"

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

SUPERSEDED BY P&H 3009

P&H NO. 3010

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) A high friction facing developed for usage where unit pressures are low, for use as molded or single plate type facings

Specific Gravity 1.795 ± .10

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing Speed	5000 ft. per min.
Temperature (max.)	500°F
Coef. of friction at 350°F	.35
Rate of wear at 350°F	.0024 cu. in. Hp/Hr.

(c)

Procurement	Tolerance
O.D. Range 0 - 7"	± .015
O.D. Range 7 - 15"	± .020
O.D. Range 15 - 25"	± .030

Thickness	
1/8 to 1/4	±.005

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 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 Asbestos Manufacturing Co. Material No. 3M-211C

Original: 1-10-56

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

SUPERSEDED BY P&H 3009

P&H NO. 3011

FRICTION MATERIAL

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

2. Physical Characteristics

(a) A high quality rigid molded material especially adapted to use as internally splined discs. Relatively low friction with good wear and tooth strength.

Specific Gravity 1.972 ±.10

(b) Mechanical Qualities

Pressure	150# p.s.i.
Rubbing Speed	5000 ft. min.
Temperature (max.)	500°F
Coef. of friction at 350°F	.06
Rate of wear at 350°F	.0037 cu. in. Hp/Hr.

(c) Procurement

	Tolerance
O.D. Range 0" - 10"	± .015"
O.D. Range 10" - 20"	± .020"
O.D. Range 20" - 30"	± .030"

Thickness	
1/8 to 1/4"	± .005"

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 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 Asbestos Manufacturing Co. Material No. 796

Original: 1-10-56

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3012

SUPERSEDED BY P&H 3013

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

Frictional Stability: Superior
Structure: Semi-Rigid, Ground

Specific Gravity 1.65

B. Mechanical Qualities

Pressure	150# p.s.i.
Rubbing Speed	550 f. p. m.
Temperature (max.)	800°F
Coef. of friction at 350°F	.33
Rate of Wear at 350°F	.050 cu. in HP/Hr.

C. Procurement

Thickness range	5/32 through 3/4
Width Range	1" through 12"
Length Range	120"

TOLERANCES

Thickness	Width & Length
.005 when width is 2-1/2" or less	Width - Plus or minus .015
.008 when width is 5" or less	
.010 when width is 8" or less	Length- Plus or minus 1/16
.015 when width is 12" or less	

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 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 an American Brake Shoe Co., matl. No. 438.

12-6-55

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3013

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

A rigid moulded ground block made from asbestos, a special binder and a non-metallic friction particle. Moulded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

Specific Gravity - 2.15

B. Mechanical Qualities

Pressure	150# p.s.i.
Rubbing Speed (max.)	7500 f.p.m.
Temperature (max.)	1000°F - constant oper. 750°F
Coef. of friction at 300-750°F	.45 plus or minus .07
Rate of Wear at 350°F	.0035 cu. in./hp. hr.

C. Procurement

Thickness range	3/8" to 4"
Width range	1" to 24"
Length range	120° of circle but not over 24" lg. cord.
	Max. area 600 sq. in.

TOLERANCES

Thickness	Width	Radius	Length
Up to 8" wide +.000" -.020"	Up to 8" ± 1/32	Machined block 1/16" -0"	± 1/16"
Over 8" wide +.000" -.032"	Over 8" ± 1/16	Plain moulded 1/8"	

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 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 Johns-Manville matl., Style 150 moulded block

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3013 Superseded by Rev. 2

Friction Material

1.0 Scope

1.1 This specification covers the physical and mechanical qualities of a friction material used as lining by this company on clutch and brake shoes and brake bands transferring frictional forces on dry surfaces of friction drums.

2.0 Physical Qualities

2.1 The construction shall consist of a high friction material suitable for high temperature operations. It exhibits good wear characteristics. Used only in dry applications.

2.2 The specific gravity shall be 1.924 plus or minus .10.

3.0 Mechanical Qualities

3.1 The following are the maximum values:

Pressure	150 P.S.I.
Rubbing Speed	7000 F.P.M.
Operating Temperature	600° F.

3.2 When in operation the material shall conform to the following frictional test data at 150 P.S.I.

Coefficient of Friction	.50
Operating Temperature	350° F. Constant
Rubbing Speed	1200 F.P.M.
Rate of Wear	.0026 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range	1/8" to 1-1/4" Incl. plus or minus .005"
Width Range	Up to 10" plus or minus 1/32"
Length of Arc	Up to 30" plus or minus 1/16"

5.0 Marking

5.1 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.

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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 specification.

Note: Purchasing Department
This specification applied to material number D-483-A manufactured by the Asbestos Manufacturing Company.

Original: 1-24-56
Revision No. 1 9- 3-59

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3013

Friction Material

1.0 Scope

1.1 This specification covers the physical and mechanical qualities of a friction material used as lining by this company on clutch and brake shoes and brake bands transferring frictional forces on dry surfaces of friction drums.

2.0 Physical Qualities

2.1 The construction shall contain superior frictional stability and have a semi-rigid, ground structure.

2.2 The specific gravity shall be 1.65 plus or mnus .10.

3.0 Mechanical Qualities

3.1 The following are maximum values:

Pressure	150 P.S.I.
Rubbing Speed	1300 F.P.M.
Operating Temperature	700° F.

3.2 When in operation the material shall conform to the following frictional test data at 150 P.S.I.

Coefficient of Friction	.45
Operating Temperature	350° F. Constant
Rate of Wear	.0050 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range	5/32" thru 3/4"
Width Range	1" thru 12"
Maximum Length*	5/32" THK. - 340°
	3/16" To 1/2" - 160°
	Over 1/2" Thk. - 90°

*Subject to revisions based on manufacturing methods.

5.0 Tolerance

5.1 Thickness Tolerance

.005	Up to 2-1/2" wide
.008	Over 2-1/2" thru 5" Wide
.010	Over 5" thru 8" Wide
.015	Over 8" thru 12" Wide

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5.2 Width Tolerance
Plus or minus .015"

5.3 Length Tolerance
Plus or minus 1/16"

6.0 Marking

6.1 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.

7.0 Inspection

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

Note- Purchasing Department
This specification applies to American Brakeblok material number 438.

Revision No. 1 7-11-61
Revision No. 2 9-11-61

CONFIDENTIAL and PROPRIETARY

Harnischfeger

milwaukee, wisconsin 53246

MATERIAL SPECIFICATION P&H NO. 3013

ISSUE NO. 1, 6-73

Superseded by Iss 2, 9-74
Revised State + Vendor Sources.

FRICTION MATERIAL

1.0 SCOPE

1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2.0 PHYSICAL PROPERTIES

2.1 Construction:

2.1.1 A rigid molded ground block made from asbestos, a special binder and a non-metallic friction particle.

2.1.2 Molded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

2.2 Mechanical Qualities:

Pressure	100-150 psi
Rubbing Speed (Max.)	5,000-7,500 fpm
Temperature (Max.)	1000°F - Constant Oper. 750°F
Coefficient of Friction @ 300-750°F	.40 ± .10
Rate of Wear @ 350°F (Max).	.008 cu. in./hp hr.

2.3 Procurement:

Thickness Range	1/8" - 4"
Width Range	1" to 24"
Length Range	120° of Circle but not over 24" Lg. Cord. Max. Area 600 Sq. In.

2.4 Tolerances:

Thickness	Up to 8" Wide +.000" -.020"
	Over 8" Wide +.000" -.032"
Width	Up to 8" ± .031
	Over 8" ± .062
Radius	Machined Block .062" - 0"
	Plain Molded .125"
Length	± .062

3.0 MARKING

3.1 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.

4.0 INSPECTION

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

5.0 APPROVED VENDORS

5.1 H.K. Porter Co.
D-753

5.2 National Friction Products Co.
Molded Blocks NF-145
Radius Applications NF-155

5.3 Raybestos-Manhattan
R-3375-1
R-4000

5.4 American Brakeblock Co.
No. 693-539

5.5 Standco Co.
No. 159
No. 175

5.6 Gatke Co.
No. 2460
No. 3978

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Harnischfeger
P&H
milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3013

ISSUE NO. 2, 9-74
Superseded By Dec # 3
Add Add'l Supplier Data

FRICTION MATERIAL — MOLDED BLOCK ; FOR CLUTCH SHOES AND BRAKE BANDS

1.0 SCOPE
- 1.1 This specification covers the physical and mechanical properties of a friction material used on clutch shoes and brake bands for transferring frictional forces in dry contact with friction drums.
- 1.2 Common product applications include crane motor brakes, propel brakes, excavator hoist and digging clutches, swing clutches, boom hoist planetary brakes.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a rigid, molded, ground block of asbestos combined with a special binder and metallic or nonmetallic friction particles. The material shall be molded under high heat and pressure giving long life under a wide range of temperatures and a high friction value.
- 2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.
- 3.2 These properties 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 should be as indicated on the detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances, as they apply, shall be specified under Paragraph 7.0 for each 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 P&H 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 Abex, American Brakeblok Division - Material Number 83-2
  - 7.1.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.45
Static Coefficient of Friction	.41
Operating Temperature (Constant) Max.	700°F
Wear Rate @ 100-500°F (Cu. In./Hp. Hr.)	.002

  - 7.1.2 Size Range

Thickness:	3/16" to 5/8"
Width:	1" to 12"
Length:	140° of Circle

  - 7.1.3 Standard Tolerances

Thickness:	+ .000" - .020"
Width:	± .015"
Length:	± 1/16"

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7.2 Gatke Corporation - Material Number 2460

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.42 ± .05 Dry
Static Coefficient of Friction	.45 ± .05 Dry
Wear Rate @ 70-500°F (Cu. In./Hp. Hr.)	.009
Recommended Maximum Pressure	100 P.S.I.
Maximum Rubbing Speed (Not at Maximum Pressure)	3,000 F.P.M.
Compressive Strength	11,000 P.S.I.
Flexural Strength	5,900 P.S.I.
Impact Strength (IZOD)	4.2 P.S.I.
Hardness (Rockwell M)	34 to 52
Density (Oz./Cu. In.)	1.26

7.2.2 Size Range

Thickness: 1/16" to 3/8"
Width: 1" to 20"
Length: 26" Max.

7.2.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.3 H.K. Porter Company - Material Number 7022-1

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 100 psi, 1200 F.P.M.	.43
Static Coefficient of Friction	.31 to .35
Wear 100 to 600°F	.008"

7.3.2 Size Range

Facings
Thickness: 3/16" to 3/4"
Diameter: 30" Max.
Brake Lining
Thickness: .50" Max.

7.3.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125"
Diameters: ± .030"

7.4 H.K. Porter Company - Material Number D-753

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 150 psi, 20 F.P.S., 350°F	.50
Static Coefficient of Friction	.32 - .36
Specific Gravity	1.73

7.4.2 Size Range

Thickness: 3/16" to 3/4"
Width: 30" Max.

7.4.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125"

7.5 Raybestos-Manhattan - Material Number R-3375-1

7.5.1 Mechanical and Physical Properties

Coefficient of Friction	.43

7.5.2 Size Range

Thickness: 1/16" to 1/2"
Width: 12" Max.

7.5.3 Standard Tolerances

Up to 6" Wide		Over 6" Wide	
Thickness:	± .010"	Thickness:	± .010"
Width:	+ .000" - 1/32"	Width:	± 1/16"
		Length:	± 1/16"

7.6 National Friction Products Corporation - Material N.F. 145

7.6.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.46
Maximum Rubbing Speed	7,500 F.P.M.
Operating Temperature	480°F
Wear Rate (Cu. In./Hp. Hr.)	.005
Tensile Strength	3,000 Lbs.
Specific Gravity	1.75 ± .05

7.6.2 Size Range

National Friction Products will quote sizes on specific parts.

7.6.3 Standard Tolerances

National Friction Products will set tolerances on specific parts.

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Harnischfeger P&H
milwaukee, wisconsin, 53201

MATERIAL SPECIFICATION P&H NO. 3013

ISSUE NO. 3, 1-76

Superseded 4-80

FRICTION MATERIAL — MOLDED BLOCK ; FOR CLUTCH SHOES AND BRAKE BANDS

1.0 SCOPE
- 1.1 This specification covers the physical and mechanical properties of a friction material used on clutch shoes and brake bands for transferring frictional forces in dry contact with friction drums.
- 1.2 Common product applications include crane motor brakes, propel brakes, excavator hoist and digging clutches, swing clutches, boom hoist planetary brakes.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a rigid, molded, ground block of asbestos combined with a special binder and metallic or nonmetallic friction particles. The material shall be molded under high heat and pressure giving long life under a wide range of temperatures and a high friction value.
- 2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.
- 3.2 These properties 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 should be as indicated on the detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances, as they apply, shall be specified under Paragraph 7.0 for each 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 P&H 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 Abex, American Brakeblok Division - Material Number 83-2

7.1.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.45
Static Coefficient of Friction	.41
Operating Temperature (Constant) Max.	700°F
Wear Rate @ 100-500°F (Cu. In./Hp. Hr.)	.002

7.1.2 Size Range

Thickness:	3/16" to 5/8"
Width:	1" to 12"
Length:	140° of Circle

7.1.3 Standard Tolerances

Thickness:	+ .000" - .020"
Width:	± .015"
Length:	± 1/16"

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7.2 Gatke Corporation - Material Number 2460

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.42 ± .05 Dry
Static Coefficient of Friction	.45 ± .05 Dry
Wear Rate @ 70-500°F (Cu. In./Hp. Hr.)	.009
Recommended Maximum Pressure	100 P.S.I.
Maximum Rubbing Speed (Not at Maximum Pressure)	3,000 F.P.M.
Compressive Strength	11,000 P.S.I.
Flexural Strength	5,900 P.S.I.
Impact Strength (IZOD)	4.2 P.S.I.
Hardness (Rockwell M)	34 to 52
Density (Oz./Cu. In.)	1.26

7.2.2 Size Range

Thickness: 1/16" to 3/8"
Width: 1" to 20"
Length: 26" Max.

7.2.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.3 Gatke Corporation - Material Number 3853

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.45 ± .05 Dry
Static Coefficient of Friction	.49 ± .05 Dry
Wear Rate @ 70-500°F (Cu. In./Hp. Hr.)	.004
Recommended Maximum Pressure	150 P.S.I.
Maximum Rubbing Speed (Not at Maximum Pressure)	5,000 F.P.M.
Compressive Strength	26,000 P.S.I.
Flexural Strength	9,800 P.S.I.
Impact Strength (IZOD)	1.37 P.S.I.
Hardness (Rockwell M)	98
Density (Oz./Cu. In.)	1.20

7.3.2 Size Range

Thickness: 3/16" to 4"
Width: 1" to 24"
Length: 20" Max.

7.3.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.4 H.K. Porter Company - Material Number 7022-1

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 100 psi, 1200 F.P.M.	.43
Static Coefficient of Friction	.31 to .35
Wear 100 to 600°F	.008"

7.4.2 Size Range

Facings
Thickness: 3/16" to 3/4"
Diameter: 30" Max.
Brake Lining
Thickness: .50" Max.

7.4.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125"
Diameters: ± .030"

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7.5 H.K. Porter Company - Material Number D-753

7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 150 psi, 20 F.P.S., 350°F	.50
Static Coefficient of Friction	.32 - .36
Specific Gravity	1.73

7.5.2 Size Range

Thickness: 3/16" to 3/4"
Width: 30" Max.

7.5.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125"

7.6 Raybestos-Manhattan - Material Number R-3375-1

7.6.1 Mechanical and Physical Properties

Coefficient of Friction	.43

7.6.2 Size Range

Thickness: 1/16" to 1/2"
Width: 12" Max.

7.6.3 Standard Tolerances

Up to 6" Wide		Over 6" Wide	
Thickness:	± .010"	Thickness:	± .010"
Width:	+ .000" - 1/32"	Width:	± 1/16"
		Length:	± 1/16"

7.7 National Friction Products Corporation - Material N.F. 145

7.7.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.46
Maximum Rubbing Speed	7,500 F.P.M.
Operating Temperature	480°F
Wear Rate (Cu. In./Hp. Hr.)	.005
Tensile Strength	3,000 Lbs.
Specific Gravity	1.75 ± .05

7.7.2 Size Range

National Friction Products will quote sizes on specific parts.

7.7.3 Standard Tolerances

National Friction Products will set tolerances on specific parts.

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FRICTION MATERIAL — MOLDED BLOCK ; FOR CLUTCH SHOES AND BRAKE BANDS

1.0 SCOPE

1.1 This specification covers the physical and mechanical properties of a friction material used on clutch shoes and brake bands for transferring frictional forces in dry contact with friction drums.

1.2 Common product applications include crane motor brakes, propel brakes, excavator hoist and digging clutches, swing clutches, boom hoist planetary brakes.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a rigid, molded, ground block of asbestos combined with a special binder and metallic or nonmetallic friction particles. The material shall be molded under high heat and pressure giving long life under a wide range of temperatures and a high friction value.

2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.

3.2 These properties 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 should be as indicated on the detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.

4.2 All tolerances, as they apply, shall be specified under Paragraph 7.0 for each 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 P&H 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 Abex, American Brakeblok Division - Material Number 74-13

7.1.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.45
Static Coefficient of Friction	.42
Operating Temperature (Constant) Max.	550°F
Wear Rate @ 100-500°F (Cu.In./Hp.Hr.)	.005

7.1.2 Size Range

Thickness:	5/32 to 3/4"
Width:	1" to 14"
Length:	130° of circle

7.1.3 Standard Tolerances

Thickness:	+.000" - .020"
Width:	±.015"
Length:	±1/16"

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7.2 Gatke Corporation - Material Number 2460

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.42 ± .05 Dry
Static Coefficient of Friction	.45 ± .05 Dry
Wear Rate @ 70-500°F (Cu.In./Hp.Hr.)	.009
Recommended Maximum Pressure	100 P.S.I.
Maximum Rubbing Speed (Not at Maximum Pressure)	3,000 F.P.M.
Compressive Strength	11,000 P.S.I.
Flexural Strength	5,900 P.S.I.
Impact Strength (IZOD)	4.2 P.S.I.
Hardness (Rockwell M)	34 to 52
Density (Oz./Cu.In.)	1.26

7.2.2 Size Range

Thickness:	1/16" to 3/8"
Width:	1" to 20"
Length:	26" Max.

7.3 Gatke Corporation - Material Number 3853

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.45 ± .05 Dry
Static Coefficient of Friction	.49 ± .05 Dry
Wear Rate @ 70-500°F (Cu.In./Hp.Hr.)	.004
Recommended Maximum Pressure	150 P.S.I.
Maximum Rubbing Speed (Not at Maximum Pressure)	5,000 F.P.M.
Compressive Strength	26,000 P.S.I.
Flexural Strength	9,800 P.S.I.
Impact Strength (IZOD)	1.37 P.S.I.
Hardness (Rockwell M)	98
Density (Oz./Cu.In.)	1.20

7.3.2 Size Range

Thickness:	3/16" to 4"
Width:	1" to 24"
Length:	20" Max.

7.3.3 Standard Tolerances

Thickness:	±.010"
Width:	±1/64"
Length:	±1/16"

7.4 H.K. Porter Company - Material Number 7022-1

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 100 psi, 1200 F.P.M.	.43
Static Coefficient of Friction	.31 to .35
Wear 100 to 600°F	.008"

7.4.2 Size Range

Facings

Thickness:	3/16" to 3/4"
Diameter:	30" Max.

Brake Lining

Thickness:	.50" Max.

7.4.3 Standard Tolerances

Thickness:	±.010"
Width:	±.030"
Length:	±.125"
Diameters:	±.030"

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7.5 H.K. Porter Company - Material Number D-753

7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 150 psi, 20 F.P.S., 350° F	.50
Static Coefficient of Friction	.32 - .36
Specific Gravity	1.73

7.5.2 Size Range

Thickness: 3/16" to 3/4"
Width: 30" Max.

7.5.3 Standard Tolerances

Thickness: ±.010"
Width: ±.030"
Length: ±.125"

7.6 Raybestos-Manhattan - Material Number R-3375-1

7.6.1 Mechanical and Physical Properties

Coefficient of Friction .43

7.6.2 Size Range

Thickness: 1/16" to 1/2"
Width: 12" Max.

7.6.3 Standard Tolerances

Up to 6" Wide		Over 6" Wide	
Thickness:	±.010"	Thickness:	±.010"
Width:	±.000" - 1/32"	Width:	±1/16"
		Length:	±1/16"

7.7 National Friction Products Corporation - Material N.F. 145

7.7.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.46
Maximum Rubbing Speed	7,500 F.P.M.
Operating Temperature	480° F
Wear Rate (Cu.In./Hp.Hr.)	.005
Tensile Strength	3,000 Lbs.
Specific Gravity	1.75 ± .05

7.7.2 Size Range

National Friction Products will quote sizes on specific parts.

7.7.3 Standard Tolerances

National Friction Products will set tolerances on specific parts.

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3014

SUPERSEDED BY P&H 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

This material is a molded type brake lining consisting of a densely compressed composition of asbestos, friction modifying pigments with resin and rubber binder, heat treated and ground to give the desired frictional characteristics, for use on brakes wherever specified.

Specific Gravity 2.35

B. Mechanical Qualities

Pressure	50# p.s.i.
Rubbing speed	960 f.p.m.
Temperature (max.)	600°F. - Constant 350°F.
Coef. of friction at 400°F.	.35-.40
Rate of wear at 400°F.	.0032 cu. in/Hp hr.

C. Procurement

Thickness range	1/4" to 2"
Outside Diameter	2" to 44"

TOLERANCES

Thickness	Diameters
Plus or minus .010"	Plus or minus .020"

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 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-Manhattan, material number R-8000

12-8-55

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3015

SUPERSEDED BY P&H 3013

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

Frictional stability: Outstanding
Structure: Rigid and ground

Specific Gravity 2.32

B. Mechanical Qualities

Pressure	450# p.s.i.
Rubbing speed	550 f.p.m.
Temperature (max.)	800°F
Coef. of friction at 350°F	.28
Rate of wear at 350°F	.002 cu. in HP/hr.

C. Procurement

Thickness range	3/16" through 1"
Width range	1" through 10"
Length range	120° Arc

TOLERANCES

Thickness	Width and Length
± .005 when width is 2-1/2" or less	Width - Plus or minus .015
± .008 when width is 5" or less	
± .010 when width is 8" or less	Length - Plus or minus 1/16
± .015 when width is 12" or less	

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 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 an American Brake Shoe Co. matl., No. 550-596.

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

SUPERSEDED BY P&H 3009

P&H NO. 3016

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

Frictional Stability: Superior
Structure: Rigid and Ground

Specific Gravity 2.00

B. Mechanical Qualities

Pressure	450# p.s.i.
Rubbing Speed	550 ft. per minute
Temperature	700°F
Coef. of friction at 350°F	.39
Rate of Wear at 350°F	.002 cu. in. Hp/Hr.

C. Procurement

Thickness Range	3/16" through 1"
Width Range	1" through 10"
Length Range	120"

TOLERANCES

Thickness	Width & Length
± .005 when width is 2-1/2" or less	Width - Plus or minus .015
± .008 when width is 5" or less	
± .010 when width is 8" or less	Length - Plus or minus 1/16
± .015 when width is 12" or less	

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 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 American Brake Shoe Co., Material No. 693-499.

12-6-55

CONFIDENTIAL and PROPRIETARY

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3017

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

(a) Construction

A semi-flexible type made from a woven brass wire inserted asbestos tape impregnated with thermo-setting resin, plastic and special inorganic compound to provide high static friction for holding brakes.

Specific Gravity - Approx. 1.90

(b) Mechanical Qualities

Pressure	50# p.s.i.
Rubbing Speed (max.)	None (Holding Brakes)
Temperature (max.)	500°F. (Constant 250°F.)
Coef. of friction at 350°F.	.45 ± .07
Rate of wear at 350°F.	.0085 cu. in. Hp/Hr.

(c) Procurement

Thickness Range	1/8" to 5/16" incl.
Width Range	1" to 24" incl.
Length Range	25' and 50' rolls

TOLERANCE

Thickness	Width
All ± .010"	to 12" ± 1/16" Over 12" ± 5/16"

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 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 Johns-Manville Material No. 11-7680-2

Original: 1-11-56

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3017 Addendum #1 This book only

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

2. Physical Characteristics

A. Construction

Heavy duty woven asbestos tape with brass wire inserted yarns, vacuum impregnated with heat and wear resistant treatment. Lining is heavily compressed and ground on both surfaces. Construction and finish provide a very dense, somewhat rigid lining.

Specific gravity 1.47

B. Mechanical Qualities

Pressure (Max.)	100# p.s.i.
Rubbing Speed (Max.)	5000 f.p.m.
Temperature (Max.)	600°F Constant 450°F
Coef. of friction at 250°F	0.44
Rate of Wear at 250°F	.009 cu. in HP./Hr.

C. Procurement

Thickness range	1/4 to 1/2
Width Range	1-1/2 to 10
Length Range	25 to 50 ft. rolls

TOLERANCES

Thickness	Width & Length
Plus or Minus .005	Width - Plus or Minus 1/32 Length - Plus or Minus 1/32

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 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 Raybestos-Manhattan, Inc., Matl. No. US-2010.

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3017

Friction Material

1.0 Scope

1.1 This specification covers the physical and mechanical qualities of a friction material used by this company on brake bands for extremely high friction service on dry contact with friction drums.

2.0 Physical Qualities

2.1 The construction shall consist of heat and pressure molded dry mix material.

2.2 The specific gravity shall be 1.95 plus or minus .03.

3.0 Mechanical Qualities

3.1 The following are the maximum values:

Pressure	150 P.S.I.
Rubbing Speed	3000 F.P.M.
Operating Temperature	700° F.

3.2 When in operation the material shall conform to the following frictional test data at 75 P.S.I.

Coefficient of Friction	.45
Operating Temperature	500° F. Constant
Rubbing Speed	1300 F.P.M.
Rate of Wear	.005 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range	1/4" thru 1/2"
Width Range	2" thru 7"
Length Range	4" thru 18"

4.2 Tolerances applicable shall be as follows:

Thickness	Width
Plus or minus .005"	2" thru 2-1/2"
Plus or minus .008"	2-1/2" thru 5"
Plus or minus .010"	5" thru 7"

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5.0 Marking

5.1 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.

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 specification.

Note: Purchasing Department
This specification applied to material number 693-539 manufactured by the American Brakeblok Company.

Original: 9- 3-59

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Harnischfeger

P

milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3017

ISSUE NO. 2, 9–74

Disc

FRICTION MATERIAL– CLUTCH SHOES AND BRAKE BANDS; REINFORCED WOVEN MATERIAL

1.0 SCOPE
- 1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.
- 1.2 Common product applications include excavator propel brakes and excavator swing brakes.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a heavy-duty, semi-flexible woven and compressed asbestos yarn cloth reinforced with nonferrous wire inserts and impregnated with thermosetting resin, plastic and special inorganic compounds to provide high static friction.
- 2.2 The characteristics essential to this woven friction material shall be high friction properties under static and dynamic conditions.
- 2.3 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.
- 3.2 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 or at intervals in roll form 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 Fenner America Ltd., Type 333

7.1.1 Mechanical and Physical Properties:

Kinetic Coefficient of Friction at 400°F	.40
Recommended Maximum Rubbing Speed	5000 FPM
Recommended Maximum Pressure	150 psi
Maximum Constant Operating Temperature	400°F

7.1.2 Size Limitations:

Thickness: 3/16" to 3/4"
Width: 12" Maximum

7.1.3 Standard Tolerances:

Thickness: ± 1/32"
Width: ± 1/32"

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7.2 Raybestos Manhattan, Material Number US-2010

7.2.1 Mechanical and Physical Properties:

Coefficient of Friction	.45 dry
Coefficient of Friction	.10 oil

7.2.2 Size Limitations:

Thickness:	1/8" to 1/2"
Width:	1-1/2" to 10"

7.2.3 Standard Tolerances:

Thickness:	± .008"
Width:	± 1/32"
Length:	+ 1/16" -0"

7.3 Standco Industries Inc., Style No. 1000

7.3.1 Mechanical and Physical Properties:

Coefficient of Friction	.45 ± .07 Dry
Maximum Rubbing Speed	7,500 Ft./Min.
Maximum Constant Drum Temperature	500°F
Maximum Braking Pressure	100 psi

7.3.2 Size Limitations:

Thickness:	3/16" to 1"
Width:	1" to 12"
Length:	25' Rolls

7.3.3 Standard Tolerances:

Thickness:	3/16" to 1/4" thick	+ .010 -.015
	5/16" thick and over	+ .015 -.030
Width:	3/16" to 1/4" thick	± 1/16"
	5/16" thick and over	+ 3/32" -1/16"

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Harnischfeger

Milwaukee, Wisconsin 53201

MATERIAL SPECIFICATION P&H NO. 3017

ISSUE NO. 2, 9–74

Discontinued & superceded by P&H 3024 Issue No. 2 4/86

FRICTION MATERIAL— CLUTCH SHOES AND BRAKE BANDS; REINFORCED WOVEN MATERIAL

1.0 SCOPE
- 1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.
- 1.2 Common product applications include excavator propel brakes and excavator swing brakes.

2.0 PHYSICAL PROPERTIES
- 2.1 The construction shall consist of a heavy-duty, semi-flexible woven and compressed asbestos yarn cloth reinforced with nonferrous wire inserts and impregnated with thermosetting resin, plastic and special inorganic compounds to provide high static friction.
- 2.2 The characteristics essential to this woven friction material shall be high friction properties under static and dynamic conditions.
- 2.3 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES
- 3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.
- 3.2 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 or at intervals in roll form 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 Fenner America Ltd., Type 333
  - 7.1.1 Mechanical and Physical Properties:

Kinetic Coefficient of Friction at 400°F	.40
Recommended Maximum Rubbing Speed	5000 FPM
Recommended Maximum Pressure	150 psi
Maximum Constant Operating Temperature	400°F

  - 7.1.2 Size Limitations:
    - Thickness: 3/16" to 3/4"
    - Width: 12" Maximum
  - 7.1.3 Standard Tolerances:
    - Thickness: ± 1/32"
    - Width: ± 1/32"

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7.2 Raybestos Manhattan, Material Number US-2010

7.2.1 Mechanical and Physical Properties:

Coefficient of Friction	.45 dry
Coefficient of Friction	.10 oil

7.2.2 Size Limitations:

Thickness:	1/8" to 1/2"
Width:	1-1/2" to 10"

7.2.3 Standard Tolerances:

Thickness:	± .008"
Width:	± 1/32"
Length:	+ 1/16" -0"

7.3 Standco Industries Inc., Style No. 1000

7.3.1 Mechanical and Physical Properties:

Coefficient of Friction	.45 ± .07 Dry
Maximum Rubbing Speed	7,500 Ft./Min.
Maximum Constant Drum Temperature	500°F
Maximum Braking Pressure	100 psi

7.3.2 Size Limitations:

Thickness:	3/16" to 1"
Width:	1" to 12"
Length:	25' Rolls

7.3.3 Standard Tolerances:

Thickness:	3/16" to 1/4" thick	+ .010 -.015
	5/16" thick and over	+ .015 -.030
Width:	3/16" to 1/4" thick	± 1/16"
	5/16" thick and over	+ 3/32" -1/16"

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3018

Disc. 11-77

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on clutch shoes and brake bands for transferring frictional forces and wet contact with friction drums.

2. Physical Characteristics

(a) Construction

Semi-flexible facing made by impregnating and chemically curing woven brass wire inserted asbestos yarn cloth with an inorganic compound unaffected by oil. Specifically designed for wet operation.

Specific Gravity - 1.97

(b) Mechanical Qualities

Pressure (max.)	50 p.s.i.
Rubbing Speed (max.)	3000 ft./min.
Temperature (max.)	750° (500°F. Constant)
Coef. of friction	.20 ±.07 in oil
Rate of wear	Negligible (limited by oil)

(c) Procurement

Thickness Range	1/8" to 5/16" incl.
Diameters	1/8" to 1/4" thick - 23" max.
"	5/16" thick - 15" max.

TOLERANCE

Thickness	Width	
Plus or minus .015"	Up to 12" O.D.	± 1/64"
	12" to 18" O.D.	± 1/16"
	18" to 22" O.D.	± 1/8"
	Over 22" O.D.	± 1/4"

3. Marking

The name nad 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 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 Johns-Manville Material No. 354

Original: 1-11-56 PG 1 OF 1

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3018

SUPERSEDED BY P&H 3006

FRICTION MATERIAL

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

2. Physical Characteristics

(a) A brass wire inserted tape woven lining, semi-rigid designed for higher friction value

Specific Gravity 1.810 ±.10

(b) Mechanical Qualities

Pressure	100# p.s.i.
Rubbing Speed	7500 f.p.m.
Temperature (max.)	500°F
Coef. of Friction at 350°F	.09
Rate of wear	.0019 cu. in. Hp/Hr.

(c) Procurement

		Tolerance
Thickness Range	5/32 to 1-1/4"	±.010
Width Range	1" to 12"	±1/32
Length Range	25 to 50 ft.	±1/16

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 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 Asbestos Manufacturing Co. Material No. B&T

Original: 1-10-56

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P&H
milwaukee, wisconsin 53246

MATERIAL SPECIFICATION P&H NO. 3019

ISSUE NO. 3, 1-74

FRICTION MATERIAL - WET CONTACT

Disc

1.0 SCOPE

1.1 This Specification covers the characteristics of friction materials used on discs for transferring the frictional forces to friction plates while being immersed in oil.

2.0 MATERIAL CHARACTERISTICS

2.1 This is a special disc-type facing, rigid molded, developed for use in oil only and especially adapted for internally splined discs, has built wiping sections and made for wet applications.

2.2 Mechanical Qualities:

2.2.1 Pressure	150 psi
2.2.2 Rubbing Speed	5,000 F.P.M.
2.2.3 Temperature	400°F max.
2.2.4 Coef. of friction @350°F	.10
2.2.5 Rate of wear @350°F	.0024 Cu."/H.P. Hr.

2.3 Tolerances:

2.3.1 O.D. range of 0" - 7"	± .015" max.
2.3.2 O.D. range of 7" - 15"	± .020" max.
2.3.3 O.D. range of 16" - 25"	± .030" max.
2.3.4 Thickness range of 1/8" to 1/4"	± .005" max.

3.0 PACKAGING

3.1 The material furnished under this specification, in the absence of a method agreed upon between Purchaser and supplier, shall be packaged in such a way as to meet current OSHA standards for emission of asbestos fibers into the atmosphere.

3.2 Each package will have listed upon it the following information:

3.2.1 P&H Specification No. 3019
3.2.2 Purchase Order No.
3.2.3 Manufacturer's designation of the material
3.2.4 Manufacturer's Name

3.3 The type of material and the manufacturer's name shall appear on each piece, in such a way as to readily be identifiable.

4.0 INSPECTION

4.1 Material furnished under this specification shall be subject to incoming inspection at any of the Harnischfeger Corporation Plants, who reserves the right to reject material which does not comply with the above Specification.

5.0 APPROVED VENDOR

5.1 H. K. Porter (Thermoid Division) Material D-575A only.

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3020

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material used on shoe type crane motor brakes.

2. Physical Characteristics

A. Construction

A rigid moulded ground block made from asbestos, a special binder and a non-metallic friction particle. Moulded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

Specific Gravity - 2.15

B. Mechanical Qualities

Pressure		150# P.S.I.
Rubbing Speed (maximum)		7500 F.P.M.
Temperature (maximum)		1000° F. constant oper. 750° F.
Coef. of friction at 300-750° F.		.45 plus or minus .07
Rate of Wear	at 350° F.	.0035 Cu. in./hp. hr.

C. Procurement

Thickness range	3/8" to 1"
Width range	1" to 24"
Length range	120° of circle but not over 24" lg. cord. Maximum area 300 sq. in.

Superseded by 3020-A

TOLERANCES

Thickness	Width	Length
Up to 8" wide +.000" -.020"	Up to 8" ± 1/32	Machined block ± 1/16" 1/16", -0"
Over 8" wide +.000" -.032"	Over 8" ± 1/16	Plain moulded 1/8"

3. Marking

The name and brand of the manufacturer, Johns-Manville style 150, shall legibly appear on each piece 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 Johns-Manville material Style 150 moulded block only.

12-17-58 Sheet 1 of 2

(For useage see 715U1-DO)

HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3020

FRICTION MATERIAL

1. This specification covers the characteristics of a friction material on shoe type crane motor brakes.

2. Physical Characteristics

A. Construction

A rigid moulded lining, rubber or synthetic bonded with a low metal content. Manufacturing without backing for moderate duty service. Specifically designed and ground so that each side of the lining can be used as the wearing surface, for both external or internal brakes.

Specific Gravity 2.18

B. Mechanical Qualities

Pressure	100# P.S.I.
Rubbing Speed (maximum)	5000 F.P.M.
Temperature (maximum)	750° F. constant oper. 500° F.
Coef. of friction at 300-700° F.	100 P.S.I. .40 ±.07
Rate of wear at 350° F.	100 P.S.I. .008 Cu. in./hp. hr.

C. Procurement

Thickness range	1/8" to 3/8" incl.
Width range	1" to 12"
Length range (maximum)	10'-6"

TOLERANCES

Thickness	Width	Length	
.000" -.020"	1" and over 1/16"	1/16"	Up to 6" lg. of arc 1/16" Up to 12"lg. of arc 3/16" Over 12"lg. of arc 1/4"

3. Marking

The name and brand of the manufacturer, Johns-Manville material #200, shall legibly appear on each piece 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 Johns-Manville material #200, molded lining.

(For useage see 715U1-D0)

12-17-58 Sheet 2 of 2

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Harnischfeger

Milwaukee, Wisconsin 53246

MATERIAL SPECIFICATION P&H NO. 3020

ISSUE NO. 2, 12-71

Superseded by Issue #3 Revised Approved Sources, & Properties Data & Suppliers

FRICTION MATERIAL - SHOE-TYPE CRANE MOTOR BRAKES

1.0 SCOPE

1.1 This specification covers a type of friction material used by this company on shoe-type crane motor brakes.

2.0 PHYSICAL QUALITIES

2.1 The construction shall consist of a rigid molded ground block made from asbestos, a special binder, and a metallic or non-metallic friction particle molded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

2.2 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, width, and length 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 Purchaser's Name and Purchase Order Number

5.2.2 Supplier's Name

5.2.3 Grade or Specification

5.2.4 Purchaser's Part Numbers (Size)

6.0 INSPECTION AT PURCHASER'S WORKS

6.1 Acceptance of material furnished under this specification shall be subject to confirmation by Purchaser'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 Abex, American Brakeblok Division - Material Number 693-539 - Molded Block Only:

7.1.1 Mechanical and Physical Qualities:

The following are typical values for dry surfaces -

Pressure	25 P.S.I.
Rubbing Speed	3,000 F.P.M.
Operating Temperature	700°F (Constant Operation)
Coefficient of Friction @ 100-700°F	0.40 Min. (Dynamic & Static)
Specific Gravity	1.95 ± .10
Rate of Wear @ 400°F	0.018 Cu. In./HP Hr.

7.1.2 Size Range:

THICKNESS	WIDTH	LENGTH
1/4" To 1/2"	2" To 11"	124° Of Circle

7.1.3 Tolerances:

THICKNESS	WIDTH	LENGTH
+0.000" -0.020"	± .015"	± 1/16"

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7.2 Johns-Manville - Material Number 150 - Molded Block Only:

7.2.1 Mechanical and Physical Qualities:

The following are typical values for dry surfaces -

Pressure	150 P.S.I. Maximum
Rubbing Speed	7,500 F.P.M. Maximum
Operating Temperature	750°F Maximum (Constant Operation)
Coefficient of Friction	0.45 ± 0.07 @ 350°F, 50 P.S.I.
Specific Gravity	2.15 ± 0.10
Rate of Wear @ 350°F	0.0035 Cu. In./HP Hr.

7.2.2 Size Range:

THICKNESS	WIDTH	LENGTH
3/8" To 4"	1" To 24"	135° Of Circle - Not Over 24" Long Cord - Max. Area 600 Sq. In.

7.2.3 Tolerances:

THICKNESS	WIDTH
Up To 8" Wide +0.000" -0.020"	Up To 8" ± 1/32"
Over 8" Wide +0.000" -0.032"	Over 8" ± 1/16"

7.3 Johns-Manville - Material Number 200 - Molded Lining:

7.3.1 Mechanical and Physical Qualities:

The following are typical values for dry surfaces -

Pressure	100 P.S.I. Maximum
Rubbing Speed	5,000 F.P.M. Maximum
Operating Temperature	500°F Maximum (Constant Operation)
Coefficient of Friction	0.40 ± 0.07 @ 350°F, 50 P.S.I.
Specific Gravity	2.18 ± 0.10
Rate of Wear @ 350°F	0.008 Cu. In./HP Hr.

7.3.2 Size Range:

THICKNESS	WIDTH	LENGTH
1/8" To 3/8"	1" To 12"	120° Of Circle - Not Over 28" Long Cord

7.3.3 Tolerances:

THICKNESS	WIDTH
+0.000" -0.020"	1" And Over ± 1/16"

NOTE: The above listing of vendors and their products is in the order of preference.

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Harnischfeger

milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3020

ISSUE NO. 3, 9-74

FRICTION MATERIAL - SHOE TYPE; CRANE MOTOR BRAKES

1.0 SCOPE

1.1 This specification covers a type of friction material used by this company on shoe-type crane motor brakes.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a rigid molded ground block made from asbestos, a special binder, and a metallic or non-metallic friction particle molded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

2.2 Physical qualities shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

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, width, and length 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 P&H 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 Abex, American Brakeblok Division - Material Number 693-539

7.1.1 Mechanical and Physical Properties

The following are typical values for dry surfaces:	
Pressure	25 P.S.I.
Rubbing Speed	3,000 F.P.M.
Operating Temperature (Constant)	700°F
Coefficient of Friction @ 100-700°F (Dynamic)	.40
Specific Gravity	1.95 ± .10
Wear Rate @ 400°F (Cu. In./Hp. Hr.)	.018

7.1.2 Size Range

Thickness:	1/4" to 1/2"
Width:	2" to 11"
Length:	124° of Circle

7.1.3 Standard Tolerances

Thickness:	+.000" -.020"
Width:	±.015"
Length:	± 1/16"

11/11/77

General Info Note
Asbestos Content runs
50-60% by Gross Wgt
Not Part of Spec.

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7.2 Gatke Corporation - Material Number 3978

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.41 ± .05 Dry
Static Coefficient of Friction	.43 ± .05 Dry
Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.15 ± .05 Oil
Static Coefficient of Friction	.19 ± .05 Oil
Wear Rate @ 70-500°F (Cu. In./Hp. Hr.)	.004
Recommended Maximum Pressure	200 P.S.I.
Maximum Rubbing Speed (Not At Max. Pressure)	5,000 F.P.M.
Compressive Strength	21,600 P.S.I.
Flexural Strength	10,800 P.S.I.
Impact Strength (IZOD)	1.46 P.S.I.
Hardness (Rockwell M)	91
Density (Oz./Cu. In.)	1.08

7.2.2 Size Range

Thickness: 3/16" to 4"
Width: 1" to 24"
Length: 20" Max.

7.2.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.3 H.K. Porter Company - Material Number 7022-1

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 100 psi, 1200 F.P.M., 350°F	.43
Static Coefficient of Friction	.31 to .35
Wear @ 100 to 600°F	.008"

7.3.2 Size Range

Facings
Thickness: 3/16" to 3/4"
Diameter: 30" Max.
Brake Lining
Thickness: .50" Max.

7.3.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125
Diameters: ± .030"

7.4 H.K. Porter Company - Material Number D-753

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 150 psi, 20 F.P.S., 350°F	.50
Static Coefficient of Friction	.32 to .36
Specific Gravity	1.73

7.4.2 Size Range

Thickness: 3/16" to 3/4"
Width: 30" Max.

7.4.3 Standard Tolerances

Thickness: ±.010"
Width: ±.030"
Length: ±.125"

7.5 National Friction Products Corporation - Material Number NF-155 For Radius Applications

7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.47
Maximum Operating Temperature (Constant)	475°F
Maximum Recommended Rubbing Speed	7,000 F.P.M.
Maximum Recommended Pressure	4,000 P.S.I.
Specific Gravity	1.87 ± .05

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.

CONFIDENTIAL and PROPRIETARY

7.6 Raybestos-Manhattan - Material Number R-4000
- 7.6.1 Mechanical and Physical Properties
  - Kinetic Coefficient of Friction .43
- 7.6.2 Size Range
  - Thickness: 1/2" to 5"
  - Width: 1" to 26"
- 7.6.3 Standard Tolerances
  - Thickness: ± .010"
  - Width: ± .015"
  - Length: ± .060"

7.7 Raybestos Manhattan - Material Number R-4807
- 7.7.1 Mechanical and Physical Properties
  - Kinetic Coefficient of Friction .45
- 7.7.2 Size Range
  - Thickness: 1/2" to 5"
  - Width: 1" to 26"
- 7.7.3 Standard Tolerances
  - Thickness: ± .010"
  - Width: ± .015"
  - Length: ± .060"

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Harnischfeger

P&H

milwaukee, wisconsin, 53201

MATERIAL SPECIFICATION P&H NO. 3020

ISSUE NO. 4, 10-80

FRICTION MATERIAL—SHOE TYPE; CRANE MOTOR BRAKES

Disc 02-91

1.0 SCOPE

1.1 This specification covers a type of friction material used by this company on shoe-type crane motor brakes.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a rigid molded ground block made from asbestos, a special binder, and a metallic or non-metallic friction particle molded under high heat and pressure giving long life under a wide range of temperatures and possessing high friction.

2.2 Physical qualities shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

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, width, and length 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 P&H 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 Abex, American Brakeblok Division - Material Number 693-539

7.1.1 Mechanical and Physical Properties

The following are typical values for dry surfaces:

Pressure	25 P.S.I.
Rubbing Speed	3,000 F.P.M.
Operating Temperature (Constant)	700°F
Coefficient of Friction @ 100-700°F (Dynamic)	.40
Specific Gravity	1.95 ± .10
Wear Rate @ 400°F (Cu. In./Hp. Hr.)	.018

7.1.2 Size Range

Thickness: 1/4" to 1/2"
Width: 2" to 11"
Length: 124° of Circle

7.1.3 Standard Tolerances

Thickness: +.000" -.020"
Width: ±.015"
Length: ± 1/16"

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7.2 Gatke Corporation - Material Number 3978

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.41 ± .05 Dry
Static Coefficient of Friction	.43 ± .05 Dry
Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M. 70-500°F	.15 ± .05 Oil
Static Coefficient of Friction	.19 ± .05 Oil
Wear Rate @ 70-500°F (Cu. In./Hp. Hr.)	.004
Recommended Maximum Pressure	200 P.S.I.
Maximum Rubbing Speed (Not At Max. Pressure)	5,000 F.P.M.
Compressive Strength	21,600 P.S.I.
Flexural Strength	10,800 P.S.I.
Impact Strength (IZOD)	1.46 P.S.I.
Hardness (Rockwell M)	91
Density (Oz./Cu. In.)	1.08

7.2.2 Size Range

Thickness: 3/16" to 4"
Width: 1" to 24"
Length: 20" Max.

7.2.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.3 H.K. Porter Company - Material Number 7022-1

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 100 psi, 1200 F.P.M., 350°F	.43
Static Coefficient of Friction	.31 to .35
Wear @ 100 to 600°F	.008"

7.3.2 Size Range

Facings
Thickness: 3/16" to 3/4"
Diameter: 30" Max.
Brake Lining
Thickness: .50" Max.

7.3.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125
Diameters: ± .030"

7.4 H.K. Porter Company - Material Number D-753

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 150 psi, 20 F.P.S., 350°F	.50
Static Coefficient of Friction	.32 to .36
Specific Gravity	1.73

7.4.2 Size Range

Thickness: 3/16" to 3/4"
Width: 30" Max.

7.4.3 Standard Tolerances

Thickness: ±.010"
Width: ±.030"
Length: ±.125"

7.5 National Friction Products Corporation - Material Number NF-155 For Radius Applications

7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.47
Maximum Operating Temperature (Constant)	475°F
Maximum Recommended Rubbing Speed	7,000 F.P.M.
Maximum Recommended Pressure	4,000 P.S.I.
Specific Gravity	1.87 ± .05

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.

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7.6 Raybestos-Manhattan - Material Number R-4000
- 7.6.1 Mechanical and Physical Properties
  - Kinetic Coefficient of Friction .43
- 7.6.2 Size Range
  - Thickness: 1/2" to 5"
  - Width: 1" to 26"
- 7.6.3 Standard Tolerances
  - Thickness: ± .010"
  - Width: ± .015"
  - Length: ± .060"

7.7 Raybestos Manhattan - Material Number R-4807
- 7.7.1 Mechanical and Physical Properties
  - Kinetic Coefficient of Friction .45
- 7.7.2 Size Range
  - Thickness: 1/2" to 5"
  - Width: 1" to 26"
- 7.7.3 Standard Tolerances
  - Thickness: ± .010"
  - Width: ± .015"
  - Length: ± .060"

7.8 Scan-Pac - Style 230
- 7.8.1 Mechanical and Physical Properties
  - Kinetic Coefficient of Friction @350°F, 50 psi .45 ± .07
  - Wear Rate @ 350°F (Cu. In./Hp. Hr.) .005
  - Specific Gravity 1.90 ± 0.10
  - Recommended Max. Pressure 100 P.S.I.
  - Maximum Rubbing Speed 5,000 F.P.M.
  - Maximum Operating Temperature (Constant) 500°F
- 7.8.2 Size Range
  - Thickness: 1/8" to 1/2"
  - Width: 1" to 12"
  - Length: 120° of Circle
- 7.8.3 Standard Tolerances
  - Thickness: +.000 to .020
  - Width: ±1/16"

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HARNISCHFEGER CORPORATION MATERIAL STANDARD

P&H NO. 3021

Friction Material

1.0 Scope

1.1 This specification covers the physical and mechanical qualities of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry surfaces of friction drums.

2.0 Physical Qualities

2.1 The construction shall consist of a rigid molded block made of asbestos with a special binder for metallic friction particles. Molded under high heat and pressure affording long life under a wide range of temperatures, possessing high friction qualities.

2.2 The specific gravity shall be 1.74

3.0 Mechanical Qualities

3.1 The following are the maximum values:

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

3.2 When in operation the material shall conform to the following frictional test data at 50 p.s.i.

Coefficient of Friction	.56 plus or minus .07
Operating Temperature	350° F.
Rubbing Speed	1200 F.P.M.
Rate of Wear	.0043 Cubic Inches per Horsepower Hour

4.0 Procurement

4.1 This material is available in the following ranges:

Thickness Range	1/4" to 4"
Width Range	1" to 24"
Length Range	120° circle (Limited to 24" on chord length) maximum area 600 sq. in.

ORIG. 12-61

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5.0 Tolerance

5.1 Thickness

Up to 8" wide
plus .000" minus .020"
8" to 12" wide
plus .000" minus .032"

Width

Up to 8" wide
plus or minus 1/32"
8" and over
plus or minus 1/16"

Radius

Machined block
plus 1/16" minus .000"
Plain Moulded
plus or minus 1/8"

Over 12" O.D. ground
plus .125" minus .000"

Length

plus or minus 1/16"

6.0 Marking

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

7.0 Inspection

7.1 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 specification.

Note: Purchasing Department - This specification applies to material 1257 manufactured by the Johns-Manville Company.

Original: 12-30-61

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FRICTION MATERIAL — MOLDED BLOCK WITH METALLIC FRICTION PARTICLES Disc 07-99

1.0 SCOPE

1.1 This specification covers the physical and mechanical properties of a friction material used on clutch shoes and brake bands for transferring frictional forces on dry contact with friction drums.

1.2 Common product applications include clutch shoes, brake bands, and holding brakes.

2.0 PHYSICAL PROPERTIES

2.1 The construction shall consist of a rigid molded block of asbestos combined with a special binder containing metallic friction particles. The material shall be molded under high heat and pressure to provide a long life under a wide range of temperature along with high frictional qualities.

2.2 Other physical properties shall be as specified under Paragraph 7.0.

3.0 MECHANICAL PROPERTIES

3.1 This molded block must maintain maximum coefficient of friction under static conditions and be suitable for holding brake applications.

3.2 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this specification.

3.3 These properties 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 detailed drawings or in accordance with the section relating to part identification in the Harnischfeger Quality Control Standard.

4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 P&H 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 National Friction Products Corporation - Material Number NF-160

7.1.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.50
Maximum Recommended Pressure	4,000 P.S.I.
Maximum Recommended Rubbing Speed	7,500 F.P.M.
Maximum Constant Operating Temperature	480°F
Wear Rate (Cu. In./Hp. Hr.)	.006
Specific Gravity	1.78 ± .05
Tensile Strength	3,000 Lbs.

7.1.2 Size Range

National Friction Products will quote sizes on specific parts.

7.1.3 Standard Tolerances

National Friction Products will set tolerances on specific parts.

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7.2 Gatke Corporation - Material Number 3508

7.2.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 75 psi, 1575 F.P.M.	.56 ± .05 Dry
Static Coefficient of Friction	.60 ± .05 Dry
Wear Rate (Cu. In./Hp. Hr.)	.005
Maximum Recommended Pressure	150 P.S.I.
Maximum Recommended Rubbing Speed	5,000 F.P.M.
Energy Absorption(HP/sq.in.)	2.50
Compressive Strength	12,000 P.S.I.
Flexural Strength	9,500 P.S.I.
Impact Strength (IZOD)	1.20 P.S.I.
Hardness (Rockwell M)	84
Density (Oz./Cu. In.)	1.23

7.2.2 Size Range

Thickness: 3/16" to 4"
Width: 1" to 24"
Length: 20" Max.

7.2.3 Standard Tolerances

Thickness: ± .010"
Width: ± 1/64"
Length: ± 1/16"

7.3 H.K. Porter Company - Material Number D-650

7.3.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 100 P.S.I.	.51
Static Coefficient of Friction	.32 to .36
Wear @ 100 to 600°F, 100 P.S.I.	.00127 In.

7.3.2 Size Range

Thickness: 1/8" to 3/4"
Diameter: 24" Max.

7.3.3 Standard Tolerances

Thickness: ± .010"
Diameter: ± .030"

7.4 H.K. Porter Company - Material Number D-813

7.4.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F, 100 P.S.I.	.44
Static Coefficient of Friction	.31 to .36
Wear @ 100 to 600°F	.0011 In.

7.4.2 Size Range

Thickness: .50 In. Max.
Smallest Drum Diameter for .50" Thick is 16"

7.4.3 Standard Tolerances

Thickness: ± .010"
Width: ± .030"
Length: ± .125

7.5 Abex Corporation, American Brakeblok Div. - Material Number 41-16

7.5.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 1300 F.P.M., 75 P.S.I., 350°F	.46
Wear Rate @ 500°F (Cu. In./Hp. Hr.)	.006

7.5.2 Size Range

Abex Corporation will quote sizes on specific parts.

7.5.3 Standard Tolerances

Thickness: +.000" -.010"
Width: +.030" -.000"
Length: ± 1/32"

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7.6 Abex Corporation, American Brakeblok Div. - Material Number 150-102B

7.6.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 1300 F.P.M., 75 P.S.I., 350°F	.52
Wear Rate @ 500°F (Cu. In./Hp. Hr.)	.040

7.6.2 Size Range

Abex Corporation will quote sizes on specific parts.

7.6.3 Standard Tolerances

Thickness:	+.000" -.010"
Width:	+.030" -.000"
Length:	± 1/32"

7.7 Raybestos Manhattan - Material Number MA-428

7.7.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction @ 350°F	.43
Wear (SAE Test)	.019"

7.7.2 Size Range

Raybestos-Manhattan will quote sizes on specific parts.

7.7.3 Standard Tolerances

Raybestos-Manhattan will set tolerances on specific parts.

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Harnischfeger
P&H
milwaukee, wisconsin. 53201

MATERIAL SPECIFICATION P&H NO. 3023

ISSUE NO. 1, 1-80

FRICTION MATERIAL - MOLDED BLOCK WITH METALLIC FRICTION PARTICLES

1.0 SCOPE
- 1.1 This specification covers the characteristics of a friction material used on clutch shoes and brake bands for use on dry contact with friction drums.
- 1.2 It is recommended for high duty cycle applications.

2.0 PHYSICAL PROPERTIES
- 2.1 This material is an asbestos/organic containing product with metal chips.
- 2.2 It exhibits a medium to high coefficient of friction with good elevated temperature stability.

3.0 MECHANICAL PROPERTIES
- 3.1 The mechanical properties shall be as specified under Paragraph 7.0 for each product furnished under this Specification.
- 3.2 These properties 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 satisfactory 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 detailed drawing or in accordance with the section on part identification in the Harnischfeger Quality Control Standard.
- 4.2 All tolerances as they apply shall be specified under Paragraph 7.0 for each 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 Suppliers Name
  - 5.2.3 Grade or Specification Number
  - 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 National Friction Products Corporation - Material NF-802
  - 7.1.1 Mechanical and Physical Properties

Kinetic Coefficient of Friction	.41
Maximum Recommended Pressure	2,000 P.S.I.
Maximum Recommended Rubbing Speed	3,000 F.P.M.
Maximum Constant Operating Temperature	500°F
Wear Rate (Cu. In./Hp. Hr.)	.0079
Specific Gravity	1.77 ±.07
Tensile Strength	2,800 P.S.I.

  - 7.1.2 Size Range
    National Friction Products will quote sizes on specific parts.
  - 7.1.3 Standard Tolerances
    National Friction Products will set tolerances on specific parts.

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