Asbestos

By Robert A. Clifton [1]

Shipments of asbestos from mines in the United States decreased 25% from the record high in 1973. Construction industry troubles and the recession were the main reasons for the decreased demand. Imports were 3% below 1973 levels.

The world's leading producer, Canada, decreased shipments to the United States, its largest market, 3% and Canada's total 1974 shipments were 97% of 1973 shipments.

Table 1.—Salient asbestos statistics

	1970	1971	1972	1973	1974
United States:					
Production (sales) ____ short tons __	125,314	130,882	131,663	150,116	112,533
Value ____ thousands __	$10,696	$12,174	$13,409	$16,288	$13,759
Exports and reexports (unmanufactured) ____ short tons __	46,585	53,678	58,624	66,442	61,723
Value ____ thousands __	$6,996	$7,863	$9,051	$9,342	$9,192
Exports and reexports of asbestos products (value) ____ thousands __	$25,391	$31,409	$32,110	$40,777	$60,396
Imports for consumption (unmanufactured) ____ short tons __	649,402	681,367	735,515	792,473	766,164
Value ____ thousands __	$75,146	$80,090	$87,732	$98,914	$123,822
Released from stockpile (unmanufactured) __ short tons __	4,782	10,210	13,174	6,761	28,851
Consumption, apparent [1] short tons __	732,913	768,781	821,728	882,908	845,825
World: Production ____ do ____	r 3,846,475	r 3,951,373	r 4,163,675	4,512,032	4,535,924

r Revised.
[1] Measured by quantity produced, plus imports, plus stockpile releases, minus exports.

Legislation and Government Programs.—The Environmental Protection Agency (EPA) published clarifications and amendments to its asbestos emission standards in May. In August, the second portion of the effluent guidelines for asbestos manufacturing point sources was published. In October EPA published some controversial proposed amendments to its national asbestos emission standards. In July the Mining Enforcement and Safety Administration promulgated amendments to its Metal and Nonmetal Mines Health and Safety Standards which substituted "fiber counts" for the former "dust counts" for asbestos mines and mills. The new standards and monitoring techniques now agree with those of the Office of Safety and Health Administration (OSHA) of the Labor Department. In 1974 the General Services Administration (GSA) reduced Government inventories by disposing of 11,586 short tons of amosite, 16,890 tons of crocidolite, and 375 tons of chrysotile. Southern Rhodesian asbestos continued to arrive in the country because of the "strategic material" exception to the U.S. observance of the United Nations sanctions.

[1] Physical scientist, Division of Nonmetallic Minerals.

Minerals Yearbook: Asbestos Chapters, 1974
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Table 2.—Stockpile objectives and Government inventories as of December 31
(Short tons)

	Stockpile objectives	Total inventories		Released 1974
		1973	1974	
Amosite	None	58,179	46,593	11,586
Chrysotile	1,100	r 10,443	10,455	--
Subspecification	XX	1,528	1,153	375
Crocidolite	None	19,368	2,478	16,890
Total	XX	89,518	60,679	28,851

r Revised. XX Not applicable.

Environmental Impact.—Threatened effects of environmental regulations on the asbestos manufacturing industry again failed to materialize in 1974. The small decrease in asbestos consumption was a sign of a relatively healthy industry.

The cost of coming into compliance with environmental regulations was the announced cause of the GAF Corp.'s decision to leave the asbestos-mining industry and at least somewhat of a factor in the closing of two mines in California.

On October 15 the U.S. Supreme Court let stand a lower court decision in *Borel* v. *Fibreboard Paper Products Corp., et al.* making asbestos products manufacturers and their suppliers liable for asbestos-related diseases among workers.

DOMESTIC PRODUCTION

U.S. mines shipped only 75% as much asbestos in 1974 as in 1973. The value was only 84% of the 1973 amount. Four States produced asbestos; California, with 53%, was the leader, followed in order by Vermont, Arizona, and North Carolina. Total output was 112,533 tons valued at $13,759,000.

The California segment of the asbestos industry led the sharp decline in U.S. production. The closing early in the year of the Christie mine of the Coalinga Asbestos Co., Inc. was followed by the closing of the Pacific Asbestos Corp. mine. These mine closures led to production of only 57% of the 1973 State total. Only 55% of the 1973 dollar value of the fiber was realized. At yearend negotiation was underway aimed at acquisition and reopening of the Pacific Asbestos mine. Yearend mining was limited to the Joaquin Ridge near Coalinga with Atlas Asbestos Corp. working its Santa Cruz mine in Fresno County and Union Carbide Corp. operating its Santa Rita mine in San Benito County.

GAF Corp.'s mine in Orleans County, Vt., remained the U.S. asbestos mine with the highest production; its output increased significantly over that in 1973. This mine was scheduled for closure by GAF in March 1975, but at yearend it appeared that an employee group might be successful in efforts to purchase the mine and keep it operating. Arizona production in 1974 was less than a third of the 1973 level. The Jaquays Mining Corp. mine in Gila County was the only active asbestos mine in the State. The mine in North Carolina of Powhatan Mining Co. was inactive, but some shipments from stockpile were made in 1974. U.S. asbestos producers and mine sites follow:

State and company	County	Name of mine	Type of asbestos
Arizona: Jaquays Mining Corp	Gila	Chrysotile	Chrysotile.
California:			
Atlas Asbestos Corp	Fresno	Santa Cruz	Do.
Coalinga Asbestos Co., Inc [1]	do	Christie	Do.
Pacific Asbestos Corp [1]	Calaveras	Pacific Asbestos	Do.
Union Carbide Corp	San Benito	Santa Rita	Do.
North Carolina:			
Powhatan Mining Co	Yancey	Hippy	Anthophyllite.
Vermont: GAF Corp	Orleans	Lowell	Chrysotile.

[1] Closed at yearend.

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CONSUMPTION AND USES

Apparent consumption in table 1 was revised to reflect stockpile adjustments; with these adjustments it reveals a 4% decrease in overall usage.

Consumption data in table 3 were obtained from a new survey form. The new options available on the form break continuity between the 1974 data and those data in table 6 of the 1973 chapter. A benefit of the new form and computer assistance in tabulation is that end use data can now be presented by grade for chrysotile. The data in table 3 have been adjusted to agree with those in table 1.

Table 3.—Asbestos distribution by end use, grade, and type, 1974
(Short tons)

	Chrysotile							
	Group 1 & 2	Group 3	Group 4	Group 5	Group 6	Group 7	Group 8	Total chrysotile
Asbestos cement pipe	--	--	92,600	20,300	--	72,300	--	185,200
Asbestos cement sheet	--	--	10,900	15,800	52,000	11,800	--	90,500
Flooring products	--	--	--	49,000	--	104,500	--	153,500
Roofing products	--	--	3,700	11,100	12,700	46,300	--	73,800
Packing and gaskets	100	1,900	7,500	7,500	1,400	10,300	--	28,700
Insulation, thermal	--	100	900	100	3,400	2,800	--	7,300
Insulation, electrical	--	--	400	1,600	--	2,700	--	4,700
Friction products	--	5,600	1,300	29,500	6,300	36,600	300	79,600
Coatings and compounds	--	--	100	400	300	36,700	400	37,900
Plastics	400	1,000	900	800	--	7,500	6,300	16,900
Textiles	700	14,200	3,900	800	--	800	--	20,400
Paper	--	--	5,500	400	23,900	33,300	--	63,100
Other	--	300	1,100	--	2,300	32,700	--	36,400
Total	1,200	23,100	128,800	137,300	102,300	398,300	7,000	798,000

	Crocidolite	Amosite	Anthophyllite	Total asbestos
Asbestos cement pipe	36,400	1,100	200	222,900
Asbestos cement sheet	--	4,300	--	94,800
Flooring products	--	--	--	153,500
Roofing products	--	1,700	--	75,500
Packing and gaskets	100	--	--	28,800
Insulation, thermal	--	1,800	--	9,100
Insulation, electrical	--	--	--	4,700
Friction products	--	--	200	79,800
Coatings and compounds	--	--	--	37,900
Plastics	200	--	700	17,800
Textiles	--	--	--	20,400
Paper	200	--	--	63,300
Other	400	500	--	37,300
Total	37,300	9,400	1,100	845,800

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For the first time asbestos cement pipe as an end use has been isolated; it is the largest single user of asbestos with better than 26% of the total consumption. This was not unexpected, but that asbestos cement sheet would remain the third largest user at over 11% was a surprise. Flooring products at 18% were in the second spot. If the near 9% used in roofing products is added to the top three these construction industry products account for nearly two-thirds of U.S. asbestos use. The other major asbestos-using end products are friction materials at 9%, paper at 7% and coatings and compounds at 4%. Another newcomer to the Bureau of Mines survey is plastics, which uses better than 2% of the asbestos total.

Table 4 shows asbestos usage in the United Kingdom during 1973.

Table 4.—United Kingdom: Breakdown of asbestos fiber usage, 1973 [1]

(Percent)

	Chrysotile	Amosite	Anthophyllite	Crocidolite	Total
Asbestos cement for building products	37.5	--	--	--	32.2
Asbestos cement pressure, sewage, and drainage pipes	5.3	5.0	--	--	5.2
Fire-resistant insulation boards	2.0	81.3	--	--	13.1
Insulation products, including spray	.9	11.2	--	--	2.3
Jointings and packings	7.7	--	--	--	6.6
Friction materials	11.5	--	--	--	9.9
Textile products not included in "Friction materials"	5.6	--	--	--	4.8
Floor tiles	10.9	--	--	--	9.4
Molded plastics and battery boxes	1.5	2.5	--	--	1.6
Fillers and reinforcements (felts, millboard, paper, underseals, mastics, adhesives, etc.)	17.1	--	100.0	--	14.9
Total	100.0	100.0	100.0	--	100.0

[1] Data furnished by Asbestos Information Association of North America.

Figure 1 shows variations in the average annual growth rate in demand over a span of years. These growth rates projected to the year 2000 can give demands ranging from 2.6 million tons down to 1.0 million tons.

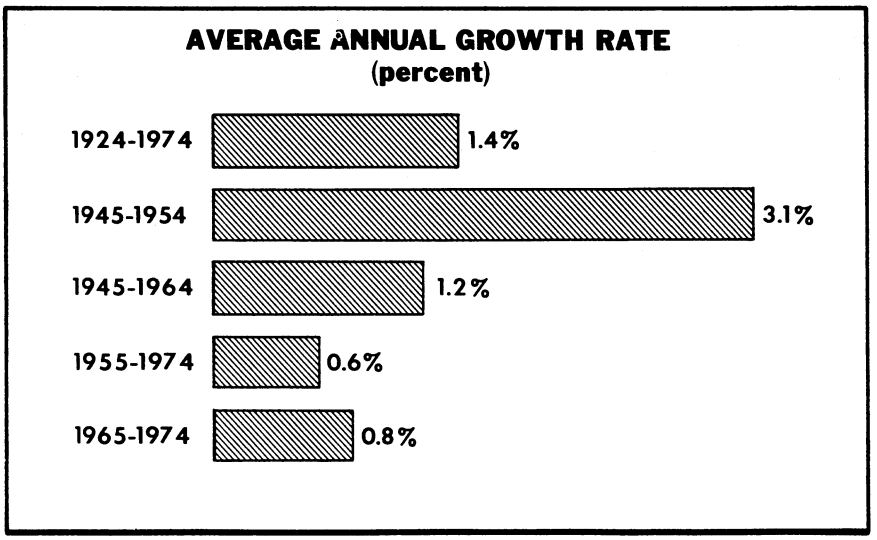


Figure 1.—U.S. asbestos demand, historical trends.

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PRICES

Quoted prices for Quebec asbestos rose more than 39% during 1974 with the last rise effective on August 1, 1974. A further rise was announced effective in 1975. British Columbia asbestos prices rose more than 45% during the year in three steps, the last one also effective August 1, 1974. Another increase to start the new year was announced.

Prices for some grades of Arizona chrysotile asbestos were raised on April 1, 1974. Quotations, f.o.b. Globe, follow:

Grade	Description	Per short ton
Group No. 1	Crude	$1,750
Group No. 2	---- do	1,000
AAA		1,000
Group No. 3	Nonferrous filtering and spinning	$550–700
Group No. 4	Nonferrous plastic and filtering	550–600
Group No. 5	Plastic and filtering	385–425
Group No. 6	Refuse or shorts	350
Group No. 7	---- do	65–100

As of May 1, 1974, Vermont chrysotile asbestos, f.o.b. Morrisville, was priced as follows:

Grade	Description	Per short ton
Group No. 4	Shingle fiber	$250.00–$424.00
Group No. 5	Paper fiber	180.00–212.00
Group No. 6	Waste, stucco, or plaster fiber	131.00
Group No. 7	Shorts and floats	50.00–114.00

Quotations for Canadian (Quebec) chrysotile, f.o.b. mine, were as follows, as of August 1, 1974:

Grade	Description	Per short ton
Group No. 1	Crude	Can $2,428
Group No. 2	---- do	1,320
Group No. 3	Spinning fiber	$619–1,016
Group No. 4	Asbestos-cement fiber	318–576
Group No. 5	Paper fiber	214–290
Group No. 6	Waste, stucco or plaster	180
Group No. 7	Refuse or shorts	76–146

Prices for British Columbia and Yukon Territory, Canada, chrysotile asbestos were effective August 1, 1974. Quotations, f.o.b. Vancouver, follow:

Grade	Description	Per short ton
	CASSIAR MINE	
C–1	Crude	Can $2,214
AAA	Nonferrous spinning fiber	1,301
AA	---- do	1,034
A	---- do	787
AC	---- do	564
AK	Asbestos cement fiber	402
AS	---- do	349
AX	---- do	319
AY	---- do	226
AZ	---- do	166
	CLINTON MINE	
CP	Asbestos cement fiber	Can $380
CT	---- do	341
CY	---- do	226
CZ	---- do	166

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African asbestos producers privately negotiate sales and this rules out market quotations. The following are averages, regardless of grade, of the values of South African imports, calculated from U.S. Department of Commerce data:

The increased demand for asbestos in all categories resulted in price increases almost across the board. Additional rises were expected early in 1975.[2]

Type	Per short ton				
	1970	1971	1972	1973 [r]	1974 [1]
Amosite	$160	$164	$187	$188	$228
Crocidolite	196	212	211	213	251
Chrysotile	198	120	202	234	282

[r] Revised.
[1] 1st 10-month data on imports, U.S. Bureau of the Census.

FOREIGN TRADE

The value of exports of asbestos products manufactured in the United States increased 48% over the value of those exported in 1973. Five of the nearly 100 countries buying these products accounted for 60% of the foreign sales. They were Canada (38%), West Germany (8%), the United Kingdom (6%), Mexico (4%), and Australia (4%).

Major groupings of exported products and their share of the total were friction products (21%), packing and gaskets (21%), asbestos cement products (18%), textiles and yarns (14%), and insulation products (8%).

In 1974 56% of the cost of imported asbestos was recovered by the exporting and reexporting of fibers and products. Only 20% of the cost of Canadian fiber was recovered from exports to Canada.

In 1974 the United States imported 91% of its asbestos needs. This was above the 1973 percentage. Canada provided better than 96% of the imports, the Republic of South Africa provided 3%, and nine other countries provided the remainder. Chrysotile, with 97%, dominated the imported types. There was a 25% increase in the dollar value of imported fibers.

[2] Asbestos. V. 56, No. 7, January 1975, p. 28.

Table 5.—Importers of U.S. asbestos products in 1974, by type and country
(Thousand dollars)

	Canada	Germany, West	United Kingdom	Australia	Mexico	Other	Total
Friction products	7,728	560	273	594	97	3,387	12,639
Packing and gaskets	1,982	326	434	262	317	9,261	12,582
Asbestos cement products	5,385	2,493	79	85	84	2,937	11,063
Textiles and yarns	4,901	195	63	1,268	833	1,148	8,408
Insulation products	481	46	122	99	125	3,668	4,541
Other	2,255	1,007	2,738	227	759	4,037	11,023
Total	22,732	4,627	3,709	2,535	2,215	24,438	60,256

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Table 6.—U.S. exports and reexports of asbestos and asbestos products

Product	1973 Quantity	1973 Value (thousands)	1974 Quantity	1974 Value (thousands)
EXPORTS				
Unmanufactured:				
Crude and spinning and nonspinning fibers ---- short tons	42,791	$6,604	22,633	$6,069
Waste and refuse ---- do	23,109	2,647	32,481	2,574
Total ---- do	65,900	9,251	55,114	8,643
Products:				
Gaskets and packing ---- do	3,309	10,483	3,235	12,582
Brake linings ---- do	5,813	7,863	5,924	10,136
Clutch facings, including linings ---- number	2,620,486	1,870	2,429,537	2,503
Textiles and yarn ---- short tons	9,598	6,454	9,465	8,408
Shingles and clapboard ---- do	11,226	2,586	12,345	3,348
Articles of asbestos cement ---- do	9,336	2,478	31,275	7,715
Protective clothing	NA	462	NA	556
Insulation, heat and sound	NA	2,850	NA	4,541
Manufactures, n.e.c	NA	5,659	NA	10,467
Total	XX	40,705	XX	60,256
REEXPORTS				
Unmanufactured:				
Crude and spinning and nonspinning fibers ---- short tons	438	86	2,129	548
Waste and refuse ---- do	104	5	4,480	1
Total ---- do	542	91	6,609	549
Products:				
Gaskets and packing ---- do	8	22	5	17
Brake linings ---- do	1	2	34	39
Clutch facings, including linings ---- number	9,600	11	14,504	21
Textiles and yarn ---- short tons	9	22	47	12
Shingles and clapboard ---- do	--	--	28	8
Articles of asbestos cement ---- do	54	15	45	5
Manufactures, n.e.c	--	--	NA	38
Total ---- short tons	XX	72	XX	140

NA Not available. XX Not applicable.

Table 7.—U.S. imports for consumption of asbestos from specified countries, by grade

(Short tons)

Grade	1973 Canada	1973 Southern Rhodesia	1973 Republic of South Africa	1974 Canada	1974 Southern Rhodesia	1974 Republic of South Africa
Chrysotile:						
Crudes	1,991	845	1,235	115	1,717	987
Spinning fibers	15,665	--	8	26,768	4	66
All other	746,988	--	3,427	712,228	--	3,291
Crocidolite (blue)	--	--	12,552	--	--	11,302
Amosite	--	--	7,842	--	--	8,018
Total	764,644	845	25,064	739,111	1,721	23,664

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Table 8.—U.S. imports for consumption of asbestos (unmanufactured), by class and country

Year and country	Crude (including blue fiber)		Textile fiber		All other		Total	
	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)	Quantity (short tons)	Value (thousands)
1973								
Canada	1,991	$397	15,665	$6,020	746,988	$86,449	764,644	$92,866
Finland	--	--	--	--	1,027	93	1,027	93
Germany, West	79	21	--	--	--	--	79	21
Guyana	--	--	--	--	303	8	303	8
Italy	--	--	--	--	8	3	8	3
Malagasy, Republic	--	--	--	--	3	1	3	1
Mexico	--	--	--	--	43	7	43	7
Mozambique	51	27	--	--	5	1	56	28
Panama	--	--	--	--	12	11	12	11
Portugal	--	--	--	--	1	(1)	1	(1)
Rhodesia, Southern	845	423	--	--	--	--	845	423
South Africa, Republic of	21,629	4,510	8	1	3,427	733	25,064	5,244
Swaziland	200	122	130	73	--	--	330	195
Yemen	--	--	--	--	50	11	50	11
Yugoslavia	--	--	--	--	8	3	8	3
Total	24,795	5,500	15,803	6,094	751,875	87,320	792,473	98,914
1974								
Brazil	--	--	--	--	20	2	20	2
Canada	115	13	26,768	10,416	712,228	106,085	739,111	116,514
Finland	--	--	--	--	557	74	557	74
Germany, West	99	35	--	--	1	1	100	36
Italy	--	--	1	4	--	--	1	4
Mexico	--	--	--	--	55	11	55	11
Portugal	--	--	--	--	4	2	4	2
Rhodesia	1,717	1,010	4	2	--	--	1,721	1,012
South Africa, Republic of	20,307	5,157	66	16	3,291	510	23,664	5,683
Swaziland	480	361	--	--	--	--	480	361
U.S.S.R	--	--	--	--	451	123	451	123
Total	22,718	6,576	26,839	10,438	716,607	106,808	766,164	123,822

[1] Less than ½ unit.

Table 9.—Canadian fiber sources corporately related to major U.S. asbestos products manufacturing firms [1]

U.S. asbestos products firms	Canadian mine sources	Fiber-producing capacity (short tons per year)
The Flintkote Co	Flintkote Mines, Ltd., Quebec	33,000
Asarco	Lake Asbestos of Quebec, Ltd	210,000
Johns-Manville Corp	Canadian Johns-Manville Co., Ltd	835,000
Jim Walter Corp	Carey-Canadian Mines, Ltd	200,000
Raybestos-Manhattan, Inc	Cassiar Asbestos Corp. Ltd (partial interest)	110,000
General Dynamics Corp	Asbestos Corp., Ltd. (54% interest)	500,000
Total		1,888,000

[1] Extracted from Economic Analysis of Proposed Effluent Guidelines, The Asbestos Products Manufacturing Industry, EPA–230/1–73–001, September 1973.

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WORLD REVIEW

Available information indicates that 1974 was another record year for asbestos in spite of a decline in Canadian production. Demand outstripped supply, as evidenced by a shortage throughout the year. Market growth was again limited by supply, but no real hardships surfaced, except that spinning-grade fibers were in very short supply all year. The market situation, labor problems, and worldwide inflation would indicate substantial price increases again in 1975.

An interesting comment on the world market was made by an industry publication.[3] "Directly or indirectly, the apparent consumption of asbestos is linked to comparative levels of industrialization. For instance, in the period from 1964 to 1970, North American asbestos consumption declined by 0.9% while, in the same period, demand from Western Europe grew by only 3.0%. In the developing countries, consumption rose substantially during those years: the Middle East 11.9%; Africa 16.0%; South America 9.5%; Pacific Basin countries 10.3%; and Eastern European countries and China, 18.3%."

Australia.—The Woodsreef mine was producing at a rate of about 50,000 tons per year even though Chrysotile Corp., the parent company, was in receivership.

Bolivia.—Development work on a chrysotile prospect was continuing. A truck road 87 miles long now joins the mine and the new experimental processing mill at Cochabamba.

Canada.—Even though Canadian production was 3% below the record high of 1973, it was still the second highest ever and Canada remained the world's primary producer of asbestos fiber. Significantly Quebec production was actually higher than in 1973; the drop in production came from other Provinces.

The possibility of labor problems in 1975 led to an analysis of some 1973 data released by the Bureau de la Statistique du Québec. The average production worker actually worked nearly enough hours for 52 forty-hour weeks, and was paid for even more. His annual wages were $9,516 at $4.06 per hour worked. In contrast, in 1910[4] an entire shift of 13 men in a mill had a labor cost of $24.50. Only one, the millwright, made more for the entire shift than the average worker made per hour in 1973.

With the aim of increasing manufacturing in the Province, the Minister of Resources of Quebec announced creation of a Provincial mineral marketing corporation to increase the quantity of mineral raw materials exported in a manufactured form. Asbestos was to be among the first minerals scrutinized by the corporation.

The complexities of the asbestos marketplace were described in a report[5] on one Quebec producer who offered his customers 420 grades of fiber in 1,320 different forms.

The fire that destroyed part of the King-Beaver mill of the Asbestos Corp. Ltd. on December 8 could result in the loss of 160,000 tons of fiber production in 1975, or about 30% of the corporation's total production.

United Asbestos Corp. Inc. has firm plans to bring its Midlothian mine into full production in mid-1975. This mine should add 100,000 tons per year to Canadian production.

Extensive milling and testing were still underway at the Chibougamau mine of McAdam Mining Corp., but at yearend no production decision had been announced. The Amos mine of the Abitibi Asbestos Mining Co. has scheduled production for 1978.

Cassiar Corp. announced the probable closure in 1977 of its Clinton Creek, Yukon, mine. This would mean a loss of 100,000 tons per year of production.

Colombia.—Eternit Colombiana has purchased the 70% interest of Nicolet Industries, Inc., in the Las Brisas asbestos project. The mine is now expected onstream in late 1976 and will produce a high proportion of grades 4 and 5.

Turkey.—Domestic funding is being raised to develop the rich asbestos deposits in Sivas Province.

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[3] Asbestos Producer (Quebec Asbestos Mining Association). June–July 1974.
[4] Cirkel, F. Chrysotile Asbestos—Its Occurrence, Exploitation, Milling, and Uses. 1910, pp. 151–152.
[5] Asbestos Producer (Quebec Asbestos Mining Association). June–July 1974.

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U.S.S.R.—A midsummer Pravda article, while discussing the projected Baikal-Amur rail line which will parallel the trans-Siberian Railway from Central Siberia to the Pacific, discussed at length the natural resources in areas to be touched by the new railway. Among those discussed were large deposits of long-fibered asbestos discovered at Molodezhny. A mine and mill are planned at the site 15 miles south of the railway in the Burgat A.S.S.R.

Table 10.—Asbestos: World production, by country
(Short tons)

Country [1]	1972	1973	1974 [p]
North America:			
Canada (sales)	1,687,051	1,862,976	1,824,000
Mexico	--	17	6
United States (sold or used by producers)	131,663	150,036	112,533
Latin America:			
Argentina	1,001	683	[e] 660
Brazil	36,247	51,809	49,458
Europe:			
Bulgaria	1,653	[e] 1,700	[e] 1,700
Finland [2]	7,042	6,985	6,165
Italy	144,702	164,525	165,629
Portugal	[3] 9	[e] 140	198
U.S.S.R.[e]	1,345,000	1,411,000	1,500,000
Yugoslavia	12,170	10,352	13,500
Africa:			
Egypt, Arab Republic of	486	363	[e] 330
Mozambique	[r] 600	624	--
Rhodesia, Southern [e]	88,000	88,000	88,000
South Africa, Republic of	356,206	366,683	369,739
Swaziland	36,817	40,675	35,738
Asia:			
China, People's Republic of [e]	220,000	230,000	230,000
Cyprus	[r] 32,827	34,950	[e] 28,000
India	13,528	12,456	21,310
Japan	15,903	[e r] 15,000	[e] 11,000
Korea, Republic of	[r] 5,819	6,291	6,294
Taiwan	2,962	5,851	3,964
Turkey	5,428	5,201	[e] 5,500
Oceania:			
Australia	18,561	45,715	[e] 62,200
Total	[r] 4,163,675	4,512,032	4,535,924

[e] Estimate. [p] Preliminary. [r] Revised.
[1] In addition to the countries listed, Czechoslovakia, North Korea, and Romania also produce asbestos, but available information is inadequate to make reliable estimates of output levels.
[2] Includes asbestos flour.
[3] Gross weight.

TECHNOLOGY

The terms "asbestos," "fiber," and their composite "asbestos fiber" have been the subjects of much discussion and controversy between and among producers, users, and those interested in the health aspects of asbestos. There is some mineralogic support for several variations of the definitions. It was thought that a consensus definition, arrived at by the deliberations of a group representing all viewpoints, would have validity. Such a group, the Task Force Group on Naturally Occurring Inorganic Fibers of The American Society for Testing and Materials Committee E–34 (Toxic Substances) has proposed the following mineralogical definitions of terms relating to naturally occurring inorganic fibers to reconcile the varying viewpoints:

Asbestiform.—Mineral structured in the form of asbestos.

Asbestos.—Generic term for naturally occurring, inorganic hydrated silicates that when processed separate into flexible fibers made up of fibrils. Minerals defined as asbestos are the asbestiform varieties of the following: serpentine (chrysotile), riebeckite (crocidolite), cummingtonite (amosite), anthophyllite, tremolite, and actinolite.

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Fiber.—For the purpose of this standard, fibrous particulate designates fibers, fiber fragments, and fiber agglomerates.

Fibril.—A single crystal in the form of a fiber.

Fibrous particulate.—For the purpose of this standard, fibrous particulate designates fibers, fiber fragments, and fiber agglomerates.

Naturally occurring inorganic fiber.—Form of mineral characterized by properties of flexibility and length-to-width ratio in the order of 100, composed of definite crystal unit cells oriented with respect to a specific axis.

Note 1.—The designated 100:1 aspect ratio is considered to represent a reasonable lower limit for naturally occurring inorganic fibers. Fibers of these dimensions can be broken into parts of fibers that may maintain their same surface properties and activities. Therefore, fiber fragments may have to be evaluated for atmospheric monitoring purposes. However, attempting to define a fiber by its aspect ratio alone is inadequate since it is obvious that particles of nonfibrous material do not become fibers as their aspect ratio increases through comminution.

A Bureau of Mines study to be published in 1975 compared differences between the costs of mining asbestos in the Yukon Territory, Canada, and the probable costs in nearby Alaska. The conclusion reached by the author was that 30% higher costs, due principally to labor costs, were indicated for the Alaska operation.

Late in 1973 the Materials Division of the Hitco Corp. announced a high-temperature silica fiber coated with chromium oxide.

Many substitutes for asbestos were announced in 1974. The "Saffil" alumina and zirconium dioxide fibers developed by Imperial Chemical Industries of the United Kingdom had attractive chemical and thermal properties and good filtration characteristics. Some equally attractive fibers were made by a group of Soviet scientists and others using molten basalt. A Canadian scientist[6] published the details on how to fiberize asbestos tailings to produce mineral wool.

It is significant that the proposed uses for these substitute fibers was for thermal insulation and in no case as a reinforcing agent, the most common use of asbestos, which, incidentally, was named the material having the highest ultimate tensile strength of those listed in an article for 1975 publication.[7]

Both Hooker Chemical Corp. and Diamond Shamrock Corp. announced a synthetic membrane to replace the conventional asbestos diaphragm cell in the chlor-alkali process. Commercial testing of both cell types was underway at yearend.

Union Carbide Corp. announced its new RG–600 form of asbestos which has been treated with a proprietary coupling agent that promotes better dispersion of the fiber in plastic matrices as well as increasing bonding strength between the two.

On August 15 the EPA administrator announced that the agency was conducting an investigation of the presence of asbestos in all areas of the environment and that a fiber-sampling program had been designed to study natural runoff from geologic deposits, mining and milling operations, other industrial sources, and public water supply intakes. He also announced that EPA was cooperating with several Health, Education, and Welfare organizations in launching a major animal-feeding study.

[6] Winer, A. Mineral Wool Insulation From Asbestos Tailings. CIM Bulletin, December 1974, pp. 97–104.

[7] Materials Engineering. Comparison of Materials. V. 81, No. 2, February 1975, p. 43.

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