UNION CARBIDE THE DISCOVERY COMPANY

PLAINTIFF'S EXHIBIT
UC-1052

Resin-Grade 144 Asbestos

~ in Epoxy Systems

- Effective, low-cost thickening agent and thixotrope for epoxy resin systems
- Imparts excellent aging characteristics to epoxy resin systems
- Effective with amine hardeners

KMX 02078

Typical physical properties

Specific Gravity	2.45
Moisture Content, % by wt.	2.0, maximum
Surface Area, sq. meters per gram	60, appr.
Reflectance, G. E. Brightness	72-76
Nature of Surface Charge	Electropositive (cationic)
pH in Water	9.5
Bulking Value, gallons per 100 lb.	4.8
Oil Absorption (DOP), pounds per 100 lb.	120
Refractive Index, n_D 25° C.	1.54-1.56
Wet Bulk Density in Water, ml.	
as received, 20 g. per liter; 3-hr. settling	700
after dispersion, 2 g. per liter; 1-hr. settling	900-1,000
Dry Bulk Density, lb. per cubic foot	4
Shipping Density, lb. per cubic foot	12-14
Standard Package Weight, lb.	35

Resin and amine hardener evaluation

METHOD OF INCORPORATING THE THIXOTROPE:

In preparing the test samples used in determining data for Tables 1, 2 and 3, the thixotrope—Resin-Grade 144 Asbestos—was added to the liquid resin or hardener at 25°C. and dispersed in a "Cowles" Dissolver at 2400 rpm. for 5 minutes.

VISCOSITY MEASUREMENTS:

Viscosities of the prepared test samples were measured on a Brookfield Model RVF Viscometer at 2 and 20 rpm.

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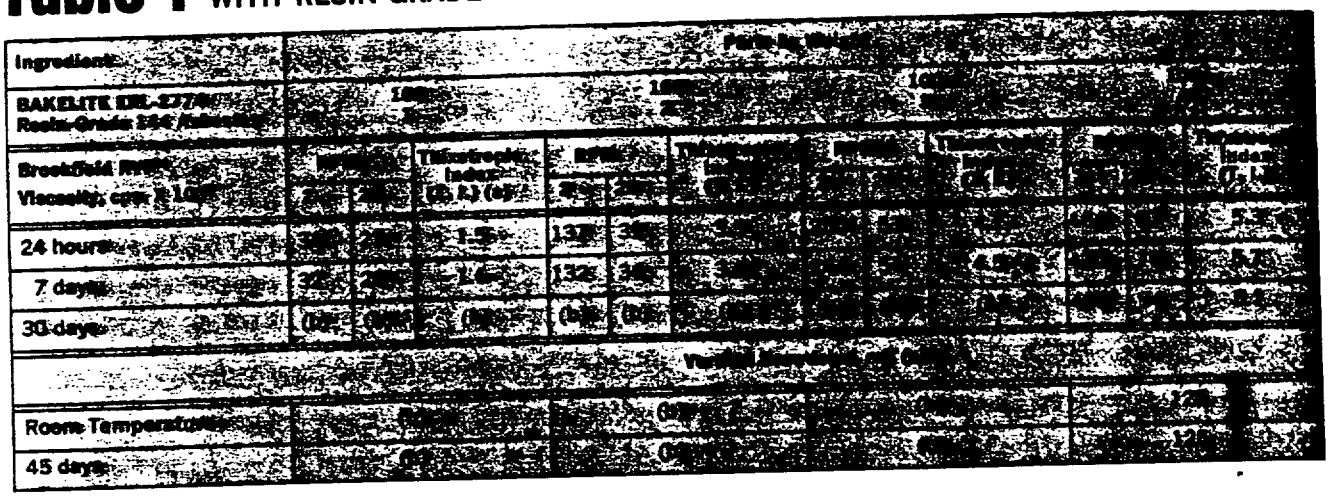
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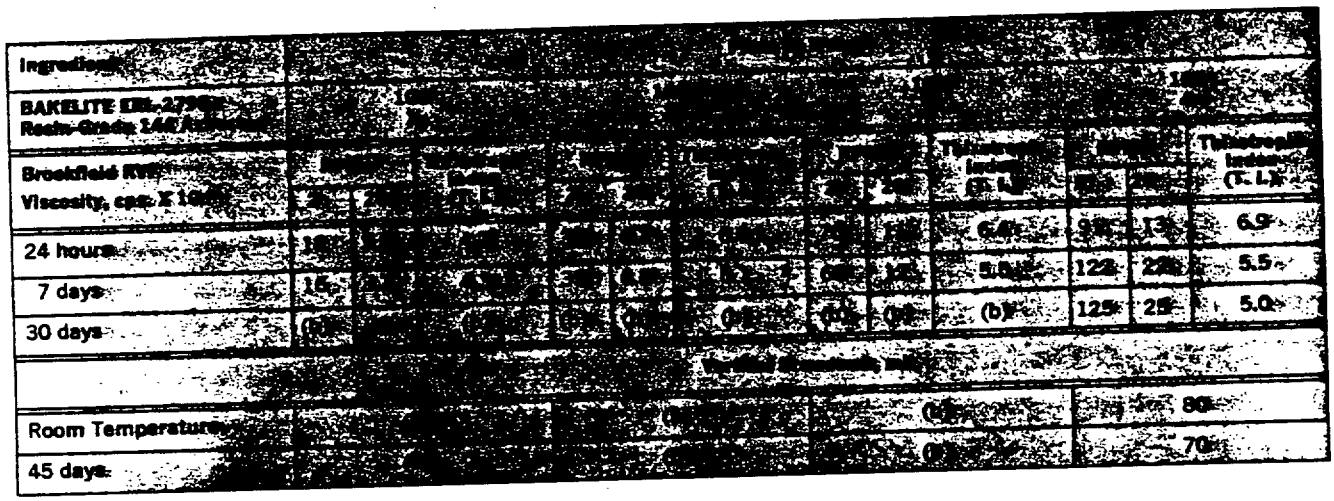
This folder is printed on Glatfelter Old Forge Opaque Offset, vellum finish, paper containing Asbestos T-135. Note the high opacity and brightness of the paper. Asbestos T-135 is one of UNION CARBIDE's specialty asbestos products for the paper industry.

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Table 1 shows performance data of bisphenol-based resins, BAKELITE ERL-2774 and ERL-2795, with up to 4 PHR. of Resin-Grade 144 Asbestos. Vertical drawdown was excellent, and even higher asbestos loading should result in even higher vertical drawdown.

Table 1 THICKENING OF BISPHENOL-BASED RESINS WITH RESIN-GRADE 144 ASBESTOS





(a) Thixotropic Index (T. I.) = $\frac{\text{viscosity at 2 rpm.}}{\text{viscosity at 20 rpm.}}$

(b) Not run.

(c) Vertical Drawdown: A 2-inch wide drawdown was made on a horizontal sandblasted steel panel. The panel was immediately raised to a vertical position and any sag noted. If no sag occurred in 10 minutes, the procedure was repeated and the thickness increased until sagging occurred.

Table 2 presents data that show the effectiveness of Resin-Grade 144 Asbestos as a thickener of several types of BAKELITE amine hardeners. Generally, other thickeners are not effective with amine hardeners.

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UNION CARBIDE CORPORATION
ASBESTOS
270 PARK AVENUE, NEW YORK, N. Y. 10017

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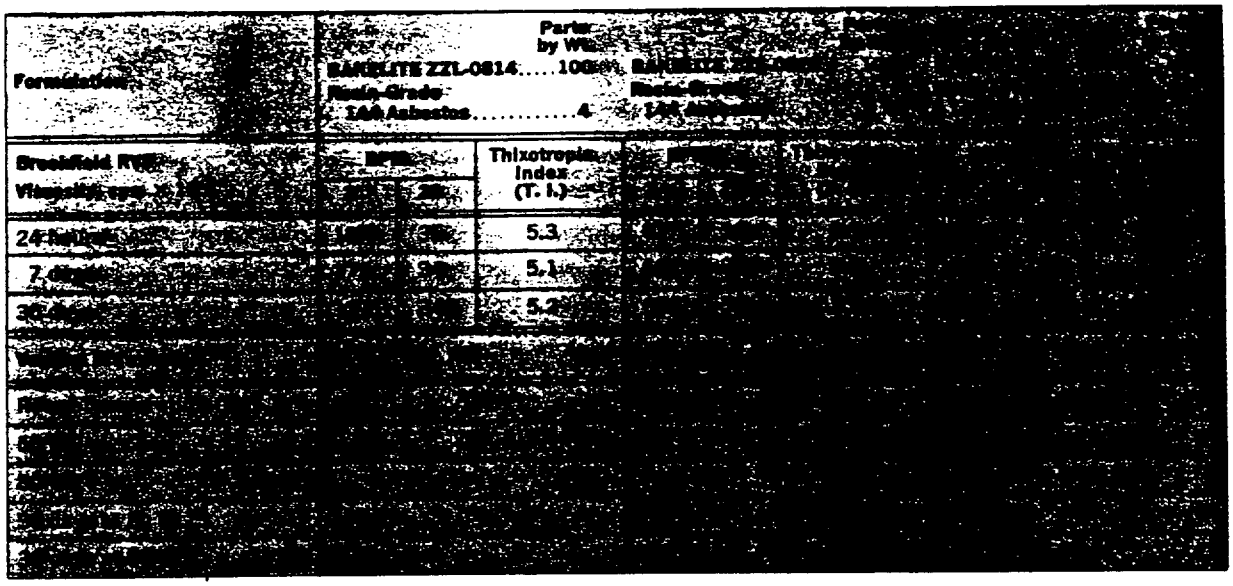
UNION CARBIDE Resin-Grade 144 Asbestos ~ in Epoxy Systems

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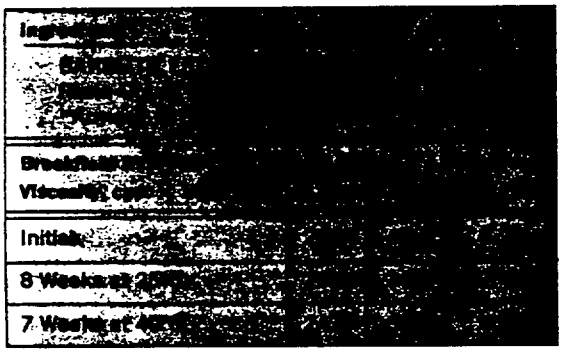
Table 2 THICKENING OF AMINE HARDENERS WITH RESIN-GRADE 144 ASBESTOS



Formulation	Parts by Wt.		
	BAKELITE ZZL-0814	100	
	Resin-Grade 144 Asbestos	4	
Brookfield RVT Viscosity, cps	RPM	Thixotropic Index (T. I.)	
24 hrs.		5.3	
7 days		5.1	
30 days		5.2	

Table 3 shows the thickening of a low-viscosity, cyclo-aliphatic epoxide, BAKELITE ERL-4221, with Resin-Grade 144 Asbestos and "Armac" C, a long chain aliphatic amine salt. BAKELITE ERL-4221 is the exception that requires an amine salt to be used with Resin-Grade 144 Asbestos for viscosity build-up or thixotropic stabilization.

Table 3 THICKENING OF A LOW-VISCOSITY, CYCLO-ALIPHATIC EPOXIDE WITH RESIN-GRADE 144 ASBESTOS AND "Armac" C



Ingredients	
Brookfield RVT Viscosity, cps	
Initial	
8 Weeks at 25°C	
7 Weeks at 40°C	

Systems evaluation

BAKELITE ERL-2774/ZZL-0814

With a Resin-Grade 144 Asbestos loading of 4 per cent on both resin and hardener, it was possible to hold a 70-mil thickness at room temperature. Higher loadings on the amine should result in much higher vertical drawdown.

BAKELITE ERL-2774/ZZL-0820

A 4-per cent loading of Resin-Grade 144 Asbestos resulted in a 40-mil thickness that did not sag within 40 minutes at 80°C. The system was gelled at that time.

BAKELITE ERL-2774/ZZL-0854

With a 4-per cent loading of Resin-Grade 144 Asbestos, it was possible to hold a 40-mil thickness at 80°C. until gelled (65 minutes).

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Predetermined amount of adhesive is applied to specific locations on road surface with truck-mounted meter-mix and dispense equipment. The thixotropic properties of resin-grade asbestos keep adhesive viscosity constant, assuring no runoff during application. (right): Button marker is hand applied on the prepared spot.

Improved "Glue" Puts Traffic Buttons In Place

IN California, pavement markers are installed on most state highways in accordance with a state law designed to replace line striping, the raised markers are used to delineate traffic lanes, especially at night and during wet weather. Since every ninth marker is reflectorized, lane differentiation is accomplished primarily by visual means. The raised markers also give an audible sound as the vehicle rides over them.

An average of 30 grams of adhesive is used per button, but the amount varies depending upon marker shape—round or square—and on the type and condition of the pavement. Although about 3 million button markers will be applied in 1968, the program will continue for several more years before all California roads will be equipped.

All adhesives used are pre-tested by the Highway Division's test laboratory, placed in specific inventory, and released to contractors by state inspectors at the time of application. In many instances, storage time is quite extensive, sometimes under temperatures that reach 115 deg. F. or higher. Under these circumstances, the viscosity and thixotropy achieved by the use of colloidal silica in the "A" or epoxy resin component is unstable and loss is excessive and quite rapid. When this instability occurred it resulted in adhesive rejects or in critical runoff during application that left insufficient resin to assure a proper bond.

To improve these characteristics, the state highway division sought a thixotrope that would extend shelf life without any effect on adhesive performance or structural strength.

After testing several different materials, the laboratory found that a resin-grade asbestos, such as Union Carbide Corporation's Calidria Asbestos, Type R-G 144, could do the job.

The asbestos also proved less costly than other thixotropes, with an average reduction of about 60 to 70 cents per pound. Processing costs also are lower because comparatively smaller amounts of asbestos are required. In addition, resin-grade asbestos is easier to store, handle and disperse. Its excellent shear strength eliminated the need for polar additives. ■

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UNION CARBIDE CORPORATION
CHEMICALS & PLASTICS
P. O. BOX 'K' – KING CITY, CA. 93930

UNION CARBIDE THE DISCOVERY COMPANY

Calidria ASBESTOS

RESIN-GRADE 144

Union Carbide's R-G 144 Asbestos is a highly refined, purified chrysotile asbestos. There are about 1 x 10^{14} colloidal fibrils per gram of R-G 144. For this reason R-G 144 is an effective low cost thickening agent for liquid resins. Because of the favorable aspect ratio (ca. 200:1) of the fibrils, they perform well as mineral reinforcing whiskers in resin systems. The physical characteristics of R-G 144 are shown below.

Typical Physical Characteristics

Specific Gravity	2.45
Moisture Content, % by Wt.	2.0 max.
Surface Area, Sq. meters per gram	60 approx.
Reflectance, G.E. Brightness	72-76
Nature of Surface Charge	Electropositive (Cationic)
pH in Water (2% slurry)	9.0
Bulking Value, gal./100 lb.	4.8
Oil Absorption (DOP) lb./100 lb.	120
Refractive Index, n_d 25°C	1.54-1.56
Aspect Ratio (Average L/D)	200:1
Tensile Strength, psi*	824,000 max. (281,000-436,000)
Tensile Modulus, psi*	23.2 x 10^6
Dry Bulk Density, lb./cu. ft (fully aerated)	4
Shipping Density, lb./cu. ft.	12-14
Standard Pallet Weight, lb.	1400

Chrysotile is one of a group of six different asbestiform minerals. It is a tubular, hydrated magnesium silicate ($Mg_6(OH)_8Si_4O_{10}$) and accounts for 90% of all asbestos currently used in the United States. (Most of which is mined and processed in Canada and is known, consequently, as Canadian Chrysotile.)

Canadian chrysotile normally occurs as a cross fiber in serpentine rock. It is refined by crushing with subsequent air separation from large quantities of waste rock and is graded according to Fiber length; from Grade 3 (the longest) to Grade 7.

*1968 Modern Plastics Encyclopedia, p. 594

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R-G 144 differs from conventional chrysotile because of the unusual morphology of the massive California deposit from which it is mined and the exclusive hydraulic process by which it is refined. R-G 144 contains more than 98% chrysotile fiber and less than 0.7% magnetite. R-G 144 is also unique because it contains a higher concentration of fully liberated asbestos fibrils (whiskers) than any other chrysotile product.

CALIDRIA R-G 144, because of its unusual purity, high concentration of liberated fibrils, and controlled moisture content is recommended for use in superior products in the following areas of application.

For Viscosity Control

1. Vinyl plastisols
2. Asphaltic sealants and mastics
3. Polysulfide sealants
4. Epoxy adhesives and encapsulating compounds
5. Butyl rubber sealants
6. Polyester premixes
7. Casein adhesives

For Whisker Reinforcement

1. Rigid vinyls (with excellent see-through)
2. Nylon molding compounds
3. Polysulfone compounds
4. Polyethylene compounds

To obtain samples and additional information on CALIDRIA asbestos, contact your nearest Union Carbide Sales Office.

12-13-68

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UNION CARBIDE THE DISCOVERY COMPANY

Price Schedule
Continental United States

Sheet No. CA2-001
Date - 7/1/68
Supersedes - 12/1/67

Calidria ASBESTOS

Resin-Grade 144

Resin-Grade 144 - An effective viscosity control agent for epoxy adhesives, mastics and sealants.

Net Prices - Cents per lb.			
Shipping Points	Ordering Quantity		
	Carload	Less than Carload to 1400 Lbs.	Less than 1400 Lbs.
King City, Calif.	10.0*	11.5	15.0
Atlanta, Ga.	-	13.5	17.0
Cleveland, Ohio	-	13.5	17.0
Columbus, Ohio	-	13.25	16.75
Detroit, Michigan	-	13.25	16.75
Hackensack, N.J.	-	13.0	16.5
Hammond, Ind.	-	13.0	16.5
Oakland, Calif.	-	12.0	15.5
Portland, Oregon	-	12.75	16.25
Torrance, Calif.	-	12.0	15.5

KMX 02078 H

*Truckload quantities available at carload price from King City Plant only.

Payment Terms - Net 10th Proximo
Shipping Terms - FOB Shipping Point
Minimum Order Quantity - $25.00

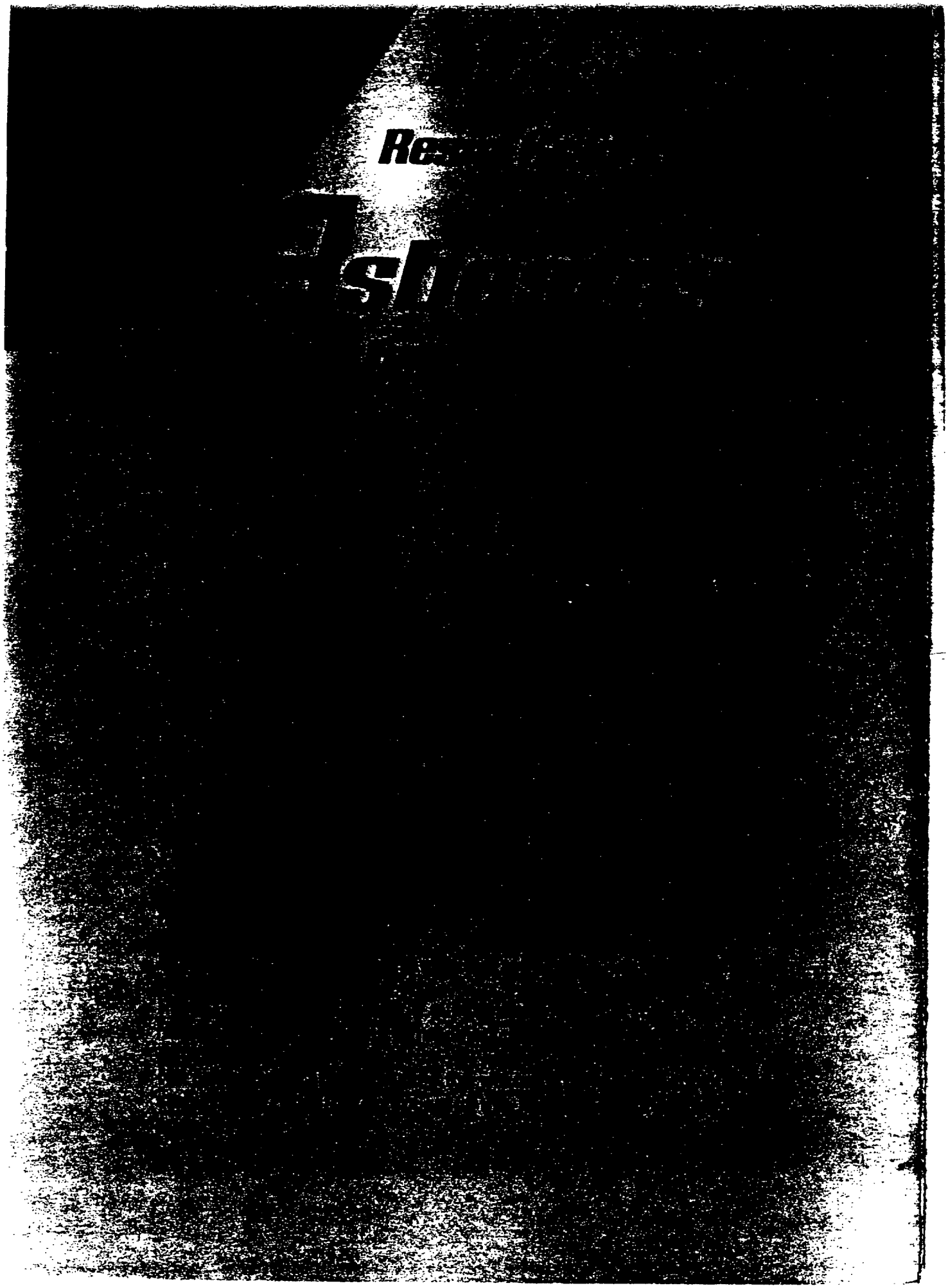
Packaging Information
One Package - 35 lbs.
Pallet Wt. - 1400 lbs.

R-G 144 is packaged with a sealed polyethylene overwrap.

Combined Shipments - Shipments of a pallet or more of CALIDRIA Asbestos Products are always combinable with other CALIDRIA Products of a pallet or more for total quantity price, but less than pallet quantities may not be combined for total quantity price.

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