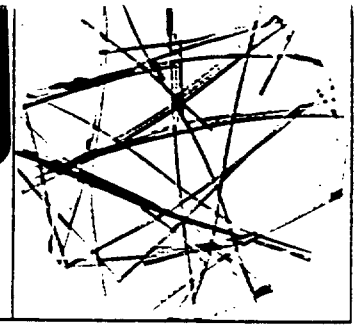
ASBESTOS

INFORMATION

PLAINTIFF'S EXHIBIT

UC-897



UNION CARBIDE HIGH-PURITY ASBESTOS

A NEW FIBROUS FILLER AND RETENTION AID

FOR PAPERBOARD

PROVIDES

IN TOP LINER—

- Opacity
- Pigment Retention
- Improved Formation
- Reduced Underliner Show-Through
- Cost Savings

PLUS

Improved Printability

Surface Flexibility and Toughness

For Improved Folding

SEE ATTACHED MILL TRIAL DATA

A05307

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APPLICATION—BOARD MILL EVALUATION

TOP LINER OF 22 PT. FOLDING BOXBOARD

Purpose of Trial:

1. Improve Titanium Dioxide Retention
2. Reduce stream pollution
3. Improve surface coverage or reduce underliner show-through.

Type of Paper Machine: An 8-cylinder Board Machine with 120" of effective trim.
Production Rate: 165 tons per day Machine Speed: 270 ft./min.
Basis Weight: 85 lbs./1000 Ft.^{2} or 255 lbs./3000 Ft.^{2}

Top Liner Furnish: (All waste papers)	Top Liner Furnish with Asbestos:
50% Blank (unprinted Newsprint) News	no change
29% Hard White Envelope Clippings	no change
21% Bleached Sulfate Cuttings	no change

Chemical and Color Additives:	Chemical and Color Additives:
1% TiO_2 (25¢/lb.)	1% TiO_2*
1% Mer-Size	no change
1% Natural Gum	no change
0.5% Sodium Aluminate	no change
pH 5.8 with Alum.	no change
6% Luster Clay (3¢/lb.) (reduced 3% with 3% asbestos added)	3% Asbestos added
3 oz. Paper Blue R.	no change

* Not needed with asbestos; see comments below.

Material Savings and quality gains associated with the use of asbestos:

I. Improved Brightness:

% Asbestos	0	2	3
Top Liner Brightness	65	66	67
Basis Weight (Lbs./1000 Ft.^{2})	85.5	85.1	85.4

II. Surface coverage improvement and reduced underliner show through was apparent to the Technical Superintendent and stated to be a very important quality gain.

III. The customer stated that shade was much better with the asbestos; getting away from their characteristic "tattle-tale" grey appearance.

IV. The brightness levels obtained with improved retention due to asbestos would, without question according to the Technical Superintendent, allow the elimination of the 1% TiO_2. The top liner represents 2500 lbs. per hour or 25 lbs./hr. of TiO_2. At 25¢/lb., 600 lbs. of TiO_2 per day would yield $150/day savings. Since 3¢/lb. luster clay was replaced pound for pound with asbestos, the actual cost of the asbestos use would be about 2¢/lb. or $36/day leaving this Paper Mill a daily savings of $114 or with the 22 pt. Folding Box Board being produced on this one machine 100 days per year *annual savings would be $11,400 per year.*

V. Top liner vat overflow to the sewer was reduced to coincide with the use of 3% asbestos yielding an estimated savings of $310 per day of *$31,000 annually.*

VI. These savings are significant. They are enhanced by improvement in the bending characteristics of heavier board brought about by the flexibility effects of asbestos.

A05908

APPLICATION

IMPROVING BOARD TOP LINER

TYPE BOARD: 33 pt. — 120 lb./1000 Ft.^{2} WHITE VAT LINED CHIP

Purpose of Application:

1. Improve top liner appearance and reduce show-through
2. Improve top liner brightness
3. Improve smoothness
4. Improve printing characteristics

Type of Paper Machine: 5 cylinder machine producing 40 tons per day. These results would apply to many high tonnage machines producing the same grade of board.

Asbestos Used: High Purity at the 1% addition level

Furnish for Top Liner:		
	Tabulating Stock	42%
	Kraft	52%
	Clay	5%
	Size (Rosin)	0.3%
	Alum	0.7%

System pH 4.5

RESULTS OBTAINED FROM THIS APPLICATION OF HIGH PURITY ASBESTOS

I. *SHOW-THROUGH REDUCTION OR TOP LINER FORMATION IMPROVEMENT* was visually apparent. Using the top liner brightness divided by the bottom liner brightness as an indication of reduced show-through indicated a 20% improvement.

II. Brightness of the top liner was improved 4 points (62.5 increased to 66.5 with the asbestos present).

III. Smoothness (Sheffield) of the top liner was improved 16%.

IV. The board samples containing the asbestos gave improved Vanceometer readings indicating better printability. Better printability should also be expected with the improved brightness, smoothness, reduced show-through and improved uniformity.

This manufacturer continues to use High Purity Asbestos as a result of this work. Substantial quality gain permits the producer to reduce the weight of top liner with accompanying savings.

A0596

INFORMATION ON UNION CARBIDE ASBESTOS BUSINESS

THE UNION CARBIDE "CALIDRIA" ASBESTOS BUSINESS

(J. L. Myers 5/1/79, Rev. 7/11/79)

In 1957 a Union Carbide exploration geologist was in central California looking for nickel or other metallic mineral deposits which could be of value to the Corporation. He took note of a peculiar white, leathery mineral which was eventually determined to be chrysotile asbestos in a unique physical form. Exploration activities were centered in the nearly town of Coalinga, and the deposits have become known as Coalinga Asbestos.

Asbestos (from a Greek word meaning non-burning) is a commercial term applied to several fibrous metal silicate minerals which are fire-proof and capable of being processed into flexible fibers. There are six varieties of asbestos which are divided into two groups, serpentine and amphibole, based on their crystal structure (Att. 1). Chrysotile is the only member of the serpentine group while the amphiboles include crocidolite, amosite, anthophyllite, tremolite and actinolite.

Chrysotile accounts for over 95% of world consumption; and, of the amphiboles, only crocidolite and amosite have any commercial significance. Sources and general uses of the three varieties are shown in Att. 2; and Att. 3 summarizes comparative data for them.

Based on epidemiological and other data, many medical and scientific authorities agree that crocidolite and amosite are more harmful to human health than chrysotile. Although U.S. regulations do not reflect this, the UK and other countries have severely restricted the use of crocidolite and amosite.

Chrysotile has several characteristics which are responsible for its widespread usage in over 3000 applications: worldwide availability, positive surface charge, flexibility, softness, high tensile strength (see Att. 4). Chrysotile occurs only in serpentine (California's official State Rock), which is a fine-grain rock composed almost entirely of hydrous magnesium silicate minerals similar to chrysotile in composition. Canada is the free world's largest producer of chrysotile asbestos, and supplies about 90% of the U.S. asbestos requirements.

The Canadian and most other deposits of serpentine contain chrysotile in cross-fiber veins that are rarely more than half an inch thick. A typical ore contains only 6-10% fiber, of random lengths and tightly bonded together in a parallel configuration (see Att. 5). The Coalinga Asbestos deposit bears little resemblance to other serpentine bodies found throughout the world since most of the mass has been highly sheared and pulverized by nature. It consists of soft, friable sheets and clumps of asbestos fibers, and the only other known ore body of this type is the Stragari deposit in Yugoslavia. In contrast to the cross-fiber arrangement of conventional ores, the Coalinga deposit occurs as a swirling mesh of disoriented fibers (see Att. 6). Each fiber or fiber bundle is only in point contact with its neighbor, and the fiber content ranges from 50-60%.

The Coalinga deposit is located in the southern part of the Diablo Mountain range, in Fresno and San Benito Counties (see Att. 7). It is in what is known

A03554

as the New Idria mining district, which has long been famous as the oldest producing mercury mine (since 1853) in the United States, and is thought to be the largest single mineral deposit in the world. (Union Carbide's trade-name "CALIDRIA" is a combination of "CAL" from California and "IDRIA" from New Idria.) Rich asbestos ore has been found over an area of 40-50 square miles, and to depths of over 500 feet. Conservative estimates indicate that over one hundred million tons of Chrysotile asbestos are available, while Canada's ore reserves have been estimated at less than 50 million tons.

In addition to having a very low fiber content, Canadian ore deposits contain fibers of various lengths, from a few microns up to several inches. These are defined by Canadian screening tests and designated as Grades 3 through 7 (see Att. 8). Conventional Canadian processing techniques include blasting, crushing, grinding and air classifying. A typical Canadian Grade 7 product will contain about 30-40% serpentine rock dust and 60-70% asbestos fibers. Most of the fibers will still be in bundles as shown in Att. 9.

Union Carbide mines the Coalinga ore by conventional open pit methods (see Att. 10). After removing 20 feet or less of overburden, ripper-equipped bull-dozers and self-propelled scrapers are used to remove ore from the deposit. Before hauling the ore 55 miles to the plant near King City, it is screened to minus 3/4-inch. Mining operations are carried out every other year during the dry season (May to October), and ore is delivered to the plant every year during this same period. Mining and hauling are sub-contracted, but supervised by plant personnel.

Union Carbide evaluated various dry processing methods but the best product looked little different than that depicted in Att. 9, and performed very similar to Canadian asbestos. An investment to produce such a product for conventional asbestos applications was not justified. In order to take full advantage of the unique features of the Coalinga ore deposit (summarized in Att. 11), a hydraulic beneficiation process was developed. Conventional mineral processing techniques were combined with the innovative use of special equipment and a plant was designed with three basic systems: rock fiber separation, refining, and special treatment (see Att. 12). This enables production of three basic product categories: fiber, colloidal, and modified, all with liberated fibers as shown in Att. 13.

The semi-works plant (see Att. 14) was started in 1963 and was expanded to its present capacity, except for RG-244, in 1966. The asbestos business was in the Nuclear Division until 1965 when it was transferred to the Metals Division. In an attempt to achieve better market compatibility, and hopefully increased sales, the business was transferred to the Chemicals and Plastics Division (Group I) in 1967. RG-244 was introduced in 1968; and, because of lack of sales growth and no apparent upper management interest, the asbestos business was put up for sale in 1969. It should be noted that considerable losses had been experienced since startup and negative net income was shown through 1970. The asbestos business has never had a good "fit" in the Corporation and probably never will have unless other non-metallic minerals can be developed and marketed by the same group as a separate entity or department.

The business was not sold but it was transferred back to the Metals Division in 1970; and, in 1971, the first positive net income was realized. During 1970 the marketing philosophy was changed from trying to develop new products and

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markets, to selling existing products to conventional asbestos markets and spending a minimum amount of resources on development. Personnel who had been with the business for several years in production and technical capacities were transformed into a sales group which also performed technical and marketing service functions. This group is essentially still intact and the financial performance of the business for the last seven years is shown in Att. 15. A historical summary of the asbestos business is shown in Att. 16.

Although, on paper, the asbestos business conforms to the regular organization of the Metals Division, there are some aspects which, in reality, are considerably different when compared to other Division product lines. There are basically two groups which operate the business: plant production and product marketing. In addition to production, plant personnel also handle order entry, invoicing, shipments (domestic and foreign), inventory control, warehousing and associated responsibilities. In addition to direct sales, marketing personnel handle technical service, orders, health and regulatory matters, product and market development, sales promotion and literature development, international sales and other associated responsibilities which are normally handled by special departments within the Division. There is very close cooperation between plant and marketing personnel with little involvement by New York management. There is obviously some concern over this type of operation but a small business, such as asbestos, can be operated successfully in this manner. (Plant and Marketing organization charts are shown on Att. 17 and 18.)

Union Carbide's asbestos business involves the mining, milling and production of short fiber, high quality asbestos fiber products for world-wide marketing into relatively small segments of various industries. Major tonnage sales are to the vinyl-asbestos floor tile industry and similar applications for short fiber asbestos. "Calidria" asbestos does not compete with non-short fiber asbestos in other markets, which comprise the major share of the asbestos industry. Major dollar sales of our asbestos business are from viscosity control markets where the competition is non-asbestos products. Again, "Calidria" asbestos does not compete with these non-asbestos products in the major share of their markets.

As mentioned earlier, asbestos, especially chrysotile, is mined and produced throughout the world. Att. 19 summarizes the major sources of asbestos.

Apparent consumption of chrysotile asbestos in the U.S. has dropped from a peak of 876,000 tons in 1973 to an estimated 641,000 tons in 1978. Union Carbide is responsible for about 25% of U.S. production and supplies about 3% of total U.S. comsumption (see Att. 20). According to USBM estimates, UCC was responsible for 36% of U.S. production in 1978 and provided 4.1% of total U.S. consumption.

Based on preliminary estimate for 1978, chrysotile was used in the U.S. as shown in Att. 21. This was a typical year and shows that the construction industry continues to use about 63% of the total consumption. The markets in which we are able to at least partially compete with Canadian asbestos are marked and total about 282,000 tons.

Attachment 22 summarizes the domestic applications for various "Calidria" products. As shown in Att. 23, the asbestos industry consumes 95% of tons and

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65% of dollars, while the non-asbestos industry consumes only 5% of tons but provides 35% of sales dollars.

Attachments 24-32 describe how "Calidria" asbestos fits into the potential domestic asbestos and non-asbestos markets as previously described.

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ATT. 1

ASBESTOS - HYDRATED METAL SILICATE

SERPENTINE

CHRYSOTILE

AMPHIBOLE

CROCIDOLITE
AMOSITE
ANTHOPHYLLITE
TREMOLITE
ACTINOLITE

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ATT. 2

GENERAL ASBESTOS INFORMATION - U.S.

	Major Sources	Applications	1978 Estimated U.S. Consumption
Chrysotile	U.S., Canada	cement, tile, friction materials, textiles, plastics, insulation, asphaltics	632,000 T
Crocidolite	So. Africa	reinforcing, insulation	16,500 T
Amosite	So. Africa	insulation, packings	1,500 T
		TOTAL	641,000 T

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COMPARATIVE DATA FOR ASBESTOS MINERALS

	CHRYSOTILE	CROCIDOLITE	AMOSITE
FORMULA	$3MgO \cdot 2SiO_2 \cdot 2H_2O$	$Na_2O \cdot Fe_2O_3 \cdot 3FeO \cdot 8SiO_2 \cdot H_2O$	$1.5MgO \cdot 5.5FeO \cdot 8SiO_2 \cdot H_2O$
COMPOSITION,%			
SiO_2	37-44	49-53	49-53
MgO	39-44	0-3	1-7
FeO	0-6	13-20	34-44
Fe_2O_3	0-5	17-20	-
Al_2O_3	0-2	-	2-9
H_2O	12-15	2-5	2-5
CaO	0-5	-	-
Na_2O	-	4-8	-
$CaO+Na_2O$	-	-	0-3
CRYSTALS	FINE FIBERS	BRITTLE FIBERS	PRISMATIC CRYSTALS
COLOR	GRAY/GREEN	BLUE	GRAY/BROWN
TEXTURE	SOFT/SILKY	HARSH	HARSH
FLEXIBILITY	VERY GOOD	GOOD	GOOD
HARDNESS,Mohs	2.5-4	4	5.5-6
FIBER DIA., °A	180-300	600-900	600-900
TENSILE, Mpsi	800	600	200
SURFACE CHG.	POSITIVE	NEGATIVE	NEGATIVE
RES. TO ACID	POOR	GOOD	GOOD
RES. TO ALK.	GOOD	GOOD	FAIR

SOURCE: MODERN PLASTICS ENCYCLOPEDIA (1972-3), AND ENCYCLOPEDIA OF CHEMICAL TECHNOLOGY, VOLUME 2, P. 136 (1948).

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ATT. 4

ADVANTAGES OF CHRYSOTILE FIBER

WORLDWIDE AVAILABILITY

POSITIVE SURFACE CHARGE

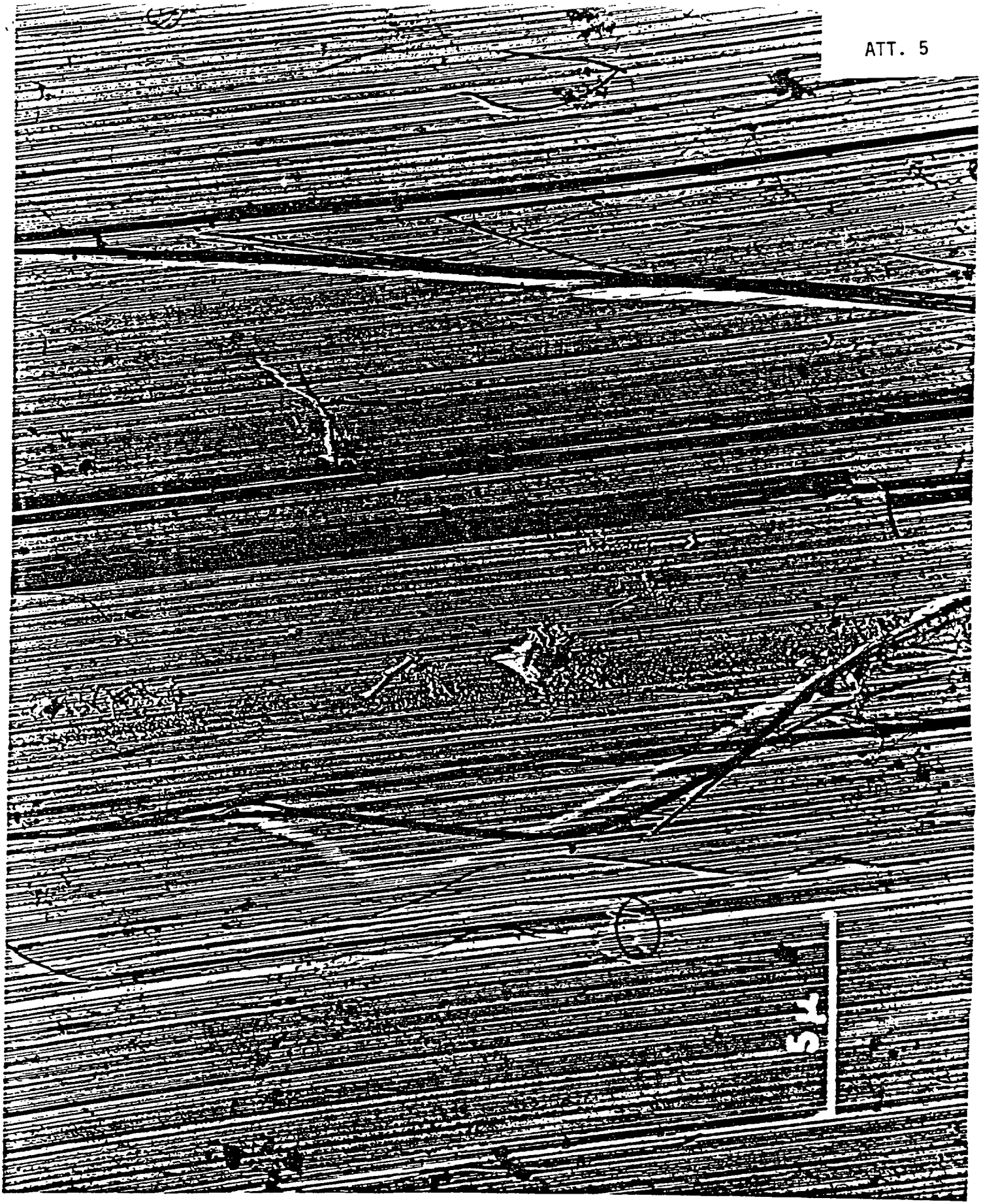
FLEXIBILITY

HIGH TENSILE STRENGTH

SOFTNESS

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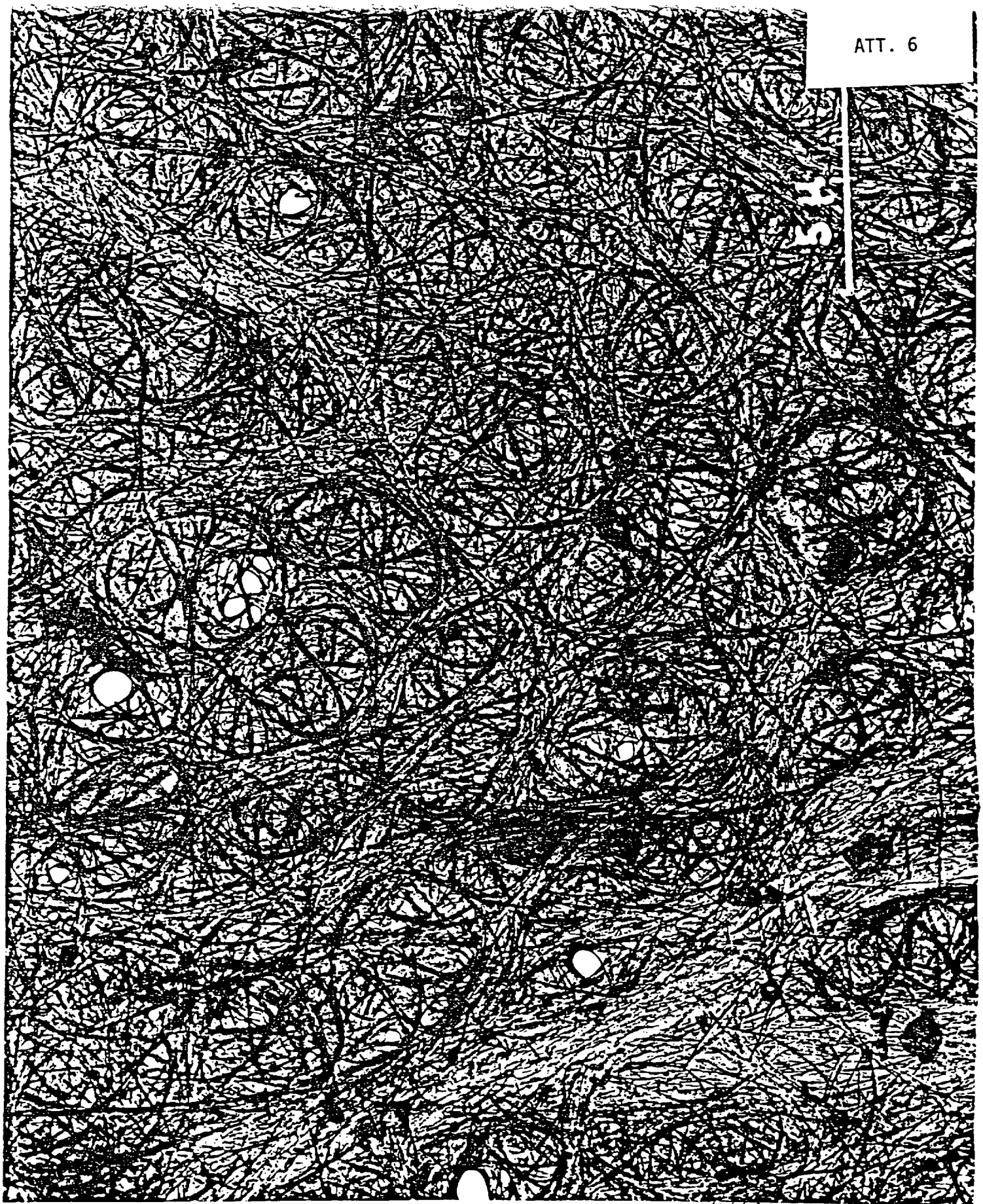
ATT. 5



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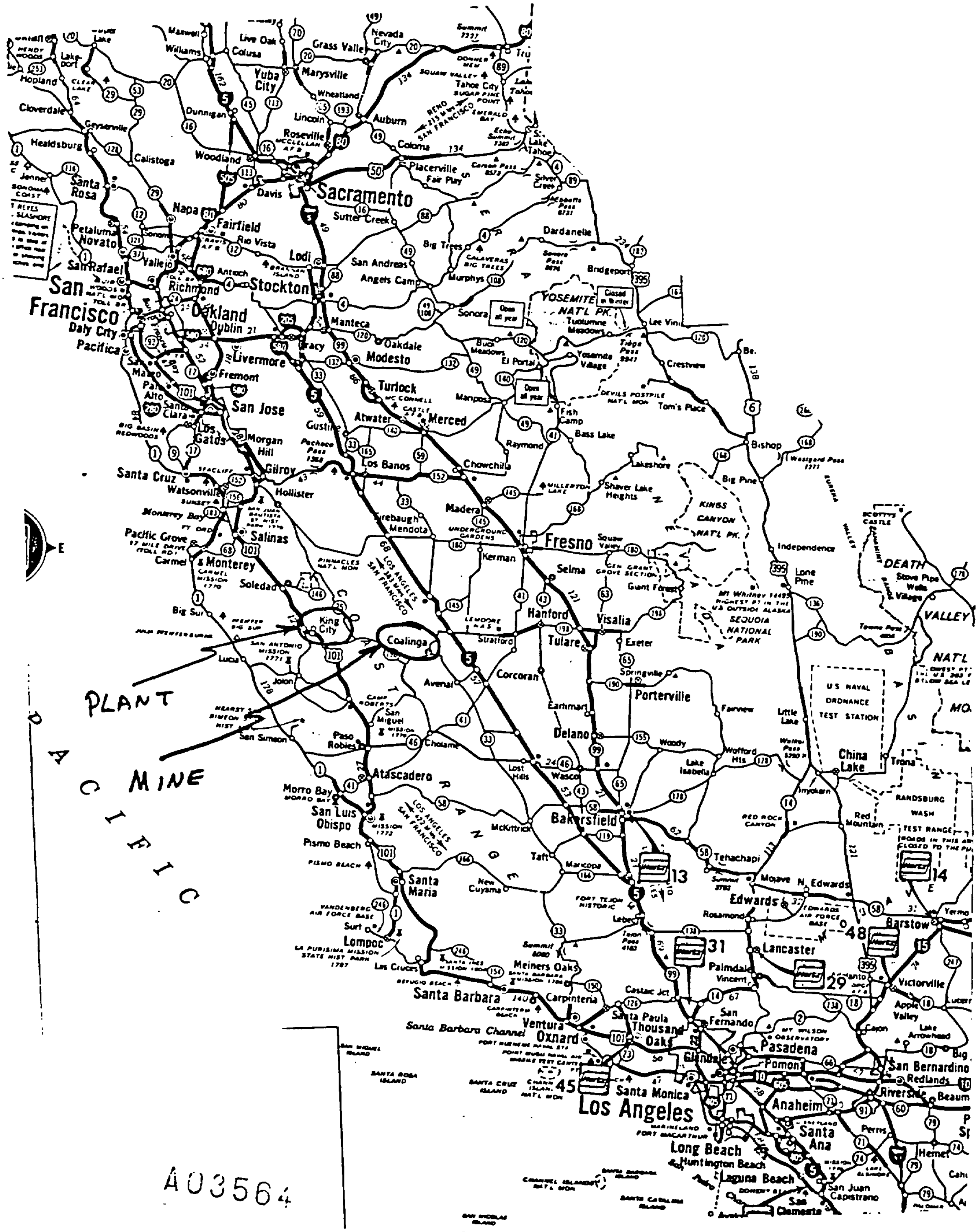
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ATT. 6



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ATT. 7



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Canadian Chrysotile Asbestos Classification

Standard Designation Of Grade	Guaranteed Minimum Shipping Test* ½" Mesh	4 Mesh	10 Mesh	Pan	Group Number
3F	10.5	3.9	1.3	0.3	Group 3 (Spinning Fibre)
3K	7	7	1.5	0.5	
3R	4	7	4	1	
3T	2	8	4	2	
3Z	1	9	4	2	
4A	0	8	6	2	Group 4 (Shingle Fibre)
4D	0	7	6	3	
4K	0	4	9	3	
4M	0	4	8	4	
4T	0	2	10	4	
4Z	0	1.5	9.5	5	
5D	0	0.5	10.5	5	Group 5 (Paper Fibre)
5K	0	0	12	4	
5M	0	0	11	5	
5R	0	0	10	6	
6D	0	0	7	9	Group 6 (Waste)
7D	0	0	5	11	Group 7 (Shorts)
7F	0	0	4	12	
7H	0	0	3	13	
7K	0	0	2	14	
7M	0	0	1	15	
7R	0	0	0	16	
7T	0	0	0	16	
7RF (Floats)	No Test				
7TF (Floats)	No Test				
8S	No Test				

*Guaranteed minimum shipping test is that test below which the actual shipping test shall not fall. The shipping test is the average for each carload or smaller shipment of tests of representative samples taken at time of shipment.

Uses of Asbestos with Corresponding Recommended Carey Grades

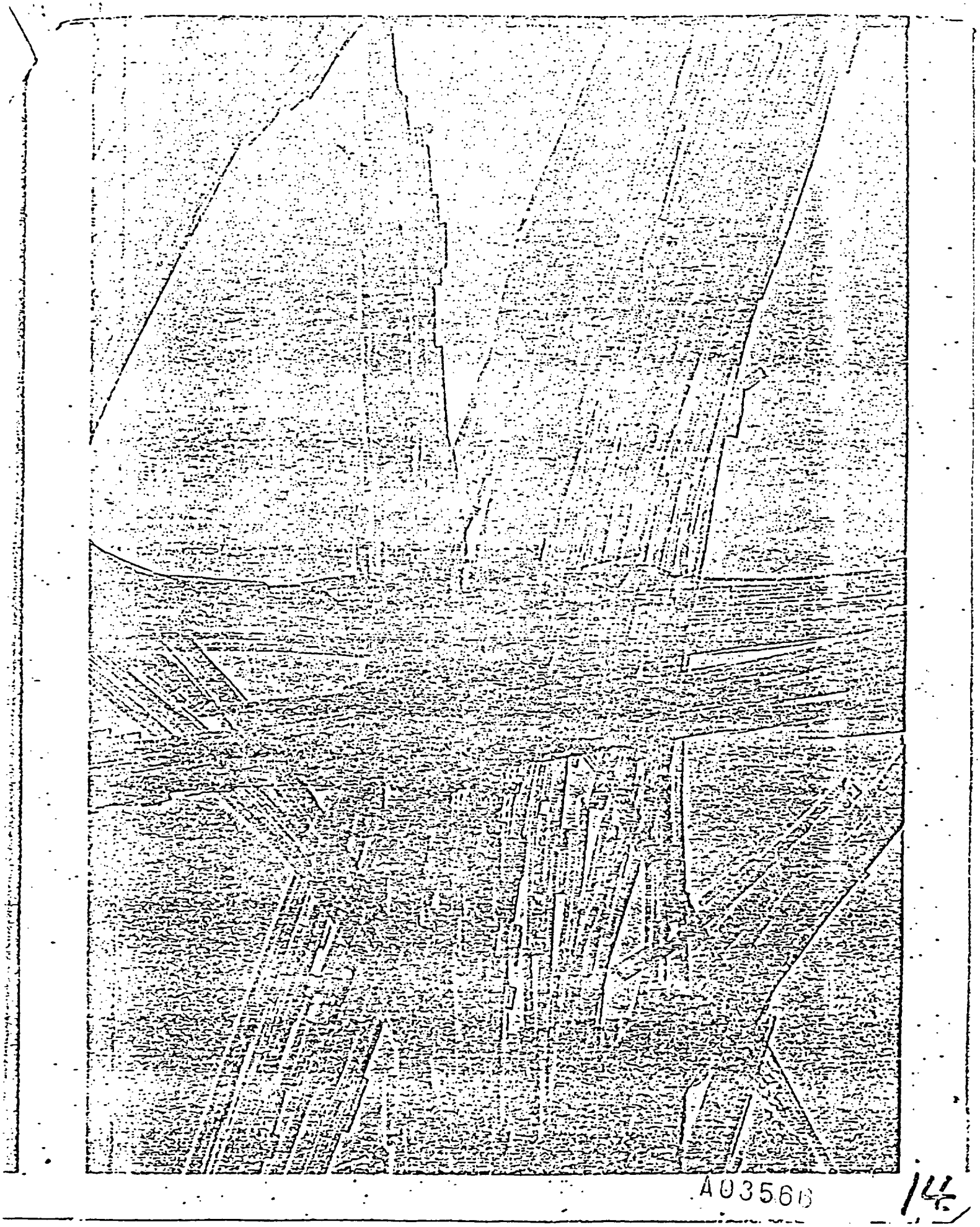
Canadian Chrysotile Asbestos is an essential raw material for a wide variety of products. To meet the requirements of specific industries, sub-grades, or grades within grades, have been developed by research. Grades are divided into sub-grades according to fibre length, degree of "crudiness" and amount or size of fines. Variations of this combination can change such characteristics as density, absorption, wet volume and setting rate. Carey Canadian produces a wide range of sub-grades as shown in the table below.

Important Products Containting Asbestos	*Recommended Carey-Canadian Grades**
Acoustical Plaster	6D-1, 7D-3, 7MS-1, 7M-5
Adhesives	7R-3, 7T-5, 7RF-9, 7TF-8
Asbestos Cement Products	4K-1, 4T-1, 5D-1, 5K-1, 5R-1, 5R-5, 6D-1, 6D-5
Asbestos Millboard	4T-1, 5D-1, 5K-1, 5R-1, 6D-1, 7D-3, 7M-5
Asbestos Paper and Felt	5D-1, 5K-1, 5R-1, 6D-1, 6D-01, 7D-3, 7M-5
Asphalt Compounds	7D-1, 7F, 7K3, 7KS-1, 7MS-1, 7M-5, 7RS-1, 7R-3, 7TS-1, 7T-5, 7RF-9, 7TF-8
Caulking and Sealers	7D-3, 7F, 7K-3, 7MS-1, 7M-5, 7RS-1, 7R-3, 7TS-1, 7T-5, 7RF-9, 7RF-10, 7TF-8
Cements	
Dry Wall Joint	7RF-9, 7RF-10, 7TF-8, 7TF-12
Fireproofing	5D-1, 5R-1, 6D-1, 7D-3, 7MS-1
Insulation Finishing	6D-1, 7D-3, 7M-5, 7M-90, 7T5,
Refractory	5R-1, 6D-1, 7M-5, 7M-90, 7MS-1
Fibrated Greases	7F, 7RF-9, 7RF-10
Floor Tiles	
Asphalt	7R-3, 7RS-3
Vinyl Asbestos	7R-3
Rubber	7R-3, 7T5
Friction Material	5K-1, 5R-1, 5R-5, 6D-1, 6D-5, 7D-3, 7D-5, 7F, 7K-3, 7MS-1, 7M-5
Magnesite Flooring	7T-5, 7RF-9
Oil Well Muds	7R-3, 7RF-9
Pipe-fibre	7M-5, 7R-3
Plastics	
Cold Molded	5R-1, 6D-1, 7D-3, 7M-5, 7T-5, 7RF-9
Molding Compounds	7RF-9, 7TF-8, 7TF-12
Pre-mix Molding	7T5, 7TF-8
Radiator Sealing Compounds	7M-5, 7T-5, 7RF-9
Sheet Packing	4K-1, 4T-1, 5D-1, 5K-1, 5R-1, 5R-01, 6D-1
Textiles	3T-1, 4K-1
Welding Rods	7M-5, 7R-3, 7T-5, 7RF-9

*Sub-grade designations for all grades except Shorts indicate: (-1) well-opened, (-5) semi-crudy. Sub-grade designations for Short grades indicate: (-1) high bulk and oil absorption, (-3) (-5) (-9)(-10 (medium bulk and oil absorption, (-8)(-90) low bulk and oil absorption

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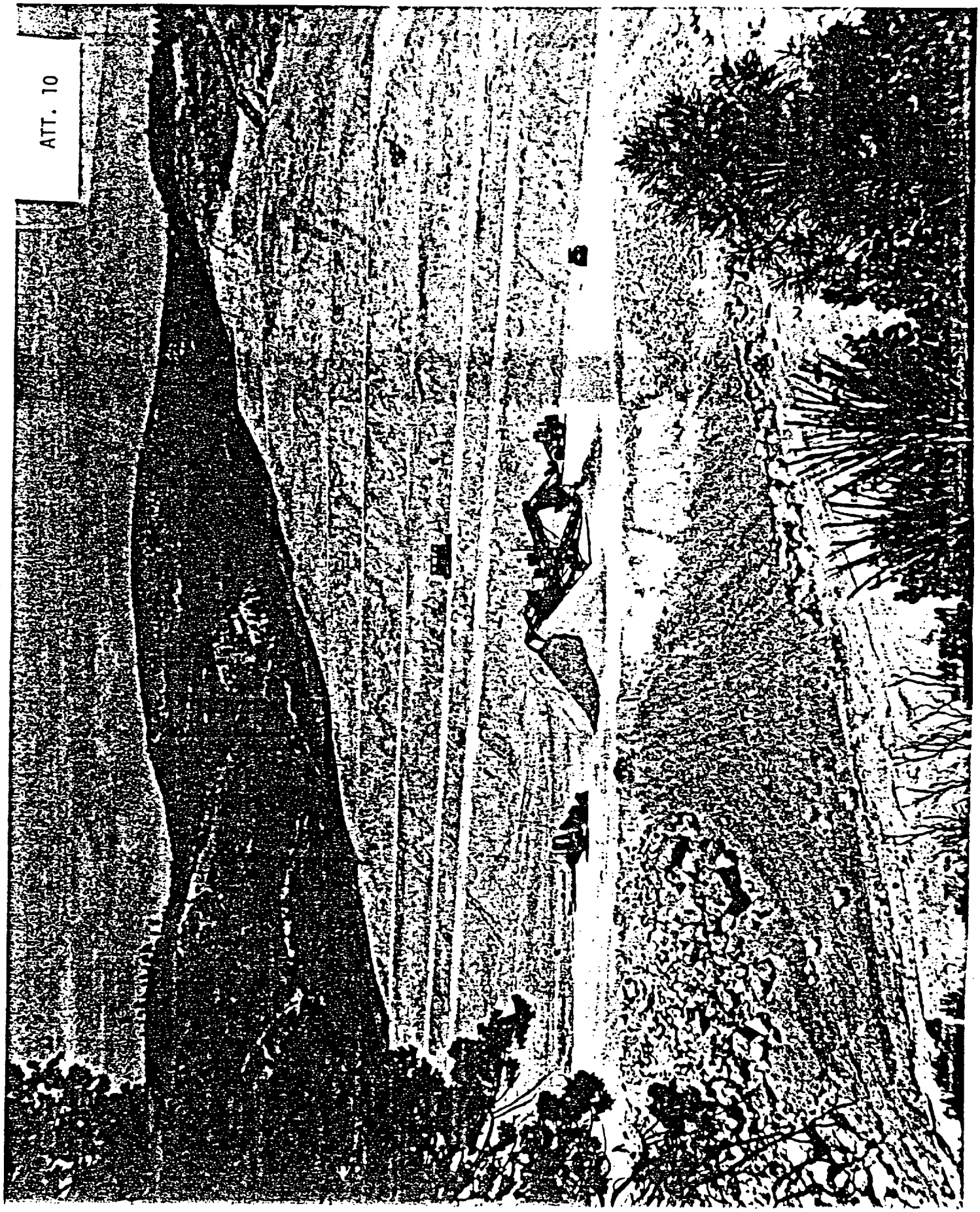
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ATT. 10



ATT. 11

UNIQUE CHARACTERISTICS

OF THE COALINGA ORE DEPOSIT

All Chrysotile

All Short Fiber

Random-Oriented Fibers

Over 50% Fiber

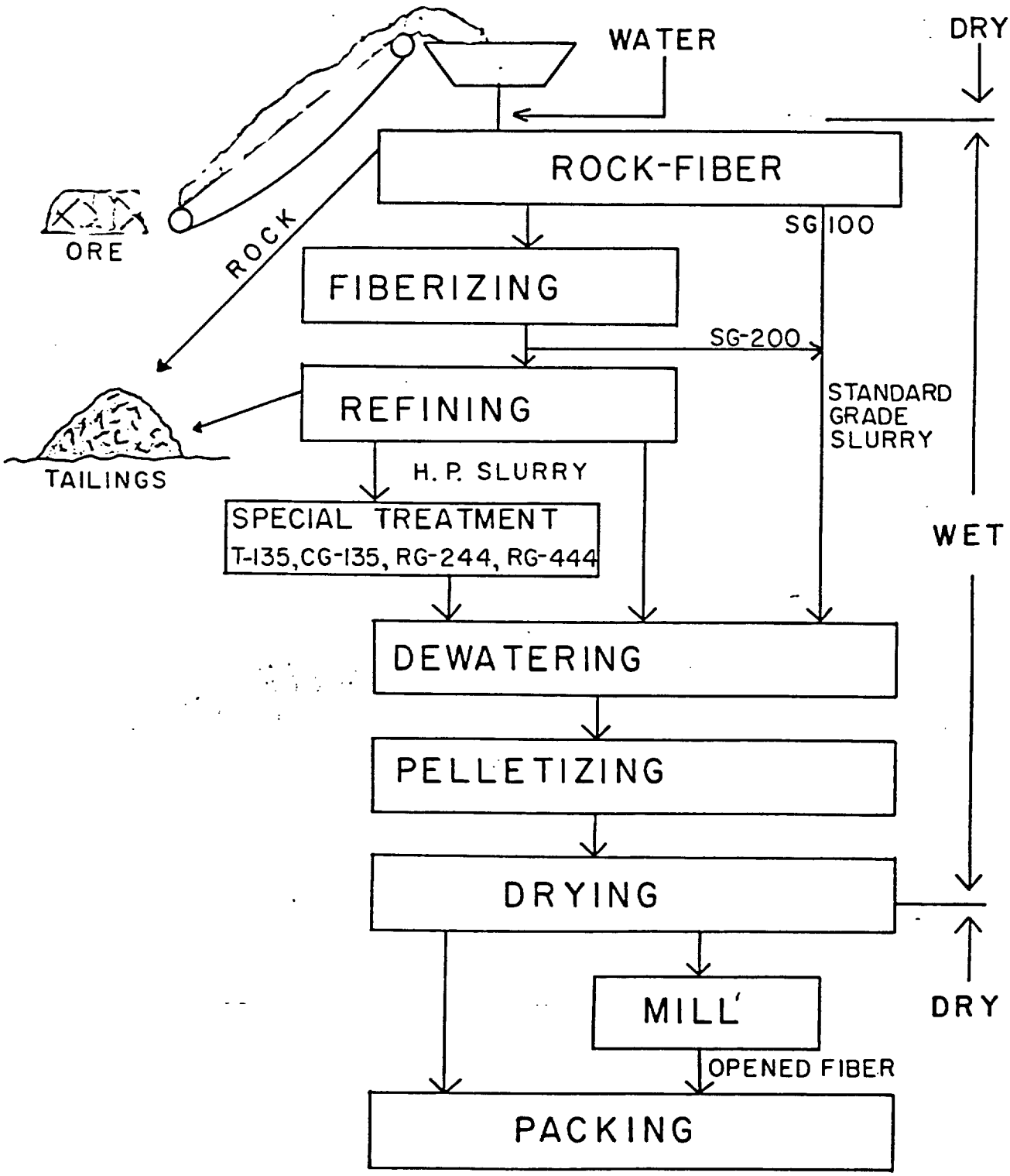
15-20% Moisture

Easy to Mine

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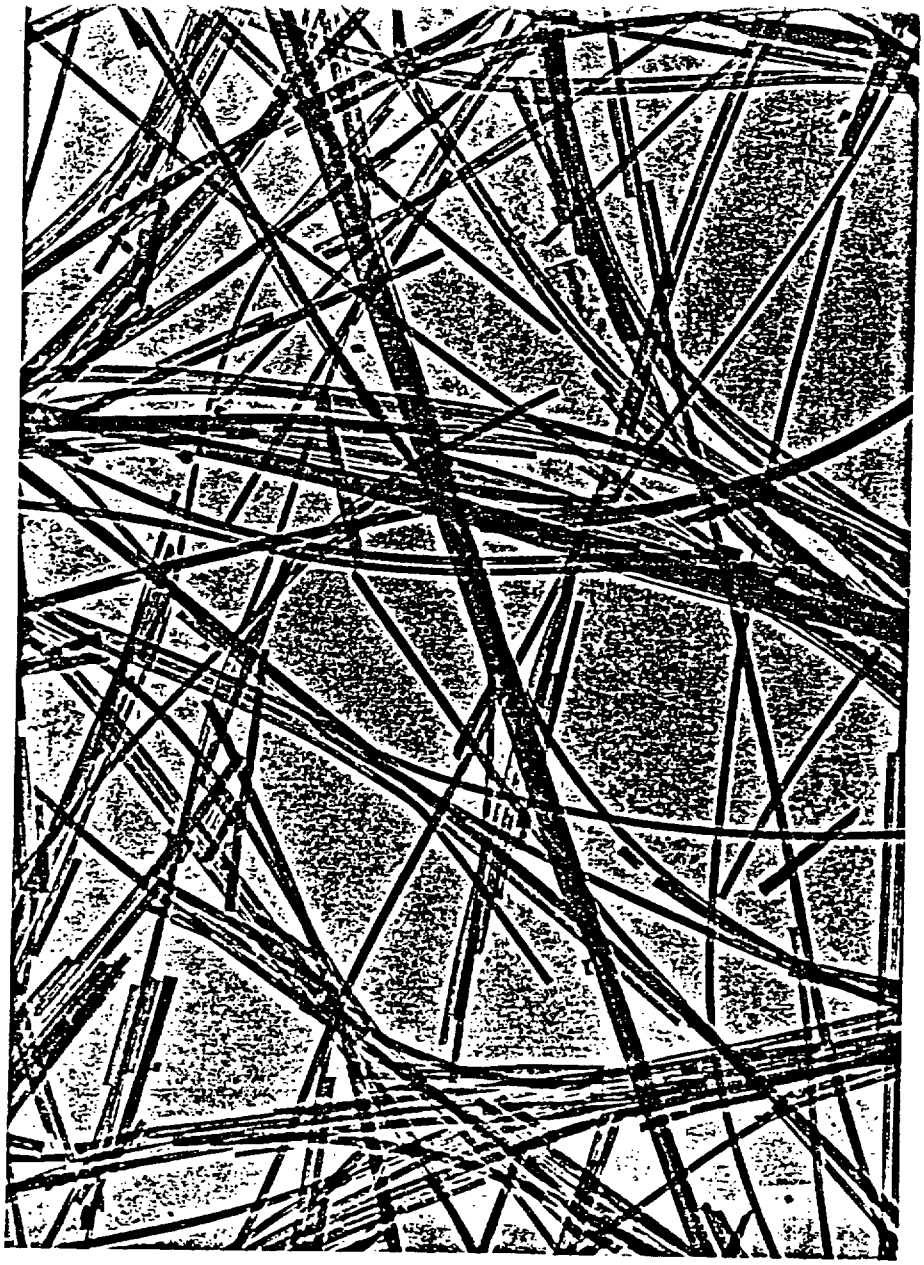
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CALIDRIA ASBESTOS PRODUCTION



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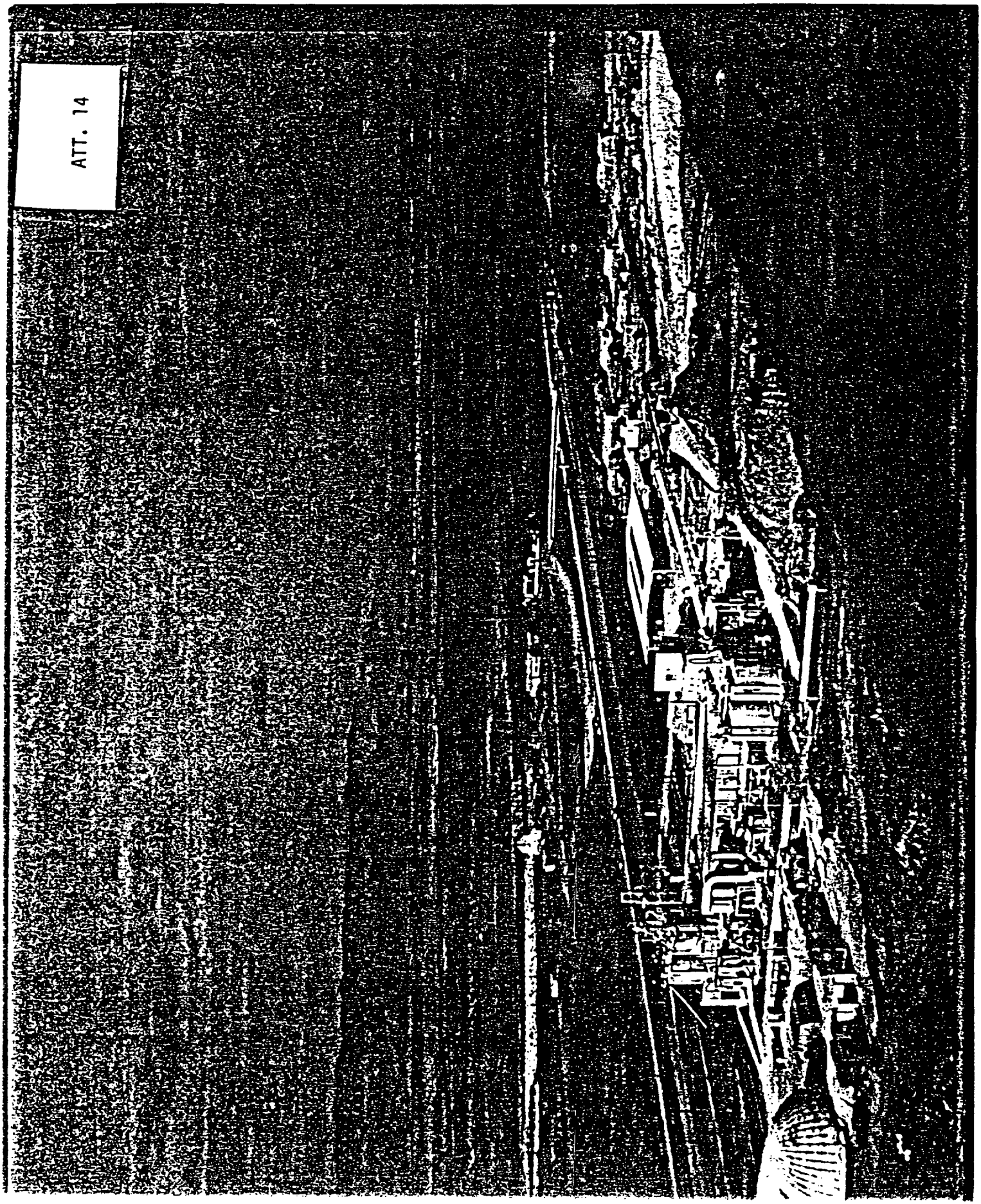
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ATT. 13

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ATT. 15

"CALIDRIA" ASBESTOS SALES & FINANCIAL SUMMARY

(JLM 5/1/79)

	1972	1973	1974	1975	1976	1977	1978	1979 Budget	1979 Fsct. II
Domestic Sales, $M	2127	2691	2483	3432	3085	3295	4566	4200	4186
Export Sales, $M	503	1112	1278	910	1774	2005	2590	2400	2846
Total Sales, $M	3043	3802	3761	4342	4859	5300	7156	6600	7032
Total Sales, Tons	21786	30724	25767	30081	24555	24891	35198	31210	31380
Plant Cost & Distr, $M	1802	2414	2604	2977	2920	3252	4212	4400	4228
Gross Margin, $M	828	1389	1157	1365	1939	2048	2944	2200	2804
Selling Costs, $M	429	494	574	640	679	733	715	676	711
Total O'Head, $M	555	844	871	960	1074	1066	997	1000	1020
Oper. Income, $M	273	545	286	405	865	982	1947	900	1784
Net Income, $M	79	342	87	73	458	631	1190	600	958
Earnings, ¢/Share	0.09	0.57	0.14	0.22	0.80	1.00	1.9	0.9	1.4
% ROA	--	11.4	2.6	2.9	10.5	12.8	25.4	12.1	18.2
Cash Generated, $M	(130)	(117)	(721)	176	122	1100	1035	600	1200
Product Value, $/T	140	124	146	144	198	213	203	211	224
Product Cost, $/T	83	79	101	99	119	131	120	141	135

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ATT. 16

"CALIDRIA" CHRONOLOGY

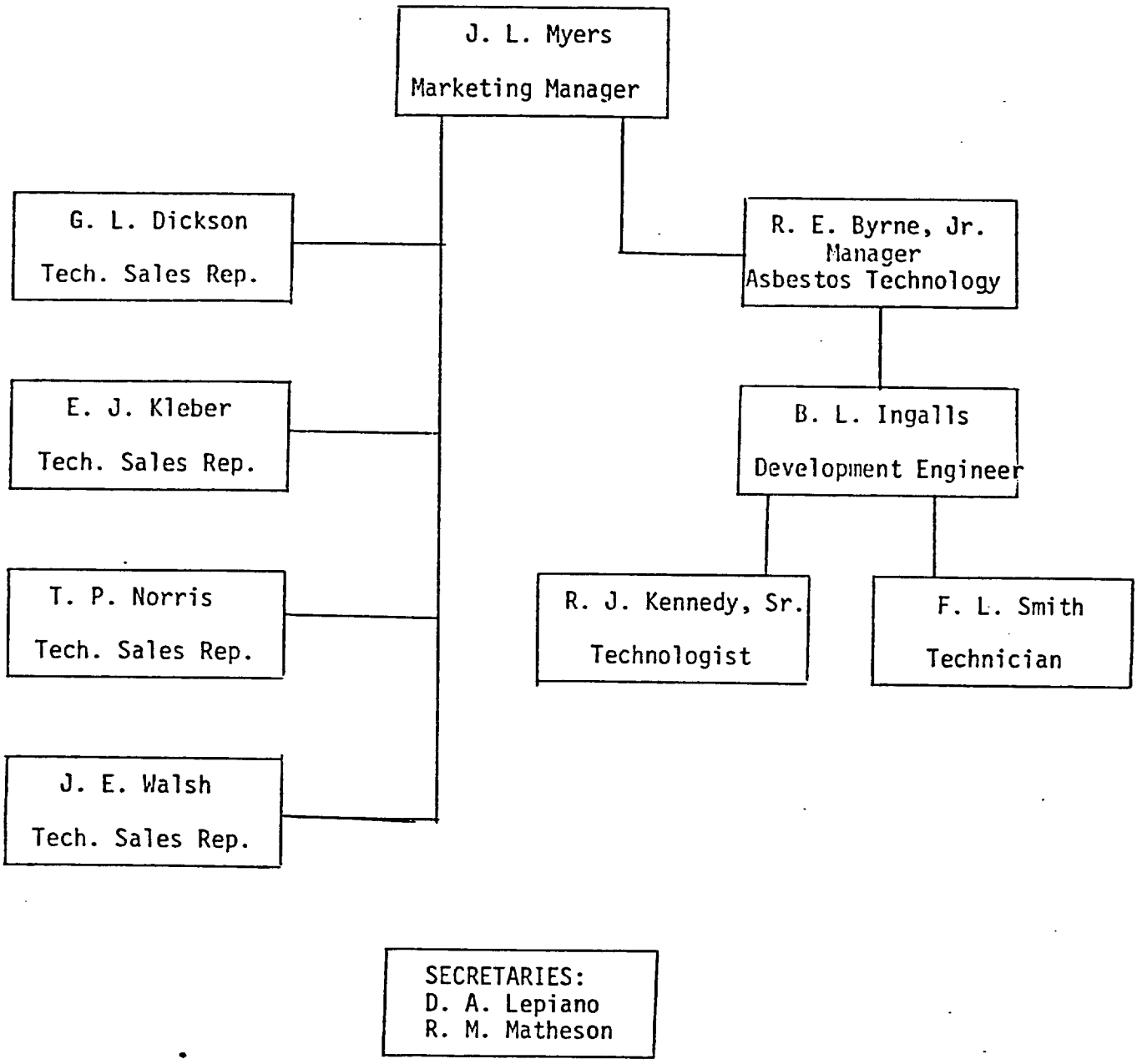
1957	MINE DISCOVERED (NUCLEAR DIV.)
8/63	SEMI-WORKS PLANT STARTED
1965	TO METALS DIVISION
1/66	PLANT EXPANDED
1966	SALES OVER ONE MILLION DOLLARS
1/67	BUSINESS TRANSFERRED TO GROUP 1
2/68	INTRODUCED RG-244
1969	BUSINESS FOR SALE
1/70	BUSINESS TRANSFERRED TO METALS
1970	SALES ALMOST TWO MILLION DOLLARS
1971	FIRST POSITIVE NET INCOME
1972	SALES NEAR PLANT CAPACITY, OVER 3 MILLION DOLLARS
1973	SALES ALMOST 4 MILLION DOLLARS
5/74	INTRODUCED RG-600
1975	PLANT ON 21 SHIFTS/WK., SALES OVER 4 MILLION DOLLARS FIRST POSITIVE CASH FLOW
1976	SALES ALMOST 5 MILLION DOLLARS
1977	SALES OVER 5 MILLION DOLLARS, CASH FLOW OVER 1 MILLION DOLLARS
1978	SALES OVER 7 MILLION DOLLARS, RECORD PRODUCTION AND EARNINGS

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ATT. 17

"CALIDRIA" ASBESTOS MARKETING ORGANIZATION
4/1/79



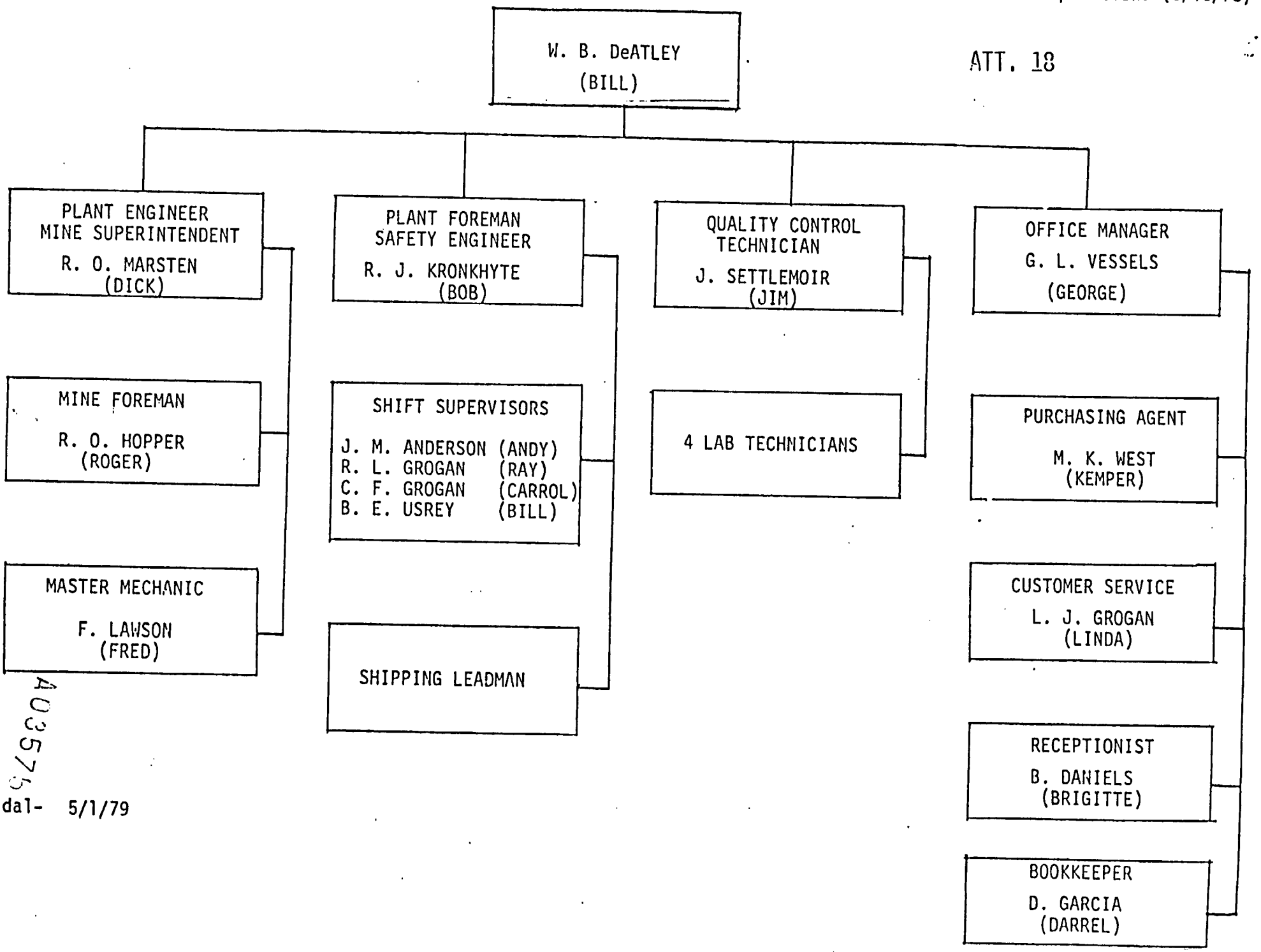
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Union Carbide trial exhibit UC-897: Union Carbide High-Purity Asbestos Paperboard Information Sheet, with J. L...
ACL Doc 16105 · Page 25 of 39

Union Carbide Corporation Metals Division
"Calidria" Asbestos Operations (5/15/78)

ATT. 18



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dal- 5/1/79

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ATT. 19

MAJOR WORLD SOURCES OF ASBESTOS

(BASED ON 1977 USBM ESTIMATES)

COUNTRY	SHORT TONS
USSR	2,710,000
CANADA	1,700,000
SO. AFRICA	419,000
SO. RHODESIA	220,000
P.R. OF CHINA	220,000
ITALY	170,000
BRAZIL	105,000
U.S.A.	102,000
AUSTRALIA	61,000
TOTAL	5,879,000

AU3570

ATT. 20

ASBESTOS STATISTICS, M SHORT TONS

(JLM, 3/27/79)

	1978 ESTIMATES	1973-1978 AVERAGE
U.S. CONSUMPTION	640*	728
U.S. IMPORTS	588*	658
U.S. EXPORTS	35*	47
U.S. PRODUCTION	100*	113
UCC PRODUCTION	36	29
UCC DOM. SHMPTS.	26	22
UCC EXPORT	9	7

*FROM USBM REPORTS AND PRIVATE COMMUNICATION WITH R. A. CLIFTON OF USBM

AU3577

ATT. 21

U.S. Chrysotile Consumption - 1978

	Tons	% of Total**
Asbestos-cement pipe	153,000	24.0
Flooring Products*	147,000	23.0
Friction Products	86,400	13.5
Roofing Products*	61,000	9.5
Asbestos-cement sheet	41,400	6.5
Coatings & compounds*	35,200	5.5
Packings & gaskets	25,600	4.0
Paper	22,400	3.5
Insulation (Thermal & Electric)	19,200	3.0
Textiles	9,600	1.5
Plastics*	6,400	1.0
Other*	32,000	5.0
TOTAL	640,000	100

** - "Asbestos", December 1978, pp. 16-18
* - Markets in which UCC partcipates

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"CALIDRIA" ASBESTOS PRODUCT APPLICATIONS

PRODUCT	APPLICATIONS
SG-100	VINYL-ASBESTOS FLOOR TILE
SG-130	MASONRY COATINGS
SG-200	RUBBER FLOOR TILE
SUPER VISBESTOS	DRILLING MUDS
SG-210	MASTICS ASPHALTIC COATINGS PHENOLIC MOLDING COMPOUNDS
HPP	RUBBER SHEET GOODS MINERAL BOARD (JAPAN) PAPER (JAPAN)
HPO	ASPHALTIC COATINGS, ADHESIVES
RG-110	ASPHALTIC SPRAY COATINGS ALUMINIZED COATINGS MASTICS, CAULKS & SEALANTS
RG-144	ADHESIVES (EPOXY, CASIM, PHENOLICS) COATINGS VINYL PLASTISOLS (HIGH BUILD, DIP COATINGS) MASTICS, CAULKS & SEALANTS (VINYL, BUTYL, POLYSULFIDE, BITUMINOUS)
RG-244	POLYESTER RESINS (LAMINATING, GEL COATS, PUTTIES) CAULKS & SEALANTS (VINYL, BUTYL, ACRYLIC, POLYURETHANE) COATINGS (EPOXY, URETHANE, ASPHALTIC)

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1978

CALIDRIA ASBESTOS DOMESTIC APPLICATIONS AREAS

			T	$M	% of Total T	% of Total $
(1)	Floor Tile	SG-100 SG-200	17,500	1800	67	39
(1)	Phenolic Compounds	SG-210 HPO	350	80	1	2
(1)	Roofing Compounds	SG-210 HPO	510	100	2	2
(1)	Asphaltic Coatings	SG-130 SG-144 RG-110	940	180	4	4
(1)	Rubber-Sheet Goods	HPP RG-100	370	130	1	3
(2)	Adhesives	RG-144 RG-244	280	230	1	5
(2)	Sealants	RG-144 RG-244	430	540	2	12
(2)	Polyester Laminates	RG-244	100	200	0.5	4
(2)	Coatings	CG-135 RG-144 RG-244	550	630	2	14
(1)	Drilling Muds	Visb. CSV SHUR	3,000	400	11	9
(1)	Miscellaneous		1,920	280	7	6
			25,950	4570		

(1) Asbestos Industry (2) Non-Asbestos Industry

Summary:

Asbestos Industry	24,590	2970	95	65
Non-Asbestos Industry	1,360	1600	5	35

AU3580

"Calidria" Participation in Typical Domestic Asbestos Markets in 1978

	Domestic Market, Tons	Potential Segments, Tons	"Calidria" Share of Segment Tons	%
Flooring Products	147,000	75,000	17,500	23.3
Roofing	61,000	6,000	500	8.3
Coatings & compounds (Asphaltic Coatings)	35,200	12,000	1,000	8.3
Plastics (Phenolic & Rubber)	6,400	6,000	700	11.7
Drilling Muds	8,000	8,000	3,000	37.5
Other	24,000	24,000 (?)	2,300	9.6
TOTAL	281,600	131,000	25,000	19.1

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DOMESTIC

MARKET DETAIL

Typical Asbestos Markets for "Calidria"

I. Flooring Products

Total market 147,200 tons

"Calidria" share 17,500 tons (11.9% of total)

Total market includes both tile & sheet goods.

"Calidria" participation only in tile market which is about 1/2 of total. "Calidria" share of this reduced market is, therefore, about 24%.

Major competitors - Carey Canadian - Canada

Atlas Mineral - California

Floor tile market is split as follows:

Carey	50%
Atlas	20%
"Calidria"	24%
Others	6%

II. Roofing Compounds

Total market 61,000 tons

"Calidria" share 510 tons (0.8% of total)

Market includes primarily asphalt compounds using asbestos as a flow control agent. Much of the market requires slightly longer fibers than "Calidria" has available. Realistically we can probably only compete for perhaps 10% of the total or 6100 tons.

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Major competitors - Johns-Manville - Most Canadian suppliers
Carey - " " "
Bell - " " "

Market is split as follows:

J-M	60%
Carey	20%
Bell	19%
"Calidria"	1%

III. Coatings & Compounds

Total market 35,200 tons

"Calidria" share 940 tons (2.7% of total)

"Calidria" particpates primarily in the asphaltic coatings portion of this market which excludes roof coatings. Products include automotive undercoats, coatings for waterproofing below grade concrete and for driveways and tennis courts. The portion of the market in which "Calidria" might compete is unknown, but is probably at least 1/3 of the total market.

Major competitors - Canadian producers

Market is split by all manufacturers (primarily Canadian) and represents an outlet for as much short fiber product as can be allocated to this high volume, low cost application.

IV. Plastics

AU3583

Total market 6,400 tons

"Calidria" shares 720 tons (11.3% of total)

Market includes primarily plastics used for structures, molded goods, etc. Larger segments include chemical resistant fibers, molded phenolic parts and some rubber goods.

"Calidria" participates primarily in the latter two areas.

Major competitors - Johns-Manville

Market is split as follows:

J-M	89%
"Calidria"	11%

V. Other

(Oil and gas well drilling)

Total market for short fiber asbestos 20,000 tons

"Calidria" share 4,000 tons (20% of total)

Current market is about 6-8000 tons because of regulatory restraints.

Total market could be realized in the absence of regs.

Major competitors - Johns-Manville (Flosal)

Current market is shared by "Calidria" and Johns-Manville about equally.

Production capacity is adequate for full development of market.

AU3584

DOMESTIC

"Calidria" Markets - Not Typical Asbestos

(Viscosity Control)

	Tons	Total Market*	UCC %
Adhesives	280	2500	11.2
Sealants	430	1500	28.7
Polyester Laminates	100	3400	2.9
Coatings	550	4600	12.0
TOTAL	1360	12,000	11.3

*Total Market estimates -

- Modern Plastics, January 1979
- C & P sources (Skeist Laboratory Market Analyses - 1978)
- Assumed nominal loadings for "Calidria," i.e., 1% in polyesters, etc.

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Markets for "Calidria" - Not Typical Asbestos

I. Adhesives

Total market 3MM tons - portion requiring viscosity additives 125,000 tons - assuming 2% addition level - market "available" 2500 tons

"Calidria" share - 280 tons (11.2% of total)

Major competitors - National Lead (Bentones)
Cabot Corporation (Cab-O-Sil)
Other (Thixcin, etc.)

Market share:

Cabot	45%
National Lead	39%
"Calidria"	11%
Others	5%

II. Sealants

Total market about 150,000 tons split as follows:

Construction	90,000 tons
Automotive	30,000 "
Glass (Insulating)	6,000 "
Aircraft	1,000 "
Highways & Airfields	15,000 "
Appliances	7,000 "

Assuming a 1% loading of viscosity additive, a market of 1500 tons is available.

AU3586

"Calidria" share 430 tons (28.7% of total)

Major competitors - Cabot (Cab-O-Sil)

National Lead (Bentones)

Market share is split as follows:

Cabot	45%
National Lead	26%
"Calidria"	29%

III. Polyester Laminates

Total market for thixotropic laminates 340,000 TPY

Assuming 1% average addition, 3,400 TPY available

"Calidria" share 100 tons (2.9% of total)

Major competitors - Cabot Corp. (Cab-O-Sil)

DeGussa (Aerosil)

Others (Thixcin, Ircogel, etc.)

Market share is split as follows:

Cabot Corp.	70%
DeGussa	24%
Others	3%
"Calidria"	3%

IV. Coatings

Total market for thixotropic, viscosity modifying and pigment suspending agents is 4600 TPY (1% of 460,000 TPY)

"Calidria" share is 550 TPY (12% of total)

AU3587

Major competitors - Cabot Corp. (Cab-O-Sil)

DeGussa (Aerosil)

National Lead (Bentones)

Baker Castor Oil (Thixcin, Thixatrol)

Others

Market is split as follows:

Cabot	30%
DeGussa	20%
National Lead	20%
Baker Castor Oil	13%
"Calidria"	12%
Others	5%

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COMPETITORS AND MARKET SHARE

SHORT FIBER ASBESTOS MARKET

	U.S.A.	JAPAN	TOTAL
UCC	19%	16%	18%
J-M	23	11	20
CAREY	47	73	53
ATLAS	11	0	9

VISCOSITY CONTROL MARKET

	U.S.A.	JAPAN	EUROPE	TOTAL
UCC (RG-144 & -244)	11	25	19	15
DEGUSSA	25	70	70	40
CABOT	49	2	5	40
NATIONAL LEAD	10	2	3	3
BAKER	5	1	3	2

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