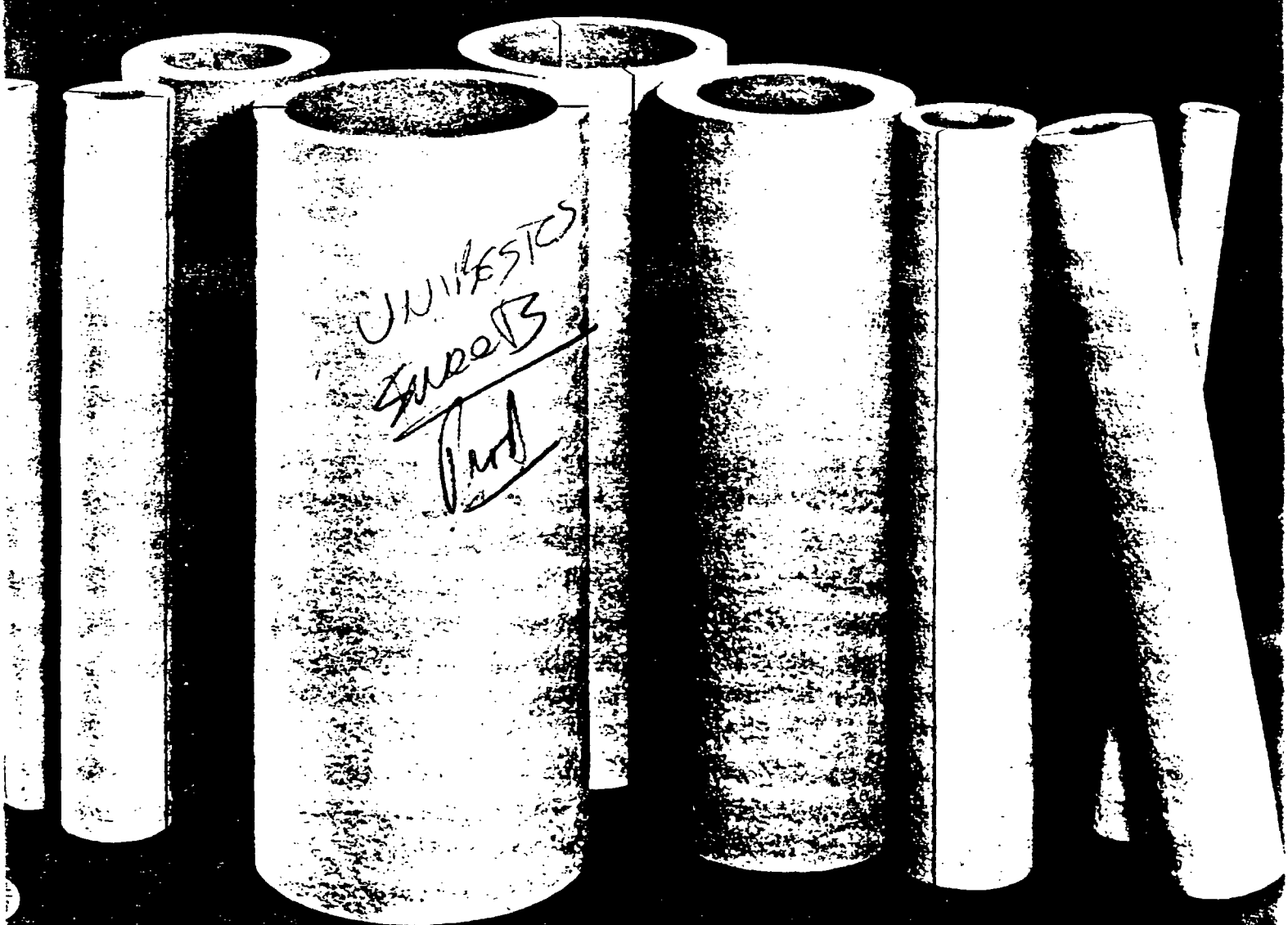
PLAINTIFF'S EXHIBIT
U-631

UNIBESTOS®



PITTSBURGH pc® CORNING

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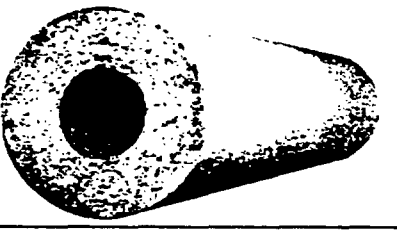
Now manufactured by Pittsburgh Corning

UNIBESTOS—a rugged, heavy duty pipe insulation for practically every high temperature insulation requirement.

UNIBESTOS is an excellent high temperature insulating material composed largely of long-fibered Amosite asbestos combined with an inert silicate binder and diatomaceous earth. This combination results in a rugged, durable insulation that withstands even the most severe on-the-job abuse without crumbling, cracking or any of the other problems so often found in ordinary high temperature insulations. It has found very wide acceptance in high temperature applications (up to +1500° F.) in the petrochemical industries, power plants, the marine field and on underground conduit piping.

Amosite Fibers Make the Difference—The extra-long, amosite fibers found chiefly in the Union of South Africa, offer a host of natural insulation advantages. The fibers are tough and resilient. They have a high degree of resistance to moisture and are chemically inert and incombustible. When these fibers are processed by *fiberizing*, they are screened, air blown, and brushed, thus "opening up" or fluffing the fibers into an interlaced mass which entraps millions of insulating air spaces.

This base material is then formed into pipe insulation sections of precise thickness and a smooth, inert refractory coating is applied to the outside.



Examine These Outstanding Physical Properties of UNIBESTOS

Density	16 lb./ft.³
Compressive Strength	1800 lb./ft.² (dry; at 5% deformation)
Shrinkage	0.00% to 1500°F. (one surface) exposed to operating temperature for 24 hours
Hygroscopicity	3.5% 70°F. @ 90% R.H. 24 hours
Combustibility	Will not burn
pH	10.5
Thermal Shock Resistance	Will not thermal shock
Tensile Strength	67 psi
Acid Resistance	Negligible effect on physical characteristics from common industrial acids and caustics
Leechable Chlorides	less than 100 ppm
Noncorrosive	Will not contribute to stress corrosion of stainless steel

UNIBESTOS complies with:
ASTM Designation C391-62T
Federal Specification HH-I-561 Type III Class B
Military Specification MIL-I-2781
Grade II Class e (750°F.)
Grade III Class f (1200°F.)

This combination of properties makes UNIBESTOS your best choice for high temperature insulation

UNIBESTOS Is Rugged—If one word could be used to describe UNIBESTOS, "rugged" is that word. None of the other commonly used high temperature insulations can withstand the abuse which UNIBESTOS can. It doesn't have to be handled delicately. It won't crumble, crack or thermal shock. It can be re-used time and time again. Walk on it; drop it; bang it around . . . it's still in one piece and giving top performance.

UNIBESTOS Resists Water, Moisture, Fumes, and Acids—You can use UNIBESTOS in high humidities or corrosive atmospheres with no worries of the possibility of failure or loss of efficiency. Even when submerged under water for weeks, UNIBESTOS dries to its original characteristics. Continuous exposure to chemicals and chemical fumes does not change its insulation value or effectiveness.

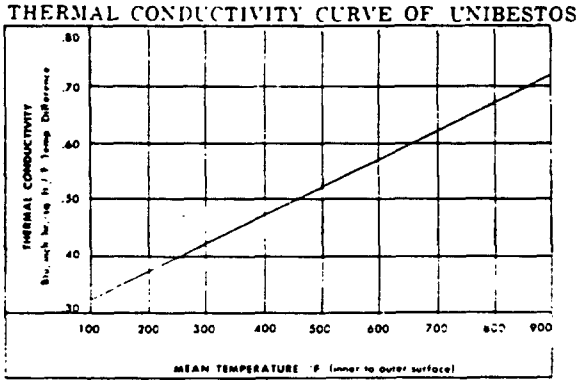
UNIBESTOS Can Be Installed In A Single Layer—Because of the interlocking of Amosite asbestos fibers at butt joints, positive heat seals result. This means that a single-layer installation is possible with UNIBESTOS without attendant heat loss at the joints. Tests show that for equal thicknesses, a single layer of UNIBESTOS loses considerably less heat at the joint than the outside joint of a double thickness of other kinds of insulation.

UNIBESTOS Comes In Half-Round or Full-Round Sections In All Sizes and Thicknesses—No matter how big a line you wish to insulate(up to 36" OD pipe) UNIBESTOS is available in either a half-section or a full round. Instead of time-consuming application of segmental pipe insulation, the UNIBESTOS sections are simply placed around the pipe and fastened.

UNIBESTOS Is Easy to Work and Handle—UNIBESTOS can be cut, mitered, or grooved with ordinary hand tools and is easily fabricated for elbows, tees, flanges, etc. Fabrication is simple . . . just cut the UNIBESTOS to size and join with sodium silicate adhesive.

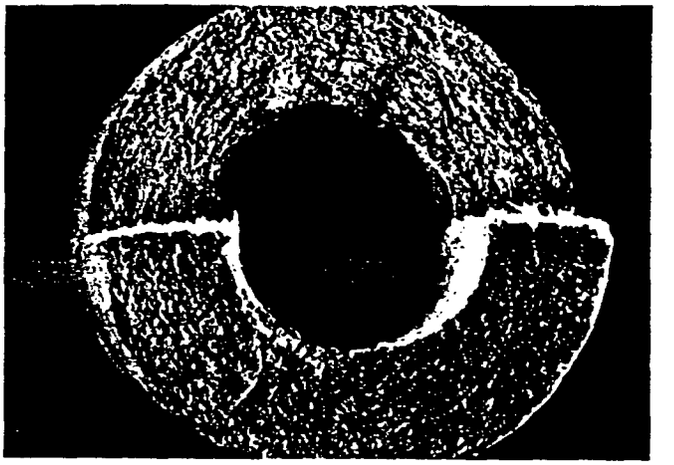
UNIBESTOS Won't Shrink — Pipe insulation joints stay tight at elevated temperatures when you specify UNIBESTOS. It is extremely heat stable and it won't react chemically at high temperatures. It doesn't shrink and open up joints . . . thus minimizes heat losses.

THERMAL CONDUCTIVITY CURVE OF UNIBESTOS



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Economical, practical *single-layer* application of UNIBESTOS saves time and lowers installation costs.

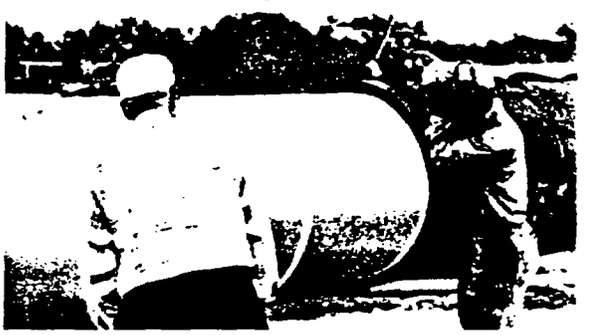


Here is a magnified photo showing how the long, fine amosite asbestos fibers interlock when sections of UNIBESTOS are joined. This interlocking of hundreds of thousands of fibers forms a positive heat seal which eliminates heat losses at joints. Other insulations not having this interlocking action require double layer applications for proper maintenance and control of temperatures. Since only a single layer of UNIBESTOS is necessary to maintain the required temperatures, a significant saving in time and application costs results.

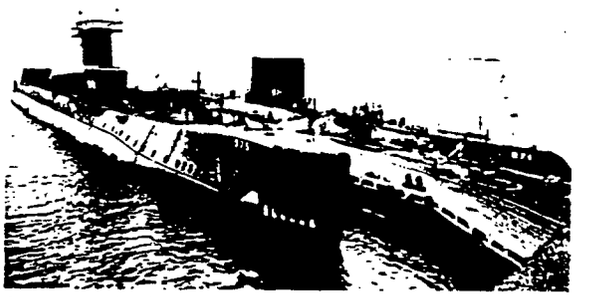
Versatile UNIBESTOS has solved high temperature insulation problems in a wide variety of markets.



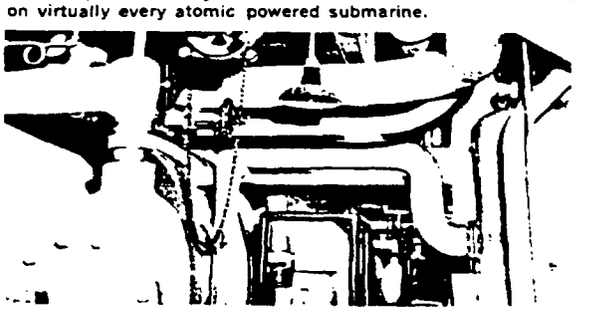
Refineries and Petrochemical Plants—Usually, this type of facility is characterized by high humidities and corrosive atmospheres. UNIBESTOS, being inert and unaffected by fumes, moisture and the like, offers superior insulation performance and even provides an additional safety factor in the protection it provides against fire. It is particularly effective on heat traced lines because it will conform to this irregular shaping without cracking or breaking.



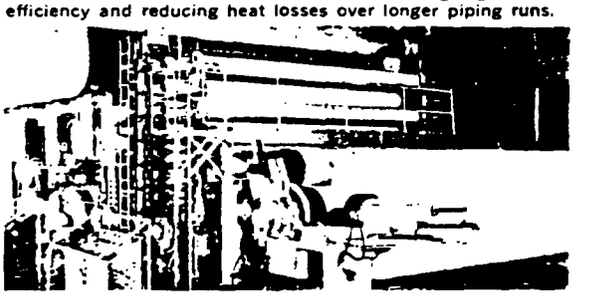
Underground Lines—An exclusive UNIBESTOS feature is its availability in full-round sections. Because of this, it has been widely used as a time-saving insulation for underground distribution piping. The full cylinders provide an ideal way to insulate a line for conduit application. The sections are merely slid onto the pipe. The casing is sealed and a strong, efficient assembly results.



Marine Applications—Aboard ship, UNIBESTOS has few equals. Its fibrous structure withstands the pounding and vibration common to shipboard applications. Again, its incombustibility is an important safety factor. UNIBESTOS has been installed on virtually every atomic powered submarine.



Power Plants—UNIBESTOS is ideal for high temperature steam lines, for commercial steam heat systems, and for exposed critical temperature lines of all types. Tough and resilient, it won't crack or thermal shock, thus maintaining high thermal efficiency and reducing heat losses over longer piping runs.



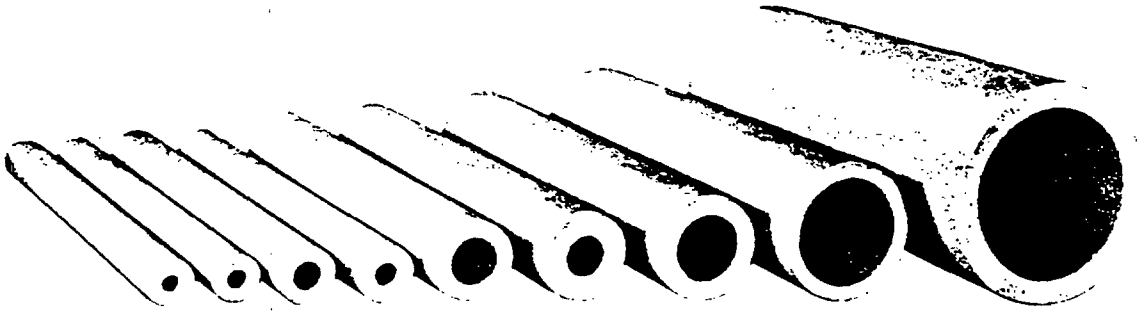
Pulp and Paper Mills—The high humidity, chemical laden fumes common in pulp and paper mills have no effect on the insulation performance of UNIBESTOS. Even after being totally immersed in water for weeks, it dries quickly to its original thermal characteristics.

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UNIBESTOS is available in the sizes and thicknesses indicated for every high temperature insulation demand

UNIBESTOS is available up to 4" thickness for any size pipe or tubing from ½" tubing through 36" O.D. Pipe. All sections are 36" long. For information on greater thicknesses (up to a maximum insulation O.D. of 44") contact our Industrial Insulation Sales Department or your local UNIBESTOS distributor.

Note: UNIBESTOS is normally furnished in half sections in all sizes and thicknesses. *Full round* sections are also available in every size and thickness on request.



NOTE: 4½" and 5" thicknesses also available from 4" IPS to 34" IPS. Insulation O.D.'s subject to standard tolerances.

Thickness of UNIBESTOS insulation

IRON PIPE SIZES—(INCHES)		NOMINAL 1"		NOMINAL 1½"		NOMINAL 2"		NOMINAL 2½"		NOMINAL 3"		NOMINAL 3½"		NOMINAL 4"	
NOMINAL	O.D. Actual	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation	UNIBESTOS thickness	O.D. of insulation
½	.84	1.00	2.88	1.56	4.00	2.06	5.00	2.88	6.63	3.38	7.63	3.88	8.63	4.38	9.63
¾	1.05	.88	2.88	1.44	4.00	1.94	5.00	2.75	6.63	3.25	7.63	3.75	8.63	4.25	9.63
1	1.32	1.06	3.50	1.56	4.50	2.09	5.56	2.63	6.63	3.13	7.63	3.63	8.63	4.13	9.63
1¼	1.66	.88	3.50	1.63	5.00	1.91	5.56	2.44	6.63	2.94	7.63	3.44	8.63	3.94	9.63
1½	1.90	1.00	4.00	1.50	5.00	2.31	6.63	2.81	7.63	3.31	8.63	3.81	9.63	4.38	10.75
2	2.38	1.03	4.50	1.56	5.56	2.09	6.63	2.59	7.63	3.09	8.63	3.59	9.63	4.16	10.75
2½	2.88	1.03	5.00	1.84	6.63	2.34	7.63	2.84	8.63	3.34	9.63	3.91	10.75	4.41	11.75
3	3.50	1.00	5.56	1.53	6.63	2.03	7.63	2.53	8.63	3.03	9.63	3.59	10.75	4.09	11.75
3½	4.00	1.28	6.63	1.78	7.63	2.28	8.63	2.78	9.63	3.34	10.75	3.84	11.75	4.34	12.75
4	4.50	1.03	6.63	1.53	7.63	2.03	8.63	2.53	9.63	3.09	10.75	3.59	11.75	4.09	12.75
4½	5.00	1.28	7.63	1.78	8.63	2.28	9.63	2.84	10.75	3.34	11.75	3.84	12.75	4.47	14.00
5	5.56	1.00	7.63	1.50	8.63	2.00	9.63	2.56	10.75	3.06	11.75	3.56	12.75	4.19	14.00
6	6.63	.97	8.63	1.47	9.63	2.03	10.75	2.53	11.75	3.03	12.75	3.66	14.00	4.16	15.00
7	7.63	1.00	9.63	1.53	10.75	2.03	11.75	2.53	12.75	3.16	14.00	3.66	15.00	4.16	16.00
8	8.63	1.00	10.75	1.53	11.75	2.03	12.75	2.66	14.00	3.16	15.00	3.66	16.00	4.16	17.00
9	9.63	1.00	11.75	1.53	12.75	2.16	14.00	2.66	15.00	3.16	16.00	3.66	17.00	4.16	18.00
10	10.75	.94	12.75	1.59	14.00	2.09	15.00	2.59	16.00	3.09	17.00	3.59	18.00	4.09	19.00
11	11.75	1.06	14.00	1.59	15.00	2.09	16.00	2.59	17.00	3.09	18.00	3.59	19.00	4.09	20.00
12	12.75	1.06	15.00	1.56	16.00	2.06	17.00	2.56	18.00	3.06	19.00	3.56	20.00	4.06	21.00
14	14.00			1.44	17.00	1.93	18.00	2.44	19.00	2.94	20.00	3.44	21.00	3.94	22.00
15	15.00			1.44	18.00	1.93	19.00	2.44	20.00	2.94	21.00	3.44	22.00	3.94	23.00
16	16.00			1.44	19.00	1.93	20.00	2.44	21.00	2.94	22.00	3.44	23.00	3.94	24.00
17	17.00			1.44	20.00	1.93	21.00	2.44	22.00	2.94	23.00	3.44	24.00	3.94	25.00
18	18.00			1.44	21.00	1.93	22.00	2.44	23.00	2.94	24.00	3.44	25.00	3.94	26.00
19	19.00			1.44	22.00	1.93	23.00	2.44	24.00	2.94	25.00	3.44	26.00	3.94	27.00
20	20.00			1.44	23.00	1.93	24.00	2.44	25.00	2.94	26.00	3.44	27.00	3.94	28.00
21	21.00			1.44	24.00	1.93	25.00	2.44	26.00	2.94	27.00	3.44	28.00	3.94	29.00
22	22.00			1.44	25.00	1.93	26.00	2.44	27.00	2.94	28.00	3.44	29.00	3.94	30.00
23	23.00			1.44	26.00	1.93	27.00	2.44	28.00	2.94	29.00	3.44	30.00	3.94	31.00
24	24.00			1.50	27.00	1.93	28.00	2.44	29.00	2.94	30.00	3.44	31.00	3.94	32.00
25	25.00					1.93	29.00	2.44	30.00	2.94	31.00	3.44	32.00	3.94	33.00
26	26.00					1.93	30.00	2.44	31.00	2.94	32.00	3.44	33.00	3.94	34.00
27	27.00					1.93	31.00	2.44	32.00	2.94	33.00	3.44	34.00	3.94	35.00
28	28.00					1.93	32.00	2.44	33.00	2.94	34.00	3.44	35.00	3.94	36.00
29	29.00							2.44	34.00	2.94	35.00	3.44	36.00	3.94	37.00
30	30.00							2.44	35.00	2.94	36.00	3.44	37.00	3.94	38.00
31	31.00									2.94	37.00	3.44	38.00	3.94	39.00
32	32.00									2.94	38.00	3.44	39.00	3.94	40.00
33	33.00									2.94	39.00	3.44	40.00	3.94	41.00
34	34.00									2.94	40.00	3.44	41.00	3.94	42.00
35	35.00									2.94	41.00	3.44	42.00	3.94	43.00
36	36.00									2.94	42.00	3.44	43.00	3.94	44.00

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Table of suggested thicknesses.

UNIBESTOS pipe insulation is manufactured in thicknesses that conform to accepted industrial and manufacturer's standards known as **simplified dimensional standards.** In order to conform to these standards, the outside diameters of all UNIBESTOS sections closely approximate those of iron pipes.

By conforming to these standards the installation of UNIBESTOS is further simplified and any dimensional confusion or adjustment is eliminated. These uniform manufacturing standards are particularly useful in the fabrication of valve and fitting covers, etc., where nesting layers of UNIBESTOS are required.

You will note that four tables of suggested thicknesses are supplied. These range from the minimum requirements (personnel protection) to the maximum thickness (for commercial work).

Recommended minimum thickness, nominal inches UNIBESTOS pipe insulation for personnel protection only

(Surface Temperature less than 161°F., Ambient Temperature 80°F.)

Nominal Pipe Size	Temperature Hot Pipe, °F.													
	200	300	400	500	600	700	800	900	1000	1100	1200	1300	1400	1500
	Temperature Difference Pipe to Air													
	120	220	320	420	520	620	720	820	920	1020	1120	1220	1320	1420
1" and Less	1	1	1	1	1	1	1½	1½	1½	2	2	2½	2½	2½
1½"	1	1	1	1	1	1½	1½	1½	2	2	2	2½	3	3
2"	1	1	1	1	1	1½	1½	1½	2	2	2½	2½	3	3
3"	1	1	1	1	1	1½	1½	2	2	2½	2½	3	3	3½
3½"	1	1	1	1	1	1	1½	1½	2	2	2½	2½	3	3½
4"	1	1	1	1	1	1½	1½	2	2	2½	2½	3	3½	3½
5"	1	1	1	1	1	1½	2	2	2½	2½	3	3	3½	4
6"	1	1	1	1	1½	1½	2	2	2½	3	3	3	3½	4
8"	1	1	1	1	1½	1½	2	2	2½	3	3	3	3½	4
10"	1	1	1	1	1½	1½	2	2½	2½	3	3½	3½	4	4
12"	1	1	1	1	1½	1½	2	2½	2½	3	3½	3½	4	4½
14" to 18"	1½	1½	1½	1½	1½	1½	2	2½	3	3	3½	3½	4	4½
20"	1½	1½	1½	1½	1½	2	2	2½	3	3½	3½	4	4	4½

Commercial, industrial/Recommended thickness—UNIBESTOS

Pipe Temp.	200°F				300°F				400°F				500°F				600°F				700°F			
Temp. Diff.	120°F				220°F				320°F				420°F				520°F				620°F			
Pipe Size	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E
½	1	16.5	93.5	76.1	1	32.8	104	79.3	1½	40.2	104	85.2	1½	57.3	109	86.7	2	67.0	108	90.2	2	85.0	114	90.4
¾	1	19.7	95.8	76.7	1	38.1	108	80.1	1½	45 8	104	86.5	1½	64.4	114	87.9	2½	64.4	101	91.7	2½	82.2	106	92.5
1	1	20.2	93.6	80.6	1	39.2	104	83.2	1½	50.8	104	87.8	1½	71.2	113	89.1	2½	73.1	103	92.4	2½	92.1	109	93.2
1¼	1	25.6	97.3	79.9	1	50.8	111	82.5	1½	57.5	104	89.0	1½	80.1	113	90.2	2½	85.8	108	92.9	2½	108	113	93.6
1½	1	26.3	95.8	82.0	1	52.3	108	84.4	2	51.4	98.9	91.3	2	72.0	104	92.2	3	79.5	100	94.3	3	99.1	104	94.8
2	1	30.7	96.2	83.3	1	58.0	109	85.6	2	61.5	101	91.5	2	86.2	108	92.5	3	91.2	103	94.6	3	115	108	95.1
2½	1	34.8	96.8	83.8	1	67.5	110	86.1	2	65.1	99.0	92.5	2	89.9	106	93.4	3	98.2	103	95.2	3	122	107	95.7
3	1	40.7	97.8	84.3	1	80.3	112	86.4	2½	70.3	98.7	93.3	2½	97.2	105	94.1	3½	105	102	95.7	3½	131	106	96.2
4	1	49.0	98.0	85.2	1	95.6	112	87.2	2½	82.4	100	93.8	2½	115	106	94.5	3½	121	103	96.1	3½	152	108	96.5
5	1	60.0	99.0	85.1	1	116	114	87.2	2½	95.8	101	94.1	2½	132	108	94.8	3½	138	105	96.4	3½	173	110	96.8
6	1½	52.7	93.9	88.8	1½	103	105	90.4	2½	110	103	94.2	2½	152	109	94.9	4	145	102	96.8	4	182	107	97.1
7	1½	57.6	93.9	89.0	1½	114	105	90.7	2½	123	103	94.4	2½	171	110	95.0	4	160	103	96.9	4	200	108	97.2
8	1½	64.4	94.2	89.3	1½	127	105	90.8	2½	130	102	94.7	2½	179	109	95.4	4	175	104	97.0	4	219	109	97.3
9	1½	70.1	94.6	89.2	1½	139	106	90.8	2½	143	102	94.8	2½	197	110	95.4	4	185	103	97.1	4	231	108	97.4
10	1½	74.4	94.1	89.7	1½	147	105	91.2	3	139	101	95.4	3	193	106	95.9	4½	193	105	97.3	4½	259	110	97 4
12	1½	86.1	94.3	89.9	1½	170	106	91.4	3	160	100	95.5	3	221	107	96.1	4½	220	103	97.4	4½	274	109	97.7
14	1½	89.0	95.4	89.3	1½	196	107	90.9	3	177	101	95.4	3	245	108	96.0	4½	235	104	97.4	4½	296	109	97.7
16	1½	115	95.6	89.4	1½	218	108	91.0	3	197	101	95.5	3	273	109	96.1	5	242	102	97.7	5	302	106	97.9
18	1½	128	95.9	89.5	1½	240	108	91.0	3	218	102	95.6	3	301	109	96.1	5	266	102	97.7	5	333	107	98.0
20	1½	141	96.3	89.6	1½	271	109	91.1	3½	210	99.0	96.1	3½	293	105	96.6	5	290	103	97.8	5	363	107	98.0
24	1½	153	96.6	89.7	1½	302	109	91.1	3½	246	99.6	96.2	3½	343	106	96.7	5½	309	101	98.0	5½	391	105	98.2

RT=Recommended Thickness. HL=Heat Loss (BTU/HR/LF). ST=Surface Temperature (°F.). E=Efficiency (%).

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Process industries — Recommended thicknesses

Pipe Temperature	200°F			300°F			400°F			500°F			600°F			700°F			800°F		
Temperature Difference	120°F			220°F			320°F			420°F			520°F			620°F			720°F		
Pipe Size	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST
½	1	16.5	93.5	1	32.8	104	1	50.5	116	1	70.8	128	1	93.5	140	1	119	149	1½	116	134
¾	1	19.7	95.8	1	38.1	108	1	60.9	122	1	85.1	135	1½	84.8	123	1½	107	133	1½	130	142
1	1	20.2	93.6	1	39.2	104	1	62.4	117	1	87.1	128	1½	94.1	122	1½	118	131	2	126	125
1¼	1	25.6	97.3	1	50.8	111	1	80.5	126	1	112	141	1½	106	123	1½	133	132	2	150	133
1½	1	26.3	95.8	1	52.3	108	1	81.3	122	1	113	135	1½	118	128	1½	150	138	2	146	125
2	1	30.7	96.2	1	58.0	109	1	92.6	123	1	128	136	1½	133	128	1½	169	138	2	174	132
2½	1	34.8	96.8	1	67.5	110	1	106	124	1	149	138	1½	135	123	1½	172	132	2	182	125
3	1	40.7	97.8	1	80.3	112	1	126	127	1	173	141	1½	175	133	1½	221	144	2	227	139
4	1	49.0	98.0	1	95.6	112	1	149	128	1	209	143	1½	210	136	1½	268	147	2	270	142
5	1	60.0	99.0	1	116	114	1	182	130	1	254	146	1½	251	139	1½	318	150	2½	270	133
6	1	71.1	100	1	139	116	1½	162	117	1½	227	129	2	237	127	2	299	137	2½	313	135
7	1½	57.6	93.9	1½	114	105	1½	178	117	1½	250	129	2	264	128	2	333	138	2½	346	136
8	1½	64.4	94.2	1½	127	105	1½	198	118	1½	276	130	2	290	129	2	366	139	2½	365	134
9	1½	70.1	94.6	1½	139	106	1½	219	119	1½	306	131	2	303	127	2	385	137	2½	400	135
10	1½	74.4	94.1	1½	147	105	1½	230	119	1½	323	130	2	343	129	2	435	140	2½	450	138
12	1½	86.1	94.3	1½	170	106	1½	267	118	1½	375	130	2	395	130	2	500	141	2½	520	140
14	1½	89.0	95.4	1½	196	107	1½	307	121	1½	430	134	2	445	133	2	565	144	3	498	133
16	1½	115	95.6	1½	218	108	1½	345	122	1½	480	135	2	500	134	2	635	145	3	556	134
18	1½	128	95.9	1½	240	108	1½	385	122	1½	540	135	2	555	135	2	705	146	3	616	135
20	1½	141	96.3	1½	271	109	1½	406	123	1½	605	136	2½	510	126	2½	649	135	3	678	135
24	1½	153	96.6	1½	302	109	1½	451	124	1½	652	136	2½	600	126	2½	761	136	3	797	136

Power, utility — Recommended thicknesses

Pipe Temperature	200°F			300°F			400°F			500°F			600°F			700°F			800°F		
Temperature Difference	120°F			220°F			320°F			420°F			520°F			620°F			720°F		
Pipe Size	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST
½	1	16.5	93.5	1	32.8	104	1	50.5	116	1	70.8	128	1½	75.2	111	1½	94.6	125	2	104	119
¾	1	19.7	95.8	1	38.1	108	1	60.9	122	1	85.1	135	1½	84.8	123	1½	107	133	2	117	126
1	1	20.2	93.6	1	39.2	104	1	62.4	117	1	87.1	128	1½	94.1	122	1½	118	131	2	126	125
1¼	1	25.6	97.3	1	50.8	111	1½	57.5	105	1½	80.1	113	1½	106.0	123	2	123	124	2½	132	120
1½	1	26.3	95.8	1	52.3	108	1½	64.3	108	1½	90.1	118	2	94.8	111	2	120	117	2½	132	116
2	1	30.7	96.2	1	58.0	109	1½	72.7	109	1½	101	118	2	113	116	2	142	123	2½	154	121
2½	1	34.8	96.8	1	67.5	110	1½	74.8	104	1½	106	113	2	119	114	2	150	120	2½	164	119
3	1	40.7	97.8	1	80.3	112	1½	95.6	112	1½	134	122	2	147	120	2	186	128	3	178	119
4	1	49.0	98.0	1	95.6	112	1½	115	113	1½	161	124	2	175	123	2	220	132	3	206	120
5	1	60.0	99.0	1	116	114	1½	137	115	1½	192	126	2½	175	116	2½	220	123	3	240	123
6	1	71.1	100	1	139	116	1½	162	117	1½	227	129	2½	203	118	2½	256	126	3½	241	117
7	1½	57.6	93.9	1½	114	105	1½	178	117	1½	250	129	2½	226	119	2½	284	127	3½	270	119
8	1½	64.4	94.2	1½	127	105	1½	198	118	1½	276	130	2½	237	117	2½	302	125	3½	295	120
9	1½	70.1	94.6	1½	139	106	1½	219	119	1½	306	131	2½	260	118	2½	329	126	3½	316	120
10	1½	74.4	94.1	1½	147	105	1½	230	119	1½	323	130	2½	290	120	2½	366	128	3½	353	122
12	1½	86.1	94.3	1½	170	106	1½	267	118	1½	375	130	2½	339	122	2½	427	130	4	364	118
14	1½	89.0	95.4	1½	196	107	2	243	112	2	340	122	3	323	116	3	407	123	4	398	120
16	1½	115	95.6	1½	218	108	2	272	112	2	380	122	3	360	117	3	456	125	4	443	121
18	1½	128	95.9	1½	240	108	2	301	113	2	420	123	3	400	118	3	503	126	4	440	121
20	1½	141	96.3	1½	271	109	2	335	113	2	468	124	3	439	118	3	555	126	4	535	122
24	1½	153	96.6	1½	302	109	2	398	114	2	560	125	3	517	119	3	650	127	4½	565	118

RT=Recommended Thickness. HL=Heat Loss (BTU/HR/LF). ST=Surface Temperature (°F.).

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INIBESTOS

Process industries

900°F			1000°F			1100°F			1200°F			1300°F			1400°F			1500°F		
820°F			920°F			1020°F			1120°F			1220°F			1320°F			1420°F		
RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST
1½	140	143	2	146	135	2	171	142	2	196	150	2½	181	132	2½	223	139	3	218	136
1½	159	151	2	165	141	2	193	149	2½	189	134	2½	202	138	2½	228	145	3	242	141
2	149	133	2½	157	127	2½	185	133	2½	212	140	3	218	135	3	242	140	3	272	146
2	181	141	2½	186	134	2½	217	141	3	228	136	3	246	141	3	276	148	3½	291	144
2	176	132	2½	185	128	2½	214	134	3	229	131	3	246	136	3	280	142	3½	295	139
2	210	140	2½	216	135	2½	253	142	3	265	139	3	287	144	3½	302	140	3½	343	147
2	221	136	2½	231	133	2½	269	139	3	282	137	3½	285	134	3½	322	138	4	342	137
2	274	148	2½	279	142	2½	326	150	3	335	146	3½	332	140	3½	377	146	4	397	144
2	325	151	3	291	134	3	338	141	3½	354	139	3½	384	143	4	408	141	4	461	148
2½	322	141	3	338	138	3	394	145	3½	400	141	4	407	138	4	462	143	4½	490	142
2½	376	143	3	389	141	3	453	148	3½	451	142	4	460	139	4	520	144	4½	545	145
2½	419	145	3½	380	132	3½	443	139	3½	508	147	4	503	142	4½	534	140	4½	596	146
2½	438	142	3½	416	134	3½	484	140	4	510	140	4	546	144	4½	580	142	4½	650	148
2½	483	144	3½	446	134	3½	520	141	4	537	139	4½	553	137	4½	621	142	5	650	142
2½	541	147	3½	498	137	3½	579	144	4	601	143	4½	598	139	4½	679	143	5	715	144
2½	629	149	3½	568	138	3½	661	145	4	684	145	4½	680	141	5	722	140	5	814	146
3	600	141	3½	622	141	3½	724	148	4½	685	140	5	697	137	5	790	142	5½	830	143
3	669	142	4	623	134	4	725	141	4½	758	141	5	763	138	5	865	142	5½	916	144
3	742	143	4	690	135	4	803	142	5	771	136	5	806	138	5½	900	140	6	1012	140
3	815	144	4	755	136	4	880	143	5	843	137	5½	865	135	5½	976	140	6	1026	141
3	959	145	4	879	137	4	1024	144	5	980	139	5½	1000	136	6	1060	139	6½	1110	139

INIBESTOS

Power, utility

900°F			1000°F			1100°F			1200°F			1300°F			1400°F			1500°F		
820°F			920°F			1020°F			1120°F			1220°F			1320°F			1420°F		
RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST	RT	HL	ST
2	125	128	2½	127	117	2½	148	123	3	160	121	3	172	126	3	194	131	3½	208	128
2	141	133	2½	142	122	2½	165	127	3	176	125	3½	181	123	3½	203	127	4	219	127
2	151	132	3	147	118	3	172	123	3	197	129	3½	201	127	4	217	126	4	242	130
2½	159	127	3	170	124	3	198	130	3½	211	127	4	192	125	4	242	130	4½	258	128
2½	158	121	3	171	120	3	199	125	3½	213	124	4	219	122	4	247	126	4½	265	127
2½	186	128	3	198	126	3	231	132	4	229	122	4	250	127	4½	271	126	4½	302	131
2½	197	125	3	211	124	3	246	130	4	245	122	4	267	126	4½	287	126	4½	324	131
3	214	125	3½	227	125	3½	265	129	4	282	128	4½	294	127	4½	331	132	5	348	130
3	248	127	3½	263	126	3½	309	132	4½	312	126	4½	316	127	5	358	128	5	401	133
3	289	130	4	276	121	4	320	126	4½	353	129	5	360	126	5	406	131	5½	436	131
3½	288	123	4	316	124	4	368	130	5	372	126	5	400	127	5	459	133	5½	485	133
3½	324	125	4½	328	121	4½	381	126	5	408	127	5	443	128	5½	468	130	5½	527	134
3½	355	126	4½	356	122	4½	415	128	5½	416	124	5½	424	125	5½	511	130	5½	570	135
3½	381	126	4½	386	124	4½	450	129	5½	450	125	5½	480	126	5½	547	131	6	585	132
3½	424	129	4½	420	125	4½	488	130	5½	484	126	5½	528	128	5½	598	133	6	634	134
4	437	124	5	441	122	5	514	127	5½	550	128	5½	595	129	6	638	131	6	724	136
4	478	126	5	473	123	5	551	127	5½	589	129	6	610	127	6	692	132	6½	760	135
4	532	127	5	525	123	5	612	129	5½	650	130	6	678	128	6	768	134	6½	815	135
4	589	127	5½	535	120	5½	624	125	5½	716	131	6	743	129	6½	782	130	6½	880	136
4	643	128	5½	585	122	5½	681	125	5½	781	132	6	806	130	6½	859	131	7	905	132
4½	681	124	5½	678	122	5½	789	127	5½	904	133	6½	875	128	6½	992	132	7	1050	134

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UNIBESTOS expansion control data

Expansion joints and fitting covers are easy to fabricate from UNIBESTOS pipe insulation on the job. Some typical vertical and horizontal expansion joints and fitting coverings are shown on the opposite page. Variations can be adapted using different membranes and shield for the expansion gap. All variations should meet with the approval of the design engineer on a specific project.

The number and spacing of expansion joints can be determined from the table below. For example, at 750°F. pipe temperature and 24′ spacing, the expansion per joint will be 1.5″. Fixed points, bends, etc. should be considered in establishing locations of expansion joints.

EXPANSION CONTROL CHART

(Figures shown below are inches of expansion per joint at the joint interval indicated)

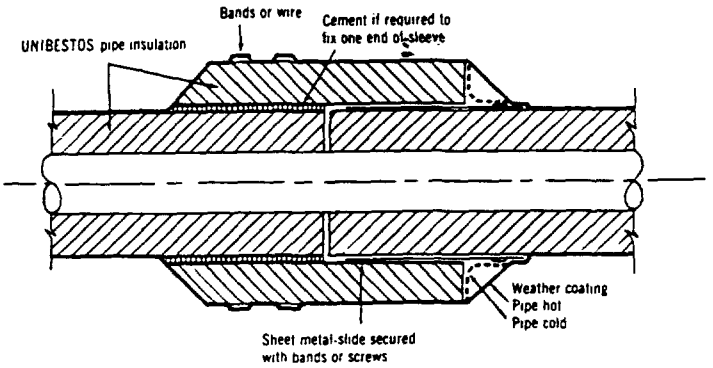
Pipe Temperature °F.	Linear Expansion of Pipe* (inches/100 ft.)	INTERVAL OF EXPANSION JOINT SPACING										
		9′	12′	15′	18′	21′	24′	27′	30′	36′	42′	48′
1500°	14.89	1.3	1.8	2.2	2.7	3.1	3.6	4.0	4.5	5.4	6.2	7.1
1450°	14.19	1.3	1.7	2.1	2.6	3.0	3.4	3.8	4.3	5.1	6.0	6.8
1400°	13.59	1.2	1.6	2.0	2.4	2.9	3.3	3.7	4.1	4.9	5.7	6.5
1350°	12.89	1.2	1.6	1.9	2.3	2.7	3.1	3.5	3.9	4.6	5.4	6.2
1300°	12.29	1.1	1.5	1.8	2.2	2.6	3.0	3.3	3.7	4.4	5.2	5.9
1250°	11.69	1.1	1.4	1.8	2.1	2.5	2.8	3.2	3.5	4.2	4.9	5.6
1200°	11.09	1.0	1.3	1.7	2.0	2.3	2.7	3.0	3.3	4.0	4.7	5.3
1150°	10.49	.94	1.3	1.6	1.9	2.2	2.5	2.8	3.1	3.8	4.4	5.0
1100°	9.89	.89	1.2	1.5	1.8	2.1	2.4	2.7	3.0	3.6	4.2	4.7
1050°	9.29	.84	1.1	1.4	1.7	2.0	2.2	2.5	2.8	3.3	3.9	4.5
1000°	8.76	.79	1.0	1.3	1.6	1.8	2.1	2.4	2.6	3.2	3.7	4.2
950°	8.20	.74	.98	1.2	1.5	1.7	2.0	2.2	2.5	3.0	3.4	3.9
900°	7.65	.69	.92	1.1	1.4	1.6	1.8	2.1	2.3	2.8	3.2	3.7
850°	7.11	.64	.85	1.0	1.3	1.5	1.7	1.9	2.1	2.6	3.0	3.4
800°	6.59	.59	.79	.99	1.2	1.4	1.6	1.8	2.0	2.4	2.8	3.2
750°	6.07	.55	.73	.91	1.1	1.3	1.5	1.6	1.8	2.2	2.5	2.9
700°	5.56	.50	.67	.83	1.0	1.2	1.3	1.5	1.7	2.0	2.3	2.7
650°	5.08	.46	.61	.76	.91	1.1	1.2	1.4	1.5	1.8	2.1	2.4
600°	4.58	.41	.55	.69	.82	.96	1.1	1.2	1.4	1.6	1.9	2.2
550°	4.10	.37	.49	.62	.74	.86	.98	1.1	1.2	1.5	1.7	2.0
500°	3.63	.33	.44	.54	.65	.76	.87	.98	1.1	1.3	1.5	1.7
450°	3.16	.28	.38	.47	.57	.66	.76	.85	.95	1.1	1.3	1.5
400°	2.71	.24	.33	.41	.49	.57	.65	.73	.81	.98	1.1	1.3

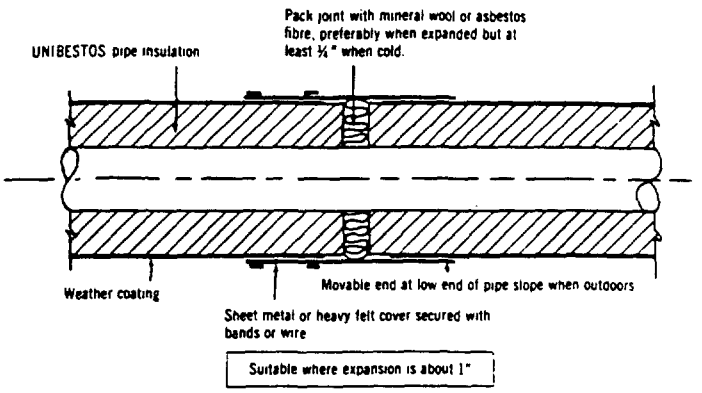
*Installation temperature assumed at 70°F. Table based on carbon and low-alloy steel pipe.

NOTE: Use sleeve-type expansion joints *only* if expansion figure to the right of heavy line in chart is used.

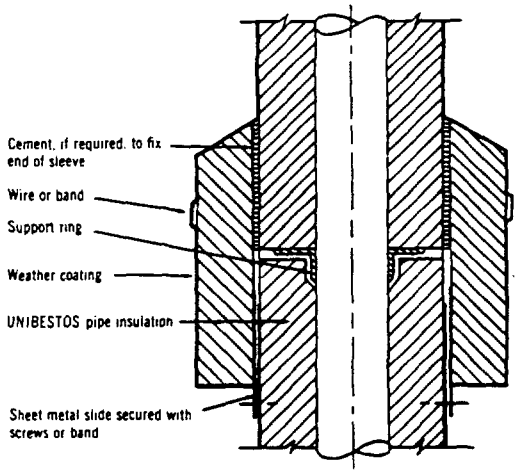
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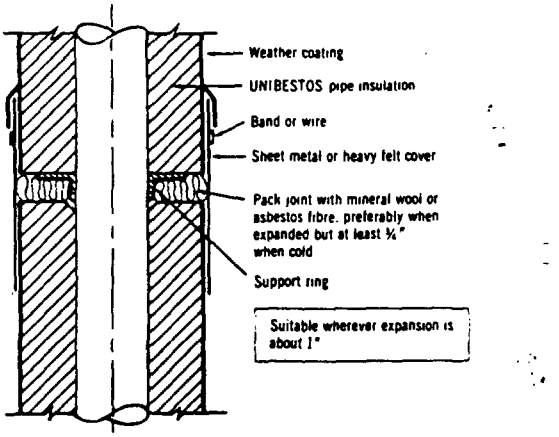
HORIZONTAL EXPANSION JOINTS





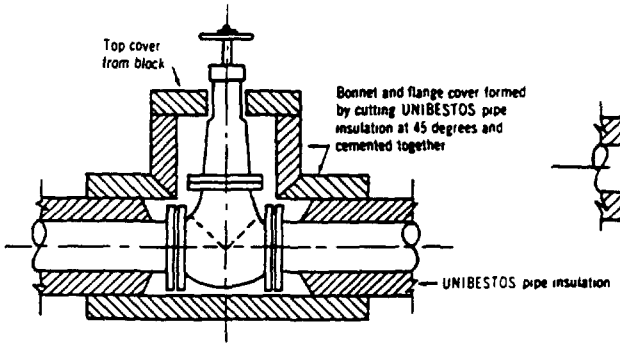
VERTICAL EXPANSION JOINTS



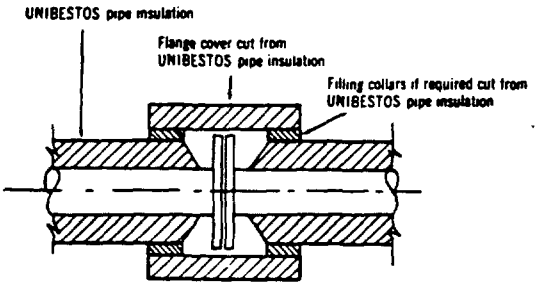


TYPICAL FITTING INSULATION

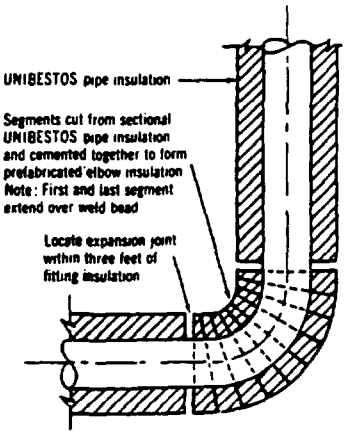
HIGH TEMPERATURE FLANGED VALVE INSULATION



FLANGE INSULATION



PREFABRICATED INSULATION FOR PIPE BEND



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Typical specification for UNIBESTOS

1. **Temperature Range.** UNIBESTOS shall be used on piping operating from +100°F. to +1500°F.

2. **Thickness Required.** Thickness shall be determined from the table of suggested thicknesses or the most economic thickness may be calculated using the NIMA Guide for determining economic thickness.

3. **Material.** All piping shall be insulated with UNIBESTOS as manufactured by Pittsburgh Corning Corporation.

4. **Application.** UNIBESTOS shall be applied over clean, dry surfaces. Adjoining sections shall be butted firmly together using single-layer applications. Circumferential and longitudinal joints do not require pointing with finishing cement to conserve heat. Insulation under 12″ I.P.S. shall be wired in place using 16 gauge soft annealed wire; on pipe sizes over 12″ use 14 gauge wire. The wiring shall be spaced no greater than 9″ on centers. Fittings, flanges, and valves shall be insulated with fabricated mitered segments of UNIBESTOS equal to the thickness of the insulation adjoining pipe.

5. **Finishes.** Indoor: On indoor lines, UNIBESTOS does not require a finish. If a finish is desired, a 6 oz. canvas shall be secured to the insulation with a lagging adhesive.

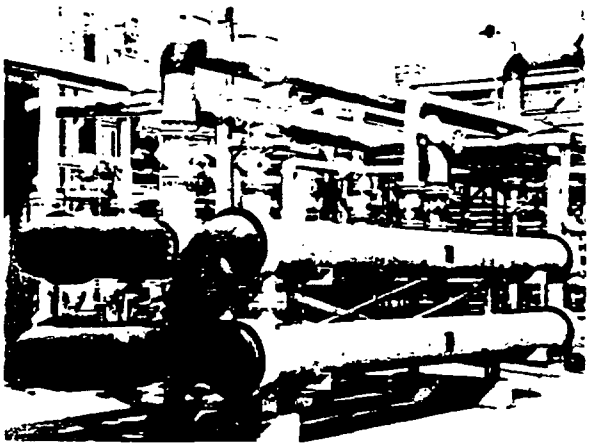
Outdoor: Outdoor piping shall be finished with a 45 lb. roofing felt lapped not less than 2″. Felt jacket shall be secured with 16 gauge copper wire banded on 9″ centers. Other finishes such as glass fabric and breathing-type mastic and metal jacketing may be used. Flanges, valves, and fittings may be finished in the same manner as the adjacent pipe covering.

Note: The above specifications are general in nature and final specifications shall meet with the approval of the design engineer.

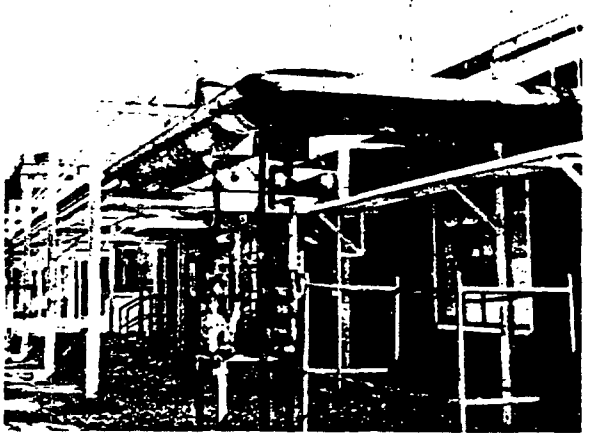
UNIBESTOS is available nationally

Pittsburgh Corning provides national distribution for UNIBESTOS. More than 100 distributors stand ready to serve your insulation requirements. The PC authorized UNIBESTOS distributor is highly trained and he is well equipped to survey your job, make recommendations and estimates, and to install UNIBESTOS to meet your requirements. For your next high temperature job: select the insulation most suited to single-layer applications; select the distributor most experienced with high temperature installations.

Call or write your nearest Pittsburgh Corning District office listed on the back cover for the name of your local authorized distributor.



UNIBESTOS insulates the towers and piping at this major oil company refinery in Texas. It is unaffected by the corrosive atmospheres common to this service.



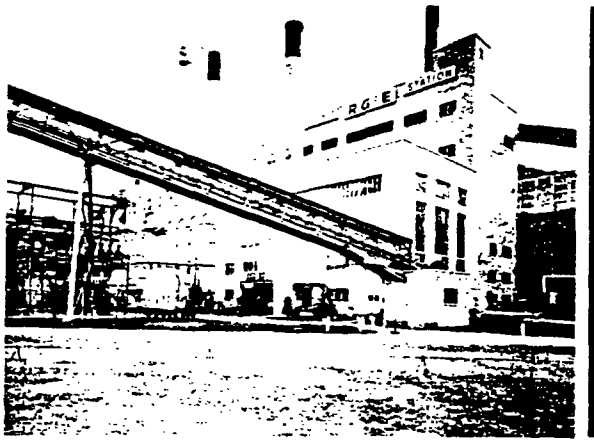
Practically all of the piping is protected with UNIBESTOS on this Jal, New Mexico field processing plant of El Paso Natural Gas Company. UNIBESTOS is available in a wide range of pipe and tubing sizes.



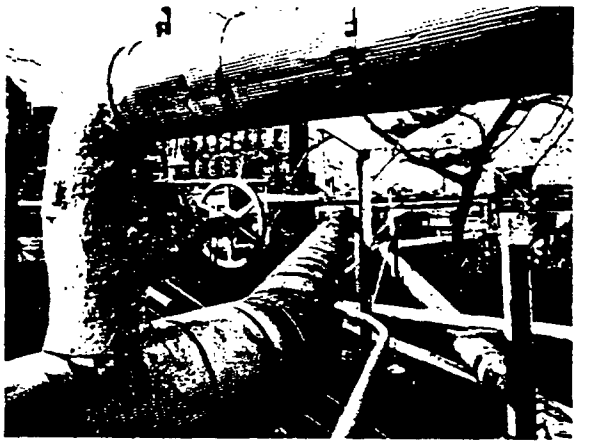
The piping at this large Illinois refinery is protected by UNIBESTOS. Note the ease with which the fabricated sections of UNIBESTOS accommodate the sharp bends of the piping.

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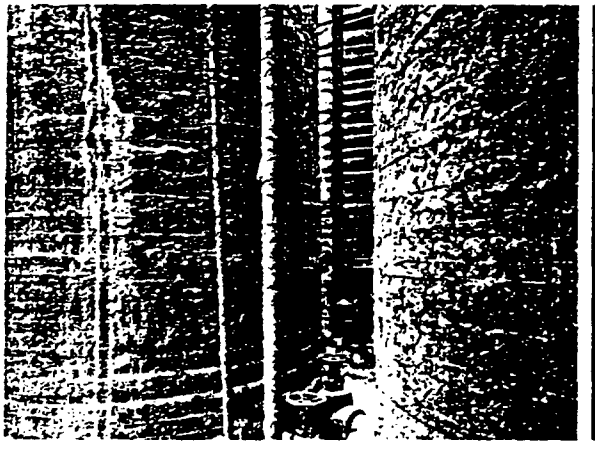
Typical examples of UNIBESTOS insulation performance



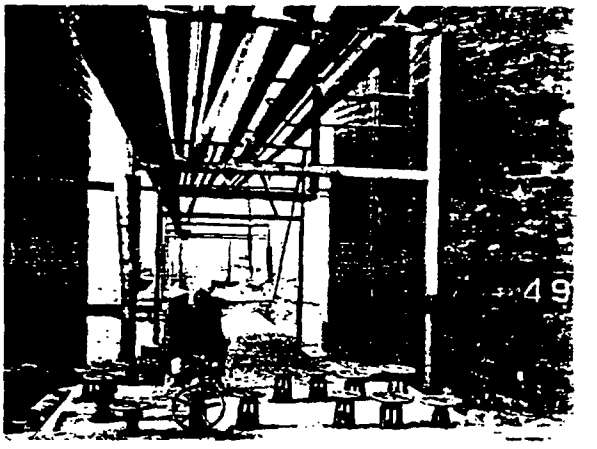
"In a quarter century of experience with UNIBESTOS, it is entirely satisfactory even though it has been drenched, banged, burnt, or otherwise assaulted" says Mr. Julius Schenk, Superintendent of Steam Distribution at



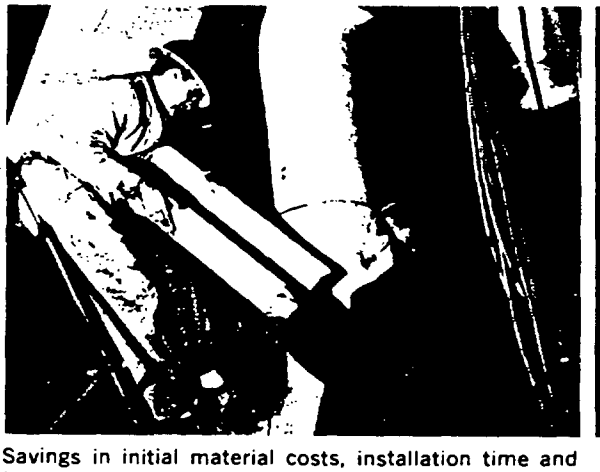
Rochester Gas and Electric, Rochester, New York. UNIBESTOS meets the most rugged of service demands, providing lasting protection and insulation efficiency.



In 1938, UNIBESTOS went to work at a storage, processing and distribution facility of a major New Jersey oil producer. One 100,000 gallon tank, four 20,000 gallon asphalt mixing tanks and 1400 feet of 4-in. and 10-in.



pipe were insulated. Today the UNIBESTOS is as good as the day it went on. This has resulted in substantial savings in both material and maintenance costs.



Savings in initial material costs, installation time and job clean-up are just a few of the advantages which Sun Shipbuilding attributes to UNIBESTOS. Single-layer in-



stallations of superheated steam lines is an everyday occurrence. No insulation shrinkage occurs, thus joints stay tight and heat losses are minimized.

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