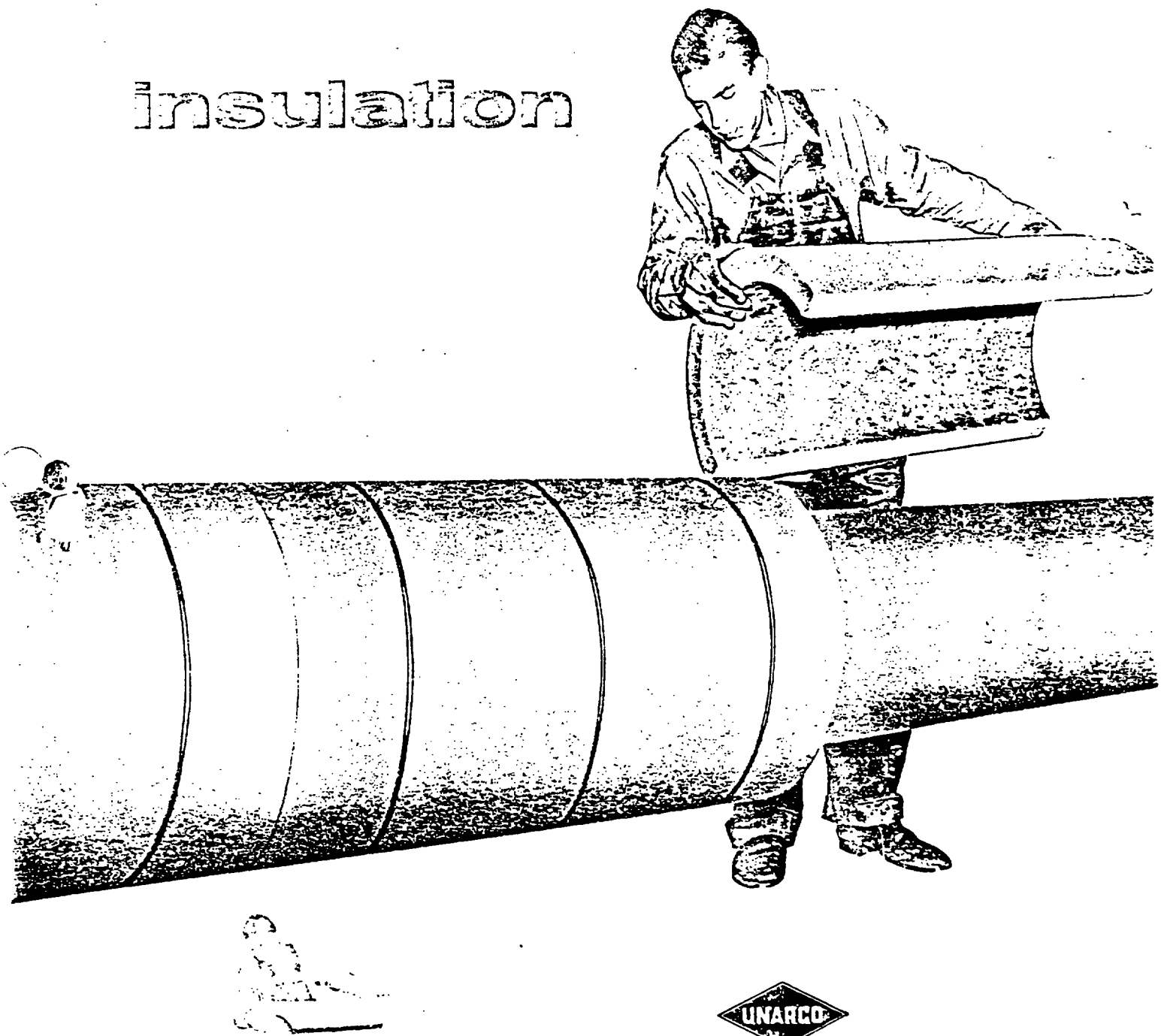
PLAINTIFF'S EXHIBIT
U-473

UNIBESTOS

insulation

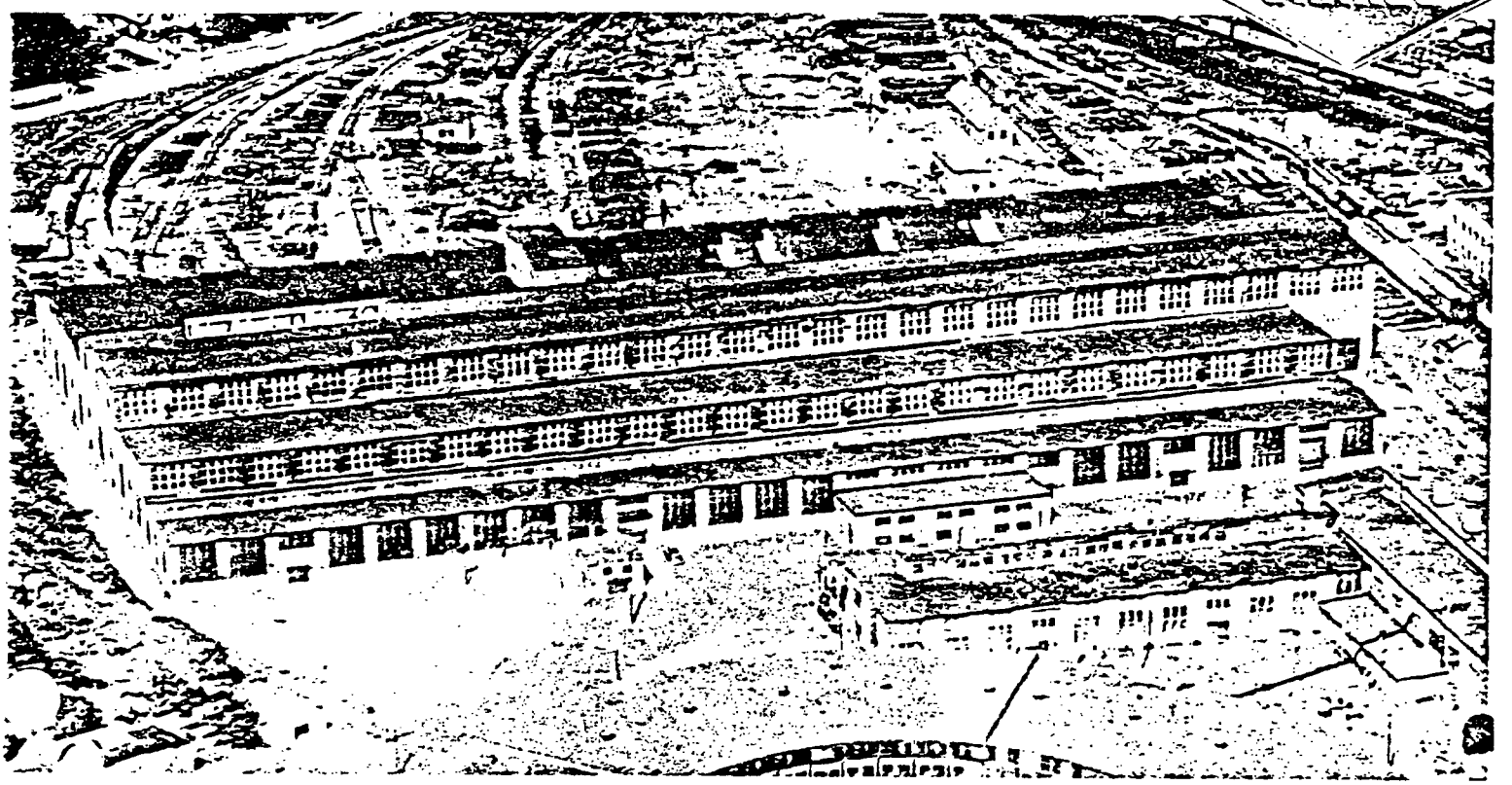


UNARCO

FIBROUS PRODUCTS DIVISION
UNION ASBESTOS & RUBBER COMPANY
1111 WEST PERRY STREET, BLOOMINGTON, ILLINOIS

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UNIBESTOS...built and backed by UNARCO



Bloomington, Illinois—Plant and General Sales Office

- 1918 UNARCO,® the Union Asbestos & Rubber Company, was incorporated in the state of Illinois as a manufacturer in the railroad supply business.
- 1925 The company built a new plant in Cicero, Illinois. Production facilities at this plant were chiefly devoted to the manufacture of flexible insulations, packing, gaskets and other asbestos fibrous products.
- 1936 The birthday of Unibestos. This new insulation was soon to prove itself for its durability and flexibility, as well as its superior insulating properties.
- 1947 Company facilities were further expanded with the purchase of a plant at Marshville, North Carolina. Here the entire production was devoted to asbestos textile products.
- 1950 A new factory was established at McGregor, Texas and later moved to Tyler, Texas. This plant, with a manufacturing area of 100,000 square feet, is devoted entirely to the production of Unibestos.
- 1951 Sales volume demanded further expansion and another plant was opened in Bloomington, Illinois, devoting its entire area of 250,000 square feet to the manufacture of Unibestos Insulation and other related insulation products.
- TODAY, in addition to the ever expanding facilities of the Fibrous Products Division, there are numerous UNARCO plants scattered over the country representing the various other divisions of the company. Development of Unibestos has been a major part of the company's success. As a result of its outstanding performance, Unibestos is the preferred insulation in more and more industries today and is proving to be a superior insulation in the atomic and nuclear field.

Copyright 1955—Union Asbestos & Rubber Company

Marshville, North Carolina—Plant

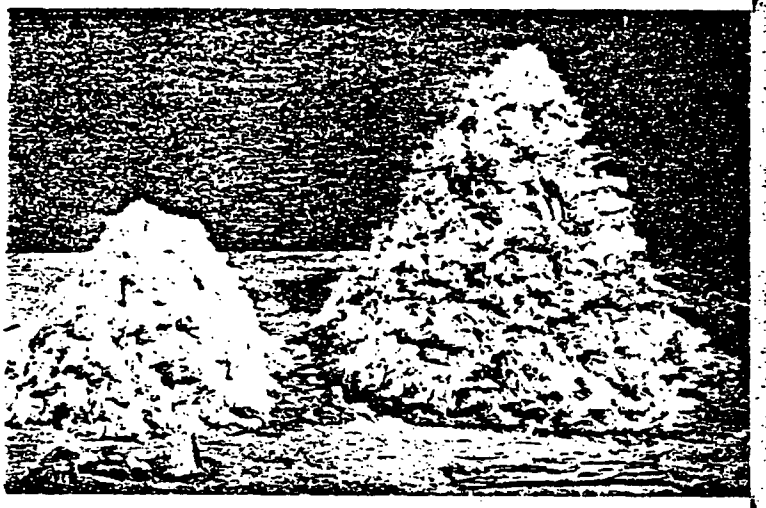


Tyler, Texas—Plant



AMOSITE...

the special fiber that gives UNIBESTOS long-lasting strength



There's a difference in asbestos. Ordinary asbestos as shown on the left tends to pack down. An equal weight of Amosite (shown on the right) retains its resiliency and remains fluffy to form more and better heat seals.

Asbestos has long been known for its excellent insulating properties. More popularly known as a "fireproof" material, asbestos has offered protection in a broad range of applications—everything from the fireproof tablecloth of Emperor Charlemagne to the white suits that fire-fighting crews use.

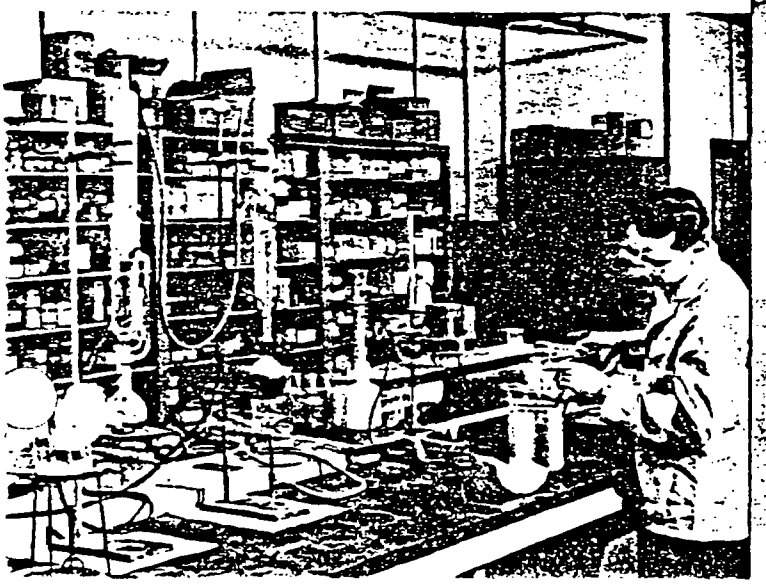
Asbestos, like everything else, varies in quality. Amosite, the asbestos used exclusively in Unibestos pipe insulation, is one of the top grades.

To get this superior asbestos, UNARCO has to go to Transvaal, a distant province in South Africa. There the long-fibered Amosite asbestos is mined hundreds of feet below the earth's surface. The long fibers of Amosite make it exceptionally suitable as an insulation material. It is not unusual in the native state to see fibers measuring over a foot in length.

The raw fibrous material is then shipped to one of the UNARCO plants for processing. There the Amosite undergoes fiberizing, by an exclusive UNARCO method. It is screened, blown, brushed and combined with an inert binder. Each step of this processing is carefully coordinated—assuring uniformity throughout. The Amosite is now ready to begin the carefully engineered process that will produce Unibestos.

RESEARCH...

develops superior single-layer insulation



A lab scene at the UNARCO plant in Bloomington, Illinois. Here Unibestos is continually tested to assure that its strength, durability and insulating efficiency conform to quality standards.

Because Unibestos is made with processed Amosite, UNARCO engineers are able to build a tough pipe insulation with high thermal efficiency. In fact, Unibestos provides positive protection at temperatures ranging up to 1200° F. Tests and on-the-job installations prove that there are negligible shrinkage and minimum heat loss when Unibestos is used.

This fact paved the way for one of the most notable advances in pipe-insulation history: *single-layer application.* The long interlacing fibers between abutting sections form positive heat seals . . . make double-layer application unnecessary with Unibestos.

Besides providing outstanding savings in installation time and cost, Unibestos is able to resist shock . . . to withstand moisture, acid or other chemical fumes . . . to remain efficient after continued removal and reapplication.

This outstanding performance is the result of a special combination of superior materials, advanced engineering and the most modern and efficient manufacturing methods.

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1. Raw material by the carload. Amosite, the special long fiber asbestos, arrives at the plant after completing the long trip from the mines in Transvaal, South Africa.



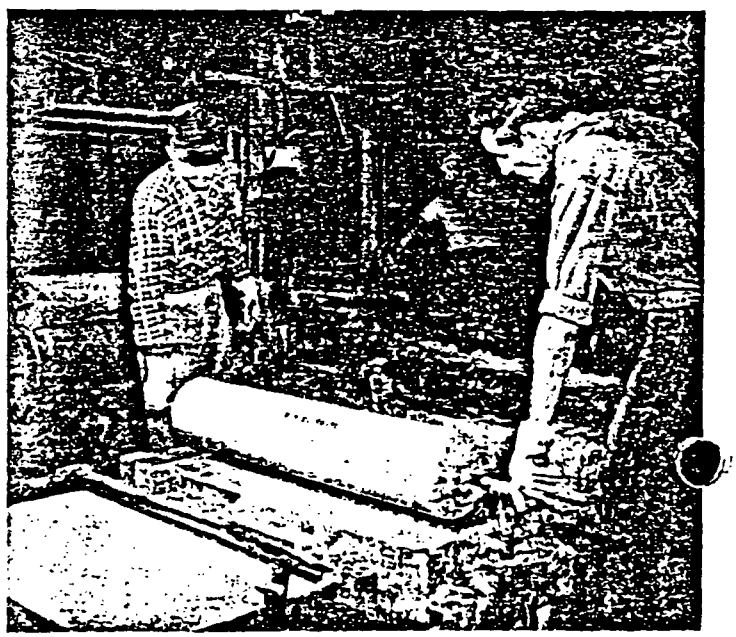
2. A blend of two grades of Amosite is fed into the fiberizer. Here the fibers are opened up, combined with diatomaceous earth and sprayed with a siliceous binder.

UNARCO PRECISION METHODS®

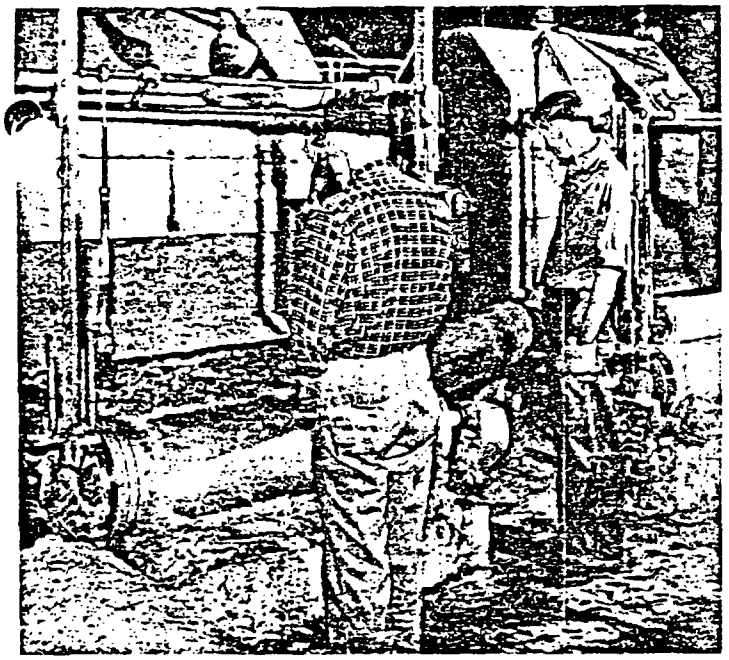
5. When the desired thickness is reached, the mandrel is moved to the sizing rolls where the outside diameter of the section is controlled.



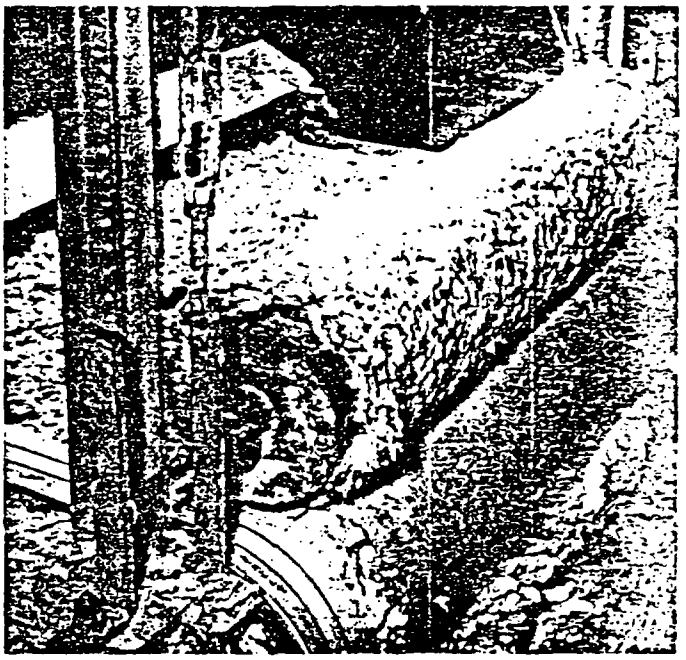
6. After an exacting weight check, the insulating section is stamped with an identifying code number . . . then it gets a refractory coating to provide a smooth surface.



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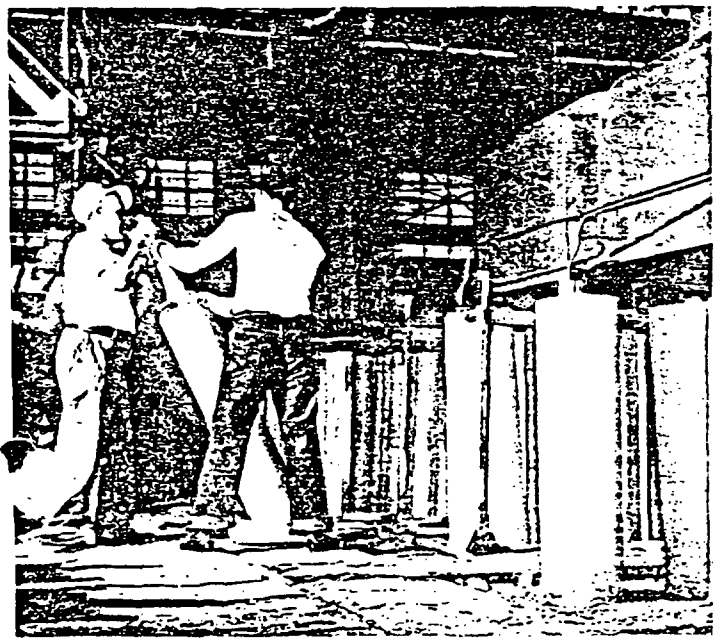
3. A metal cylinder, called the mandrel, is placed into position. The diameter of the mandrel determines the inside diameter of the pipe insulation to be formed.



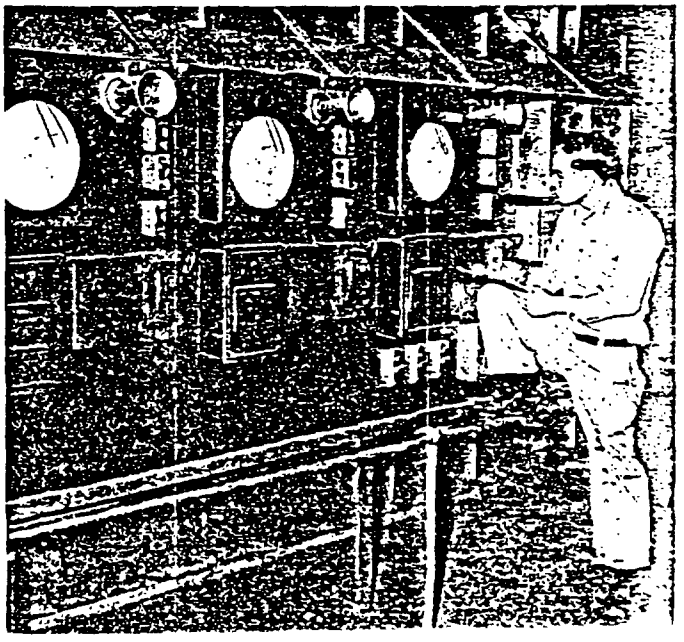
4. Traveling on a 40" belt, the "lap," or layer of treated fiber, rolls around the mandrel building up its thicknesses with each revolution.

SSURE SUPERIOR CONSTRUCTION

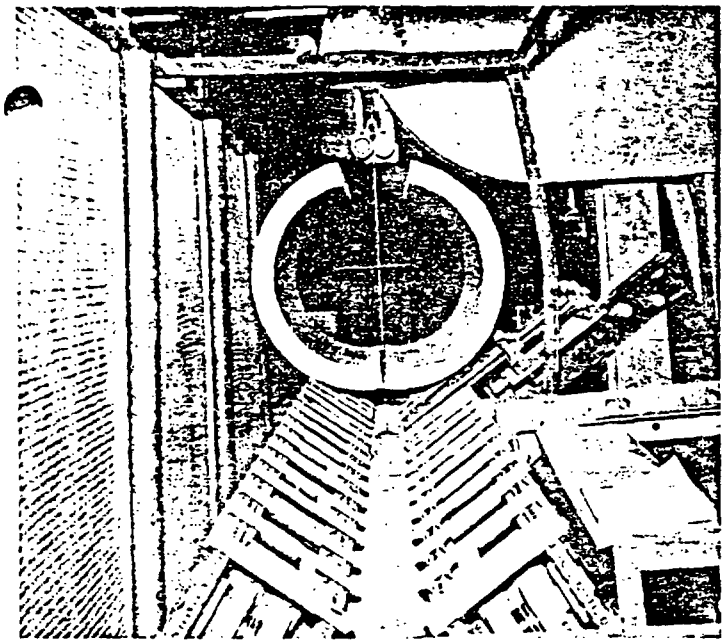
7. The mandrel is removed and returned to the building machine to form another cylindrical section. Now the insulating section is ready for the drying oven.



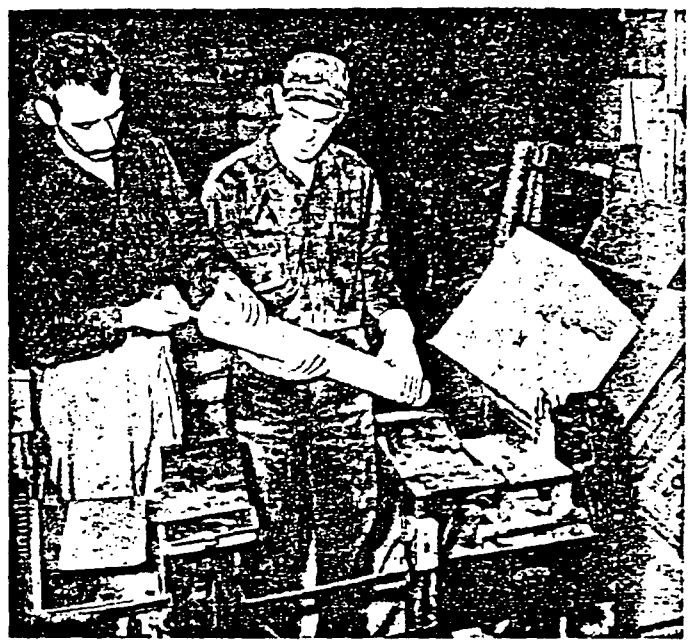
8. Constant checking of the temperature and belt speed assures completely effective drying.



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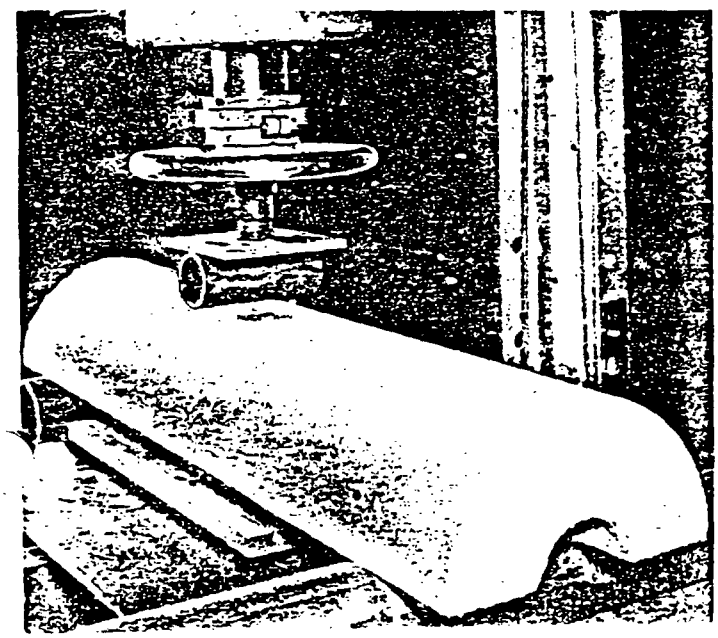
11. Then the well-trimmed sections are moved to another cutting machine which splits the cylinders in half. When specified, these sections are available in full cylindrical form.



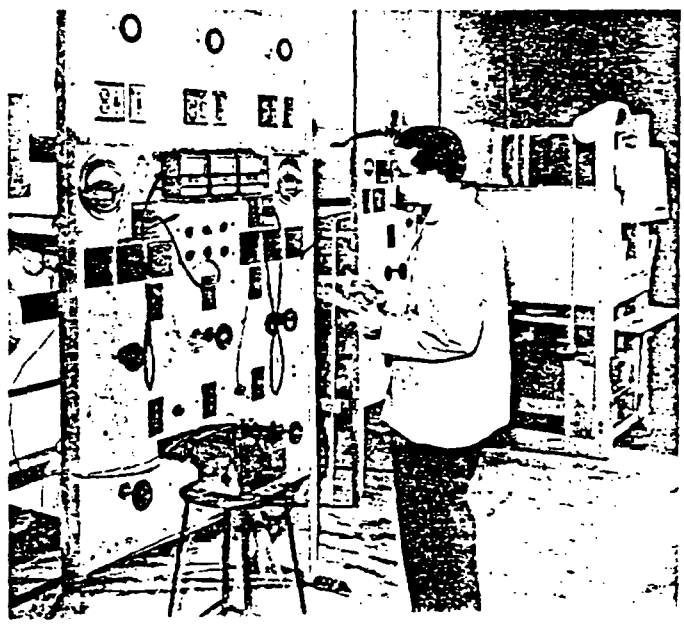
12. Before packing, the sections are checked to assure proper conformity to exacting dimensional standards. Smaller sections are tied together for protection in shipment.

UNIBESTOS QUALITY POSITIVELY CONTROLLED

15. In the laboratory, quality testing is a continuous operation. Here, Unibestos is subjected to increased pressure to determine the rupture point.



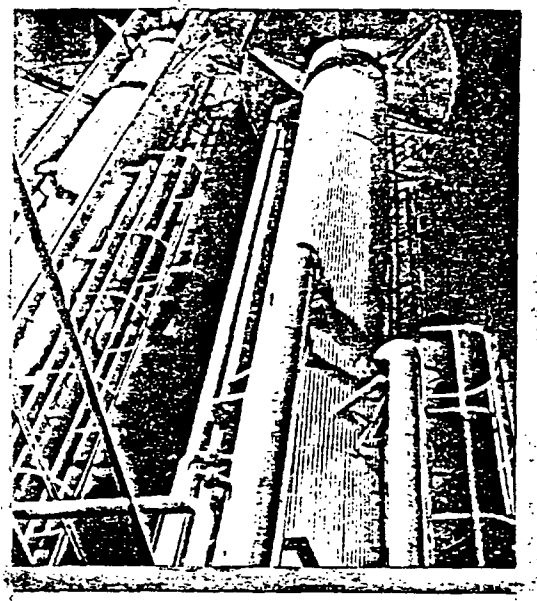
16. Special equipment tests Unibestos for thermal conductivity and strength. These and other tests assure a uniform quality insulation that pays off on the job.

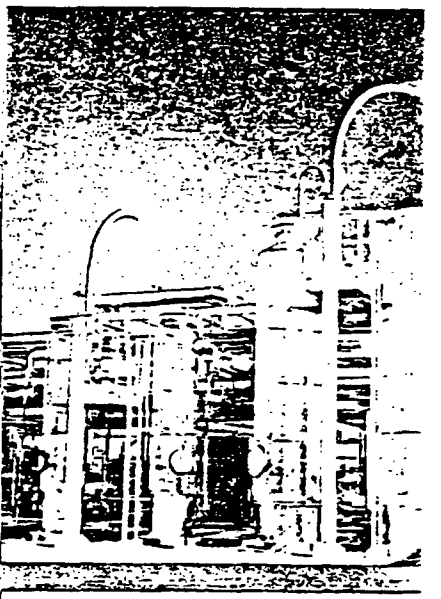


UNIBESTOS--THE QUALITY INSULATIO

FOR REFINERIES AND PETROCHEMICAL PLANTS

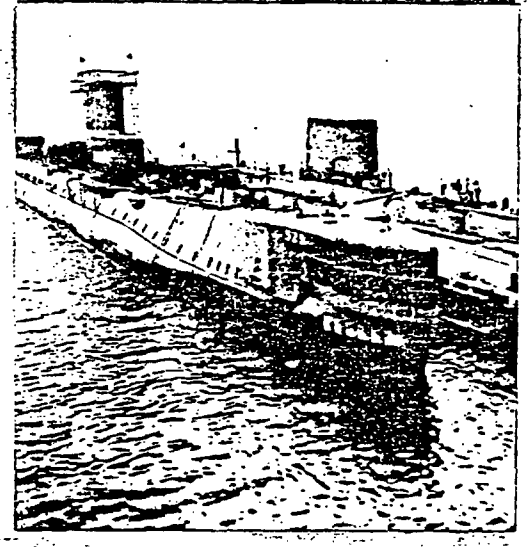
Unibestos offers superior insulation . . . withstands fumes. Built extra strong, it may be effectively removed and reapplied again and again. It's the ideal insulation for installations demanding periodical pipeline inspection.

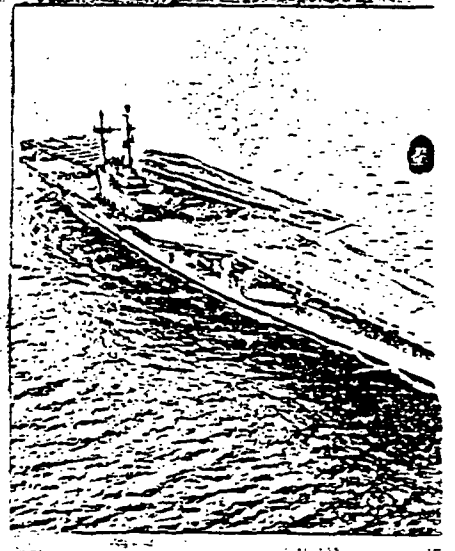




FOR MARINE AND ATOMIC INDUSTRIES

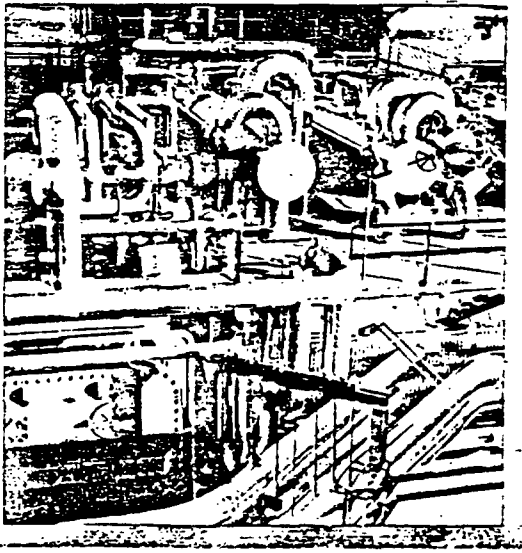
Single-layer Unibestos is well suited for ships and other installations where space is at a premium. Its unmatched characteristics make it the preferred insulation for atomic projects everywhere.

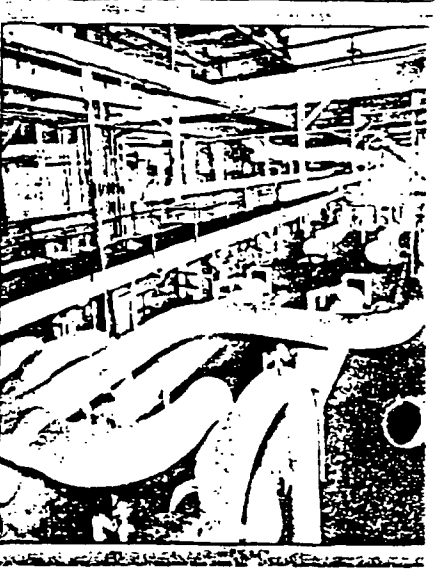




FOR POWER PLANTS AND HIGH-TEMPERATURE STEAM LINES

When Unibestos is on the job, more live steam is available for efficient power production. This tough, durable insulation withstands vibration . . . doesn't shatter under extraordinary impact . . . maintains long-life efficiency.





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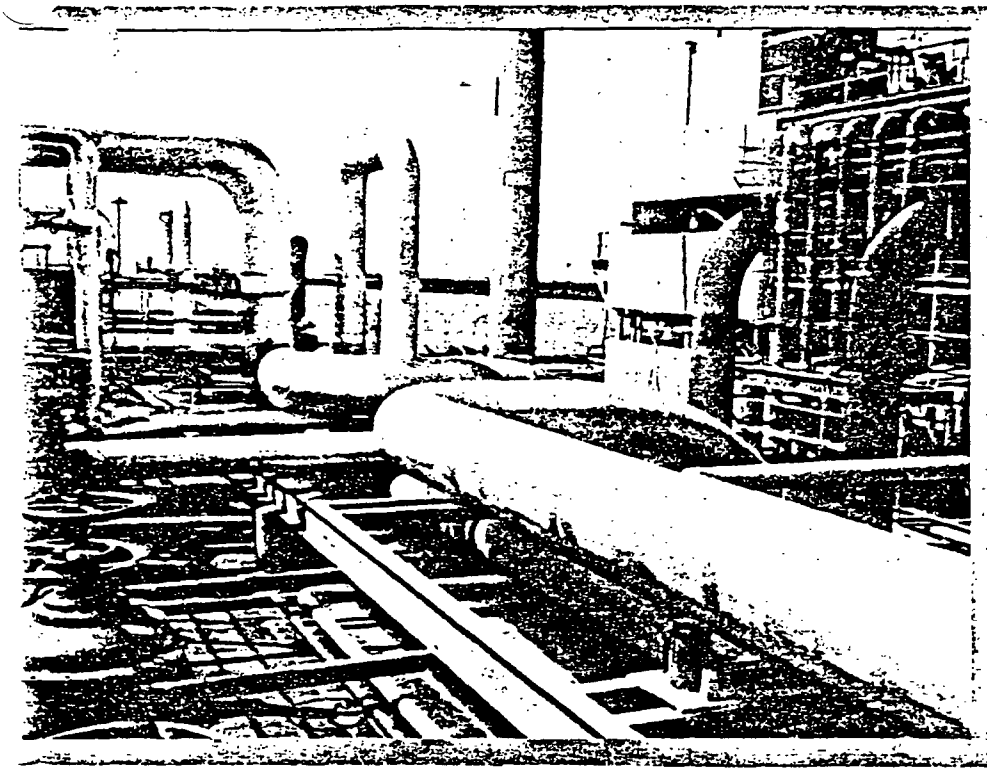
TO MEET YOUR EVERY REQUIREMENT

UNARCO

- ✓ Positive protection against heat loss
- ✓ Cuts application time and costs
- ✓ Withstands moisture, acids and chemical fumes
- ✓ Resists shock . . . reduces costly breakage
- ✓ Less heat loss at the joints
- ✓ Constantly and effectively re-used
- ✓ Negligible shrinkage at 1200° F.
- ✓ Fully coated — for exceptional handle-ability
- ✓ Fire resistant
- ✓ Effective in nuclear installations
- ✓ Easily adapted for fabrication into any shape
- ✓ Widest range of sectional sizes

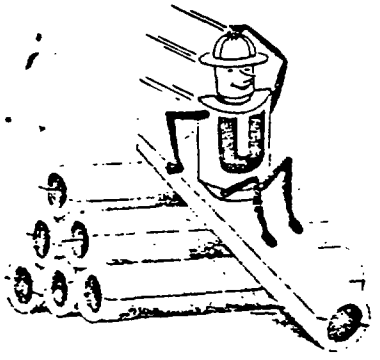
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ONLY UNIBESTOS OFFERS YOU SO MANY



Positive protection against heat loss

Now one material, Unibestos, offers superior insulation for all temperatures up to 1200° F. Unibestos provides a durable seal against heat flow. And with Unibestos, calcination and dehydration are virtually eliminated. Its low thermal conductivity guarantees real insulating efficiency.



JOE BESTOS SAYS:

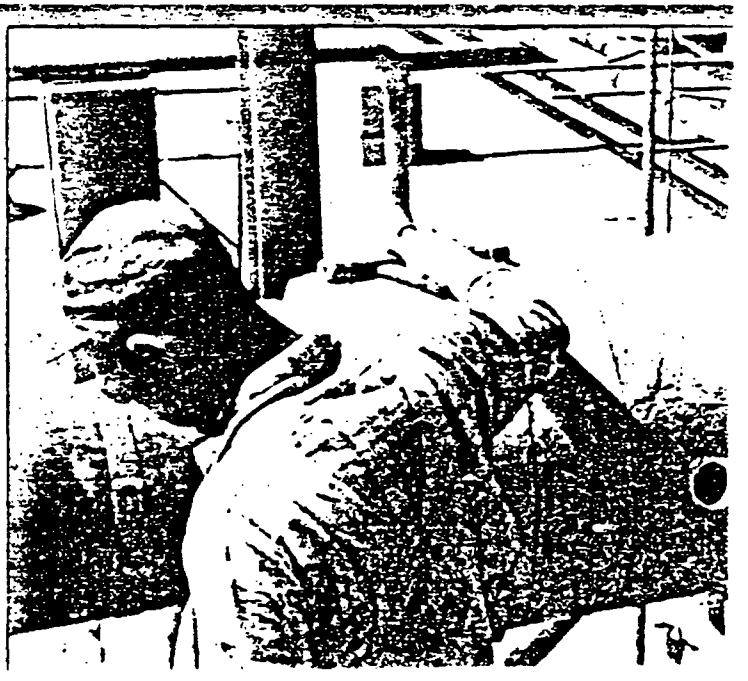
Smoother . . . no sharp splinters here. Unibestos has a special coating that makes it a pleasure to handle, yet costs nothing extra.

Fully coated for exceptional handle-ability

Now Unibestos is manufactured with an integral refractory coating. Besides creating a better appearing insulation, this smooth coating makes handling easier, and application handling becomes more convenient. In most cases there is no need for canvas for durable Unibestos requires no additional protection inside buildings. However, canvas and bands are available on request.

Cuts application time and costs

Because Unibestos is a strong, durable insulation, it can be applied with the minimum of fuss or muss using the standard methods and regular tools. Short lengths can be quickly cut on the job without shattering or end breakage. Installations made with single-layer sectional Unibestos require less time . . . less labor.



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IMPORTANT ADVANTAGES

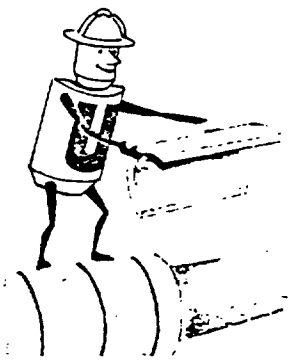
UNARCO

Less heat loss at the joints

The long interlacing fibers of Unibestos form their own heat seals . . . provide positive insulation for the most difficult joints. Independent tests show that pipes insulated with single-layer Unibestos lose less heat than pipes insulated with other double-layer insulation. Since a Unibestos installation needs no calking at the joint, there's an appreciable saving in installation time.

JOE BESTOS SAYS:

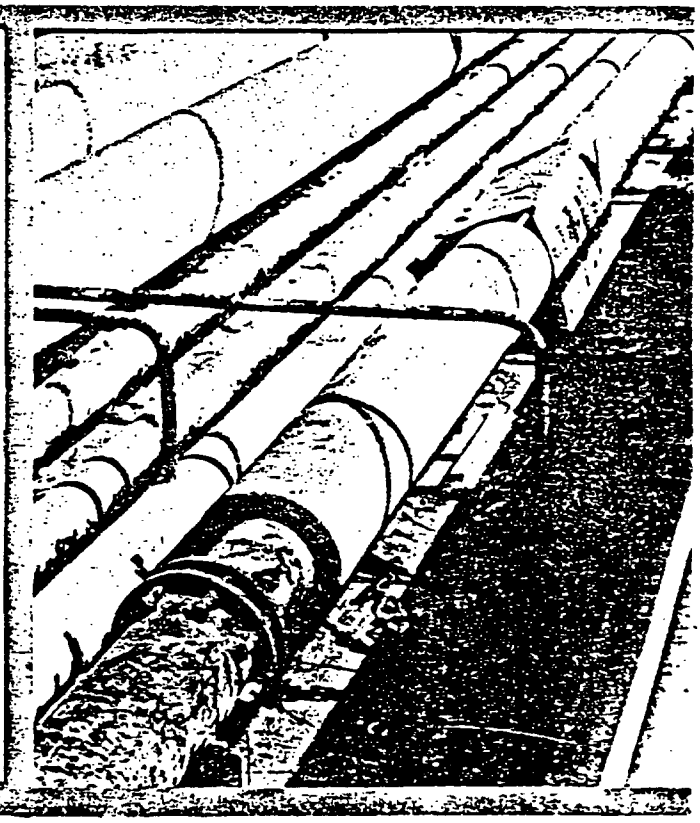
Remember, single-layer Unibestos locks in more heat than most *double-layer* insulations.





JOE BESTOS SAYS:

Acid or chemical fumes don't get anywhere with Unibestos! This quality insulation withstands all kinds of fumes and vapors.

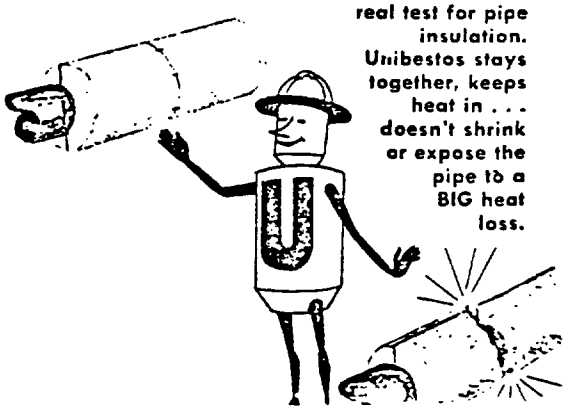


Withstands moisture, acids and chemical fumes

With Unibestos, there is no danger of acid fumes impairing the effectiveness of the insulation. Even after continuous exposure to various chemical fumes, the insulating capacity of Unibestos remains unchanged. Since acid and chemical fumes are so often encountered in today's industries, the chemical stability of Unibestos is a big advantage. Submerged under water for weeks, it dries to its original characteristics.

JOE BESTOS SAYS:

1200° F! That's a real test for pipe insulation. Unibestos stays together, keeps heat in . . . doesn't shrink or expose the pipe to a BIG heat loss.

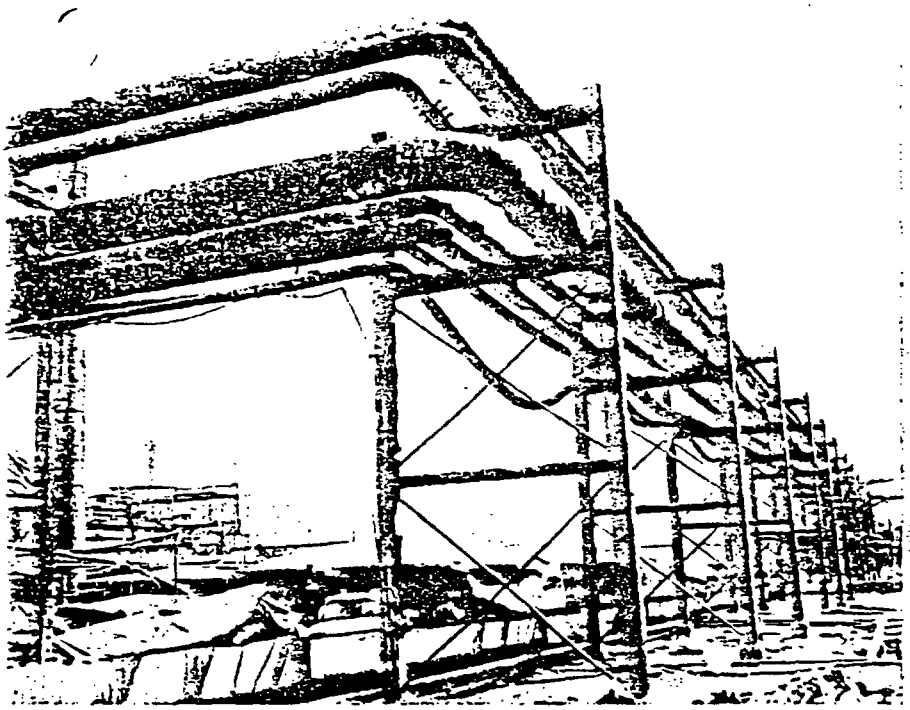


Negligible shrinkage at 1200°

Minimum shrinkage is one of the most important advantages of Unibestos. When subjected to high temperatures, ordinary pipe insulations pull apart between sections . . . allow heat to escape from the pipe surface. Because Unibestos has *no* shrinkage at temperatures up to 750° F., and negligible shrinkage up to 1200° F., there is little danger of heat loss at any point along the line. This means that the added precaution of double-layer installation is unnecessary, and the added application cost is eliminated.

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YOU CAN BE SURE OF DURABILITY . . .



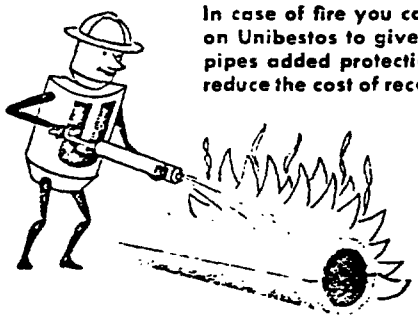
This devastating fire produced such terrific heat that even tanks buckled (left foreground). But pipes insulated with Unibestos stayed intact—proving the resistance of Unibestos to extreme temperatures.

Fire resistant

Laboratory tests have demonstrated that Unibestos protects against an excessive and rapid gain of heat . . . holds up even when subjected to long exposure to extremely high temperatures. Sudden and violent fires occasionally encountered in industry really prove the point. Where non-insulated pipe has buckled, given away to permit the pipe to melt, Unibestos has remained unchanged. Vital lines stay in place and the pipe itself remains protected until the fire is brought under control. Made almost entirely of Amosite asbestos, the well-known "fireproof" material, Unibestos offers additional safety against hazardous costly fires.

JOE BESTOS SAYS:

In case of fire you can depend on Unibestos to give your pipes added protection . . . reduce the cost of reconstruction.



Constantly and effectively re-used

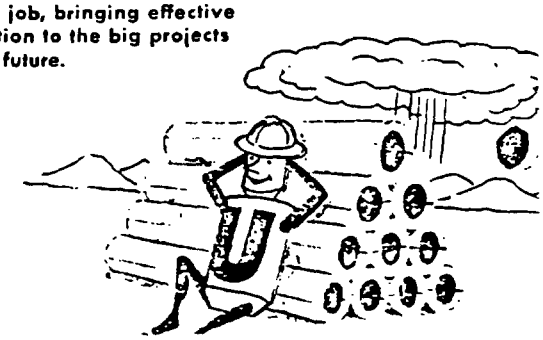
Many industrial operations require repeated access to pipes and fittings and here's where Unibestos pays off again. Unibestos can be removed and reapplied again and again without damage and without losing its excellent thermal efficiency. Records show that Unibestos has been reapplied as many as 25 times and still performs like new.

Effective in nuclear installations

Unibestos is playing an important part in the development of the vital atomic energy program. Its unmatched characteristics are being used to advantage for insulating various nuclear power plants. Unibestos is also particularly well suited for insulating the most modern atomic-powered ships. The same outstanding properties that make Unibestos so widely used in today's industrial operations are proving equally effective in the developments of the future.

JOE BESTOS SAYS:

Atomic sub or atomic plant, you can expect to see Unibestos on the job, bringing effective insulation to the big projects of the future.



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STRENGTH . . . PERFORMANCE WITH UNIBESTOS



Easily adapted for building any shapes

Unibestos is simple to cut, miter or groove for rapid and effective insulation of bends, ells, tees, expansion joints and other fittings. In fact, fabrications are easily made by cutting strips, segments or other shapes as needed and joining these elements with silicate and fiber binder. The resulting fabrication is as strong as the original insulation . . . reduces drying time and eliminates cracks.

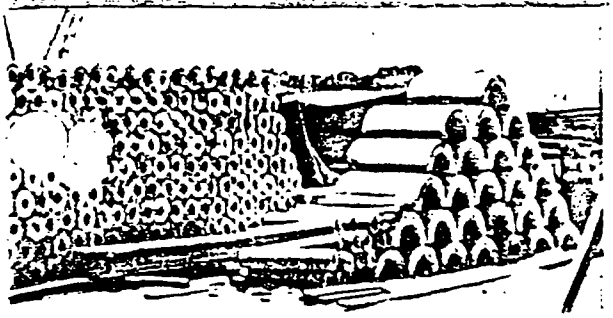
Resists shock . . . reduces costly breakage

Here's a big savings. Many industrial plants report that breakage from other types of insulation can range from 10% to 20%. This costly waste is practically eliminated when Unibestos is used. Its fibrous structure makes it tougher so that it's almost impervious to all sorts of impact and vibrations. Pound it, drop it or subject it to all sorts of rough treatment—Unibestos won't shatter. It stays together in shipping, in warehousing, in installation. Losses are negligible and installation costs go down.



JOE BESTOS SAYS:

No shattering here! Unibestos pipe insulation resists shock. Built strong to stay strong, Unibestos gives you extra durability.



Widest range of sectional sizes

Whatever the installation, Unibestos meets the requirement. For Unibestos pipe insulation is available in the widest range of sectional coverings, both in sizes and thicknesses. Manufactured in these standard dimensional sizes, Unibestos is easy to order and provides the right fit without special specifications. Standardized sizes mean faster delivery, too. Special sizes are available up to 44" O.D.

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HOW SINGLE LAYER CONSTRUCTION CUTS COSTS

MOTION STUDY OF APPLYING INSULATION TO A 4" LINE

The presence of a large number of light streaks indicates a relatively greater time-motion operation . . . the absence of light streaks indicates relatively smaller time-motion operation.





Until the development of Unibestos, it was necessary to apply insulating materials in two or more layers for high temperature applications.

The material available could not be used over the entire range of temperatures to 1200°F. because the more efficient insulations would not withstand the higher temperatures, and the insulations which were suitable for use at higher temperatures were not too efficient.

Being non-fibrous, the smooth edges of the available insulation did not form a proper heat seal at the joints. It was necessary, therefore, to apply multiple layers with staggered joints.

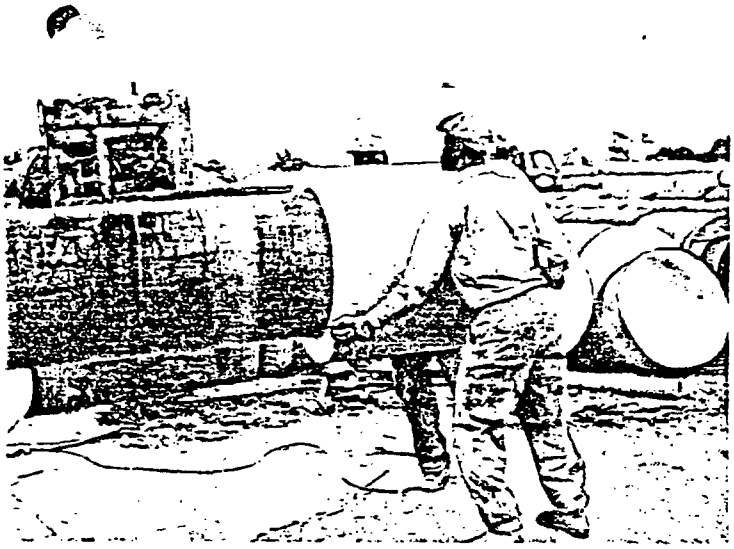
With the development of Unibestos, a fibrous insulation, a new method of applying insulation was introduced—the *single-layer application* method.* Being fibrous, there is an interlacing of fibers between all joints that is more efficient than multiple-layer application. See joint heat loss table. Unibestos has the inherent strength to withstand handling in large half-round sections . . . is suitable for all temperatures to 1200°F.

* *As with any pipe insulation, some provision must be made to accommodate pipe expansion. For further details on the application of Unibestos sectional pipe covering, see page 16.*

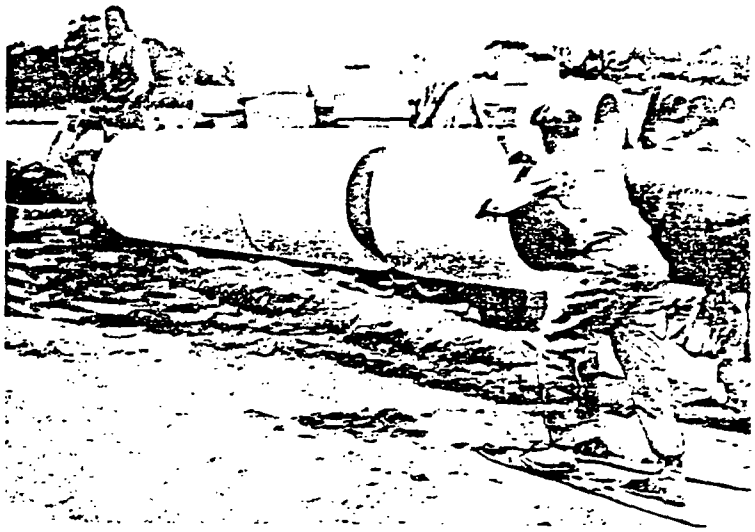
JOINT HEAT-LOSS TEST RESULTS Test Results of Surface Temperatures and Heat-Loss at Joints	UNIBESTOS Pipe Insulation (Single Layer)	"B" Insulation (Single Layer)	"B" Insulation (Double Layer)
Thickness of covering, inches	2.50	2.48	2.45
Density of covering, lbs./cu. ft.	14.00	12.95	12.24
Energy supplied to heating coil, watts	580	650	610
Energy supplied to heating coils, Btu's/hr.	1979	2218	2081
Temperature of pipe, °F.	600	600	597
Temperature of test room, °F.	75	75	75
Temperature difference (pipe minus room), °F.	525	525	522
(Average surface temperature (not including joints), F.)	114	122	116
(Average joint temperature, F.)	134	152	143
(Average rise in temperature at joint, F.)	20	30	27
Heat-loss through end caps, Btu's/hr.	246	246	244
Heat-loss through covering, Btu's/hr.	1735	1972	1837
Unit heat loss through covering, Btu's/hr. per sq. ft. of pipe surface per degree (F.) of temperature difference	0.244	0.278	0.260

Test results of an independent laboratory.

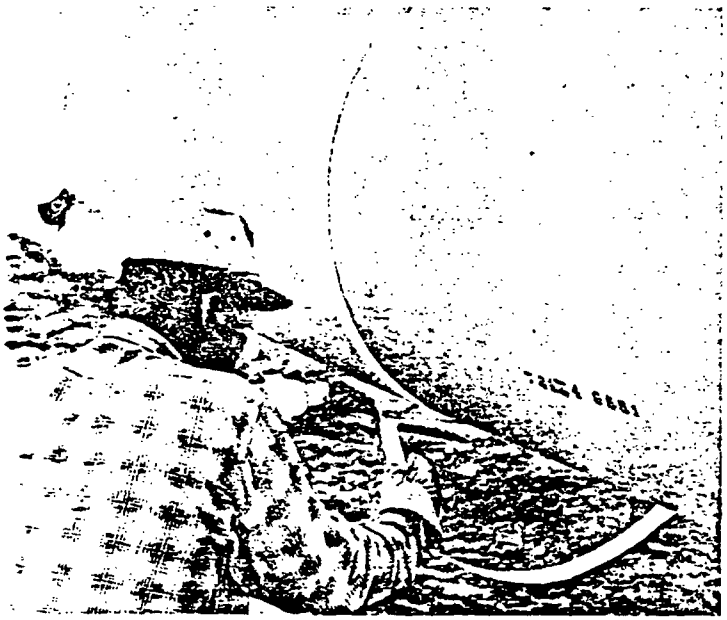
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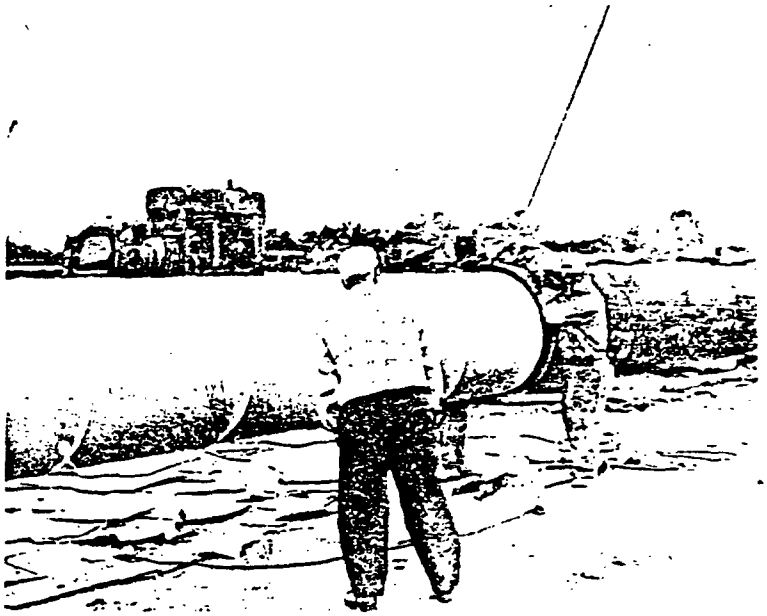
Sliding insulation on a 24" pipe.



Sliding 3' sections in place.



Sealing joints with asbestos tape.



Starting a 36" shell over 24" insulated pipe.

HOW UNIBESTOS SAVES ON UNDERGROUND LINES

Because Unibestos is available in full cylindrical shapes up to 44" O.D., it has gained widespread acceptance as the time-saving way to insulate underground lines. Requiring less handling and no special banding, these full cylinders provide an ideal way to insulate a line for tunnel, trench or conduit application.

Installation is simple: the insulation is slid onto the pipe; the transverse joints are taped and the insulated pipe is ready for the casing. The casing is then sealed to make a strong, efficient and economical assembly for the distribution of steam or fluids underground.

This system has become increasingly popular where heat is supplied from a central heating station. In situations like these, Unibestos has supplied superior underground insulation for everything from schools, churches and colleges to hospitals, utilities and railroads as well as for processing lines for industrial plants.

APPLICATION OF UNIBESTOS SECTIONAL PIPE COVERING

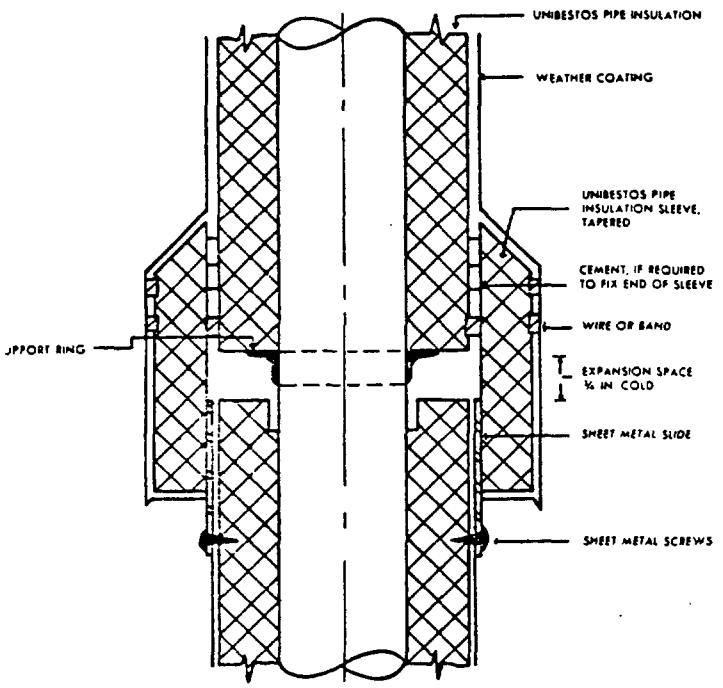
The conventional application methods for sectional coverings are suitable. Since the edges are all square and felted, they close up tightly and, as a rule, need little or no pointing. Unibestos is now manufactured with an integral refractory coating that provides a smooth surface for easier handling. The conventional canvas finish can be eliminated for most inside work since the appearance is attractive; tough Unibestos does not require reinforcement.

Where the pipe insulation is exposed to traffic or severe service conditions, an application of a layer of asbestos cloth, cemented on with sodium silicate, is recommended.

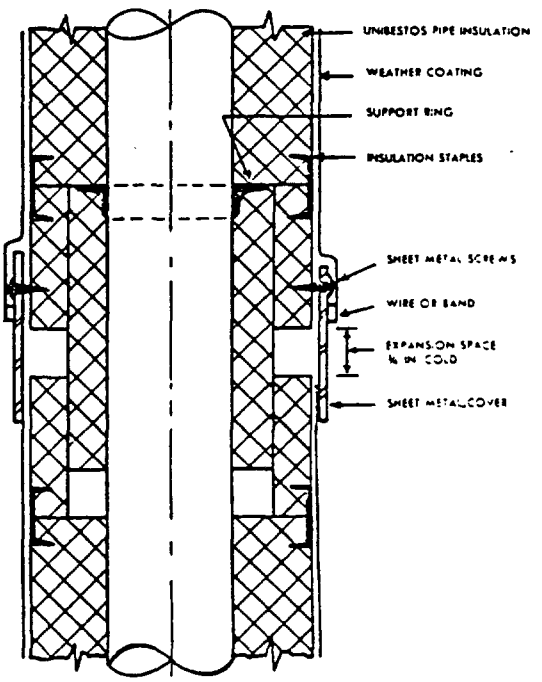
Unibestos has a pre-calculated inside diameter to permit radial expansion of the pipe at high temperatures. This permits the pipe to move longitudinally inside the insulation and expand and contract without opening up the joints between sections. With Unibestos expansion joints can fulfill their function without danger of heat loss so that the whole line is insulated efficiently.

The number and spacing of expansion joints depend on the pipe temperature which affects the linear expansion of the pipe. (See the Expansion Control Chart on the opposite page.)

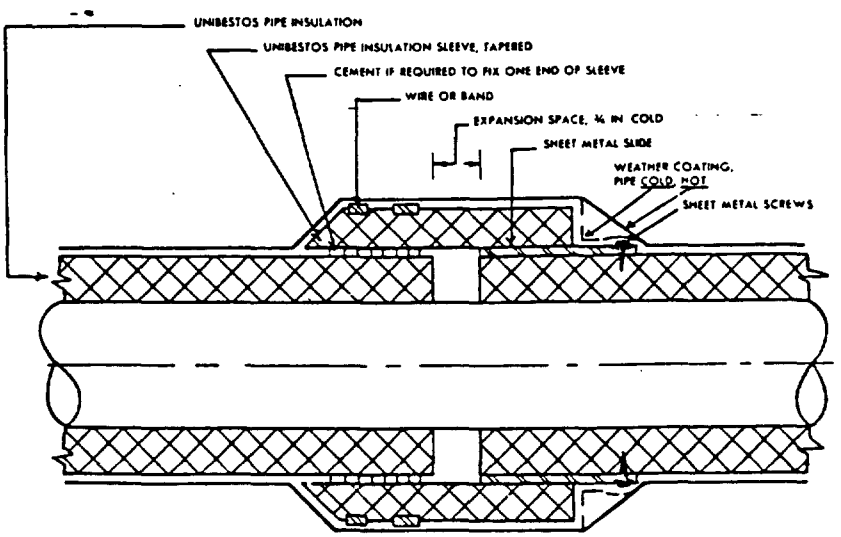
Typical expansion joints are shown below. Piping bends can be covered with mitered sections or prefabricated insulation fittings. Unibestos is easy to fit.



Vertical Type Expansion Joint



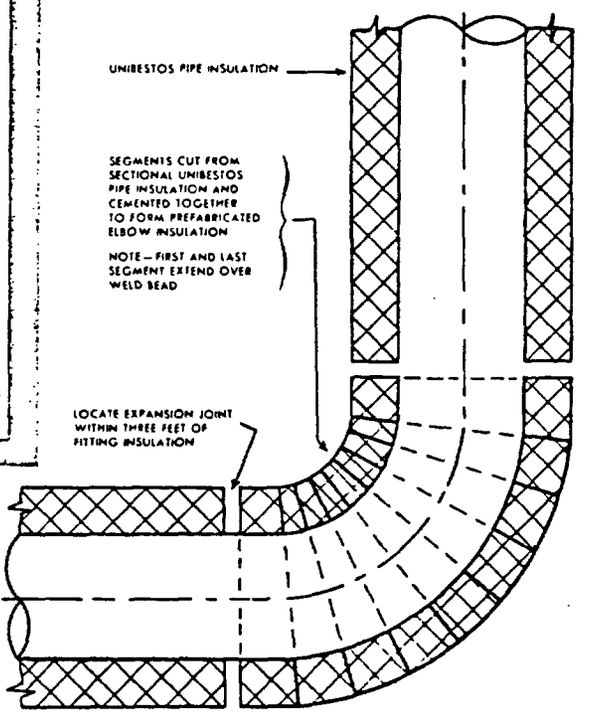
Vertical Type Expansion Joint



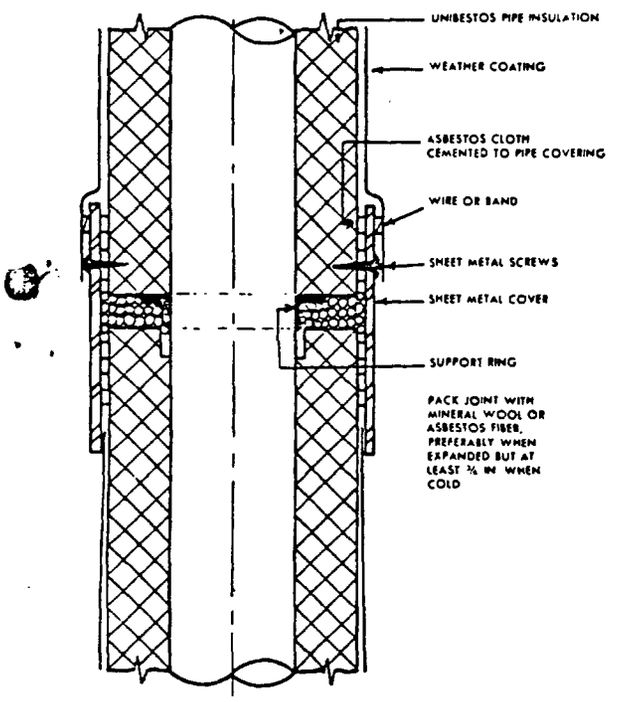
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EXPANSION CONTROL

Temp. F.	Linear Expansion per 100 Ft.	Insulation Expansion Joint Spacing	Average Expansion Per Joint
1000	9.4″	12′	One Inch
950	8.8″	12′	One Inch
900	8.3″	12′	One Inch
850	7.7″	15′	One Inch
800	7.3″	15′	One Inch
750	6.7″	15′	One Inch
700	6.2″	18′	One Inch
650	5.7″	18′	One Inch
600	5.3″	18′	One Inch
550	4.7″	21′	One Inch
500	4.3″	21′	One Inch

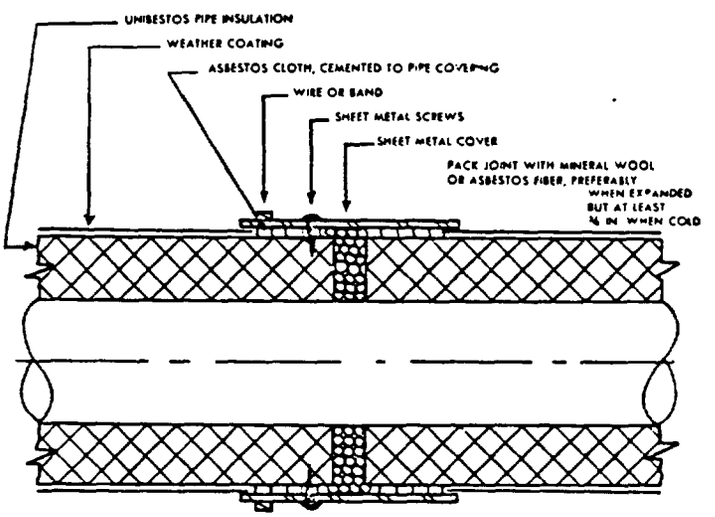


Prefabricated Insulation for Pipe Bend



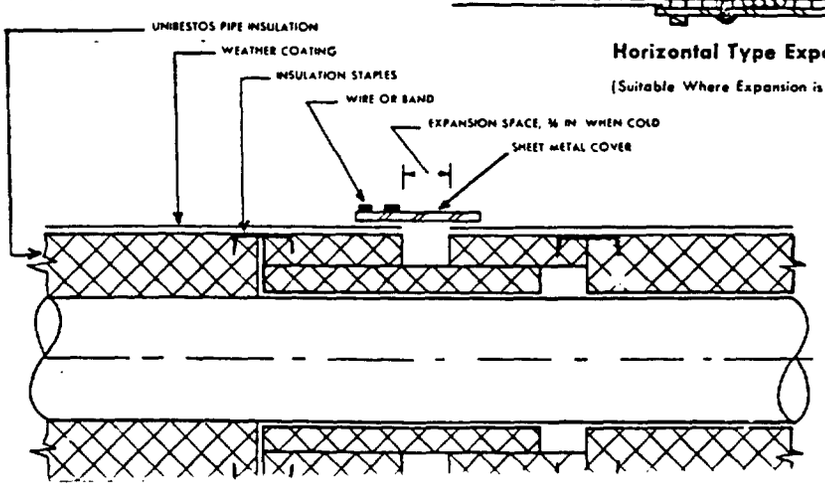
Vertical Type Expansion Joint

(Suitable Where Expansion is About One Inch)



Horizontal Type Expansion Joint

(Suitable Where Expansion is About One Inch)



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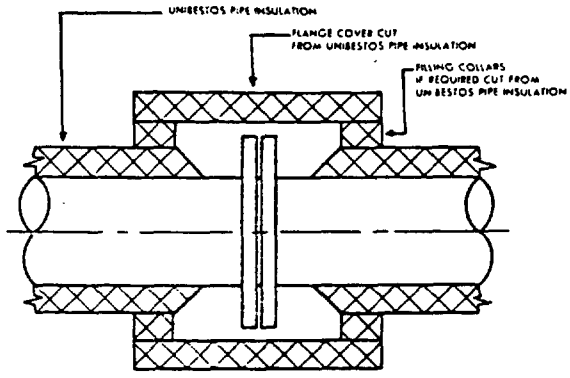
APPLICATION OF UNIBESTOS TO FLANGES, VALVES AND FITTINGS

Since Unibestos is available in sectional form to 44" O.D. and in thicknesses up to 5", it is simple to cover various fittings with fabricated, removable insulation.

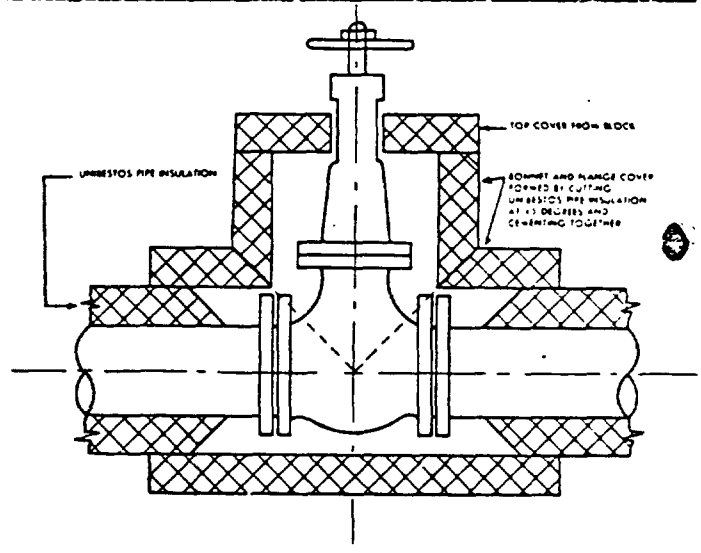
Sectional pipe insulation should be installed with sufficient space to permit the withdrawal of bolts. Where thicknesses of insulation less than 3" are involved, build up to the height of the flange with collars cut from a standard section of a larger pipe size to fit around the pipe insulation. A section of sufficient length is placed over the collars, thus completing the flange installation. *On valves* the insulation can be fabricated to cover flanges and bonnet by cutting sectional Unibestos pipe insulation at 45° and cementing it together to form a "tee."

Reducers, 45° laterals, and crosses can be insulated by using sectional insulation.

Where a complete removable and replaceable job is desired, the unique features of Unibestos insulation lend themselves admirably to efficient, low-cost installation.

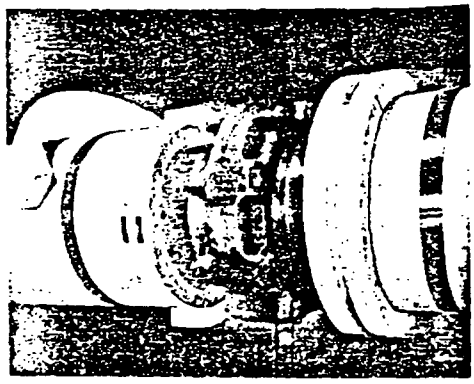


Flange Insulation

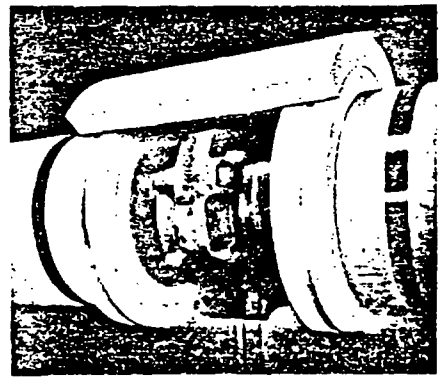


High Temperature Gate Valve Insulation

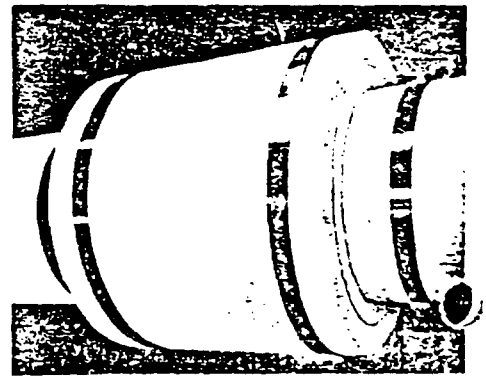
HOW TO INSULATE A FLANGE



Fitting short collars over ends of the insulation on each side of the flange.



Placing a long collar (also cut from Unibestos) over the two short collars.



The complete installation. Smooth, neat, efficient and readily removable.

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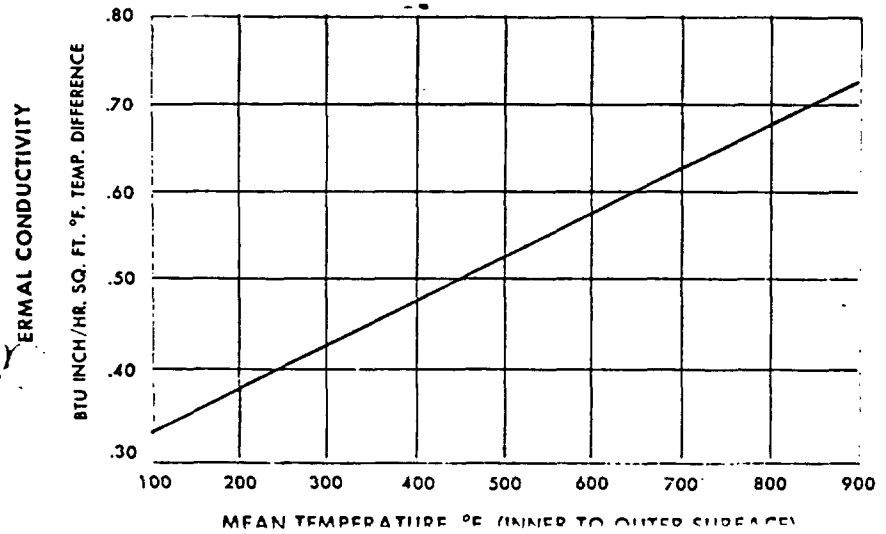
PHYSICAL AND THERMAL CHARACTERISTICS

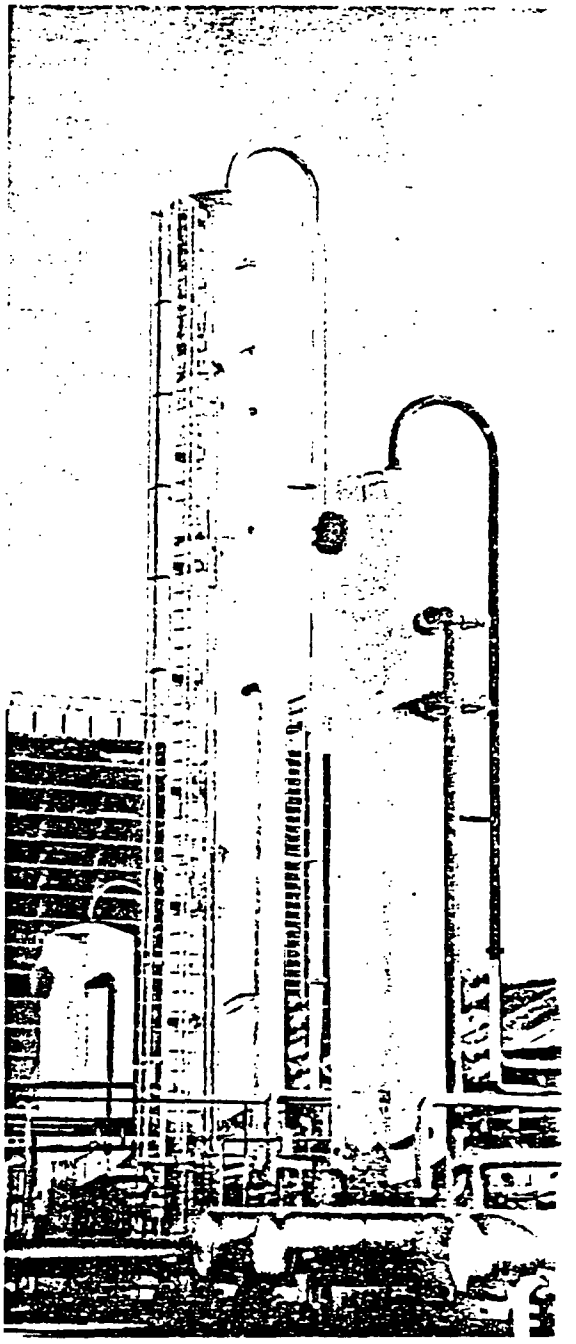
	Unibestos Pipe Insulation
Density (lbs. per cu. ft.)	18
Modulus of Rupture (lbs. per sq. in.)	120
Compressive Strength (at 5% deformation—lbs. per sq. ft.)	
Dry	1600
Saturated	1100
Compressive Strength (at 5% deformation—lbs. per sq. ft.) After soaking heat for 24 hrs. at	
500° F.	1600
750° F.	1450
1000° F.	1300
1200° F.	1200
Weight Loss after soaking heat for 24 hrs. at	
500° F.	1.0%
750° F.	2.3%
1000° F.	5.1%
1200° F.	6.9%
Linear Shrinkage Soaking heat 24 hrs. at	
500° F.	0.0%
750° F.	.01%
1000° F.	.02%
1200° F.	.05%
Linear Shrinkage One face exposed 24 hrs. at	
500° F.	0.0%
750° F.	0.0%
1000° F.	0.0%
1200° F.	0.0%
Moisture Absorption by Volume In atmosphere of 70° F., 90% relative humidity	
1 day	1.01%
7 days	2.7%
14 days	3.5%
30 days	6.1%

Thermal Shock Resistance—No warpage, spalling, or cracking by air cooling or water quenching from maximum temperature recommendation.

Combustibility—Material is completely inorganic; no flash or flame point.

Resistance to Acids and Caustics—Can be exposed to either solutions or vapors of acids or caustics commonly used in industry with negligible effect on the physical characteristics





UNIBESTOS

Low thermal conductivity . . . high efficiency . . . long life

The thermal conductivity curve shown at the left represents the average values of tests obtained in accordance with accepted test methods. Field tests have proved the ability of Unibestos to maintain its insulating efficiency for the entire service life of the material.

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TABLE OF THICKNESSES FOR UNIBESTOS PIPE INSULATION

Iron Pipe Size		Nominal 1 Inch Thick	Nominal 1½" Thick	Nominal 2" Thick	Nominal 2½" Thick	Nominal 3" Thick	Nominal 3½" Thick	Nominal 4" Thick
Nominal Inches	O. D. Inches	Actual Thickness Inches	Actual Thickness Inches	Actual Thickness Inches	Actual Thickness Inches	Actual Thickness Inches	Actual Thickness Inches	Actual Thickness Inches
½	0.840	1	1 9/16	2 1/16	2 7/8	3 11/32	3 7/8	4 3/8
¾	1.050	2 9/32	1 15/32	1 31/32	2 3/4	3 1/4	3 3/4	4 9/32
1	1.315	1 3/32	1 19/32	2 1/8	2 21/32	3 5/32	3 21/32	4 5/32
1 1/4	1.660	2 9/32	1 21/32	1 15/16	2 15/32	2 31/32	3 15/32	3 31/32
1 ½	1.900	1 1/32	1 17/32	2 5/16	2 27/32	3 11/32	3 27/32	4 3/8
2	2.375	1 1/16	1 19/32	2 1/8	2 5/8	3 1/8	3 5/8	4 5/32
2 ½	2.875	1 1/16	1 7/8	2 11/32	2 7/8	3 3/8	3 29/32	4 13/32
3	3.500	1 1/32	1 9/16	2 1/16	2 9/16	3 1/16	3 19/32	4 3/32
3 ½	4.000	1 9/32	1 13/16	2 9/32	2 23/32	3 11/32	3 27/32	4 5/16
4	4.500	1 1/16	1 9/16	2 1/16	2 9/16	3 3/32	3 19/32	4 3/32
4 ½	5.000	1 9/32	1 13/16	2 5/16	2 13/16	3 11/32	3 27/32	4 7/16
5	5.563	1 1/32	1 17/32	2 1/32	2 9/16	3 1/16	3 9/16	4 7/32
6	6.625	1	1 ½	2 1/32	2 17/32	3 1/32	3 11/16	4 1/8
7	7.625	....	1 17/32	2 1/32	2 17/32	3 1/8	3 5/8	4 1/8
8	8.625	....	1 17/32	2 1/32	2 11/16	3 1/8	3 5/8	4 3/16
9	9.625	....	1 17/32	2 3/32	2 21/32	3 1/8	3 21/32	4 5/32
10	10.750	....	1 19/32	2 3/32	2 19/32	3 3/32	3 19/32	4 3/32
11	11.750	....	1 19/32	2 3/32	2 5/8	3 3/32	3 19/32	4 3/32
12	12.750	....	1 19/32	2 3/32	2 5/8	3 3/32	3 19/32	4 1/8
14 to 18	14.000	....	1 ½	2	2 ½	3	3 ½	4
Up to and Including 36	.....	....	....	2	2 ½	3	3 ½	4

Unibestos pipe insulation is manufactured in thicknesses that conform to accepted industrial and manufacturers' standards—sometimes known as "simplified dimensional standards." In order to adhere to the exacting requirements of these standards Unibestos builds the outside diameters of all their pipe insulation to closely approximate the outside diameters of corresponding iron pipes.

By conforming to these standards, Unibestos further simplifies installation and virtually eliminates any dimensional confusion or adjustment. Such uniform manufacturing standards are particularly useful in those few cases where double-layer insulation is desired.

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LIST PRICES OF STANDARD SIZES AND THICKNESSES

UNIBESTOS INSULATION

List Prices Per Lineal Foot — Unibestos Pipe Insulation — Standard Sizes

Nominal Pipe Size	Thicknesses								
	1"	1½"	2"	2½"	3"	3½"	4"	4½"	5"
½"	.22	.46	.75	1.00	1.20	1.55*	....	....	....
¾"	.24	.49	.80	1.05	1.35	1.75*	....	....	....
1"	.27	.52	.85	1.10	1.40	1.80*	....	....	....
1¼"	.30	.56	.90	1.15	1.45	1.95*	....	....	....
1½"	.33	.60	.95	1.20	1.55	2.00*	....	....	....
2"	.36	.64	1.00	1.25	1.65	2.10	2.45*	....	....
2½"	.40	.70	1.05	1.35	1.75	2.25	2.70*	....	....
3"	.45	.76	1.15	1.50	1.90	2.35	2.85*	....	....
3½"	.50	.82	1.25	1.65	2.05	2.60	3.15*	....	....
4"	.60	.88	1.35	1.80	2.20	2.70	3.30	3.80*	4.45*
4½"	.65	.94	1.45	1.95	2.35	2.95	3.50	4.10*	4.80*
5"	.70	1.00	1.55	2.10	2.50	3.00	3.55	4.15*	4.85*
6"	.80	1.10	1.70	2.25	2.70	3.30	3.90	4.50*	5.30*
7"	...	1.20	1.85	2.40	2.90	3.60	4.25	4.85*	5.75*
8"	...	1.35	2.00	2.55	3.15	3.85	4.55	5.25*	6.10*
9"	...	1.50	2.20	2.80	3.40	4.20	4.90	5.60*	6.65*
10"	...	1.65	2.40	3.05	3.65	4.65	5.40	6.15	7.10
11"	...	1.75	2.55	3.20	3.90	4.90	5.70	6.50*	7.50*
12"	...	1.85	2.70	3.40	4.10	5.15	6.00	6.85	7.90
14"	...	2.10	3.00	3.80	4.60	5.55	6.50	7.45	8.55
16"	...	2.35	3.30	4.20	5.10	6.15	7.15	8.15	9.30
18"	...	2.60	3.60	4.60	5.60	6.70	7.80	8.85	10.10
20"	...	....	4.00	5.00	6.00	7.25	8.45	9.55	10.85
22"	...	....	4.30	5.40	6.50	7.85	9.05	10.25	11.65
24"	...	....	4.50	5.75	7.00	8.25	9.65	11.00	12.45

* Nonstandard sizes subject to minimum order requirements.
** Sizes 26" and larger sizes are available, and subject to minimum order requirements.

UNIBESTOS COPPER WATER TUBE INSULATION

Unibestos insulation is also manufactured in standard sizes for copper water tubing. The outside diameter of copper *water* tubing is ⅛" larger than copper tubing.

List Prices — Unibestos Insulation for Copper Water Tubing

Nominal Tubing Size	Thicknesses				
	1"	1½"	2"	2½"	3"
½"	.22	.46	.75	1.00	....
¾"	.24	.49	.80	1.05	....
1"	.27	.52	.85	1.10	....
1¼"	.30	.56	.90	1.15	....
1½"	.33	.60	.95	1.20	....
2"	.36	.64	1.00	1.25	1.65
2½"	.40	.70	1.05	1.35	1.75
3"	.45	.76	1.15	1.50	1.90
3½"	.50	.82	1.25	1.65	2.05
4"	.60	.88	1.35	1.80	2.20
4½"	.65	.94	1.45	1.95	2.35
5"	.70	1.00	1.55	2.10	2.50
6"	.80	1.10	1.70	2.25	2.70

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UNIBESTOS PROVIDES DURABLE PROTECTION TO INDUSTRIES...EVERYWHERE

Refineries, Gas and Oil Companies

American Liberty Oil Company
Anderson Pritchard Oil Corp.
Arkansas Fuel Co.
Associated Refinery
Atlantic Refining Co.
Atlas Processing
Barnsdall Oil Co.
Bay Refining Company
Ben Franklin Refining Co.
Champion Refining Co.
Cit-Con Company
Cities Service Oil Co.
Consumers Cooperative Association
Continental Oil Co.
Cosden Petroleum Corp.
Crown Central Petroleum Corp.
Deep Rock Oil Corp.
Derby Oil Co.
Eastern States Petroleum Co.
El Dorado Refining Co.
Esso Standard Oil Co.
Ethyl Corporation
Frontier Refining Co.
Gulf Oil Corp.
Humble Oil Refinery
Lion Oil Co.
MacMilliam Petroleum Co.
Magnolia Petroleum Co.
McMurray Refining Co.
N. M. Asphalt & Refining Co.
Paluxy Company
Panhandle Refining Co.
Pennzoil Co.
Phillips Petroleum
Pontiac Refining Co.
The Premier Refining Co.
The Pure Oil Co.
Shell Oil Co.
Union Oil Co.
Sid Richardson Gasoline Co.
Sinclair Refining Co.
Skelly Oil Co.
Socony-Vacuum
Southport Petroleum
Standard Oil Co. of California
Standard Oil Co. of Indiana
Standard Oil Co. of Louisiana
Standard Oil Co. of Ohio
Sun Oil Company
Sunray Oil Corp.
Texas Co.
Tidewater Associated Oil Co.
Tutwiler Refining Co.
Wagner Refining Co.
Warren Petroleum Co.

Chemical Companies

Carbide & Carbon Chem. Div.
Dow Chemical Co.
Jefferson Chemical Corp.
Lion Chemicol Co.
Mathieson Chemical Co.
Monsanto Chemical Co.
Phillips Chemical Co.
Shell Chemical Corp.
Spencer Chemical Corporation

Paper Mills

Container Corp.
East Texas Pulp & Paper Co.
Everett Pulp & Paper Co.
Filing Fibre Co.
Longview Pulp & Paper
Oxford Paper Company
Rising Paper Co.
Southern Paper Co.
Strathmore Paper Co.
Sutherland Paper Co.
Weyerhaeuser Pulp & Paper Co.

Large Industrials

Aluminum Co. of America
American Can Co.
Balco, Inc.
Bendix Aviation Corp.
Buda Co.
Celanese Corp. of America
Columbian Carbon Co.
Commercial Solvents Corp.
Continental Can Co.
Copolymer Corp.
Corn Products Refining Co.
Diamond Alkali Co.
E. I. duPont de Nemours
Eastman Kodak Co.
Firestone Tire & Rubber Co.
General American Tank Co.
General Electric Co.
General Tire & Rubber Co.
B. F. Goodrich Co.
Goodyear Synthetic Rubber Co.
Great Southern Corp.
International Paper Co.
Jefferson Lake Sulphur Co.
Kaiser Aluminum Co.
The Koppers Co.
Morton Salt Co.
Nash-Kelvinator Co.
Neches Butane Rubber Co.
Pan Am Southern Corp.
Potlach Forest, Inc.
Pullman-Standard Car Mfg. Co.
Rohm & Haas Co.
Southern Alkali Corp.
Tennessee Eastman Corp.
United States Rubber Co.

Steel Companies

Bethlehem Steel Co.
Carnegie-Illinois Steel Co.
Inland Steel Co.
Pittsburgh Crucible Steel Co.
Truscon Steel Co.
U.S. Steel
Wheeling Steel Corp.
Youngstown Sheet & Tube Co.

Utilities

Alabama Power Co.
Arkansas Power & Light Co.

Central New York Power Corp.
Commonwealth Edison Co.
Consolidated Edison Co.
Dayton Power & Light Co.
Dept. of Water & Power, City of Los Angeles, California
Detroit Edison Co.
El Paso Natural Gas Co.
Florida Power Co.
Georgia Power Co.
Mississippi Power Co.
Nebraska Power Co.
Pacific Gas & Electric Co.
Philadelphia Electric Co.
Public Service of Indiana
Public Service of Okla.
Rochester Gas & Electric Co.
Southwestern Gas & Electric Co.
Southwestern Public Service Co.
Texas Eastern Transmission Corp.
United Gas Pipe Line Co.
West Penn. Power Co.

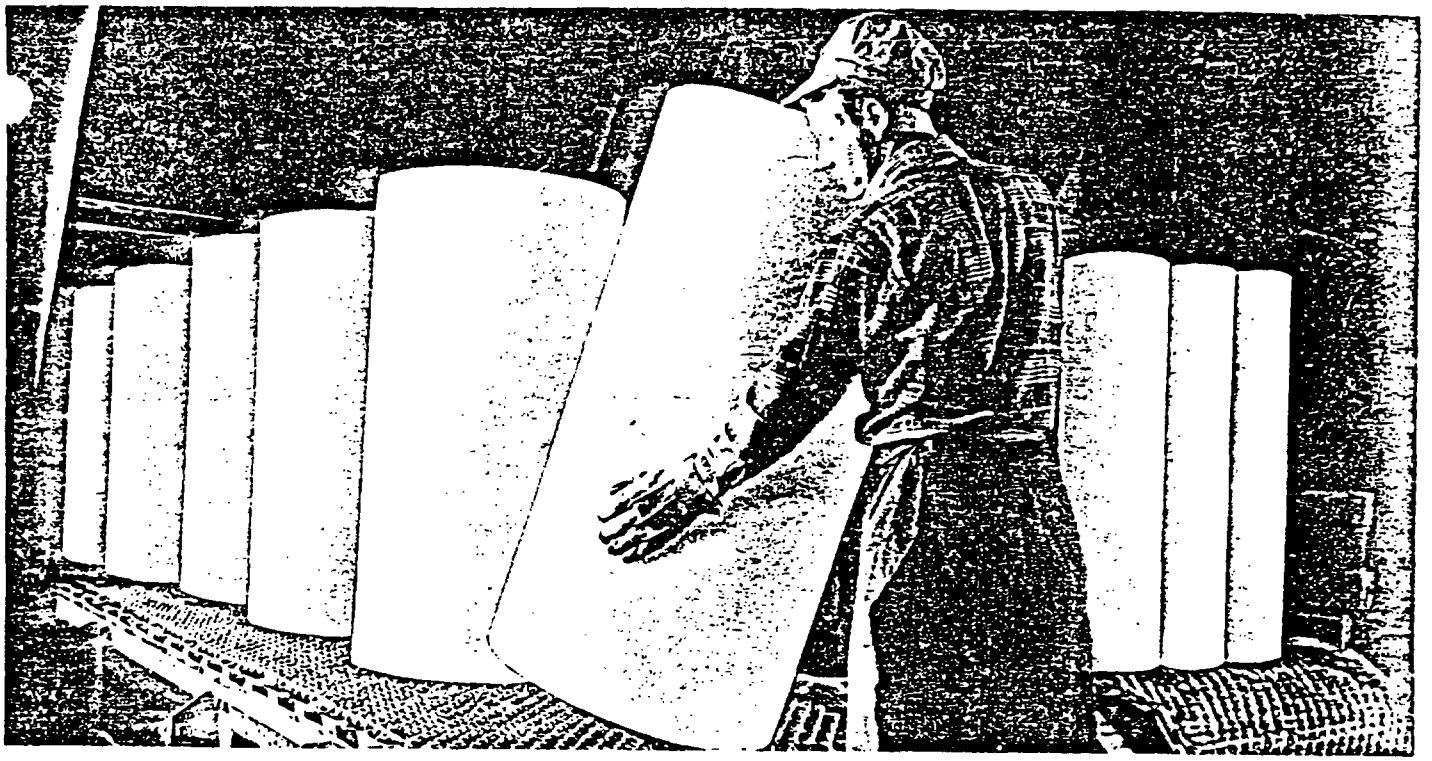
Designers and Engineering Companies

Babcock & Wilcox Co.
E. B. Badger & Sons Co.
C. F. Braun Company
Combustion Engineering
Delta Engineering Co.
The Dravo Co.
Dresser Engineering Co.
Esbasco Services
Fish Engineering Co.
Fluor Corp.
Foster-Wheeler Co.
Gasoline Plant Construction Co.
Wyatt C. Hedrick Engr. Corp.
Kaiser Engineers Co.
M. W. Kellogg Co.
Koch Engr. & Const. Co.
Kuljian Corp.
The Lummus Co.
Arthur G. McGee Co.
J. F. Pritchard Co.
Refinery Engineering Co.
Frick Reid Supply Corp.
Rust Engineering Co.
Sargent & Lundy
Southwestern Engineering Co.
Stearns-Roger Mfg. Co.
Stone & Webster Engr. Co.
Universal Oil Products
Vogt Company
Walco Engr. & Const. Co.

Universities

Iowa State College
Northwestern University
University of Notre Dame
University of California
University of Chicago
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NOMENCLATURE:

a = Annual per cent fixed charges or the annual rent of an annuity whose present value is $1.00 (i.e., if the interest rate is 5% and the payout period is 10 years, then "a" = .130, an annual payment of .130 for 10 years compounded at 5%, has a present value of $1.00.) Table showing annual rents or annuities which $1.00 will purchase is available in handbooks. See pages 2-29, 1936 edition, Handbook of Engineering Fundamentals, Ovid W. Esbach, published by John Wiley & Son. Annual per cent fixed charges will include annual charges for insurance and maintenance in addition to the annual rent.

Δ(BTU) = Heat saved by addition of insulation increment, BTU/hr. ft.

ΔP = Increment of list price of insulation, $/ft. The increment considered is the addition of ½" of insulation.

s = Cost of useful heat, $/1,000,000 BTU. The cost of useful heat may be computed by dividing the fuel cost by its calorific value and the overall efficiency.

V = A multiplying factor to obtain the in-place cost of an increment of insulation. It should be kept in mind that once the decision to insulate has been made, there are some costs such as scaffolding, etc., that should be charged against only the first increment of insulation. Accordingly, the proper evaluation of the multiplying factor "V" will be something less than the contract price divided by the total list price of the insulation.

V Δ P = Cost of insulation increment in place, $/ft.

N = Years required to amortize the increment of insulation.

HOW TO SELECT INSULATION

The selection of the proper insulation for a particular service is an engineering problem with consideration given to a number of factors:

1. Low conductivity, a prime requisite for an insulation material in that excessive thickness will not be required to provide the necessary heat resistance.
2. Heat-resisting qualities so that the insulation will stay in place at the maximum operating temperature.
3. Ruggedness, including durability and structural strength, to assure minimum breakage during application and proper performance during the service life.
4. Workability to assure the proper application of the insulation.
5. Availability of a broad range of sizes to keep application costs to a minimum.
6. The selection of the proper thickness to provide:

A. Personnel protection:

Here the thickness selected is properly based upon the maximum surface temperature of the insulation that can be tolerated without undue hazard to personnel. It should be kept in mind that an insulation covering having a low emissivity will increase the surface temperature. The surface temperatures shown in the heat loss tables have been computed assuming an emissivity of .9.

B. Process control:

Here the temperature of the fluid must be maintained within specific limits. Of course, flow rates

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How to select insulation — cont.

The problems are numerous and varied. Union Asbestos & Rubber Company maintains a technical engineering staff whose services are available for consultation on specific insulation requirements.

C. Economic thickness for heat conservation:

Here the selection of thickness of insulation required is properly made upon the basis of economic factors considering the amortized cost of an increment of insulation and the cost of heat saved by that increment of insulation. A considerable amount of computation is required to arrive at the proper economic thickness:

In order to simplify such computation, an index

$$J = \frac{1{,}000{,}000}{8760} \quad \frac{\Delta P}{\Delta BTU}$$

—which is approximately proportional to the cost of heat saved by the addition of an increment of insulation—is shown in the heat loss tables.

For a particular operating condition, a limiting value of "J" may be computed once. Then the economical thickness can be selected from the heat loss tables for any pipe size.

For straight line depreciation: it is economical to add that increment of insulation for which

$$J < \frac{NSg}{V}$$

Conversely, the time required to amortize the increment of insulation is:

$$N = \frac{VJ}{Sg}$$

For example, if:

the amortization period is 10 years, N = 10
the cost of useful heat is $1.00/1,000,000 BTU, s = 1.00
the annual operation period is 8000 hours, g = .91
the in-place cost for an increment of insulation is 2.0 times the list price, V = 2.00, then

$$\frac{NSg}{V} = \frac{10 \times 1.00 \times .91}{2.0} = 4.6$$

and it is economical to add the increment of insulation for which the index "J" is less than 4.6.

For sinking fund depreciation:

The economical thickness of insulation to use in this case may be obtained by solving the following equation:

$$J < \frac{Sg}{Va}$$

For example, if:

the payout period is 10 years and the interest rate is 5%, then "a" = .130, and the values for s, g, and V are the same as in the example above, then:

$$\frac{Sg}{Va} = \frac{1.00 \times .91}{2.00 \times .130} = 3.5$$

and it is economical to add the increment of insulation for which the index "J" is less than 3.5.

If annual charges for maintenance and insurance are added to the annual rent to obtain the annual per cent fixed charges, then "a" will be greater than .130, and the corresponding value of $\frac{Sg}{Va}$ will be less than 3.5.

RECOMMENDED MINIMUM THICKNESS, NOMINAL INCHES
UNIBESTOS PIPE INSULATION
FOR PERSONNEL PROTECTION ONLY

(Surface Temperature Less Than 161° F., Ambient Temperature 75° F.)

Nominal Pipe Size	TEMPERATURE HOT PIPE, °F. 200	300	400	500	600	700	800	900	1000	1100	1200
	Temperature Difference Pipe To Air 125	225	325	425	525	625	725	825	925	1025	1125
1" and Less	1	1	1	1	1	1	1½	1½	1½	2	2
1½"	1	1	1	1	1	1½	1½	1½	2	2	2
2"	1	1	1	1	1	1½	1½	1½	2	2	2½
3"	1	1	1	1	1	1½	1½	2	2	2½	2½
3½"	1	1	1	1	1	1	1½	1½	2	2	2½
4"	1	1	1	1	1	1½	1½	2	2	2½	2½
5"	1	1	1	1	1	1½	2	2	2½	2½	3
6"	1	1	1	1	1½	1½	2	2	2½	3	3
8"	1½	1½	1½	1½	1½	1½	2	2	2½	3	3
10"	1½	1½	1½	1½	1½	1½	2	2½	2½	3	3½
12"	1½	1½	1½	1½	1½	1½	2	2½	2½	3	3½
14" to 18"	1½	1½	1½	1½	1½	1½	2	2½	3	3	3½
20"	2	2	2	2	2	2	2	2½	3	3½	3½

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UNARCO

SELECTING THE "J" FACTOR

How to select the "J" factor or the table of recommended thickness

Four different tables of economic thickness of insulation are shown on pages 26 and 27. These tables should suffice as an adequate guide for selecting the proper thickness of insulation for full heat conservation for almost all industrial operating conditions.

For average conditions, the thickness shown in the table for "J" equals 2.0 is recommended. Where fuel costs are higher and the payout period is longer, the thickness shown in the tables based on the economic index "J" equals 3 to "J" equals 5 is suggested.

If desired, the particular operating conditions may be analyzed critically by introducing the proper values into the equation $J < Sg/Va$ and then building up a table of required thickness by comparing the values shown in the heat loss tables with the derived value of "J." However, a close approximation of the proper value of "J" can be made by inspection of the table below showing typical values. Then, one of the suggested tables of "J" can be selected for use.

Should the derived value of "J" be less than 2.0, the surface temperature of the selected thickness should be checked to make sure it does not exceed the limit necessary for personnel protection.

Some typical limiting values of "J," the economic index for heat conservation, showing the variation of "J" with cost of useful heat "s," annual operating factor "g," ratio of in-place cost to list price of insulation increment "V," and annual per cent fixed charges "a."

Cost of useful heat, $/million BTU*		$1.00			
Annual operation, hours: / Annual operation, years "g":		8760 / 1.00	8000 / .913	7000 / .800	6000 / .685
Ratio of in-place cost to list price of insulation increment	Annual per cent fixed charges				
1.5	10	6.7	6.1	5.3	4.6
	12	5.6	5.1	4.4	3.8
	15	4.4	4.1	3.6	3.0
	20	3.3	3.0	2.7	2.3
	25	2.7	2.4	2.1	1.8
	30	2.2	2.0	1.8	1.5
	40	1.7	1.5	1.3	1.1
2.0	10	5.0	4.6	4.0	3.4
	12	4.2	3.8	3.3	2.9
	15	3.3	3.0	2.7	2.3
	20	2.5	2.3	2.0	1.7
	25	2.0	1.8	1.6	1.4
	30	1.7	1.5	1.3	1.1
	40	1.3	1.2	1.0	0.9

*The cost of useful heat will be $1.00 per million BTU when oil costing $0.10 per gallon with a calorific content of 141,000 BTU per gallon provides the heat at an over-all efficiency of 71%.

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RECOMMENDED ECONOMIC THICKNESS, NOMINAL INCHES, UNIBESTOS PIPE INSULATION

(Optimum Thickness for Heat Conservation Under Average Conditions Where the Index "J" = 2.0)

Nominal Pipe Size	TEMPERATURE HOT PIPE, °F. 200	300	400	500	600	700	800	900	1000	1100	1200
	Temperature Difference, Pipe to Air 125	225	325	425	525	625	725	825	925	1025	1125
1" and Less	1	1	1	1½	1½	1½	2	2½	2½	2½	2½
1½"	1	1	1	1½	1½	2	2	2½	2½	2½	2½
2"	1	1	1½	1½	1½	2	2½	2½	2½	2½	3
2½"	1	1	1½	1½	1½	2	2½	2½	2½	3	3
3"	1	1	1½	1½	2	2½	2½	3	3	3	3½
3½"	1	1	1½	1½	2	2½	2½	3	3	3	3
4"	1	1½	1½	2	2	2½	3	3	3	3	3½
5"	1	1½	1½	2	2	2½	3	3½	3½	3½	3½
6"	1	1½	1½	2	2½	3	3	3½	3½	3½	4
8"	1½	1½	2	2½	2½	3	3	3½	3½	4	4
10"	1½	1½	2	2½	3	3	3	3½	4	4	4½
12"	1½	1½	2	2½	3	3	3	3½	4	4	4½
14" to 18"	1½	1½	2	2½	3	3	3½	4	4	4½	4½
20" and over	2	2	2	2½	3	3	3½	4	4½	4½	5

RECOMMENDED ECONOMIC THICKNESS, NOMINAL INCHES, UNIBESTOS PIPE INSULATION

(Optimum Thickness for Heat Conservation Under Conditions Where the Index "J" = 3.0)

Nominal Pipe Size	TEMPERATURE HOT PIPE, °F. 200	300	400	500	600	700	800	900	1000	1100	1200
	Temperature Difference, Pipe to Air 125	225	325	425	525	625	725	825	925	1025	1125
1" and Less	1	1	1½	1½	2	2½	2½	2½	2½	3	3
1½"	1	1½	1½	2	2	2½	2½	2½	3	3	3
2"	1	1½	1½	2	2½	2½	2½	3	3	3	3½
2½"	1	1½	1½	2	2½	2½	2½	3	3	3½	3½
3"	1	1½	2	2½	2½	3	3	3½	3½	3½	4
3½"	1	1½	1½	2	2½	3	3	3	3½	3½	3½
4"	1½	1½	2	2½	3	3	3	3½	3½	3½	4
5"	1½	1½	2	2½	3	3½	3½	3½	4	4	4
6"	1½	1½	2	2½	3	3½	3½	4	4	4	4½
8"	1½	2	2	2½	3	3½	3½	4	4	4½	4½
10"	1½	2	2½	3	3	3½	4	4	4½	4½	5
12"	1½	2	2½	3	3	3½	4	4	4½	5	5
14" to 18"	1½	2	2½	3	3½	3½	4	4½	4½	5	5½
20" and over	2	2	2½	3	3½	4	4½	4½	5	5	5½

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RECOMMENDED ECONOMIC THICKNESS, NOMINAL INCHES, UNIBESTOS PIPE INSULATION

(Optimum Thickness for Heat Conservation Under Conditions Where the Index "J" = 4.0)

NOMINAL PIPE SIZE	TEMPERATURE HOT PIPE, °F. 200	300	400	500	600	700	800	900	1000	1100	1200
	Temperature Difference, Pipe to Air 125	225	325	425	525	625	725	825	925	1025	1125
1" and Less	1	1½	1½	2	2½	2½	2½	3	3	3	3½
1½"	1	1½	2	2	2½	2½	3	3	3	3½	3½
2"	1	1½	2	2½	2½	2½	3	3	4	4	4
2½"	1½	1½	2	2½	2½	3	3	3	3½	4	4
3"	1½	1½	2	2½	3	3½	3½	3½	4	4	4
3½"	1	1½	2	2½	3	3	3	3½	3½	4	4
4"	1½	2	2½	3	3	3½	3½	3½	4	4	4½
5"	1½	2	2½	3	3½	3½	4	4	4	4	4
6"	1½	2	2½	3	3½	3½	4	4	4½	4½	5
8"	1½	2½	2½	3	3½	3½	4	4½	4½	5	5
10"	1½	2½	3	3	3½	4	4½	4½	5	5	5½
12"	1½	2½	3	3	4	4	4½	4½	5	5½	6
14" to 18"	1½	2½	3	3½	4	4½	4½	5	5½	6	6
20" and over	2	2½	3	3½	4	4½	5	5	5½	6	6

RECOMMENDED ECONOMIC THICKNESS, NOMINAL INCHES, UNIBESTOS PIPE INSULATION

(Optimum Thickness for Heat Conservation Under Unusual Conditions Where the Index "J" = 5.0)

NOMINAL PIPE SIZE	TEMPERATURE HOT PIPE, °F. 200	300	400	500	600	700	800	900	1000	1100	1200
	Temperature Difference, Pipe to Air 125	225	325	425	525	625	725	825	925	1025	1125
1" and Less	1	1½	1½	2½	2½	3	3	3	3	3½	3½
1½"	1	1½	2	2½	2½	3	3	3	3½	3½	3½
2"	1½	1½	2½	2½	2½	3	3	3½	4	4	4
2½"	1½	1½	2½	2½	2½	3	3½	3½	4	4	4
3"	1½	2	2½	3	3	3½	4	4	4	4	4
3½"	1½	1½	2½	3	3	3	3½	3½	4	4	4
4"	1½	2	2½	3	3	3½	4	4	4½	5	5
5"	1½	2	3	3½	3½	4	4	4	4	5	5
6"	1½	2	3	3½	3½	4	4	4½	5	5	5½
8"	1½	2½	3	3½	4	4	4½	5	5	5½	6
10"	1½	2½	3	3	4	4½	4½	5	5½	5½	6
12"	1½	2½	3	3½	4	4½	4½	5	5½	6	6½
14" to 18"	2	2½	3	3½	4½	4½	5	5½	6	6	6½
20" and over	2	3	3½	4	4½	5	5½	6	6	6	

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HEAT SAVING TABLES

UNIBESTOS PIPE INSULATION—½ INCH PIPE*

Pipe Temperature, F.			200				300				400				500				600				700			
Temp. Diff., F.			125				225				325				425				525				625			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.00	....	200	72	....	....	300	161	....	....	400	281	....	....	500	436	....	....	600	691	....	....	700	888	....	....
1	1.00	$ .22	88.5	17.2	0.46	76.1	100	33.4	0.20	79.3	112	51.6	0.11	81.6	125	72.2	0.07	83.4	137	94.6	0.04	86.3	150	120	0.03	86.5
1½	1.59	.46	84.1	13.9	8.3	80.7	90.3	26.9	4.2	83.3	98.9	41.5	2.7	85.2	106	57.8	1.9	86.7	114	76.0	1.5	89.9	123	95.6	1.1	89.2
2	2.06	.75	.....	....	....	....	86.5	24.1	11.8	85.0	92.4	37.1	7.5	86.8	98.7	51.8	5.5	88.1	105	67.8	4.0	90.2	112	85.4	3.0	90.4
2½	2.88	1.00	.....	....	....	....	.....	.....	....	....	.....	.....	....	....	91.2	44.9	4.1	89.7	95.9	58.8	3.2	91.5	101	74.0	2.5	91.7
3	3.34	1.20	.....	....	....	....	.....	.....	....	....	.....	.....	....	....	89.0	42.4	9.1	90.3	92.7	55.6	7.1	92.0	95.8	70.0	5.7	92.1

Pipe Temperature, F.			800				900				1000				1100				1200			
Temp. Diff., F.			725				825				925				1025				1125			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.00	....	600	1201	....	....	900	1581	....	....	1000	2050	....	....	1100	2614	....	....	1200	3281	....	....
1	1.00	$ .22	164	146	0.02	87.8	178	176	0.02	88.9	...	...	....	....	...	...	....	....	...	...	....	....
1½	1.59	.46	132	117	0.94	90.3	142	140	0.76	91.1	151	165	0.03	92.0	161	192	0.02	92.7	171	220	0.02	93.3
2	2.06	.75	119	104	2.5	91.3	127	125	2.2	92.1	134	147	1.8	92.8	142	171	1.6	93.5	150	196	1.4	94.0
2½	2.88	1.00	106	90.4	2.1	92.5	111	108	1.7	93.2	117	127	1.4	93.8	123	148	1.2	94.3	129	170	1.1	94.8
3	3.34	1.20	101	85.6	4.8	92.9	106	102	3.8	93.5	111	120	3.3	94.1	116	140	2.8	94.6	121	160	2.3	95.1
3½	3.88	1.55	97.3	80.4	7.7	93.3	101	96.2	6.7	93.9	105	113	5.7	94.5	110	131	4.4	95.0	114	150	4.0	95.4
4	4.38	2.20	...	...	....	....	98.0	92.0	17.7	94.2	102	108	14.8	94.7	106	125	12.4	95.2	110	143	10.6	95.6

UNIBESTOS PIPE INSULATION—¾ INCH PIPE*

Pipe Temperature, F.			200				300				400				500				600				700			
Temp. Diff., F.			125				225				325				425				525				625			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	200	88	....	....	300	199	....	....	400	345	....	....	500	537	....	....	600	787	....	....	700	1096	....	....
1	0.91	$ .24	90.8	20.5	0.41	76.7	104	39.7	0.17	80.1	118	61.8	0.10	82.1	132	85.9	0.06	84.0	147	113	0.04	85.6	162	142	0.03	87.0
1½	1.47	.49	84.4	15.6	5.8	82.3	92.7	30.2	3.0	84.8	101	46.7	1.9	86.5	111	65.0	1.4	87.9	120	85.2	1.0	89.2	130	108	0.84	90.1
2	1.97	.80	81.9	14.0	22.1	84.1	87.9	27.1	11.4	86.4	94.4	41.9	7.4	87.9	101	58.3	5.3	89.1	109	76.4	4.0	90.3	116	96.2	3.0	91.2
2½	2.75	1.05	...	....	....	....	.....	.....	....	....	88.3	36.0	4.8	89.6	93.2	50.1	3.5	90.7	98.4	65.6	2.6	91.7	104	82.7	2.1	92.5
3	3.25	1.35	...	....	....	....	.....	.....	....	....	85.8	33.5	13.7	90.3	89.9	46.6	9.8	91.3	94.3	61.0	7.4	92.2	98.8	76.8	5.8	93.0

Pipe Temperature, F.			800				900				1000				1100				1200			
Temp. Diff., F.			725				825				925				1025				1125			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	800	1486	....	....	900	1958	....	....	1000	2545	....	....	1100	3244	....	....	1200	4076	....	....
1	0.91	$ .24	176	175	0.02	88.2	192	210	0.02	89.3	...	...	....	....	...	...	....	....	...	...	....	....
1½	1.47	.49	140	132	0.66	91.1	150	158	0.55	91.9	161	186	0.02	92.7	172	216	0.02	93.3	182	247	0.01	93.9
2	1.97	.80	124	118	2.5	92.1	132	141	2.1	92.8	140	166	1.8	93.5	149	193	1.5	94.1	157	221	1.4	94.6
2½	2.75	1.05	109	101	1.7	93.2	115	121	1.4	93.8	121	142	1.2	94.4	127	165	1.0	94.9	134	189	0.89	95.4
3	3.25	1.35	104	94.1	4.9	93.7	108	113	4.3	94.2	114	132	3.4	94.8	119	154	3.1	95.3	125	176	2.6	95.7
3½	3.75	1.75	99.5	89.1	9.1	94.0	104	107	7.6	94.5	108	125	6.5	95.1	113	145	5.0	95.5	118	166	4.6	95.9
4	4.28	2.15	...	...	....	....	...	...	....	....	104	119	7.6	95.3	108	137	5.7	95.8	112	157	5.1	96.1

*Surface Temperature (ST) F—Heat Loss (BTU) Per Hr, Lin Ft—Economical Thickness Index (J)—Efficiency (E) %
(Ambient Still Air 75 F., Emissivity = 0.9)

In case of discrepancy, list prices shown in Heat Loss Tables do not prevail over official price lists.

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UNIBESTOS PIPE INSULATION—1 INCH PIPE*

Pipe Temperature, F.			200				300				400				500				600				700			
Temp. Diff., F.			125				225				325				425				525				625			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	200	108	....	....	300	243	....	....	400	424	....	....	500	662	....	....	600	972	....	....	700	1338	....	....
1	1.09	$ .27	88.6	21.0	0.35	80.6	100	40.8	0.15	83.2	113	63.2	0.09	85.1	125	88.0	0.05	86.7	138	116	0.04	88.1	152	146	0.03	89.2
1½	1.59	.52	83.6	17.2	7.5	84.1	92.3	33.5	3.9	86.2	101	51.9	2.5	87.8	110	72.0	1.8	89.1	119	94.7	1.3	90.3	129	119	1.1	91.2
2	2.12	.85	....	....	....	....	87.5	29.0	8.4	88.1	94.0	44.9	5.4	89.4	101	62.6	3.6	90.6	108	82.1	3.0	91.6	115	103	2.4	92.4
2½	2.66	1.10	....	....	....	....	....	....	....	....	89.7	40.2	6.0	90.6	95.0	56.0	4.3	91.6	101	73.5	3.3	92.4	107	92.7	2.8	93.2
3	3.16	1.40	....	....	....	....	....	....	....	....	87.0	37.4	12.2	91.2	91.3	52.2	9.0	92.1	96.0	68.3	6.6	93.0	101	85.9	5.0	93.8
3½	3.66	1.60	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	97.1	80.6	8.6	94.1

Pipe Temperature, F.			800				900				1000				1100				1200			
Temp. Diff., F.			725				825				925				1025				1125			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	800	1839	....	....	900	2429	....	....	1000	3155	....	....	1100	4032	....	....	1200	5066	....	....
1	1.09	$ .27	165	179	0.02	90.3	176	211	0.01	91.3	....	....	....	....	....	....	....	....	....	....	....	....
1½	1.59	.52	139	146	0.86	92.1	149	175	0.79	92.8	159	206	0.02	93.5	169	239	0.02	94.1	180	275	0.01	94.6
2	2.12	.85	123	127	2.0	93.1	131	151	1.6	93.8	139	178	1.3	94.4	147	207	1.2	94.9	155	238	1.0	95.3
2½	2.66	1.10	113	113	2.1	93.9	120	136	1.9	94.4	126	159	1.5	95.0	133	185	1.3	95.4	140	212	1.1	95.8
3	3.16	1.40	106	105	4.3	94.3	112	126	3.4	94.8	117	148	3.1	95.3	123	172	2.6	95.7	129	197	2.3	96.1
3½	3.66	1.60	102	98.4	6.9	94.6	106	118	5.7	95.1	111	139	5.1	95.6	116	161	4.1	96.0	123	184	3.5	96.3
4	4.16	2.20	98.2	93.1	8.6	94.9	102	111	6.5	95.4	107	131	5.7	95.8	111	152	5.1	96.2	116	175	5.0	96.6

UNIBESTOS PIPE INSULATION—1¼ INCH PIPE*

Pipe Temperature, F.			200				300				400				500				600				700			
Temp. Diff., F.			125				225				325				425				525				625			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	200	135	....	....	300	302	....	....	400	529	....	....	500	827	....	....	600	1215	....	....	700	1701	....	....
1	0.91	$ .30	92.3	27.1	0.32	79.9	107	52.9	0.14	82.5	122	81.6	0.08	84.6	138	114	0.05	86.2	153	151	0.03	87.6	169	191	0.02	88.8
1½	1.66	.56	84.4	19.4	3.8	85.6	92.6	37.7	2.0	87.5	101	58.1	1.3	89.0	110	80.9	0.90	90.2	120	107	0.6	91.2	130	134	0.52	92.1
2	1.94	.90	82.9	17.9	25.9	86.7	89.8	34.6	12.9	88.5	97.2	53.5	8.4	89.9	105	74.7	6.3	91.0	113	97.9	4.3	91.9	122	123	3.5	92.8
2½	2.47	1.15	....	....	....	....	....	....	....	....	92.1	47.3	4.5	91.1	98.2	65.7	3.2	92.1	105	86.3	2.5	92.9	111	109	2.0	93.6
3	2.97	1.45	....	....	....	....	....	....	....	....	88.8	43.2	8.3	91.8	93.8	60.2	6.2	92.7	99.1	79.0	4.7	93.5	105	99.4	3.6	94.2
3½	3.47	1.95	....	....	....	....	....	....	....	....	....	....	....	....	90.8	56.0	13.6	93.2	95.3	73.3	10.0	94.0	100	92.3	8.0	94.6

Pipe Temperature, F.			800				900				1000				1100				1200			
Temp. Diff., F.			725				825				925				1025				1125			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	800	2309	....	....	900	3050	....	....	1000	3961	....	....	1100	5063	....	....	1200	6367	....	....
1	0.91	$ .30	185	233	0.02	89.9	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....
1½	1.66	.56	140	165	0.44	92.9	150	197	0.02	93.5	160	232	0.02	94.1	171	269	0.01	94.7	182	309	0.01	95.1
2	1.94	.90	131	151	2.8	93.5	140	181	2.4	94.1	149	213	2.0	94.6	159	248	1.8	95.1	168	284	1.5	95.5
2½	2.47	1.15	118	133	1.6	94.2	126	159	1.3	94.8	133	187	1.1	95.3	141	217	0.9	95.7	149	249	0.8	96.1
3	2.97	1.45	111	122	3.1	94.7	117	146	2.6	95.2	123	171	2.1	95.7	130	198	1.8	96.1	136	228	1.6	96.4
3½	3.47	1.95	105	113	6.3	95.1	111	135	5.2	95.6	116	159	4.8	96.0	122	184	4.1	94.4	127	211	3.4	96.7
4	3.97	2.25	101	106	4.9	95.4	106	127	4.3	95.8	111	150	3.8	96.2	116	173	3.1	96.6	121	199	2.8	96.9
4½	4.50	2.85	97.6	100	11.4	95.7	102	120	9.8	96.1	106	142	8.6	96.4	110	164	7.6	96.8	115	188	6.2	97.0

*Surface Temperature (ST) F—Heat Loss (BTU) Per Hr, Lin Ft—Economical Thickness Index (J)—Efficiency (E) %
(Ambient Still Air 75 F., Emissivity = 0.9)

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UNIBESTOS PIPE INSULATION—24 INCH PIPE*

Pipe Temperature, F.			200				300				400				500				600				700			
Temp. Diff., F.			125				225				325				425				525				625			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	200	1603	...	...	300	3656	....	...	400	6517	....	....	500	10392	....	....	600	15527	....	....	700	22021	....	....
2	2.00	$ 4.50	87.7	134	.35	91.6	98.5	259	.15	92.9	110	401	.05	93.8	122	562	.03	94.6	134	736	.02	95.3	146	931	.02	95.6
2½	2.50	5.75	95.2	110	6.0	93.1	94.0	213	3.1	94.2	103	330	2.0	94.9	113	459	1.4	95.6	123	603	1.1	96.1	134	761	.84	96.5
3	3.00	7.00	83.5	94.9	9.5	94.1	91.0	183	4.8	95.0	98.9	283	3.0	95.7	107	396	2.3	96.2	116	519	1.7	96.7	125	653	1.3	97.0
3½	3.50	8.25	....	.....	...	...	88.7	161	6.5	95.6	95.6	249	4.2	96.2	103	347	2.9	96.7	111	456	2.3	97.1	119	574	1.8	97.4
4	4.00	9.65	...	.....	...	...	86.9	144	9.4	96.1	93.1	222	5.9	96.6	99.6	310	4.3	97.0	106	406	3.2	97.4	113	512	2.6	97.7
4½	4.50	11.00	....	.....	...	...	....	.....	....	...	91.1	202	7.7	96.9	96.7	281	5.3	97.3	103	369	4.2	97.6	109	465	3.3	97.9
5	5.00	12.45	....	.....	...	...	....	.....	....	...	.....	....	....	....	94.6	259	7.5	97.5	100	339	5.5	97.6	106	427	4.4	98.1
5½	5.50	15.80	....	.....	...	...	...	.....	....	...	.....	....	....	....	.....	....	....	....	97.9	313	14.7	98.0	103	395	12.0	98.2

Pipe Temperature, F.			800				900				1000				1100				1200			
Temp. Diff., F.			725				825				925				1025				1125			
INSULATION Thickness in. Nom.	Actual	List Price	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E	ST	BTU	J	E
Bare	0.0	....	800	30375	....	....	900	40632	....	....	1000	53319	....	....	1100	68748	....	....	1200	87230	....	....
2	2.00	$ 4.50	158	1138	.01	96.3	171	1368	.01	96.6	184	1609	.01	97.0	...	...	....	....	...	..	....	....
2½	2.50	5.75	144	931	.69	96.9	155	1114	.56	97.3	166	1313	.48	97.5	177	1527	.01	97.8	186	1750	.01	98.0
3	3.00	7.00	134	799	1.1	97.4	144	959	.92	97.6	154	1127	.77	97.9	163	1308	.65	98.1	173	1502	.58	98.3
3½	3.50	8.25	127	703	1.5	97.7	135	842	1.2	97.9	144	989	1.0	98.1	153	1150	.90	98.3	162	1317	.77	98.5
4	4.00	9.65	121	626	2.1	97.9	128	749	1.7	98.2	136	881	1.5	98.3	144	1024	1.3	98.5	152	1174	1.1	98.7
4½	4.50	11.00	116	569	2.7	98.1	123	681	2.3	98.3	130	800	1.9	98.5	137	928	1.6	98.7	144	1054	1.4	98.8
5	5.00	12.45	112	522	3.5	98.3	118	625	3.0	98.5	125	735	2.6	98.6	132	854	2.2	98.8	139	980	2.0	98.9
5½	5.50	15.80	109	483	9.8	98.4	115	578	8.1	98.6	121	680	7.0	98.7	127	789	5.9	98.9	133	904	5.0	99.0
6	6.00	17.75	106	451	7.0	98.5	111	540	5.9	98.7	117	635	5.0	98.8	123	737	4.3	98.9	129	844	3.7	99.0
6½	6.50	19.70	...	...	....	....	109	507	6.8	98.8	114	595	5.6	98.9	119	692	5.0	99.0	125	792	4.3	99.1
7	7.00	21.95	...	...	...	....	106	478	8.1	98.8	111	563	7.3	98.9	116	653	6.0	99.1	121	748	5.3	99.1

*Surface Temperature, (ST) F—Heat Loss (BTU) Per Hr, Lin Ft—Economical Thickness Index (J)—Efficiency (E) %
(Ambient Still Air 75 F., Emissivity =0.9)

Areas of Flanged Fittings* Expressed in Equivalent Lineal Feet of Pipe.

Pipe Size in Inches Nominal	Actual	FLANGED COUPLING Equivalent Lineal Feet		90° ELL Equivalent Lineal Feet		LONG RADIUS ELL Equivalent Lineal Feet		TEE Equivalent Lineal Feet		CROSS Equivalent Lineal Feet	
		125#	250#	125#	250#	125#	250#	125#	250#	125#	250#
1	1.315	.93	1.28	2.31	2.96	2.59	3.15	3.60	4.58	4.72	6.02
1¼	1.660	.88	1.17	2.21	2.53	2.49	3.09	3.40	4.45	4.47	5.82
1½	1.900	.96	1.47	2.35	2.67	2.69	3.76	3.64	5.38	4.78	7.11
2	2.375	1.08	1.36	2.65	3.23	2.96	3.47	4.08	4.97	5.34	6.53
2½	2.875	1.12	1.47	2.78	3.41	3.08	3.66	4.26	5.38	5.56	6 87
3	3.500	1.03	1.52	2.60	3.81	2.93	4.08	3.99	5.82	5.21	7.58
3½	4.000	1.07	1.57	2.84	3.78	3.13	4.09	4.28	5.76	5.56	7.52
4	4.500	1.14	1.62	2.99	3.94	3.36	4.24	4.59	6.00	5.96	7.84
4½	5.000	1.13	1.56	3.02	3.85	3.38	4.18	4.66	5.91	6.03	7.70
5	5.563	1.11	1.50	3.05	3.75	3.43	4.13	4.67	5.85	6.06	7.52
6	6.625	1.05	1.60	2.95	4.03	3.45	4.48	4.53	6.14	5.81	7.92
7	7.625	1.09	1.73	3.09	4.32	3.70	4.87	4.70	6.18	6.01	8.43
8	8.625	1.07	1.67	3.09	4.32	3.79	4.91	4.67	6.53	5.96	8.41
9	9.625	1.19	1.76	3.46	4.54	4.20	5.23	5.23	6.84	6.66	8.77
10	10.750	1.22	1.85	3.61	4.82	4.38	5.54	5.47	7.25	6.95	9.32
12	12.750	1.32	2.01	3.91	5.31	4.90	5.62	5.89	7.99	7.45	10.22
14	14.000	1.47	2.26	4.47	6.08	5.49	7.01	6.77	9.18	8.60	11.75
16	16.000	1.60	2.40	4.82	6.50	6.08	7.60	7.24	9.78	9.15	12.51

*Values shown are for cast iron fittings. 125# cast iron fittings equal 150# steel fittings.
250# cast iron fittings equal 300# steel fittings.

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FIBROUS PRODUCTS DIVISION

UNION ASBESTOS & RUBBER COMPANY

1111 WEST PERRY STREET, BLOOMINGTON, ILLINOIS

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F76-J

NOW... FROM PITTSBURGH CORNING

UNIBESTOS®

HIGH TEMPERATURE INSULATION FOR SERVICE TO 1200°F

COMPOSITION	Exclusive composition offers unique natural advantages	page 2
APPLICATION	Single layer application saves time, lowers application cost	page 4
DURABILITY	Rugged UNIBESTOS incombustible, won't burn, rot, fire, mold, shrink	page 6
VERSATILITY	Versatile UNIBESTOS fits natural efficiency in every application	page 8
SELECTIVITY	Wide selectivity, half or full round sections for 4½" insulation O.D.	page 10
AVAILABILITY	Available everywhere through PC national facilities	page 16

PITTSBURGH

PC

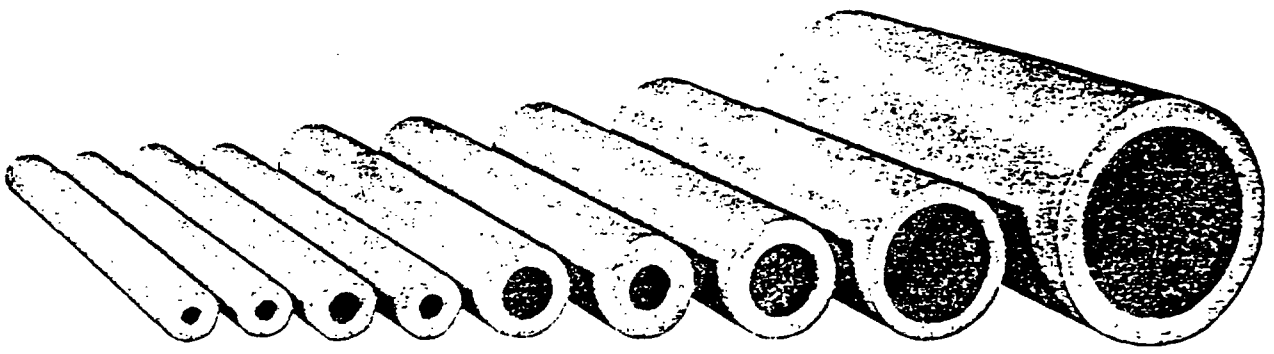
CORNING

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COMPOSITION C UNIBESTOS®

UNIBESTOS is available up to 4" thickness for any size pipe or tubing from ½" tubing through 36" O.D. pipe. Pipe sizes above 36" through 44" insulation O.D. available on request.



UNIBESTOS®... the only industrial insulation made in the United States composed of unique long-fibered Amosite asbestos... is now manufactured by Pittsburgh Corning. Rugged and durable, UNIBESTOS has proved itself an ideal high temperature insulation in the marine, refining, chemical, power, and petrochemical fields.

EXCLUSIVE COMPOSITION... offers unique natural advantages

UNIBESTOS is a sectional pipe-insulation material made up of approximately 95% long-fibered Amosite asbestos, combined with an inert silicate binder and diatomaceous earth.

Amosite asbestos offers a host of unique *natural* insulation advantages which stem from:

(1) Unusually long, fine, tough fibers.
(2) Inert chemical make-up.
(3) High degree of resistance to moisture.

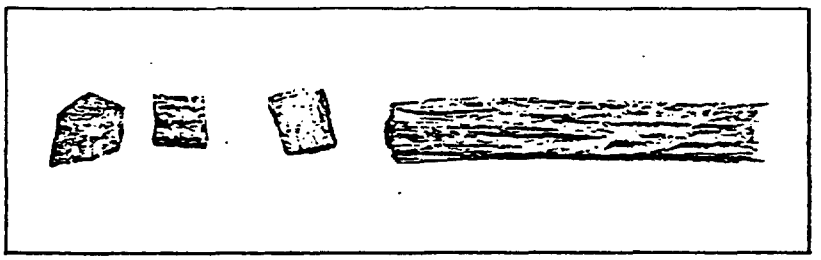
The Amosite asbestos is processed by a special Pittsburgh Corning production technique called *fiberizing*, designed to exploit the full natural advantages of the long-fibered material. In this process, the Amosite is carefully screened, air blown, and brushed to "open up" the long, fine asbestos fibers into an interlaced fibrous mass which entraps millions of insulating air spaces. UNIBESTOS is produced by carefully forming this exclusive base material into sections of precise thicknesses, then applying a smooth, chemically-inert refractory coating.

The photographs on the opposite page graphically illustrate why UNIBESTOS is unique among insulations in its make-up and manufacture; the pages following will demonstrate that . . . *for economy, efficiency, long service and re-usability UNIBESTOS is your best buy in high temperature pipe insulation.*

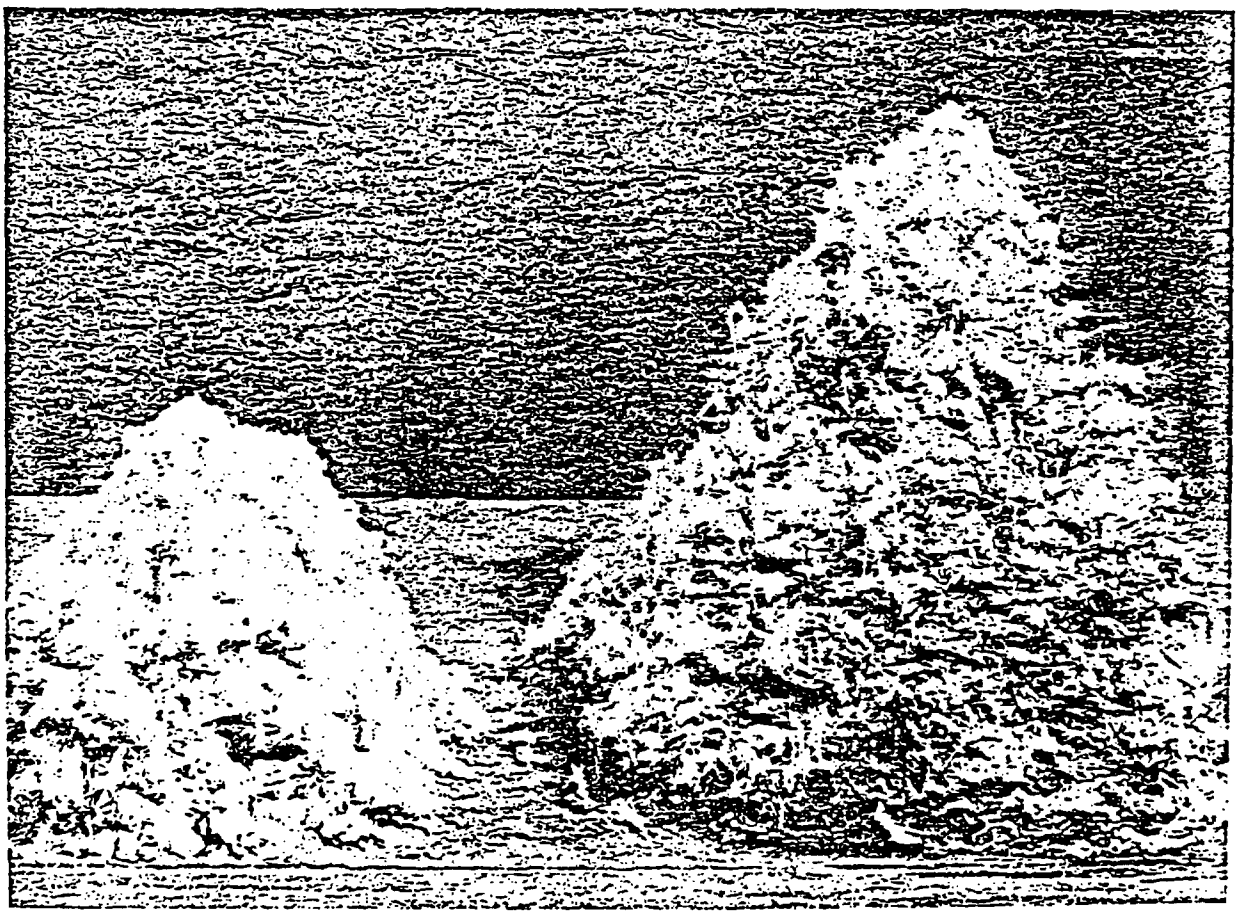
Unarco: Unibestos Brochure (1954)
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The photograph below gives a vivid demonstration of the natural difference between long-fibered Amosite asbestos and ordinary asbestos. These long, thin fibers have an amazing degree of resilience. Not only does each fiber offer a high resistance to forces that tend to bend it, but groups of fibers . . . properly processed and "opened" . . . form an interlaced fibrous mass with unusual structural strength, as well as high insulating efficiency.

Amosite asbestos is found chiefly in the north central Transvaal, a province in the Union of South Africa, where uniform, graded Amosite is produced by modern facilities of the Cape Asbestos Company for export to Pittsburgh Corning plants.



This picture shows the difference between equal weights of long-fibered Amosite asbestos and an ordinary asbestos material. The pile of Amosite on the right, "opened" to almost three times the volume by the PC fiberizing process, will retain its original fluffy mass indefinitely. Ordinary asbestos, with its short, more brittle fibers, tends to pack down.



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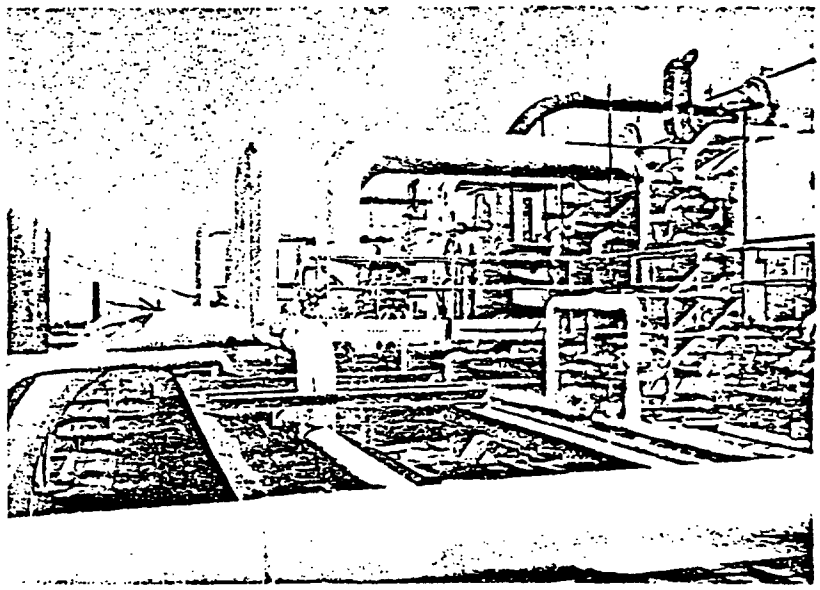
APPLICATION OF UNIBESTOS®

SINGLE-LAYER INSULATION . . . saves time, lowers application costs

Because of its unique combination of properties, UNIBESTOS offers many advantages in both thermal efficiency and reduced installation costs.

UNIBESTOS has high insulation value. UNIBESTOS is composed of Amosite, a superior grade of asbestos. One pound of Amosite will bulk to two or three times the volume of common short asbestos fibers, such as white Chrysotile or blue asbestos. The PC fiberizing process produces a mass of dead-air cells that result in low thermal conductivity. This positive thermal efficiency eliminates "guesswork" in specifying excessive safety factors, reduces over-all application costs.

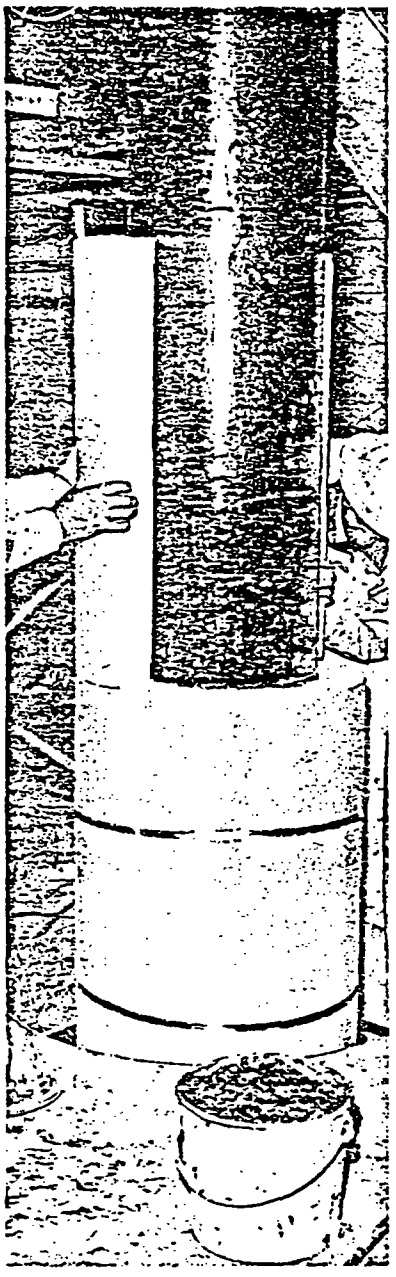
UNIBESTOS needs no additional layers. With UNIBESTOS, butted joints form natural heat seals themselves. The long, tough fibers . . . which project from the butt end of sections by the thousands . . . tend to interlace when two sections are butted together. This forms a heat-tight joint and eliminates the need for additional layers required with other insulation materials. 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.



JOINT HEAT-LOSS TEST RESULTS Test Results of Surface Temperatures and Heat-Loss at Joints	UNIBESTOS Pipe Insulation (Single Layer)	"8" Insulation (Single Layer)	"8" Insulation (Double Layer)
Thickness of covering, inches	2.50	2.48	2.45
Density of covering, lbs./cu. ft.	14.00	12.95	12.24
Energy supplied to heating coil, watts	580	650	610
Energy supplied to heating coils, Btu's/hr.	1979	2218	2081
Temperature of pipe, °F	600	600	597
Temperature of test room, °F	75	75	75
Temperature difference (pipe minus room), °F	525	525	522
Average surface temperature (not including joints), °F	114	122	116
Average joint temperature, °F	134	152	143
Average rise in temperature at joint, °F	20	30	27
Heat-loss through end caps, Btu's/hr.	246	246	244
Heat-loss through covering, Btu's/hr.	1735	1972	1837
Unit heat loss through covering, Btu's/hr. per sq. ft. of pipe surface per degree (F) of temperature difference	0.244	0.278	0.260

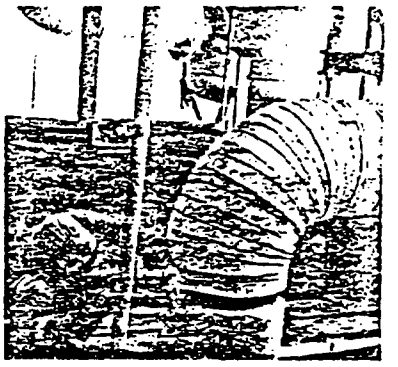
Test results from an independent laboratory.

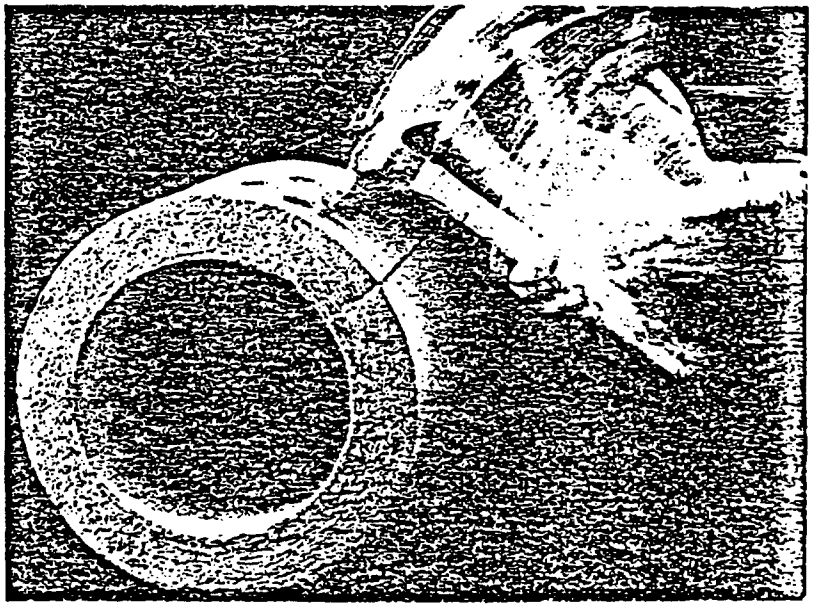
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UNIBESTOS is easy to handle, speeds installation. UNIBESTOS is a firm, easy-to-handle material not subject to breakage. This lowers installation, shipping, and materials handling cost. Single-layer UNIBESTOS can be installed in much less time than required for double-layer insulation. Fewer number of insulation pieces requires less space in storage and shipment. Fewer pieces must be handled in all operations, reducing labor time and costs all along the line.

UNIBESTOS is easily shaped to irregular contours. UNIBESTOS can be cut, mitered, or grooved with ordinary tools. It can be neatly adapted to bends, elbows, tees, expansion joints, flanges, valves, and other irregular shapes. Here, too, the joints form heat seals through the interlacing effect of the long fibers. And, since UNIBESTOS will not shrink at high temperatures, joints stay tight and efficient. This inherent heat sealing eliminates the need for special insulating treatment of joints and seams. Shop fabrication is simple . . . just cut UNIBESTOS to size and join with sodium silicate adhesive.





Practically no loss through breakage. *UNIBESTOS need not be handled delicately!* It is so rugged it will not crack or shatter on impact, even when struck with a hammer. In addition to permitting faster work, shock resistance saves money because breakage replacement costs are practically nil. It does not break in transit, thus excess quantities need not be ordered to compensate for in-transit breakage.

Independent laboratory tests prove superiority of *single-layer* UNIBESTOS insulation system.

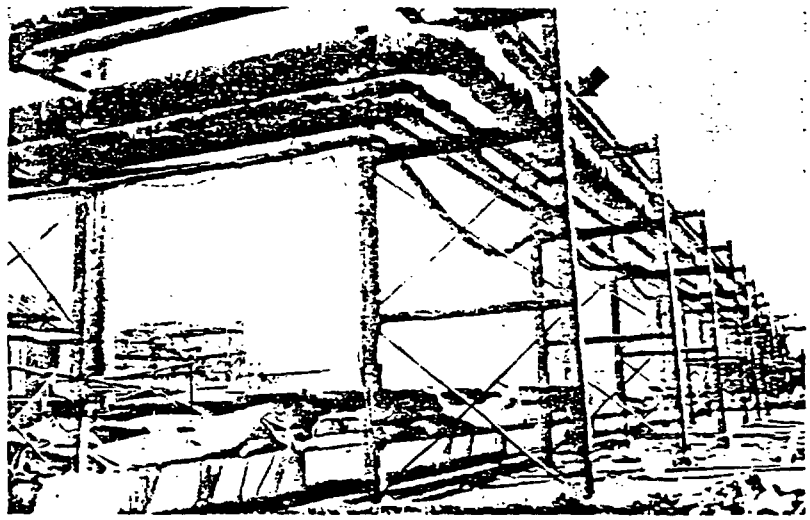
The chart illustrates results arrived at by an independent testing laboratory when testing for heat losses at insulation joints. Single-layer UNIBESTOS was tested against double-layer applications of competitive materials.

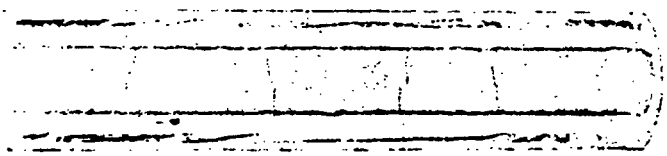
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DURABILITY
UNIBESTOS®

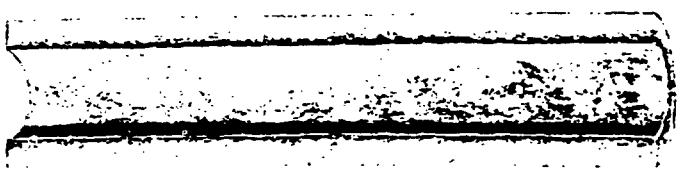
RUGGED UNIBESTOS . . . incombustible, won't shrink, no thermal shock

UNIBESTOS protects piping against costly damage from fire. UNIBESTOS is incombustible because it is a stable, inorganic iron silicate, and cannot burn. Further, its high insulation value and ability to withstand violently sudden temperature changes protect piping against excessive and rapid heat gain. Where non-insulated or poorly insulated piping buckles and melts in industrial fires, UNIBESTOS-insulated piping stays in place and is ready to function when the fire is brought under control. (See arrow in photograph of actual plant fire.)





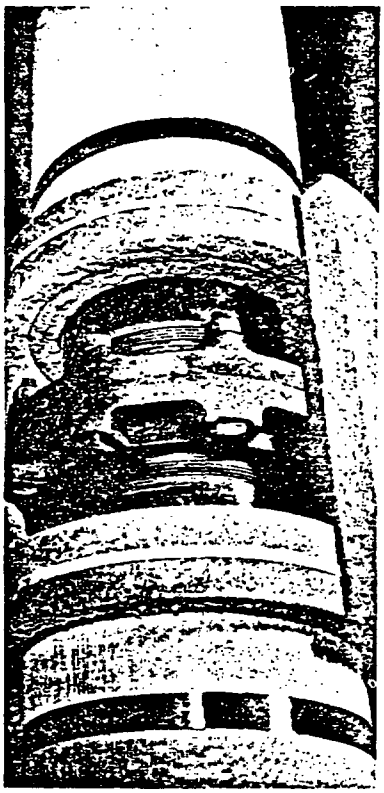
Reaction of ordinary insulation to thermal shock



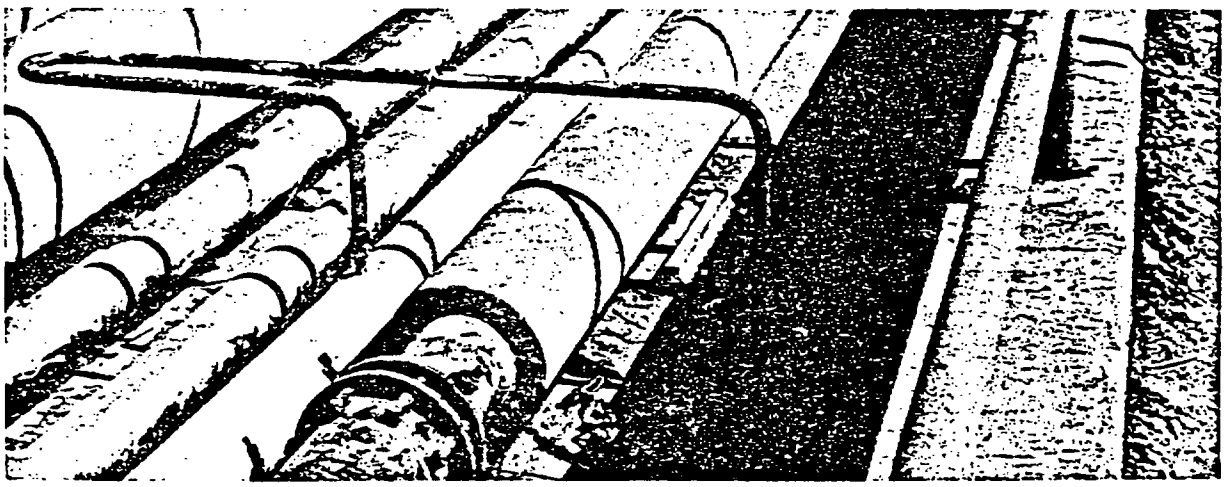
UNIBESTOS sample did not crack

No thermal shock problems. Even at temperatures higher than the 1200°F service temperature recommended for UNIBESTOS, it will not thermal shock . . . no cracks or leaks will occur to impair insulation efficiency.

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UNIBESTOS has exceptional stability—won't shrink. Because UNIBESTOS is extremely heat stable . . . it does not decompose or react chemically under high temperatures. Even more important, it is dimensionally stable . . . it does not shrink! With UNIBESTOS then, section joints stay closed, and keep heat in.



UNIBESTOS resists water, moisture, acids, fumes. UNIBESTOS is chemically stable; it is not affected by water, moisture, acids, fumes, or other corrosive substances. Submerged under water for weeks, UNIBESTOS dries to its original characteristics; continuous exposure to chemicals and chemical fumes does not change its insulating capacity.

UNIBESTOS for stainless steel applications. Many industrial users of UNIBESTOS have expressed satisfaction with the insulation performance of UNIBESTOS on stainless steel applications.

UNIBESTOS can be re-used. Because of its durability, UNIBESTOS can be re-used many times. Maintenance costs are reduced because new replacement insulation is not required when a line is repaired. As is shown in the illustration at right, even flange, valve and coupling coverings can be easily fabricated right on the job for later removal, when necessary.

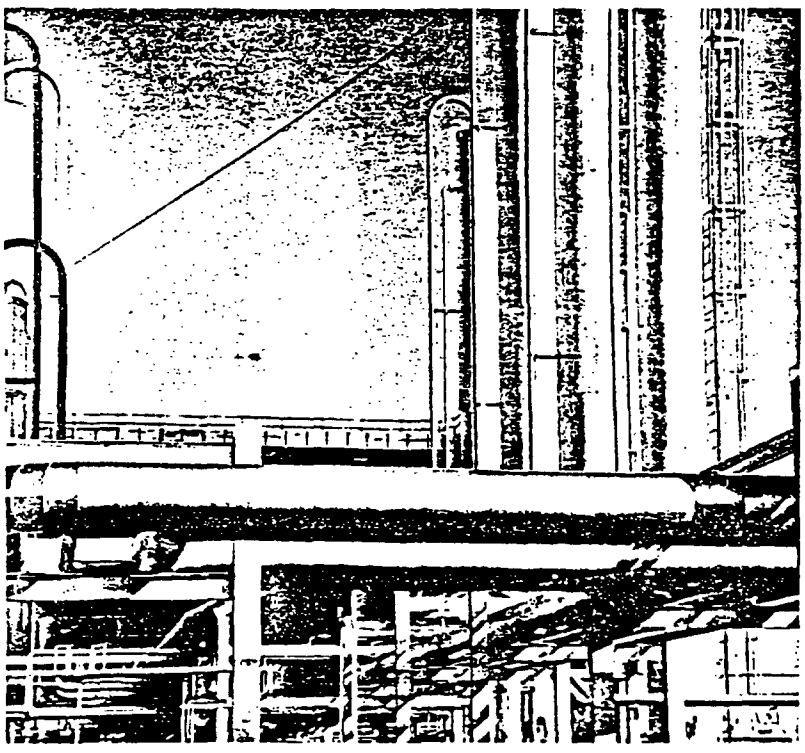
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VERSATILITY of UNIBESTOS

VERSATILE UNIBESTOS . . . high thermal efficiency in every application

UNIBESTOS has proved itself in use in the widest range of industrial, commercial, and government installations to be the most versatile high-temperature insulation available.

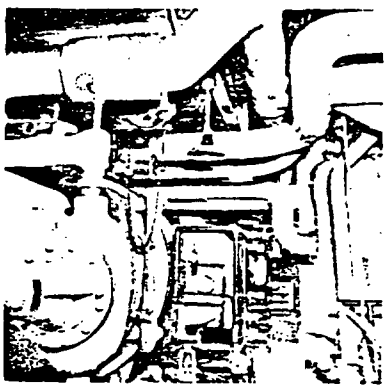
- Its high thermal efficiency means plus-profits in the form of major, long-term operational economies.
- Its inert composition, and resistance to moisture, acids and chemical fumes assure long life in the most contaminated industrial surroundings.
- Its resistance to shock and abuse, and its ease of removal and reapplication not only simplifies maintenance, but cuts maintenance expenses sharply.
- Its compact, trim, single-layer application offers the ultimate in labor-saving, without sacrifice of insulation value.

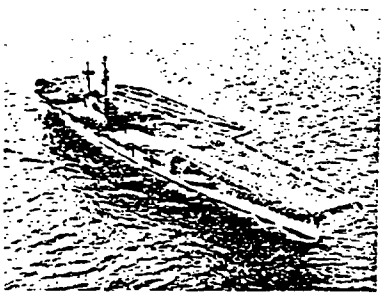


UNIBESTOS is proven best for petroleum refineries and petrochemical plants. UNIBESTOS offers superior insulation performance in corrosive atmospheres, and protects against pipe destruction in sudden and violent fires. Of particular importance is its application to heat-traced lines where its ability to conform to irregular shapes eliminate any cracking or breakage of the material. UNIBESTOS will also bridge the unsupported void between the line and tracer without breakage.

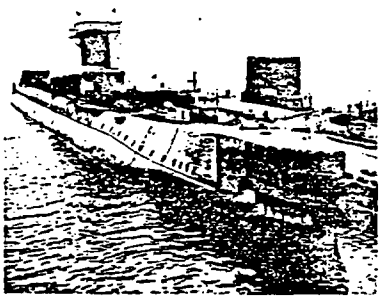
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UNIBESTOS is proven best for the utility industries. For power plants with high temperature steam lines, for commercial steam heat systems, for exposed critical-temperature lines of all types, UNIBESTOS excels in insulation performance. Tough and resilient, it won't crack or thermal shock, keeping thermal efficiency high and reducing heat losses over longer piping runs.

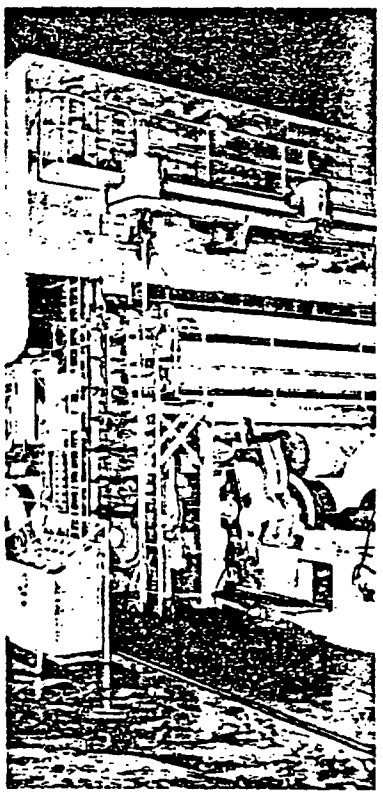




UNIBESTOS is proven best for pulp and paper mills. In the wet, corrosive atmospheres of pulp mills and paper mills, UNIBESTOS performs at peak efficiency. Continuous exposure to chemical-laden fumes does not affect it; even after being totally submerged in water for weeks, it will quickly dry to its original characteristics.



UNIBESTOS is proven best for marine use and atomic-energy applications. The *single-layer* concept of the UNIBESTOS insulation system makes it ideal for the demanding conditions of cramped shipboard piping, particularly on atomic-powered vessels. Its fibrous structure withstands the rigors of heavy vibration which could cause granular insulations to break and crumble. The combination of unique advantages in UNIBESTOS are proving equally effective in the atomic energy field.



UNIBESTOS saves on underground lines. Because UNIBESTOS is available in full cylindrical shapes up to 44" insulation O.D., it has gained widespread acceptance as the time-saving way to insulate underground lines. Requiring less handling and no special banding, these full cylinders provide an ideal way to insulate a line for conduit application.

Installation is simple: the insulation is slid onto the pipe; the transverse joints are taped and insulated pipe is ready for the casing. The casing is then sealed to make a strong, efficient and economical assembly for the distribution of steam or fluids underground.

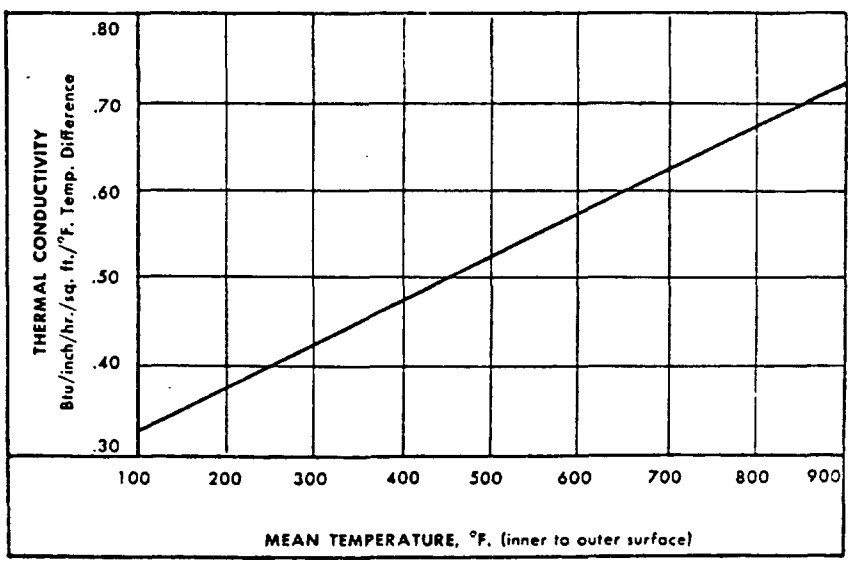
This system has become increasingly popular where heat is supplied from a central heating station. In situations like these, UNIBESTOS has supplied superior underground insulation for everything from schools, churches and colleges to hospitals, utilities and railroads as well as for processing lines for industrial plants.

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SELECTIVITY® UNIBESTOS®

WIDEST SELECTIVITY . . . half sections or full-round sections up to 44″ insulation O.D.

PHYSICAL PROPERTIES OF UNIBESTOS	
Density	16 lb./ft.³
Compressive Strength	1600 lb., ft.² (dry; at 5% deformation)
Shrinkage	0.00% to 1200°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	Will not thermal shock
Acid Resistance	Negligible effect on physical characteristics from common industrial acids and caustics
Noncorrosive	Will not contribute to stress corrosion of stainless steel



UNIBESTOS complies with:
Federal Specification HH-I-561c Type 4
Mil. Spec. MIL-I-2781
Grade II Class C (750°F.)
Grade III Class F (1050°F.)

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Tables 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 thicknesses (for commercial work).

PERSONNEL PROTECTION

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
	Temperature Difference Pipe to Air										
	120	220	320	420	520	620	720	820	920	1020	1120
1" and Less	1	1	1	1	1	1	1½	1½	1½	2	2
1½"	1	1	1	1	1	1½	1½	1½	2	2	2
2"	1	1	1	1	1	1½	1½	1½	2	2	2½
3"	1	1	1	1	1	1½	1½	2	2	2½	2½
3½"	1	1	1	1	1	1	1½	1½	2	2	2½
4"	1	1	1	1	1	1½	1½	2	2	2½	2½
5"	1	1	1	1	1	1½	2	2	2½	2½	3
6"	1	1	1	1	1½	1½	2	2	2½	3	3
8"	1½	1½	1½	1½	1½	1½	2	2	2½	3	3
10"	1½	1½	1½	1½	1½	1½	2	2½	2½	3	3½
12"	1½	1½	1½	1½	1½	1½	2	2½	2½	3	3½
14" to 18"	1½	1½	1½	1½	1½	1½	2	2½	3	3	3½
20"	2	2	2	2	2	2	2	2½	3	3½	3½

COMMERCIAL, INDUSTRIAL

RECOMMENDED THICKNESSES—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. ST = Surface Temperature. E = Efficiency.

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SELECTIVITY® PCUNIBESTOS®

PROCESS INDUSTRIES

RECOMMENDED THICKNESSES

Pipe Temperature	200°F				300°F				400°F				500°F				600°F			
Temperature Difference	120°F				220°F				320°F				420°F				520°F			
Pipe Size	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	1	50.5	116	81.6	1	70.8	128	83.4	1	93.5	140	86.3
¾	1	19.7	95.8	76.7	1	38.1	108	80.1	1	60.9	122	82.1	1	85.1	135	84.0	1½	84.8	123	89.2
1	1	20.2	93.6	80.6	1	39.2	104	83.2	1	62.4	117	85.1	1	87.1	128	86.7	1½	94.1	122	90.3
1¼	1	25.6	97.3	79.9	1	50.8	111	82.5	1	80.5	126	84.6	1	112	141	86.2	1½	106	123	91.2
1½	1	26.3	95.8	82.0	1	52.3	108	84.4	1	81.3	122	86.2	1	113	135	87.7	1½	118	128	91.4
2	1	30.7	96.2	83.3	1	58.0	109	85.6	1	92.6	123	87.3	1	128	136	88.7	1½	133	128	92.1
2½	1	34.8	96.8	83.8	1	67.5	110	86.1	1	106	124	87.7	1	149	138	89.1	1½	135	123	93.3
3	1	40.7	97.8	84.3	1	80.3	112	86.4	1	126	127	88.0	1	173	141	89.4	1½	175	133	92.8
4	1	49.0	98.0	85.2	1	95.6	112	87.2	1	149	128	88.7	1	209	143	90.0	1½	210	136	93.2
5	1	60.0	99.0	85.1	1	116	114	87.2	1	182	130	88.8	1	254	146	90.0	1½	251	139	93.4
6	1	71.1	100	84.9	1	139	116	87.1	1½	162	117	91.5	1½	227	129	92.5	2	237	127	94.7
7	1½	57.6	93.9	89.0	1½	114	105	90.7	1½	178	117	91.9	1½	250	129	92.8	2	264	128	94.9
8	1½	64.4	94.2	89.3	1½	127	105	90.8	1½	198	118	92.0	1½	276	130	92.9	2	290	129	95.0
9	1½	70.1	94.6	89.2	1½	139	106	90.8	1½	219	119	91.9	1½	306	131	92.9	2	303	127	95.3
10	1½	74.4	94.1	89.7	1½	147	105	91.2	1½	230	119	92.3	1½	323	130	93.2	2	343	129	95.2
12	1½	86.1	94.3	89.9	1½	170	106	91.4	1½	267	118	92.5	1½	375	130	93.4	2	395	130	95.3
14	1½	89.0	95.4	89.3	1½	196	107	90.9	1½	307	121	92.0	1½	430	134	93.0	2	445	133	95.1
16	1½	115	95.6	89.4	1½	218	108	91.0	1½	345	122	92.1	1½	480	135	93.1	2	500	134	94.5
18	1½	128	95.9	89.5	1½	240	108	91.0	1½	385	122	92.2	1½	540	135	93.1	2	555	135	95.3
20	1½	141	96.3	89.6	1½	271	109	91.1	1½	406	123	92.3	1½	605	136	93.2	2½	510	126	96.1
24	1½	153	96.6	89.7	1½	302	109	91.1	1½	451	124	92.4	1½	652	136	93.2	2½	600	126	96.1

POWER UTILITY

RECOMMENDED THICKNESSES

Pipe Temperature	200°F				300°F				400°F				500°F				600°F			
Temperature Difference	120°F				220°F				320°F				420°F				520°F			
Pipe Size	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	1	50.5	116	81.6	1	70.8	128	83.4	1½	75.2	111	89.9
¾	1	19.7	95.8	76.7	1	38.1	108	80.1	1	60.9	122	82.1	1	85.1	135	84.0	1½	84.8	123	89.2
1	1	20.2	93.6	80.6	1	39.2	104	83.2	1	62.4	117	85.1	1	87.1	128	86.7	1½	94.1	122	90.3
1¼	1	25.6	97.3	79.9	1	50.8	111	82.5	1½	57.5	105	89.0	1½	80.1	113	90.2	1½	106.0	123	91.2
1½	1	26.3	95.8	82.0	1	52.3	108	84.4	1½	64.3	108	89.1	1½	90.1	118	90.3	2	94.8	111	93.1
2	1	30.7	96.2	83.3	1	58.0	109	85.6	1½	72.7	109	90.0	1½	101	118	91.1	2	113	116	93.3
2½	1	34.8	96.8	83.8	1	67.5	110	86.1	1½	74.8	104	91.5	1½	106	113	92.4	2	119	114	94.1
3	1	40.7	97.8	84.3	1	80.3	112	86.4	1½	95.6	112	90.9	1½	134	122	91.9	2	147	120	94.0
4	1	49.0	98.0	85.2	1	95.6	112	87.2	1½	115	113	91.3	1½	161	124	92.3	2	175	123	94.4
5	1	60.0	99.0	85.1	1	116	114	87.2	1½	137	115	91.6	1½	192	126	92.5	2½	175	116	95.4
6	1	71.1	100	84.9	1	139	116	87.1	1½	162	117	91.5	1½	227	129	92.5	2½	203	118	95.5
7	1½	57.6	93.9	89.0	1½	114	105	90.7	1½	178	117	91.9	1½	250	129	92.8	2½	226	119	95.6
8	1½	64.4	94.2	89.3	1½	127	105	90.8	1½	198	118	92.0	1½	276	130	92.9	2½	237	117	95.9
9	1½	70.1	94.6	89.2	1½	139	106	90.8	1½	219	119	91.9	1½	306	131	92.9	2½	260	118	95.9
10	1½	74.4	94.1	89.7	1½	147	105	91.2	1½	230	119	92.3	1½	323	130	93.2	2½	290	120	95.9
12	1½	86.1	94.3	89.9	1½	170	106	91.4	1½	267	118	92.5	1½	375	130	93.4	2½	339	122	96.0
14	1½	89.0	95.4	89.3	1½	196	107	90.9	2	243	112	93.7	2	340	122	94.5	3	323	116	96.5
16	1½	115	95.6	89.4	1½	218	108	91.0	2	272	112	93.8	2	380	122	94.5	3	360	117	96.1
18	1½	128	95.9	89.5	1½	240	108	91.0	2	301	113	93.9	2	420	123	94.6	3	400	118	96.6
20	1½	141	96.3	89.6	1½	271	109	91.1	2	335	113	93.9	2	468	124	94.6	3	439	118	96.6
24	1½	153	96.6	89.7	1½	302	109	91.1	2	398	114	93.8	2	560	125	94.6	3	517	119	96.7

RT = Recommended Thickness. HL = Heat Loss. ST = Surface Temperature. E = Efficiency.

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—UNIBESTOS

700°F				800°F				900°F				1000°F				1100°F				1200°F			
620°F				720°F				820°F				920°F				1020°F				1120°F			
RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E
1	119	149	86.5	1½	116	134	90.3	1½	140	143	91.1	2	146	135	92.8	2	171	142	93.5	2	196	150	94.0
1½	107	133	90.1	1½	130	142	91.1	1½	159	151	91.9	2	165	141	93.5	2	193	149	94.1	2½	189	134	95.4
1½	118	131	91.2	2	126	125	93.1	2	149	133	93.8	2½	157	127	95.0	2½	185	133	95.4	2½	212	140	95.8
1½	133	132	92.1	2	150	133	93.5	2	181	141	94.1	2½	186	134	95.3	2½	217	141	95.7	3	228	136	96.4
1½	150	138	92.2	2	146	125	94.4	2	176	132	94.9	2½	185	128	95.9	2½	214	134	96.3	3	229	131	96.8
1½	169	138	92.9	2	174	132	94.6	2	210	140	95.1	2½	216	135	96.1	2½	253	142	96.5	3	265	139	97.1
1½	172	132	94.0	2	182	125	95.3	2	221	136	95.7	2½	231	133	96.6	2½	269	139	96.9	3	282	137	97.4
1½	221	144	93.5	2	227	139	95.1	2	274	148	95.6	2½	279	142	96.6	2½	326	150	96.9	3	335	146	97.5
1½	268	147	93.9	2	270	142	95.5	2	325	151	95.9	3	291	134	97.2	3	338	141	97.5	3½	354	139	97.9
1½	318	150	94.1	2½	270	133	96.3	2½	322	141	96.7	3	338	138	97.4	3	394	145	97.6	3½	400	141	98.1
2	299	137	95.3	2½	313	135	96.4	2½	376	143	96.8	3	389	141	97.4	3	453	148	97.7	3½	451	142	98.2
2	333	138	95.4	2½	346	136	96.5	2½	419	145	96.9	3½	380	132	97.8	3½	443	139	98.0	3½	508	147	98.2
2	366	139	95.5	2½	365	134	96.7	2½	438	142	97.1	3½	416	134	97.9	3½	484	140	98.1	4	510	140	98.4
2	385	137	95.8	2½	400	135	96.8	2½	483	144	97.1	3½	446	134	98.0	3½	520	141	98.2	4	537	139	98.5
2	435	140	95.7	2½	450	138	96.8	2½	541	147	97.1	3½	498	137	97.9	3½	579	144	98.2	4	601	143	98.5
2	500	141	95.8	2½	520	140	96.8	2½	629	149	97.1	3½	568	138	98.0	3½	661	145	98.2	4	684	145	98.5
2	565	144	95.7	3	498	133	97.2	3	600	141	97.5	3½	622	141	98.0	3½	724	148	98.2	4½	685	140	98.7
2	635	145	95.7	3	556	134	97.3	3	669	142	97.5	4	623	134	98.3	4	725	141	98.4	4½	758	141	98.7
2	705	146	95.8	3	616	135	97.3	3	742	143	97.6	4	690	135	98.3	4	803	142	98.5	5	771	136	98.8
2½	649	135	96.5	3	678	135	97.3	3	815	144	97.6	4	755	136	98.3	4	880	143	98.5	5	843	137	98.8
2½	761	136	96.5	3	797	136	97.4	3	959	145	97.6	4	879	137	98.3	4	1024	144	98.5	5	980	139	98.9

—UNIBESTOS

700°F				800°F				900°F				1000°F				1100°F				1200°F			
620°F				720°F				820°F				920°F				1020°F				1120°F			
RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E	RT	HL	ST	E
1½	94.6	125	89.2	2	104	119	91.3	2	125	128	92.1	2½	127	117	93.8	2½	148	123	94.3	3	160	121	95.1
1½	107	133	90.1	2	117	126	92.1	2	141	133	92.8	2½	142	122	94.4	2½	165	127	94.9	3	176	125	95.7
1½	118	131	91.2	2	126	125	93.1	2	151	132	93.8	3	147	118	95.3	3	172	123	95.7	3	197	129	96.1
2	123	124	92.8	2½	132	120	94.2	2½	159	127	94.8	3	170	124	95.7	3	198	130	96.1	3½	211	127	96.7
2	120	117	93.7	2½	132	116	95.0	2½	158	121	95.4	3	171	120	96.2	3	199	125	96.6	3½	213	124	97.1
2	142	123	94.0	2½	154	121	95.2	2½	186	128	95.7	3	198	126	96.4	3	231	132	96.8	4	229	122	97.5
2	150	120	94.7	2½	164	119	95.8	2½	197	125	96.2	3	211	124	96.9	3	246	130	97.1	4	245	122	97.7
2	186	128	94.6	3	178	119	96.2	3	214	125	96.6	3½	227	125	97.2	3½	265	129	97.5	4	282	128	97.9
2	220	132	95.0	3	206	120	96.6	3	248	127	96.9	3½	263	126	97.4	3½	309	132	97.7	4½	312	126	98.2
2½	220	123	95.9	3	240	123	96.7	3	289	130	97.0	4	276	121	97.8	4	320	126	98.0	4½	353	129	98.3
2½	256	126	96.0	3½	241	117	97.2	3½	288	123	97.5	4	316	124	97.9	4	368	130	98.1	5	372	126	98.5
2½	284	127	96.1	3½	270	119	97.3	3½	324	125	97.6	4½	328	121	98.1	4½	381	126	98.3	5	408	127	98.6
2½	302	125	96.4	3½	295	120	97.4	3½	355	126	97.6	4½	356	122	98.2	4½	415	128	98.4	5½	416	124	98.7
2½	329	126	96.4	3½	316	120	97.5	3½	381	126	97.7	4½	386	124	98.2	4½	450	129	98.4	5½	450	125	98.7
2½	366	128	96.4	3½	353	122	97.5	3½	424	129	97.7	4½	420	125	98.3	4½	488	130	98.4	5½	484	126	98.8
2½	427	130	96.4	4	364	118	97.8	4	437	124	98.0	5	441	122	98.5	5	514	127	98.6	5½	550	128	98.8
3	407	123	96.9	4	398	120	97.8	4	478	126	98.0	5	473	123	98.5	5	551	127	98.6	5½	589	129	98.9
3	456	125	96.9	4	443	121	97.8	4	532	127	98.1	5	525	123	98.5	5	612	129	98.7	5½	650	130	98.9
3	503	126	97.0	4	440	121	97.9	4	589	127	98.1	5½	535	120	98.7	5½	624	125	98.8	5½	716	131	98.9
3	555	126	97.0	4	535	122	97.9	4	643	128	98.1	5½	585	122	98.7	5½	681	125	98.8	5½	781	132	98.9
3	650	127	97.0	4½	565	118	98.1	4½	681	124	98.3	5½	678	122	98.7	5½	789	127	98.9	5½	904	133	99.0

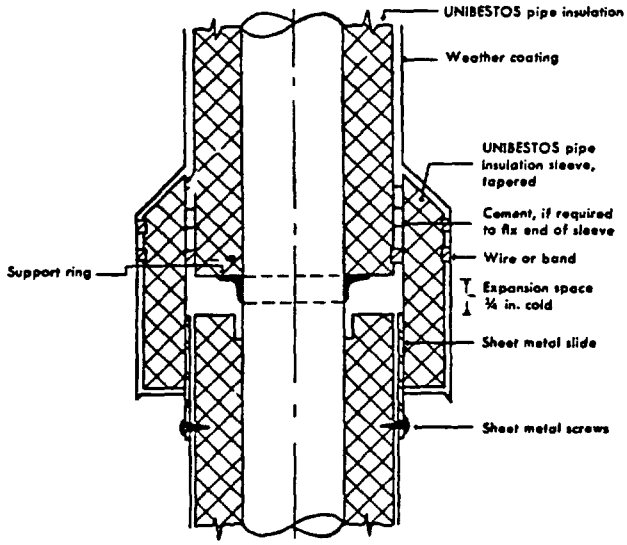
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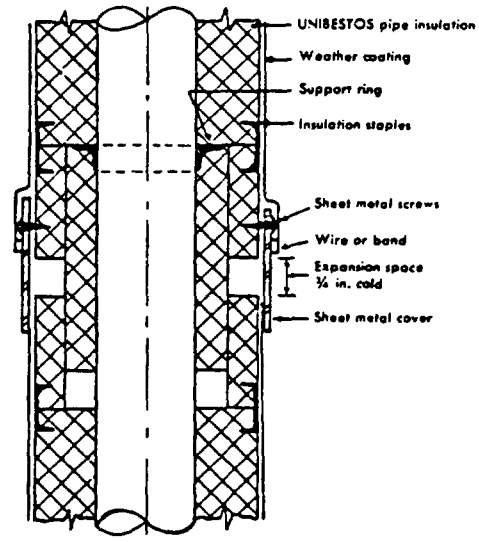
Expansion joints and fitting covers are easy to fabricate on the job. Typical expansion joints and fitting coverings are shown on these two pages; the number and spacing of expansion joints can be determined from the table at right.

EXPANSION CONTROL

Operating Temp. F.	Linear Expansion of Pipe per 100 Ft.	Expansion Joint Spacing	Average Expansion Per Joint
1000	9.4"	12'	One Inch
950	8.8"	12'	One Inch
900	8.3"	12'	One Inch
850	7.7"	15'	One Inch
800	7.3"	15'	One Inch
750	6.7"	15'	One Inch
700	6.2"	18'	One Inch
650	5.7"	18'	One Inch
600	5.3"	18'	One Inch
550	4.7"	21'	One Inch
500	4.3"	21'	One Inch

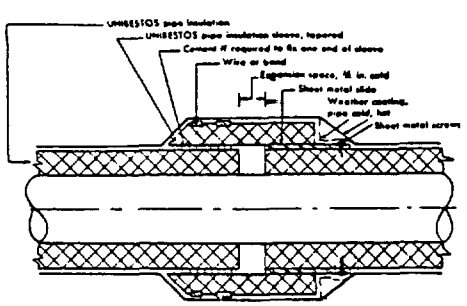


Vertical Type Expansion Joint

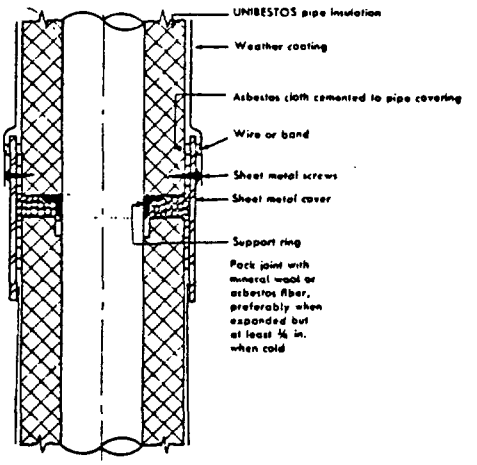


Vertical Type Expansion Joint

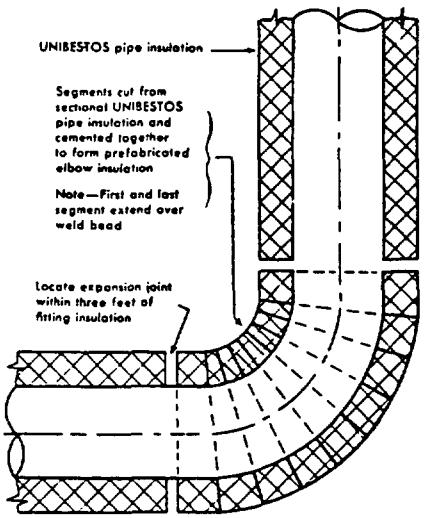
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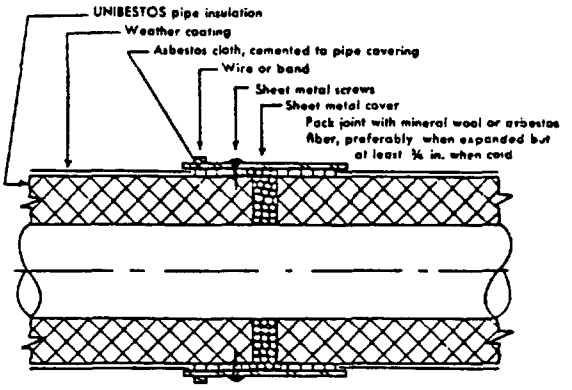
Horizontal Type Expansion Joint



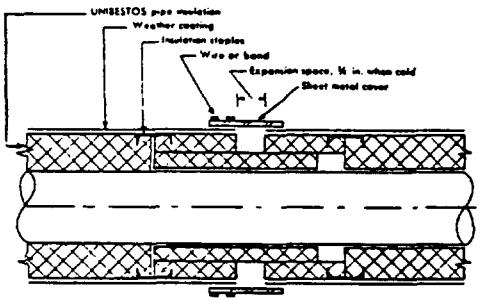
Vertical Type Expansion Joint
(Suitable where expansion is about one inch)



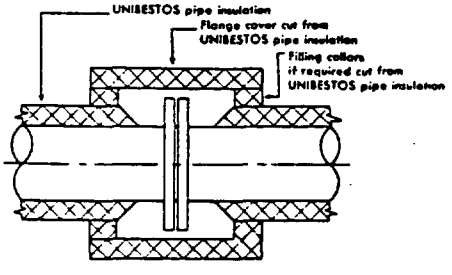
Prefabricated Insulation for Pipe Bend



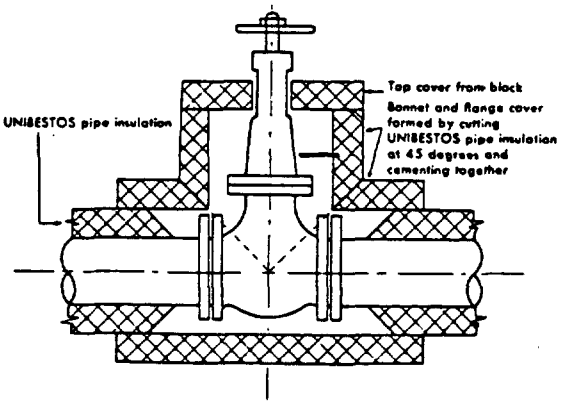
Horizontal Type Expansion Joint
(Suitable where expansion is about one inch)



Horizontal Type Expansion Joint



Flange Insulation



High Temperature Flanged Valve Insulation

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TYPICAL SPECIFICATION FOR UNIBESTOS

1. Temperature Range. UNIBESTOS shall be used on piping operating from +100°F. to +1200°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" Pipe Size 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 of the 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.

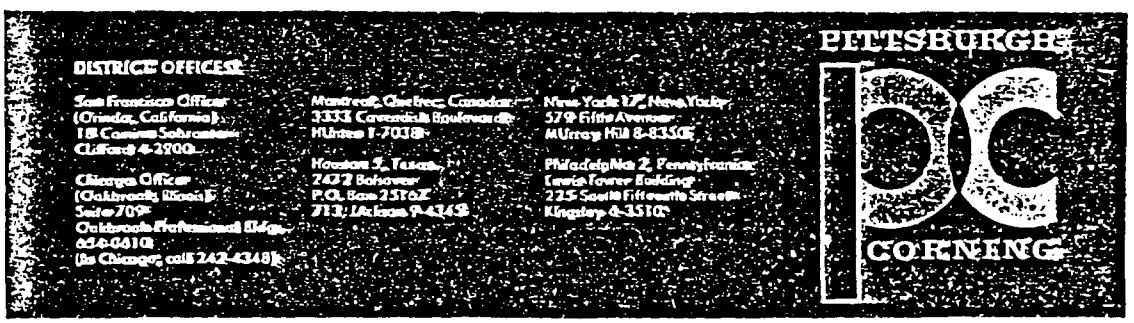
Note: The above specifications are general in nature and final specifications shall meet with the approval of the design engineer.

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 the high temperature installations.

Call or write your nearest Pittsburgh Corning District office listed below for the name of your local authorized UNIBESTOS distributor.

Pittsburgh Corning Corporation, One Gateway Center, Pittsburgh 22, Pennsylvania—261-2900.



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