PLAINTIFF'S
EXHIBIT
DUP-622

MATERIALS

185

MATERIAL SPECIFICATION
SERIES 100
PREFORMED BLOCK AND PIPE

THERMAL INSULATION
STANDARD ENGINEERING SPECIFICATION

ISSUED OCT 1954
REVISED JULY 1959

SN 100 M
Page 1 of 14

Code	101*	102*♦	103
Material	85% Magnesia	Calcium silicate	Diatomaceous earth
Material Description	Hydrated basic magnesium carbonate 80% by weight minimum	Staple, cellular, calcined fire clay base	Diatomaceous earth, asbestos fiber, with bonding clay and cementing materials
Filler	Asbestos or glass fiber		
Binder	Clay or other cementing materials 5% by weight		
Temperature Range	100°F to 500°F	100°F to 1200°F	500°F to 1800°F
K Factor	200°F – 0.4, 500°F – 0.5	500°F – 0.54 max	500°F – 0.77 max
Density	11–14 lb per cu ft	11 lb per cu ft	24–27 lb per cu ft
Compressive Strength			
Manufacturing Process	Machine molded or extru. Pipe mach cut on diameter.	Machine extruded. Pipe mach cut on diameter.	Machine molded. Pipe mach cut on diameter.
Resistance to Breakage in Handling	Good	Good	Good
Dimensions	ASTM **	ASTM **	To Specification
Other Qualifications		Good mechanical strength with low shrinkage.	

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

	85% Mag Philip Carey Mfg Co	*Calcilite* The Ruberoid Co	*High Temp No. 19* Philip Carey Mfg Co
	Thermalite 85% Ehret Mag Mfg Co. Inc	*Kaylo* Owens-Corning Corp	*Endure Hi-Temp.* Ehret Mag Mfg Co. Inc
	85% Mag. Johns-Manville Sales Corp	*Thermobestos* Johns-Manville Sales Corp	*J/M Superex* Johns-Manville Sales Corp
		Kaytherm Keasby & Mattison Co	*High Temp.* Keasby & Mattison Co
	Featherweight Keasbey & Mattison Co	*Tricalite* Mundet Cork Corp	
	85% Mag Mundet Cork Corp	*Caltemp* Pabco Ind Ins Div ***	
	Precision-molded Pabco Ind Ins Div ***		

*Bands are supplied at extra cost. Order must state "without bands" if not required. For 11" IPS and larger there is an additional charge for 2-oz canvas cover. Material should be specified "without 2-oz canvas" to avoid extra charge.

**New Simplified Dimensional System sponsored by ASTM

***Fiber Board Paper Products Corp

♦ Codes 104 and 106 are acceptable alternates unless noted on the Project Specifications.

Vendors and merchandise designations are given to describe materials and may not include all acceptable products. Substitutions are to be made only on approval of the authority initiating the use of this Specification.

DUPONT

SUBCOMMITTEE NO. 25

DUP 0960846

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DU 041038

MATERIAL SPECIFICATION - SERIES 100

Code	104		106
Material	Inorganic silicates		Asbestos and diatomaceous earth molded
Material Description	Inorganic silicas and asbestos fibers		Compressed fluffy asbestos sprayed with sodium silicate and diatomaceous earth sprinkled on the asbestos mat. External finish consists of an integral refractory coating*
Filler			
Binder			
Temperature Range	100°F to 1600°F**		200°F to 1200°F
K Factor	Pipe covering - 500°F - 0.64 max Block - 500°F - 0.58 max		500°F - 0.54 max
Density	Pipe covering - 15 lb per cu ft Block - 14 lb per cu ft		18 lbs per cu ft
Compressive Strength	65 lbs per sq in. min at 5% deformation		11 PSI at 5% deformation - Dry
Manufacturing Process	Filter moulding process		Formed and comp on mandril. Pipe mach cut on die
Resistance to Breakage in Handling	Good		Good
Dimensions			
Other Qualifications	Good mechanical strength. Shrinkage less than 2% at 1600°F		Formed on a mandril to a predetermined wt. Pressed to obtain the desired density, and baked.
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
* Available for field mixing to repair joints and seams. ** Max temp of *Kaylo 20* is 1800°F	*Allsmp* Philip Carey Co		*Unibestos* Union Asbestos & Rubber Co
	Kaylo 20 Owens-Corning Corp		

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DUP 0960847

DU 041039

OCTOBER 1954 — MATERIAL SPECIFICATION – SERIES 100 — SH 100 M

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Code	107	108	109
Material	Asbestos sponge		Corrugated asbestos preshrunk
Material Description	Asbestos sheets separated by finely ground sponged material bonded with adhesive strips.		Alternate layers of plain and corrugated asbestos sheets. Outer covering asbestos felt.
Filler			
Binder			
Temperature Range	100°F to 700°F		100°F to 400°F
K Factor	500°F – 0.60 max		200°F – 0.58 max
Density	30 lb max		
Compressive Strength			
Manufacturing Process	Laminated – 38 to 42 layers per in. of thickness		3-ply laminate
Resistance to Breakage in Handling	Very good		Good
Dimensions	To Specification		
Other Qualifications	Must be a flexible product		Preshrunk
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
* *Aircell* –4-ply *Excel* –6-ply *Cawcel*–8-ply	*Asbestos Sponge* Johns-Manville Sales Corp		*Preshrunk Asbestocel* Johns-Manville Sales Corp
	Asbestos Sponge Philip Carey Mfg Co		*Aircell* * Philip Carey Mfg Co
	Sponge Felt The Ruberoid Co		*K & M – Aircell* Keasbey & Mattison Co
	Sponge Felt Ehret Mag Mfg Co, Inc		*B–H Aircell* Baldwin-Hill Co
	Sponge Felt Smith and Kanzler Corp		

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DUP 0960848

DU 041040

Code	110	111	112
Material	Vegetable cork	Cellular glass	Glass fiber
Material Description	Vegetable cork, granulated and compressed into cork-board or molded forms, from material of vegetable origin for low and medium temperature insulation.	Cellular glass foamed and fused into unicellular form.	See codes 112.01 through 112.81
Filler			
Binder	Natural resin in cork		
Temperature Range	-200°F to 100°F	-200°F to 100°F (+300°F for dual temp.)	
K Factor	100°F - 0.29 max	100°F - 0.43 max	
Density	9 - 11 lb per cu ft	10 - 11 lb per cu ft	
Compressive Strength	15 lb per sq in. min	35 lb per sq in. min	
Manufacturing Process	Machine comp or molded. Baked at moderate temp		
Resistance to Breakage in Handling	Good		
Dimensions			
Other Qualifications	Pipe covering shall be coated on the outside with heavy mastic		
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
	Cork Armstrong Cork Co	*Foamglas* Pittsburgh Corning Corp	
	Cork Mundet Cork Co		

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DUP 0960849

DU 041041

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Code	112.01	112.02	
Material	Glass fiber	See Code 112.01	
Material Description	Textile type fine glass fiber pipe insulation, plain, with medium-temperature binder.		
Filler			
Binder	Phenol-formaldehyde or Di–Cy		
Temperature Range	80°F to 350°F		
K Factor	100°F – 0.25		
Density	3" and 6"" lb per cu ft		
Compressive Strength			
Manufacturing Process	Machine molded		
Resistance to Breakage in Handling	Very good		
Dimensions			
Other Qualifications	Specify whether for iron pipe or copper tubing		

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

CONFIDENTIAL	*Ultrafine Snap-on Gustin-Bacon Mfg Co		
	*Mono-Kover Baldwin-Hill		
	*Thermoglas Philip Cary Mfg Co		
	**Fiberglas Owens-Corning Corp		
	**Armaglas PF Pipe Insu Armstrong Cork Co		
	*Aerolag Johns-Manville Sales Corp		

DUP 0960850

DU 041042

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Code	112.11	112.12	
Material	Glass fiber	See 112.11	
Material Description	Textile type fine glass fiber banded pipe insulation with 30-lb factory-applied roofing felt finish on sizes 6" and smaller and 45-lb felt on sizes above 6" outside diameter.		
Filler			
Binder	Phenol-formaldehyde or Di-Cy		
Temperature Range	80°F to 350°F		
K Factor	100°F – 0.25		
Density	3* and 6** lb per cu ft		
Compressive Strength			
Manufacturing Process	Machine molded		
Resistance to Breakage in Handling	Very good		
Dimensions			
Other Qualifications	Specify whether for iron pipe or copper tubing, 30-lb felt used up to 6" OD of insulation		
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
* Order must specify finish noted under Material Description.	*Ultrafine Snap-on Gustin-Bacon Mfg Co		
	*Vono-Kover Baldwin-Hill		
	*Thermoglas Philip Carey Mfg Co		
	**Fiberglas Owens-Corning Corp		
	**Armaglas PF Pipe Insu Armstrong Cork Co		
	*Aeroleg Johns-Manville Sales Corp		
	*PPG Glass Fiber Pitts Plate Glass Co		
	Micro-Lok L'OF Glass Fibers Co		

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DUP 0960851

DU 041043

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Code	112.16	112.17	
Material	Glass fiber	Glass fiber	
Material Description	Textile type fine glass fiber bonded pipe insulation with 4-oz factory-applied canvas finish.	Textile type fine glass fiber bonded pipe insulation with 8-oz factory-applied canvas finish.	
Filler			
Binder	Phenol-formaldehyde or Di-Cy	Phenol-formaldehyde or Di-Cy	
Temperature Range	80°F to 300°F	80°F to 300°F	
K Factor	100°F – 0.25	100°F – 0.25	
Density	3" and 6" lb per cu ft	3" and 6" lb per cu ft	
Compressive Strength			
Manufacturing Process	Machine molded	Machine molded	
Resistance to Breakage in Handling	Very good	Very good	
Dimensions			
Other Qualifications	Specify whether for iron pipe or copper tubing	Specify whether for iron pipe or copper tubing	
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
	*Ultrafine Snap-on Gustin-Bacon Mfg Co	*Ultrafine Snap-on Gustin-Bacon Mfg Co	
	*Mono-Kover Baldwin-Hill	*Mono-Kover Baldwin-Hill	
	*Thermoglas Philip Carey Mfg Co	*Thermoglas Philip Carey Mfg Co	
	**Fiberglas Owens-Corning Corp	**Fiberglas Owens-Corning Corp	
	**Armaglas PF Pipe Insu Armstrong Cork Co	**Armaglas PF Pipe Insu Armstrong Cork Co	
	* Aeroleg Johns-Manville Sales Corp	* Aeroleg Johns-Manville Sales Corp	
	*PPG Glass Fiber Pitts Plate Glass Co	*PPG Glass Fiber Pitts Plate Glass Co	
	*Micro-Lok J-M Fiber Glass Inc	*Micro-Lok J-M Fiber Glass Inc	

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DU 041044

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114

MATERIAL SPECIFICATION – SERIES 100

Code	112.21	112.22	112.23
Material	Glass fiber	Glass fiber	Glass fiber
Material Description	Textile type fine glass fiber bonded pipe insulation with black factory-applied aluminum laminate vapor-barrier finish.	Textile type fine glass fiber bonded pipe insulation with white factory-applied aluminum laminate vapor-barrier finish.	Textile type fine glass fiber bonded pipe insulation with factory-applied white bleached kraft paper, laminated to the outer face of aluminum foil.
Filler			
Binder	Phenol-formaldehyde or Di–Cy	Phenol-formaldehyde or Di–Cy	Phenol-formaldehyde
Temperature Range	40°F to 200°F	40°F to 200°F	100°F to 250°F
K Factor	100°F – 0.25	100°F – 0.25	100°F – 0.25
Density	3" and 6"" lb per cu ft	3" and 6"" lb per cu ft	3 lb per cu ft min
Compressive Strength			Very low
Manufacturing Process	Machine molded	Machine molded	Machine molded
Resistance to Breakage in Handling	Very good	Very good	Very good
Dimensions			1/2 and 3/4 thick 3 ft sections
Other Qualifications	Specify whether for iron pipe or copper tubing. Weather protection is required for outside service.	Specify whether for iron pipe or copper tubing. Weather protection is required for outside service.	Low cost insulation for limited services such as hot water.

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

CONFIDENTIAL	*Ultrafine Snap-on Gustin-Bacon Mfg Co	*Ultrafine Snap-on Gustin-Bacon Mfg Co	Universal Jacket Owens-Corning Corp
	*Mono-Kover Baldwin-Hill	*Mono-Kover Baldwin-Hill	
	*Thermoglas Philip Carey Mfg Co	*Thermoglas Philip Carey Mfg Co	
	**Fiberglas Owens-Corning Corp	**Fiberglas Owens-Corning Corp	
	**Armaglas PF Pipe Insu Armstrong Cork Co	**Armaglas PF Pipe Insu Armstrong Cork Co	
	*Aerolag Johns-Manville Sales Corp	*Aerolag Johns-Manville Sales Corp	
	*PPG Glass Fiber Pitts Plate Glass Co	*PPG Glass Fiber Pitts Plate Glass Co	
	*Micro-Lok J-M Fiber Glass Inc	*Micro-Lok J-M Fiber Glass Inc	

Code	112.61		112.66
Material	Glass fiber		Glass fiber
Material Description	Plain semi-rigid board, formed from fibrous glass or mineral fibers.		Short, coarse steam-blown glass fibers preformed into semi-rigid board, sanded on one side and cut into lagging sizes for ease of application to curved surfaces.
Filler			
Binder	Phenol-formaldehyde		Phenol-formaldehyde
Temperature Range	40°F to 350°F		40°F to 350°F
K Factor	100°F - 0.25 to 0.30		100°F - 0.25
Density	6 and 9 lb per cu ft		9 lb per cu ft
Compressive Strength			
Manufacturing Process	Machine molded		Machine molded
Resistance to Breakage in Handling	Very good		Very good
Dimensions	Std 24" x 48" Thickness PF615 (6-lb density) 1/2" through 3". PF617 (9-lb density), 1/2" through 2 1/4".		Length - 36" Width - 6" or 12" Thickness - 3/4", 1", 1 1/4", 1 1/2", and 2".

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

CONFIDENTIAL	*Fiberglas PF615 or 617 Insulation* Owens-Corning Corp		*Fiberglas Block Insulation* Owens-Corning Corp
			Armaglas Block Insulation Armstrong Cork Co
	Armatemp Spun Wool Duct - Plain Armstrong Cork Co		
	Spintex No. 414 or 415 Johns-Manville Co		
	Spunduct Baldwin-Hill Co		

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MATERIAL SPECIFICATION – SERIES 100

188

Code	112.71		112.81
Material	Glass fiber		Glass fiber
Material Description	Bonded board insulation formed from fibrous glass or mineral fibers, with asphalt and kraft paper vapor-barrier finish.		Bonded acoustical board formed from fibrous glass or mineral fibers with a thin neoprene compound on one surface.
Filler			
Binder	Phenol-formaldehyde		Phenol-formaldehyde
Temperature Range	40°F to 150°F		40°F to 150°F
K Factor	100°F – 0.26		100°F – 0.26
Density	6 lb per cu ft		6 lb per cu ft
Compressive Strength			
Manufacturing Process	Machine molded		Machine molded
Resistance to Breakage Handling	Very good		Very good
Dimensions	24" x 48" boards 3/4" to 2" thickness		24" x 48" boards 5/8" to 2" thickness
Other Qualifications			Neoprene coating on side of board exposed to air flow
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
	Fiberglas Vapor Seal Duct Insu Owens-Corning Corp		*Fiberglas Coated Duct Insu* Owens-Corning Corp
	Armatemp Spun Wool Duct – Faced VB Armstrong Cork Co		*Armatemp Spun Wool Duct – Coated* Armstrong Cork Co
	Spintex No. 414VS Johns-Manville Co		*Coated Duct Insulation* Baldwin-Hill Co
	Spunduct Baldwin-Hill Co		

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DUP 0960855

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Code	113	114	115
Material	See Code 112.81	Mineral wool (Black only)	Mineral wool – asphalt impregnated
Material Description		Mineral slag wool	Mineral wool fibers homogeneously impregnated with an asphalt binder.
Filler			
Binder		High temp. binder	Asphalt
Temperature Range		500°F to 1700°F	-200°F to 100°F
K Factor		500°F – 0.45 max.	100°F – 0.34 max.
Density		19.2 lb. per cu. ft.	
Compressive Strength		12 lb. per sq. in.	
Manufacturing Process		Machine molded	Machine molded
Resistance to Breakage in Handling		Good	Good
Dimensions			
Other Qualifications			

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

	PV Supertemp Eagle-Picher	*Rock Cork* Johns-Manville Sales Corp.
	Mono-Block Baldwin Hill Co.	*Mineral Wool Board* Armstrong Cork Co.
	Armatemp Armstrong Cork Co.	*Koldboard* Baldwin Hill Co.
	M F Block M. H. Detrick Co.	

CONFIDENTIAL

DUP 0960856

DU 041048

MATERIAL SPECIFICATION – SERIES 100

168

Code	116	117	117.1
Material	Flexible foamed plastic	Urethane Foam Resilient	Urethane Foam Resilient
Material Description	Flexible aerated resin with a closed cellular structure. Pipe and tubing only.	See Codes 117.1 through 117.5.	Preformed resilient urethane foam pipe insulation manufactured from polyether resin and du Pont "Hylene" with a fire-retardant additive.
Filler			
Binder			
Temperature Range	32°F to 200°F		-100°F to +250°F
K Factor	0.28 at 75°F		0.30 max at 75°F
Density			3 to 3¼ lb per cu ft
Compressive Strength			
Manufacturing Process	Medium molded		Molded "snap-on" pipe and fitting covers
Resistance to Breakage in Handling	Nonbreakable		Good
Dimensions			
Other Qualifications	Chemically inert and nontoxic		Cell structure not less than 40 per inch, not more than 60 per inch.
The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.			
			Flexfoam Delaware Ins Co
			Thermax Am Cellular Products, Inc

CONFIDENTIAL

DUP 0960857

DU 041049

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OCTOBER 1954
Rev March 1959

MATERIAL SPECIFICATION – SERIES 100

SM 100 M
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Code	117.2	117.3	117.4
Material	Urethane Foam Resilient	Urethane Foam Resilient	Urethane Foam Resilient
Material Description	Preformed resilient urethane foam pipe insulation manufactured from polyether resin and du Pont "Hylene" with a fire retardant additive and 8-oz factory-applied canvas finish.	Preformed resilient urethane foam pipe insulation manufactured from polyether resin and du Pont "Hylene" with a fire retardant additive and kraft-aluminum factory-applied vapor barrier.	Preformed resilient urethane foam pipe insulation manufactured from polyether resin and du Pont "Hylene" with a fire retardant additive and 30-lb factory-applied roofing felt.
Filler			
Binder			
Temperature Range	–100°F to +250°F	–100°F to +250°F	–100°F to +250°F
K Factor	0.3 max at 75°F	0.3 max at 75°F	0.3 max at 75°F
Density	3 to 3¼ lb per cu ft	3 to 3¼ lb per cu ft	3 to 3¼ lb per cu ft
Compressive Strength			
Manufacturing Process	Molded "snap-on" pipe and fitting covers	Molded "snap-on" pipe and fitting covers	Molded "snap-on" pipe and fitting covers
Resistance to Breakage in Handling	Good	Good	Good
Dimensions			
Other Qualifications	Cell structure not less than 40 per inch, not more than 60 per inch.		

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

	Flexfoam Delaware Ins Co		*Thermax* Am Cellular Products, Inc
	Thermax Am Cellular Products, Inc		

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DUP 0960858

DU 041050

MATERIAL SPECIFICATION - SERIES 100

170

Code	117.5	118	
Material	Urethane Foam Resilient	Urethane Foam Rigid	
Material Description	Preformed resilient urethane foam pipe insulation manufactured from polyether resin and du Pont "Hylene" with a fire retardant additive and 45-lb factory-applied roofing felt.	Preformed rigid urethane foam block and pipe insulation manufactured with du Pont "Hylene" and containing a fire retardant additive.	
Filler			
Binder			
Temperature Range	-100°F to +250°F	-200°F to +200°F	
K Factor	0.3 max at 75°F	0.17 max at 75°F	
Density	3 to 3¼ lb per cu ft	2 to 2¼ lb per cu ft	
Compressive Strength			
Manufacturing Process	Molded "snap-on" pipe and fitting covers	Molded	
Resistance to Breakage in Handling	Good	Good	
Dimensions			
Other Qualifications			

The following materials have proven satisfactory in field tests and proof has been furnished by the manufacturers that their product meets the above specifications.

Flexfoam Delaware Ins Co	*Gemfoam* Texas Foam Plastics	
Thermax Am Cellular Products, Inc		

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