

INSULATING MATERIAL

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PLAINTIFF'S EXHIBIT

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PLAINTIFF'S
EXHIBIT

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INSULATING MATERIALS

SHELL OIL COMPANY
WOOD RIVER REFINERY

Revised May 1957



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INSULATING MATERIALS

FOR

HOT SERVICE

BLOCK INSULATION

BLOCK INSULATION

Source:

Shown in order of choice:

1. Caltemp = Pabco Products Incorporated
2. Tri Calite = Mundet Cork Corporation
3. 87% Magnesia = Johns Manville

Temperature:

1200°F maximum (87% Magnesia - 600°F)

Weight:

Approximately 1.4 lbs. per square foot per inch of thickness.

Characteristics:

Rigid, without tensile strength.

Principal Application

Flat sections used for insulating vessels, flat surfaces and building boxes around irregular shapes.

Fourteen inch radius curved sections used for insulating equipment 12", 14" and 16" in diameter, principally flanges and fittings.

Extent of Application

Is limited due to fragile nature of material, breaks readily in handling and has little or no recovery value when temporarily removed from an installation. However, on permanent installations, such as vessels, material has considerable merit.

Warehouse Stock: Curved and flat shapes:

<u>Size</u>	<u>Per/Mo.</u>
1½" x 6" x 36" Flat Sections	244 pcs.
1½" x 6" x 36" 14" Radius Curved Sections	424 pcs.

BLOCK INSULATION

Shown in order of choice:

Source: 1. Mono-Block - Baldwin Hill
2. Supertemp Block - Eagle Picher
3. Detrick - Detrick

Temperature: 1700°F maximum

Weight: 1.66 lbs. per sq. ft. per inch of thickness

Characteristics: Semi-rigid, fair tensile strength

Principal Application

Insulating material between brickwork and metal casing in boilers and process furnaces. Also used for breeching linings.

Extent of Application

Limited, but increasing for application on vessels. Semi-rigid material will fit radii of vessels without breaking or scoring.

Warehouse Stock: Molded Block

Size

1-1/2" x 6" x 18" Flat Sections

Pcr/Mo.

282 pcs.

BLOCK INSULATION

Source: Superior Block Co. Johns Manville
Temperature: 600°F to 1900°F maximum
Weight: 2.0 lbs. per sq. ft. per inch of thickness
Characteristics: Rigid, fair tensile strength

Principal Application

Flat sections used for refractory installations -
laboratory ovens, furnace breechings, etc.

Extent of Application

Not in general use as high temperature applications
for which material is designed are limited in number.

Warehouse Stock: Molded flat and block.

<u>Size</u>	<u>Min. Stock</u>
2" x 6" x 36" Flat Sections	100 pcs.

PIPE COVERING

SPLIT CYLINDRICAL PIPE COVERING

Source:

Shown in order of choice:

1. Snap-On - Gustin-Bacon Mfg. Company
2. Mono-Kover - Baldwin-Hill Company
3. Imperial - Ruberoid Company (Asbestos Sponge)

Temperature:

350°F maximum (Asbestos-Sponge - 550°F)

Weight:

Snap-On and Mono-Kovering are approximately 1/4 lighter than other pipe insulation

Characteristics:

Springy, tough resilient structure, will not shrink or break, moisture resistant.
Asbestos-Sponge, semi-rigid, distorted readily by moisture.

Principal Application

Low pressure steam or hot water supply and return piping, steam traced lines, hot line shields for personnel safety, (Snap-On and Mono-Kovering only for cold water piping above 65°F), lines close together where insulation distortion is necessary for application, and for use on vibrating lines.

Extent of Application

Limited, sponge is too pliable, disintegrates readily when exposed to moisture.

Warehouse Stock: Single standard thickness in 6 ft. lengths for piping as follows:

<u>Size</u>	<u>Per/Mo.</u>
1/4" x 1" thick	24'
1/2" x 1" "	378'
3/4" x 1" "	234'
1" x 1" "	381'
1-1/2" x 1" "	204'
2" x 1" "	333'
3" x 1" "	165'
4" x 1" "	132'
5" x 1" "	57'
6" x 1" "	129'

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MOLDED BISECTIONAL PIPE COVERING

Source:

Shown in order of choice:

1. Unibestos - Union Asbestos & Rubber Co.
2. Thermobestos - Johns Manville
3. Kaylo - A. G. Brauer

Temperature:

1200°F maximum (Unibestos, 750°F maximum)

Weight:

1.0 lbs. per sq. ft. per inch of thickness

Characteristics:

Rigid, fair tensile strength. Efficiency comparable to 87% Magnesia of 1/2" greater thicknesses.

Principal Application

Pipe covering on process and utility lines operating at temperatures under 750°F.

Extent of Application

In common use because of high insulating efficiency and ease of handling. Material can be removed and replaced repeatedly without breakage or loss of shape. Thermobestos and Kaylo slightly more fragile.

Warehouse Stock: Standard thickness in 36" lengths for piping as follows:

<u>Size</u>	<u>Per/Mo.</u>
1-1/2" x 1-1/2" thick	12'
1-1/2" x 2"	42'
2" x 1-1/2"	33'
2" x 2"	69'
3" x 1-1/2"	21'
3" x 2"	282'
4" x 1-1/2"	60'
4" x 2"	216'
6" x 1-1/2"	96'
6" x 2"	222'
8" x 1-1/2"	246'
8" x 2"	105'
10" x 1-1/2"	96'
10" x 2"	30'
12" x 1-1/2"	84'
14" x 1-1/2"	39'
14" x 2"	3'

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SUPER MOLDED BISECTIONAL PIPE COVERING

Source: Shown in order of choice:

1. Unibestos - Union Asbestos & Rubber Co.
2. Thermobestos - Johns Manville
3. Kaylo - A. G. Brauer

Temperature: 1200°F maximum.

Weight: 1.66 lbs. per sq. ft. per inch of thickness.

Characteristics: Rigid, fair tensile strength. Efficiency comparable to 85% Magnesia of 1/2" greater thicknesses.

Principal Application

Pipe covering on process and utility lines operating at temperatures between 750°F and 1200°F.

Extent of Application:

In common use because of high insulating efficiency and ease of handling. Material can be removed and replaced repeatedly without breakage or loss of shape. Thermobestos and Kaylo slightly more fragile.

Warehouse Stock: Double standard thickness in 36" lengths for piping as follows:

<u>Size</u>		<u>Per/Mo.</u>
3" x 3"	thick	24'
4" x 3"	"	93'
6" x 3"	"	117'
8" x 3"	"	48'
10" x 3"	"	45'
12" x 3"	"	15'
14" x 3"	"	9'
*14" x 4"	"	9'

*Above principally used for outside high pressure steam mains.

BLANKET INSULATION

ROLL TYPE BLANKET INSULATION
(Special for Tanks with Asbestocite Boards Only)

(Long Glass Fiber Insulation Bonded Together
with a Thermo-Setting Plastic Resin)

Source: 1. Ultralite #150 - Gustin-Bacon Company
2. Aerocor - Owens-Corning FiberGlas

Temperature: 425°F maximum

Weight: Are approximately 1/10 to 1/4 lighter than other
blanket insulation.

Characteristics: Springy, resilient, will not break, moisture re-
sistance will not corrode metals and does not
shrink.

Principal Application

Blanket insulation on tanks operating at maximum 425°F.

Extent of Application

Used in all new tanks and vessel construction where
welding is permitted to allow use of improved methods that
include the installation of "Asbestocite" weatherproof
covering.

Warehouse Stock: In rolls.

<u>Size</u>	<u>Min. Stock</u>
1-1/2" x 48" x 150"	None normally carried in stock. Purchase as required.

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INSULATING CEMENT

ASBESTOS CEMENT
(ONECOTE)

Source: Eagle Picher Onecote Cement or Detrick Utility Cement

Temperature: 1500°F maximum

Weight: Approx. 3 lbs. per sq. ft. per inch of thickness

Characteristics: A plastic water mixed material applied with a trowel, highly adhesive and durable. Quick setting one coat applications which do not shrink or crack - reduce job costs. Approx. coverage 40 sq. ft. per 100 lbs., 1" thick. This is preferred for general use.

Principal Application

Troweled on Irregular shapes, fittings, pumps, valve bodies, etc.
Used in conjunction with poultry wire on monolithic applications.

Warehouse Stock

<u>Size</u>	<u>Per/Mo.</u>
50 lb. bags	87

ASBESTOS CEMENT
(ROUGH FINISH)

Source: Shown in order of choice

1. Eagle Picher insulating cement "66"
2. Johns-Manville insulating cement "450"
3. Weber 48 insulating cement

Temperature: 1500°F maximum

Weight: Approx. 2.0 lbs. per sq. ft. per inch of thickness

Characteristics: A plastic water mixed material applied with trowel, highly adhesive and durable. Approximate coverage, 50-55 sq. ft., 1" thick, per 100 lbs.

Principal Application

Troweled on irregular shapes, fittings, pumps, valve bodies, etc., used in conjunction with poultry wire on monolithic applications.

Extent of Application

In widespread and popular use. Adheres readily to hot surfaces and can be reclaimed by mixing with water after removal.

Warehouse Stock

Size
50 lb. bags

Per/Mo.
36

ASBESTOS CEMENT
(SMOOTH FINISH)

Source: Johns Manville #302 Cement
Temperature: 1000°F maximum
Weight: Approx. 4.0 lbs. per sq. ft. per inch of thickness
Characteristics: A plastic water mixed material applied with trowel, adhesive and durable, approximate coverage, 25 sq. ft. per inch thick, per 100 lbs.

Principal Application

Finish coat applied over insulating material on interior and exterior installations, for smooth finish and painting surfaces.

Extent of Application

Used extensively to cover rough primary coat on monolithic installations prior to weatherproofing.

Warehouse Stock

<u>Size</u>	<u>Per/Mo.</u>
100 lb. bags	11

INTERLINER CEMENT

Source: Insulag - Quigley Products Company
Temperature: 2200°F maximum
Weight: 2.0 lbs. per sq. ft. per inch of thickness
Characteristics: Water mixed plastic material applied through nozzle under air pressure from small vessel. It can be trowel applied in accessible locations.

Principal Applications

Used for insulating double valled piping at Catalytic Crackers. material is blown into space between pipe and liner, and reactor ducts at Toluene #2.

Extent of Application

Limited to above outlined application at Catalytic Crackers, and Toluene #2.

Warehouse Stock

<u>Size</u>	<u>Min. Stock</u>
In 100 lb. bags	30

WEATHERPROOFING

THERMOTEX B OR FLINTKOTE C-13-A
WEATHERPROOFING COMPOUND

Source: 1. Thermotex B - Phillips Carey
2. Flintkote C-13-A - Flintkote Company

Temperature: 250°F maximum

Weight: 12 lbs. per sq. ft. per inch of thickness

Characteristics: Ready mixed black plastic asphalt base material - water added in field as needed.

Principal Application

Weatherproof coating on all exterior field molded insulation, vessels, heat exchangers, fittings.

Extent of Application

In popular use on installations shown.

Warehouse Stock

Size
In 30 gal. drums

Per/Mo.
19 drums

EAGLE STALASTIC-HYTEMP PLASTIC CEMENT

Temperature: 450°f maximum

Weight: 12 lbs. per sq. ft. per inch of thickness

Characteristics: A plastic asbestos and asphalt material, adherent to metal and insulation.

Principal Application

To seal boiler and furnace brickwork externally. Also for weatherproofing around nozzles on columns and to seal metal joints in ducts and sidings.

Extent of Application

Limited, used only as indicated.

Warehouse Stock

<u>Size</u>	<u>Min. Stock</u>
50 lb. Containers	5

FIRETARD
ASPHALT BACKED SHEET ASBESTOS FELT

Source: Johns-Manville
Temperature: 350°F maximum
Weight: 55 lbs. per roll of 108 sq. ft.
Characteristics: Similar in nature to rolled roofing.

Principal Application

Weatherproof covering over all forms of insulation, principally on piping. Is also used frequently to directly cover small steam tracing lines and traced line in one wrapping without the use of standard type pipe coverings. Material is frequently used in lieu of other insulation where destructive elements are present due to low replacement costs.

Extent of Application

In general use. Low cost, ease of handling and good reinstallation experience indicates material to be most suited to refinery requirements.

Warehouse Stock: In rolls (black side out)

<u>Size</u>	<u>Per/Mo.</u>
32" wide x 40' long	148 rolls

FLEXTONE FELT
DOUBLE ASPHALT COATED SHEET ASBESTOS FELT

Source: Johns Manville
Temperature: 150°F maximum
Weight: 50 lbs. per roll of 108 sq. ft.
Characteristics: Rool roofing type of material.

Principal Application

For weatherproof covering on piping insulation.

Extent of Application

Limited to use on piping in open areas, such as tank farms. Material is not fireproof and cannot be used in operating areas.

Warehouse Stock

<u>Size</u>	<u>Per/Mo.</u>
36" wide x 36 ft. long	9

COAL TAR SATURATED ASBESTOS FELT

Source: Johns Manville
Temperature: 100°F maximum
Weight: 15 lbs. per 100 sq. ft.
Characteristics: Similar to a light weight builder's felt.

Principal Application

For underground piping protection against external corrosion. To be used only with coal tar base hot fluid coatings.

Extent of Application

Limited to underground piping.

Warehouse Stock: In rolls

<u>Size</u>	<u>Min. Stock</u>
36" wide x 150' long	6 rolls

AUXILIARY MATERIALS

AUXILIARY MATERIALSSTEEL STRAPPING

Used to hold monolithic, blanket and block type insulating materials in place on vessels and small tanks.

Warehouse Stock

<u>Size</u>	<u>Min. Stock</u>
1/2" x 22 Ga. Galvanized Acme Steel Strapping	6 rolls
1/2" Locking Seals for Strapping	1/2 keg
3/4" x .035 Thick Galvanized Acme Steel Strapping	10 rolls
3/4" Locking Seals for Strapping	1/2 keg

COPPERIZED STAPLES

Used to hold poultry netting in place over monolithic and block insulation on irregular shapes.

Warehouse Stock

<u>Size</u>	<u>Min. Stock</u>
3/4" x 2" long Square Shoulder Copperized Staples	2 kegs

POULTRY NETTING

Used for full coverage support of monolithic, blanket and block type insulating materials on vessels and small tanks.

Warehouse Stock: In Rolls

<u>Size</u>	<u>Min. Stock</u>
1" Mesh x 48" x 150' Long - 19 Ga. Galvanized Wire	10

ASBESTOS PAPER AND TAPE

ASBESTOS FIBRE FELT PAPER

Used principally by welders as heat shields and in construction of temporary stress relieving furnaces. There is little or no use for material as a permanent installation in operating equipment.

Warehouse Stock: In Rolls

<u>Size</u>	<u>Min. Stock</u>
1/16" Thick x 36" x 34'	100 lbs.
1/8" Thick x 36" x 34' - Frazier	100 sq. ft.
1/4" Thick x 36" x 34'	4 rolls

ASBESTOS WOVEN TEXTILE TAPE

Used principally by Boilermakers for duct and similar joint seals such as fractionating column tray segment installations. Moderate quantities used as gaskets by Machinists. One inch used by insulators on copper tube covering.

Warehouse Stock: In Rolls

<u>Size</u>	<u>Min. Stock</u>
1" wide x 1/8" Thick	500'
1-3/4" wide x 1/8" "	200'
1-3/4" wide x 5/16" "	50'
3" wide x 1/8" "	50'
5" wide x 1/8" "	50'

INSULATING MATERIALS

FOR

COLD SERVICE

BLOCK INSULATION

PIPE COVERING

MOLDED VEGETABLE CORK BLOCK

(WITHOUT ASPHALT BACKING)

Source: Armstrong or Mundet

Temperature: 0°F to -40°F

Weight: Approx. 0.66 lbs. per sq. ft. per inch of thickness

Characteristics: A rigid molded natural cork product, highly moisture resistant. Susceptible to acid attack. It has highest relative efficiency for all cold service insulating materials.

Principal Application

Cold process and low temperature refrigeration equipment in acid free service.

Extent of Application

In extensive use - clean light weight material, can be readily fabricated into irregular shapes and applied.

Warehouse Stock: Flat Shapes

<u>Size</u>	<u>Per/Mo</u>
2" x 12" x 36"	29
3" x 12" x 36"	19
4" x 12" x 36"	6

ZEROLITE - ROCK CORK
MOLDED BI-SECTIONAL PIPE COVERING

(ICE WATER THICKNESS)

Source: Johns-Manville

Temperature: 30° to 45° F

Weight: 1.25 lbs. per sq. ft. per inch of thickness

Characteristics: A rigid, relatively heavy, molded mineral wool product. It is highly resistant to moisture and acid attack.

Principal Application

Used in ammonia refrigeration units and other installations subject to chemical vapor and fluid attack.

Extent of Application

Limited to medium cold service.

Warehouse Stock: Ice water thickness in 3" lengths.

<u>Size</u>	<u>Min. Stock</u>
1-1/2" IPS x 1.52" thick	30'
2" " x 1.52" "	30'
3" " x 1.50" "	30'
4" " x 1.75" "	36'
6" " x 1.75" "	30'
8" " x 1.94" "	18'
10" x Ice Water	12'
12" x " "	12'

VEGETABLE CORK
MOLDED BI-SECTIONAL PIPE COVERING

(SPECIAL THICK BRINE TYPE)

Source: Armstrong or Mundet

Temperature: 0°F to -40°F

Weight: Approximately 0.66 lbs. per sq. ft. per inch of thickness

Characteristics: A rigid molded natural cork product, highly moisture resistant. Susceptible to acid attack. It has highest relative efficiency for all cold service insulating materials.

Principal Application

Cold process and low temperature refrigeration piping in acid free areas.

Extent of Application

In popular use, clean light weight material that can be efficiently applied.

Warehouse Stock: Special thick brine covering in 3 ft. lengths.

<u>Size</u>	<u>Min. Stock</u>
1-1/2" IPS x 2.99" Thick	12'
2" " x 3.25" "	12'
3" " x 3.06" "	12'
4" " x 3.31" "	30'
6" " x 4" "	12'
8" " x 4" "	18'

VEGETABLE CORK
MOLDED BI-SECTIONAL FITTING SHAPES

(SPECIAL THICK BRINE TYPE)

Source: Armstrong or Mundet

Temperature: 0°F to -40°F

Weight: Approx. 0.66 lbs. per sq. ft. per inch of thickness

Characteristics: A rigid mold natural cork product, highly moisture resistant.
Susceptible to acid attack. It has highest relative efficiency
for all cold service insulating materials.

Principal Application

Cold process and low temperature refrigeration piping in acid free
areas.

Extent of Application

In popular use, clean light weight material that can be readily
applied.

Warehouse Stock: Molded shapes in special brine thicknesses.

<u>Size</u>	<u>Min. Stock</u>
2" - Flange Covers	2
3" - "	2
4" - "	2
6" - "	2
3" - Flanged Tee Covers	3
4" - "	3
6" - "	3

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SUPPLEMENTARY DATA

There are no cork materials specified or carried in stock for cold service in the temperature range 0°F to 30°F, material requirements in this range are rare. For new units or plant changes the special thicknesses required will have to be ordered accordingly. Maintenance replacements will be made, as needed, with the nearest thickness of material available from stock.

BLANKET INSULATION

HAIR FELT BLANKET

Source: Johns-Manville
Temperature: 32°F to -40°F
Weight: .69 lbs. per sq. ft. per inch of thickness
Characteristics: An animal hair product, very pliable

Principal Application

Wrapped around fittings and irregular shapes in several thicknesses for cold service.

Extent of Application

Limited, used principally for temporary insulation installations in moderate cold service. Material cannot be recovered for reuse.

Warehouse Stock: In rolls

<u>Size</u>	<u>Min. Stock</u>
1" x 72" x 50' long	1 roll

AUXILIARY MATERIALS

AUXILIARY MATERIALS

FOR USE WITH LOW TEMPERATURE

(0°F TO -40°F) INSULATION

2. Vegetable Cork (Coarse Ground) - Supplied by Armstrong or Mundet. Used as a filler material in boxes around irregular shapes packed to a density of approximately 6 lbs. per sq. ft.

Warehouse Stock: In 35 lb. bags

Coarse Grade Only

Min. Stock
5

3. Brine Putty - Supplied by Armstrong or Mundet. Used as a joint filler on molded cork installations. Sets semi-solid, must be heated to apply.

Warehouse Stock: In 50 lb. Cartons

Min. Stock
4

4. Erection Asphalt - Applied hot to molded cork board for sealing and cementing to insulated surfaces, also used in the same manner between cork board surfaces.

Warehouse Stock: In 100 lb. kegs

Min. Stock
6 kegs

5. Cork Cement - Supplied by Armstrong. Applied to seal joints of molded pipe coverings and fitting shapes.

Warehouse Stock: In One Gallon Cans

Min. Stock
10 gal.

Armstrong #340 Cement.

6. Wood Skewers - Used in conjunction with built up cork block installations in a manner similar to the common nail.

Warehouse Stock

Size

Min. Stock

1/4" x 5" Long
1/4" x 7" Long

6 boxes
6 boxes

TECH. DATA

REQUIRED PIPE COVERING SIZESFOR STEAM TRACED PIPING

The recommended insulating material sizes for pipe covering that include steam tracing lines are:

<u>Pipe Size</u>	<u>For 3/8" to 3/4" Steam Tracers Added, Use</u>
1"	1-1/2" Pipe Covering
1-1/2"	2"
2"	2-1/2"
3"	4"
4"	5"
6"	7"
8"	9"
10" and over	- Use same size pipe covering.

It is more economical to fill the open joints with plastic asbestos fillers than to use the next size covering.

Pipe covering the same as the line size can be used where the steam tracers are no larger than 1/4" and 3/16".

*The 7" and 9" pipe covering is not a stock size and will have to be purchased according to job requirements.