# Asbestos

By R. A. Clifton[1]

Shipments of asbestos (mostly chrysotile) in 1978 from mines in the United States increased minimally from those in 1977. There was another small increase in 1979. Imports in 1978 were 4% higher than those in 1977, but decreased 10% in 1979.

U.S. apparent consumption rose 2% in 1978, but declined 9% in 1979. Canadian production in 1978 was 6% lower than that for 1977, but regained the 6% in 1979. Shipments from Canada to the United States rose 7% during 1978, but dropped 1% in 1979. Imports from Canada were 95% of total U.S. imports, and those from the Republic of South Africa accounted for 4%; these figures were 97% and 3%, respectively, in 1979.

**Table 1.—Salient asbestos statistics**

| | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|
| United States: | | | | | |
| Production (sales) metric tons | 89,489 | 104,873 | 92,256 | 93,097 | 93,354 |
| Value thousands | $14,220 | $23,693 | $25,267 | $27,987 | $28,925 |
| Exports and reexports (unmanufactured) metric tons | 33,061 | 42,564 | 34,896 | 45,380 | 45,850 |
| Value thousands | $10,667 | $12,791 | $12,075 | $20,533 | $24,165 |
| Exports and reexports of asbestos products (value) do | $60,776 | $60,572 | r$62,665 | $119,915 | $130,906 |
| Imports for consumption (unmanufactured) metric tons | 488,521 | 596,737 | 550,693 | 570,020 | 513,084 |
| Value thousands | $111,011 | $142,145 | $145,146 | $154,351 | $135,211 |
| Released from stockpile (unmanufactured) metric tons | 6,238 | 501 | 188 | -- | -- |
| Consumption, apparent[1] do | 551,188 | 658,847 | 609,157 | 618,706 | 560,588 |
| World: Production do | 4,138,756 | r5,086,071 | r5,220,639 | 5,153,868 | 5,277,591 |

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

**Legislation and Government Programs.**—No date was set by the Occupational Safety and Health Administration (OSHA) for the public hearings mandatory for the proposed revisions to its asbestos standard for manufacturing. The proposal for a permissible-exposure level of 0.5 fibers per cubic centimeter has been pending for 5 years until the hearings are scheduled.

On January 10, 1978, the Supreme Court dismissed an indictment against a Michigan wrecking company accused of violating the Environmental Protection Agency's (EPA) asbestos regulation. The high court ruled that the regulation was not an "emission standard" because it had no numerical limit, but rather a work practice.

On April 26, 1978, Joseph A. Califano, Secretary of the Department of Health, Education and Welfare (HEW) initiated a government asbestos warning program. Two major steps were announced: Issuance of an advisory letter to 400,000 physicians, and startup of a public information campaign aimed at workers and others possibly exposed to asbestos.

On April 28, 1978, EPA published in the Federal Register the procedures it will follow in promulgating a hazardous waste control system. Asbestos will be included among the hazardous materials covered under authority of the Resource Conservation and Recovery Act of 1976 amendment to the Solid Waste Disposal Act.



*Minerals Yearbook: Asbestos Chapters, 1978–79*
ACL Doc 11016 · Page 1 of 14
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Asbestos was one of the 12 minerals selected for in-depth study as part of the presidentially directed Nonfuel Minerals Policy Study started in 1978.

At the direction of the President, the heads of the Consumer Products Safety Commission (CPSC), the Food and Drug Administration (FDA), OSHA, and EPA in August formed the Interagency Regulatory Liaison Group (IRLG) to insure that areas of shared interest and responsibility would be considered jointly. In the initial document issued by the group in 1978, asbestos was among the 24 hazardous materials of interest to a majority of members. Among other things it said, "...it appears that all four agencies have an interest in cooperation in the following areas: Standard definitions of asbestos/asbestiform, importance of size and shape of asbestos fibers, analytical methodologies used in asbestos determinations, use of asbestos, substitutes for asbestos, labeling requirements, asbestos removal and disposal techniques and procedures, levels of environmental contamination, levels of human exposure, human body burden levels, and economic impact statements developed for regulatory purposes and for monitoring activities."

Effective December 18, 1978, the Mine Safety and Health Administration (MSHA) began enforcing its new asbestos exposure regulation. The new regulation replacing the five-fiber level reads, "The 8-hour time-weighted average airborne concentration of asbestos dust to which employees are exposed shall not exceed 2 fibers per milliliter greater than 5 microns in length, as determined by the membrane filter method at 400 to 450 magnification (4-millimeter objective) phase contrast illumination."

In the Federal Register of December 4, 1978, the Department of Transportation (DOT) issued its final rule on asbestos transportation. Effective April 30, 1979, the areas of principal impact on the industry pertain to containers, designation, and incidence reports. This was modified in the March 29, 1978, Federal Register and again in the August 16, 1979, issue.

On March 16, 1979, EPA announced its voluntary program to provide technical assistance to school officials for the prevention of exposure of children to asbestos. In the Federal Register of July 13, 1979, EPA announced a regulatory program to run parallel to the voluntary program.

On October 17, 1979, both EPA and CPSC published Advanced Notices of Proposed Rulemakings in the Federal Register. CPSC proposed initially the elimination of all nonessential uses of asbestos in consumer products which might release the fibers. EPA's regulatory approach would involve a "life cycle" method of assessing risk.

On December 17, 1979, in separate notices, both the CPSC and EPA extended the comment period on the proposed rules cited above. EPA also stated: "Should EPA's evaluation of human health risks and economic impacts determine that all but essential uses of asbestos present unreasonable risk, a possible regulatory strategy may be to ban the manufacture, processing, distribution in commerce, and import of asbestos for all nonessential asbestos uses at some fixed date in the future." EPA is seeking comment on this overall regulatory approach and on an appropriate date for instituting a general use ban. Effective dates presently under evaluation range from 1985 to 1995.

H.R. 1524, Asbestos School Hazard Detection and Control Act of 1979, passed the House but not the Senate. It included this definition of asbestos: "Asbestos and asbestos material are defined in Section 10 to include materials composed entirely or in part of chrysotile, amosite, or crocidolite, and when they occur in fibrous habit, tremolite, anthophyllite, and actinolite."

**Environmental Impact.**—News coverage of asbestos health problems continued during 1978-79, and litigation increased. The number of law suits grew from 159 new cases in 1976, to 362 new ones in 1977, and through September 15, 1978, 530 new ones were filed, or a prorated 700-plus for the year. One $20 million suit was settled in Texas, with nearly $6 million coming from the U.S. Government. A $1 billion suit was filed in California.

The West Australian Government has decided to close down and evacuate the 150-resident town of Wittenoom because of continuing risk from airborne asbestos dust. There is apparently a very high incidence of mesothelioma and other similar diseases among present and former residents of the area in which crocidolite asbestos was mined from 1938 to 1968. In 1979, the residents were offered purchase of their property, A$750 removal expenses, and A$100 travel grant per person.

Dr. E. Cuyler Hammond, vice president for epidemiology of the American Cancer Society, presented a paper at a spring 1978 meeting of the New York Academy of Sciences in which he said that researchers

failed to find any unusual incidence of cancer among people who lived near an asbestos factory 30 to 40 years ago. The research team included Dr. Irving J. Selikoff and others from the Cancer Society and Mt. Sinai Hospital. The team did a 10-year study of residents of a Paterson, N. J., area, which was the site of an asbestos plant, and another control area several miles away.

On October 24, 1979, the United Kingdom's Health and Safety Commission published a final two-volume report of the Advisory Committee on Asbestos. The 41 recommendations were the result of 3 years of study. The committee (1) reported that there was no quantitative evidence of a risk to the general public from exposure to asbestos dust; (2) placed no prohibition on the use of asbestos (with the exception of blue asbestos), expressing the view that control of any useful but hazardous material would be preferable to the ultimate sanction of prohibition; (3) recommended the consideration of alternatives and the replacement of asbestos, providing the alternative was significantly less hazardous, and (4) pointed out that this was an area in which one should proceed with caution.

**Table 2.—Stockpile goals and Government inventories as of December 31**

(Metric tons)

| | Stockpile goals | Total inventories | | | Sales of excesses, 1979 |
|---|---|---|---|---|---|
| | | 1977 | 1978 | 1979 | |
| Amosite | 23,851 | r38,587 | 38,587 | 38,587 | -- |
| Chrysotile | -- | r9,940 | 9,940 | 9,940 | -- |
| Crocidolite | -- | r2,163 | 2,163 | 2,163 | -- |
| Total | -- | r50,690 | 50,690 | 50,690 | -- |

rRevised.

## DOMESTIC PRODUCTION

Mines in the United States shipped about 1% more asbestos in 1978 than in 1977, and had another slight increase in 1979. Value increased both years. Four States produced asbestos: California was the leader, with 69% in 1978 and 74% in 1979, followed by Vermont, Arizona, and North Carolina (1978 only). Total output was 93,097 tons valued at $27,987,000 in 1978, and 93,354 tons valued at $28,925,000 in 1979.

Calaveras Asbestos Corp. was California's and the Nation's leading producer from its Copperopolis mine. Two other mines were also active in California on the Joaquin Ridge near Coalinga, Atlas Asbestos Corp. worked its Santa Cruz mine in Fresno County and Union Carbide Corp. operated its Santa Rita mine in San Benito County, both on the ridge.

The Vermont Asbestos Group's Lowell mine in Orleans County, Vt., is no longer under the management that led to the employees' acquisition. The management is headed by a local contractor, Howard A. Manosh who now controls a majority of the shares. The company remains second in the country in production. Intensive recent exploration has revealed reserves of sufficient magnitude to promise another 12 years of production.

Arizona production in 1978 was below the 1977 level, and remained low in 1979. The Jaquays Mining Corp. in Gila County had the only active asbestos mine in the State.

Powhatan Mining Co.'s mine in North Carolina was somewhat active in 1978. Some anthophyllite was mined and shipped, but there was no activity in 1979.

The Alaska Asbestos Co., jointly owned by General Crude Oil Co. (an International Paper Co. subsidiary), McIntyre Mines, Ltd., and Tanana Asbestos Corp. have an active program of drilling and engineering feasibility tests underway at the Eagle property owned by Doyon, Ltd. The work is being done by WGM, Inc. for a 5% interest. U.S. asbestos producers and mine sites follow:


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ACL Doc 11016 · Page 3 of 14
asbestosclaims.law/library/11016/3

| State and company | County | Mine | Type of asbestos |
|---|---|---|---|
| Arizona: Jaquays Mining Corp | Gila | Chrysotile | Chrysotile. |
| California: | | | |
| Atlas Asbestos Corp | Fresno | Santa Cruz | Do. |
| Calaveras Asbestos Corp | Calaveras | Copperopolis | Do. |
| Union Carbide Corp | San Benito | Santa Rita | Do. |
| North Carolina: Powhatan Mining Co | Yancey | Hippy | Anthophyllite. |
| Vermont: Vermont Asbestos Group | Orleans | Lowell | Chrysotile. |

Employment in U.S. asbestos mines and mills averaged about 500 persons during 1978 and 1979.

## CONSUMPTION AND USES

The end use data on asbestos as reported by respondents to the Bureau of Mines questionnaire are difficult to analyze. Patterns of use that may be indicative of trends are not apparent. Compared with 1977 levels, 75% of the end uses in 1978 showed decreases in asbestos consumption; in 1979, 60% showed decreases. The asbestos used in asbestos-cement pipe increased in 1978, but decreased slightly in 1979. Use in asbestos-cement sheet decreased in 1978 and 1979. Further decreases in 1978 were in flooring products, insulation, friction products, coatings and compounds, and textiles. Other major decreases in 1979 were in packing and gaskets and in friction products.

Asbestos-cement pipe, which represented 35% of the total asbestos consumption in 1978 and 38% in 1979, and flooring products, which represented 20% and 21%, respectively, were the largest end uses of asbestos.

The sources of supply of U.S. asbestos in 1978 are shown in Figure 1.

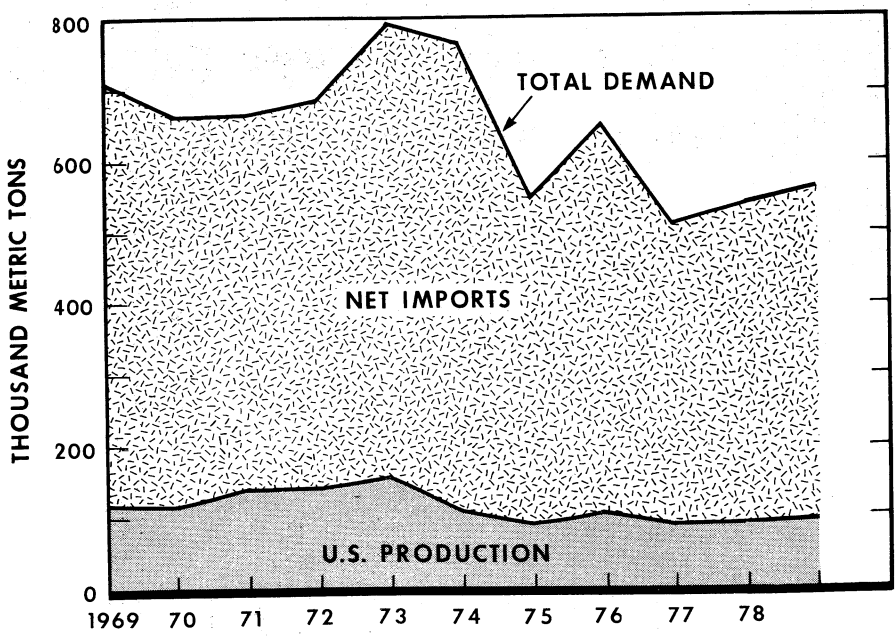



**Figure 1.—U.S. sources of asbestos, 1969-1978.**


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## Table 3.—U.S. asbestos consumption by end use, grade, and type

(Metric tons)

| | Chrysotile | | | | | | | | Crocidolite | Amosite | Anthophyllite | Total asbestos[1] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Grades 1 & 2 | Grade 3 | Grade 4 | Grade 5 | Grade 6 | Grade 7 | Grade 8 | Total chrysotile[1] | | | | |
| 1978 | | | | | | | | | | | | |
| Asbestos-cement pipe | -- | -- | 137,000 | 44,700 | 4,100 | 700 | -- | 186,500 | 29,700 | 1,200 | -- | 217,400 |
| Asbestos-cement sheet | -- | -- | 4,900 | 11,100 | 12,900 | 6,900 | -- | 35,700 | -- | 400 | -- | 36,100 |
| Flooring products | -- | -- | -- | 53,500 | -- | 72,400 | -- | 126,000 | -- | -- | -- | 126,000 |
| Roofing products | -- | -- | 300 | 2,200 | 22,200 | 37,400 | -- | 61,900 | -- | 200 | -- | 62,100 |
| Packing and gaskets | -- | 1,100 | 3,600 | 16,600 | 900 | 8,800 | -- | 31,000 | 100 | -- | (2) | 31,100 |
| Insulation: | | | | | | | | | | | | |
| Thermal | -- | (2) | 400 | 400 | 3,000 | 2,400 | -- | 6,200 | -- | -- | -- | 6,200 |
| Electrical | -- | 200 | -- | 200 | (2) | 400 | -- | 800 | -- | -- | -- | 800 |
| Friction products | -- | 400 | 2,200 | 24,400 | 9,200 | 36,900 | 300 | 73,300 | -- | -- | 400 | 73,700 |
| Coatings and compounds | -- | -- | 300 | 200 | 1,100 | 17,500 | -- | 19,100 | -- | (2) | -- | 19,100 |
| Plastics | -- | -- | -- | 900 | (2) | 1,600 | -- | 2,500 | 1,000 | -- | 1,400 | 4,900 |
| Textiles | 200 | 2,700 | (2) | (2) | -- | -- | -- | 2,900 | -- | -- | -- | 2,900 |
| Paper | -- | 100 | 100 | 1,000 | 3,300 | 4,300 | -- | 8,700 | 300 | -- | -- | 9,000 |
| Other | 100 | 200 | 1,000 | 2,500 | 2,900 | 21,600 | -- | 28,100 | -- | 1,500 | -- | 29,700 |
| Total[1] | 300 | 4,700 | 149,600 | 157,500 | 59,500 | 210,800 | 300 | 582,500 | 31,200 | 3,300 | 1,800 | 619,100 |
| 1979 | | | | | | | | | | | | |
| Asbestos-cement pipe | -- | -- | 146,100 | 31,600 | 700 | -- | -- | 178,400 | 34,700 | (2) | -- | 213,100 |
| Asbestos-cement sheet | -- | -- | 100 | 100 | 3,900 | 6,600 | -- | 10,700 | -- | 200 | -- | 10,900 |
| Flooring products | -- | -- | 6,600 | 44,400 | 11,000 | 58,500 | -- | 120,500 | -- | -- | -- | 120,500 |
| Roofing products | -- | -- | 1,300 | 100 | 18,500 | 45,900 | -- | 65,800 | -- | -- | -- | 65,800 |
| Packing and gaskets | -- | 1,300 | 3,100 | 8,500 | 400 | 5,800 | -- | 19,100 | 100 | -- | -- | 19,200 |
| Insulation: | | | | | | | | | | | | |
| Thermal | -- | -- | -- | 200 | 1,800 | 8,100 | -- | 10,100 | -- | -- | -- | 10,100 |
| Electrical | -- | 200 | 600 | 200 | 1,200 | 3,100 | -- | 5,300 | -- | -- | -- | 5,300 |
| Friction products | -- | 800 | 3,400 | 16,200 | 5,400 | 35,100 | -- | 60,900 | -- | -- | 300 | 61,200 |
| Coatings and compounds | -- | (2) | 400 | (2) | 400 | 18,700 | -- | 19,500 | -- | -- | -- | 19,500 |
| Plastics | (2) | (2) | 100 | 800 | (2) | 1,400 | -- | 2,300 | 600 | -- | -- | 2,900 |
| Textiles | -- | 5,800 | (2) | (2) | -- | -- | -- | 5,800 | -- | -- | -- | 5,800 |
| Paper | -- | 100 | -- | 400 | 100 | -- | -- | 600 | 300 | -- | -- | 900 |
| Other | 100 | 600 | 400 | 2,800 | 9,400 | 10,700 | -- | 24,000 | -- | 1,300 | -- | 25,300 |
| Total | 100 | 8,800 | 162,100 | 105,300 | 52,800 | 193,900 | -- | 523,000 | 35,700 | 1,500 | 300 | 560,500 |

[1]Data may not add to totals shown because of independent rounding.
[2]Less than 50 metric tons.

Minerals Yearbook: Asbestos Chapters, 1978–79
ACL Doc 11016 · Page 5 of 14
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## PRICES

Quoted prices for Quebec asbestos, all chrysotile, rose 5.6% during 1978 and 7.1% in 1979. The last rise was effective on July 1, 1979. British Columbia asbestos chrysotile prices rose 4.0% in 1978 and 6.5% in 1979.

Prices for Vermont chrysotile asbestos rose 5.0% on January 1, 1978, and 16% on January 1, 1979. Arizona prices did not increase during 1978 or 1979. The latest prices are still those that went into effect on July 1, 1976, and quotations, f.o.b. Globe, are shown below:

| Grade | Description | Per metric ton |
|---|---|---|
| Group 1 | Crude | $3,307 |
| Group 2 | do | 1,984 |
| AAA | | 1,433 |
| Group 3 | Nonferrous filtering and spinning | $827- 926 |
| Group 4 | Nonferrous plastic and filtering | 827- 926 |
| Group 7 | White shorts | 110- 220 |

As of January 1, 1979, Vermont chrysotile asbestos, f.o.b. Morrisville, was priced as follows:

| Grade | Description | Per metric ton |
|---|---|---|
| 4T | Fiber | $651 |
| 5K | do | 504 |
| 5R | do | 428 |
| 6D | Waste | 313 |
| 7D | Shorts | 207 |
| 7M | do | 119 |
| 7R | do | 110 |
| Hooker No. 1 | | 1,378 |
| Hooker No. 2 | | 772 |

Quotations for Canadian (Quebec) chrysotile, f.o.b. mine, as of July 1, 1979, follow:

| Grade | Description | Per metric ton |
|---|---|---|
| Group 2 | Crude | Can$2,530 |
| Group 3 | Spinning fiber | Can$1,128- 1,770 |
| Group 4 | Asbestos-cement fiber | 757- 1,114 |
| Group 5 | Paper fiber | 428- 639 |
| Group 6 | Paper and shingle fiber | 364- 388 |
| Group 7 | Shorts | 125- 240 |

The latest prices for chrysotile asbestos from British Columbia, Canada, effective January 1, 1979, f.o.b. Vancouver, follow:

| Grade | Description | Per metric ton |
|---|---|---|
| | CASSIAR MINE | |
| C-1 | Crude | Can$3,991 |
| AAA | Nonferrous spinning fiber | 2,205 |
| AA | do | 1,764 |
| A | do | 1,157 |
| AC | do | 1,058 |
| AK | Asbestos-cement fiber | 937 |
| AS | do | 816 |
| AX | do | 739 |
| AY | do | 518 |
| AZ | do | 375 |
| | CLINTON MINE | |
| CP | Asbestos-cement fiber | Can$838 |
| CT | do | 750 |
| CY | do | 518 |
| CZ | do | 375 |

African asbestos producers privately negotiate sales, thereby ruling out market quotations. The following tabulation shows the average value per metric ton of South African imports, regardless of grade, calculated from 1979 U.S. Department of Commerce data:

| Type | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|
| Amosite | $435 | $508 | $589 | $569 | $577 |
| Crocidolite | 471 | 571 | 582 | 624 | 686 |
| Chrysotile | 1,036 | 259 | 485 | 451 | 679 |

## FOREIGN TRADE

There was an increase in the value of asbestos and asbestos products exported from the United States in 1978 over that in 1977 and a further increase in 1979. Most of the 1978 gain was accounted for by the 73% increase in the value of the unmanufactured asbestos, which had a 31% rise in tonnage. There was a dramatic increase in the value, in U.S. dollars, per metric ton from $345 to $455 in 1978, but the 1979 average was $527. The fiber share of the export dollar rose from 16% in 1977 to 24% in 1978, and was 16% in 1979.


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**Table 4.—Countries importing U.S. asbestos fibers and products, by type and country**

(Thousand dollars)

| | 1978 | | | 1979 | | |
|---|---|---|---|---|---|---|
| | Unmanufactured fibers | Manufactured products | Total | Unmanufactured fibers | Manufactured products | Total |
| Australia | 536 | 2,606 | 3,142 | 429 | 2,778 | 3,207 |
| Canada | 2,354 | 46,909 | 49,263 | 2,508 | 53,761 | 56,269 |
| Colombia | 227 | 3,187 | 3,414 | 364 | 3,324 | 3,688 |
| Germany, Federal Republic of | 1,563 | 7,072 | 8,635 | 924 | 4,009 | 4,933 |
| Japan | 3,861 | 2,714 | 6,575 | 4,686 | 2,950 | 7,636 |
| Mexico | 5,107 | 4,932 | 10,039 | 4,931 | 6,430 | 11,361 |
| Netherlands | 104 | 3,013 | 3,117 | 126 | 2,712 | 2,838 |
| Saudi Arabia | 119 | 12,501 | 12,620 | 596 | 11,448 | 12,044 |
| United Kingdom | 320 | 2,655 | 2,975 | 387 | 3,217 | 3,604 |
| Venezuela | 105 | 3,967 | 4,072 | 193 | 4,078 | 4,271 |
| Other | 5,931 | 29,285 | 35,216 | 8,250 | 33,356 | 41,606 |
| Total | 20,227 | 118,841 | 139,068 | 23,394 | 128,063 | 151,457 |

In 1978, the United States recovered 51% of the cost of imported asbestos by exporting and reexporting fibers and products. This was well below the 62% realized in 1977. In 1979, the value of exports and reexports exceeded the value of asbestos imports.

**Table 5.—U.S. exports and reexports of asbestos and asbestos products**

| Products | 1977 | | 1978 | | 1979 | |
|---|---|---|---|---|---|---|
| | Quantity | Value (thousands) | Quantity | Value (thousands) | Quantity | Value (thousands) |
| EXPORTS | | | | | | |
| Unmanufactured: | | | | | | |
| Crudes, fibers, and stucco (metric tons) | 16,244 | $7,433 | 22,153 | $8,371 | 31,635 | $12,868 |
| Sand and refuse (do.) | 17,676 | 4,268 | 18,666 | 4,719 | 10,501 | 3,642 |
| Asbestos fibers (do.) | -- | -- | 3,597 | 7,137 | 2,559 | 6,784 |
| Total (do.) | 33,920 | 11,701 | 44,416 | 20,227 | 44,695 | 23,294 |
| Products: | | | | | | |
| Shingles and clapboard (do.) | 6,537 | 2,484 | 10,652 | 5,256 | 7,323 | 3,875 |
| Other articles of asbestos (do.) | (1) | (1) | 14,340 | 11,700 | 17,758 | 13,301 |
| Gaskets (do.) | (1) | (1) | 3,911 | 4,510 | 4,203 | 4,556 |
| Packing and seals (do.) | (1) | (1) | 2,396 | 11,520 | 2,405 | 14,497 |
| Insulation (do.) | NA | 4,671 | NA | 5,193 | NA | 4,524 |
| Other articles, n.s.p.f (do.) | (1) | (1) | NA | 24,876 | NA | 22,806 |
| Brake linings and disc brake pads (do.) | (1) | (1) | NA | 44,696 | NA | 55,270 |
| Clutch facings and linings (number) | 1,110,280 | 2,129 | NA | 11,090 | NA | 9,334 |
| Total | XX | XX | XX | 118,841 | XX | 128,163 |
| REEXPORTS | | | | | | |
| Unmanufactured: | | | | | | |
| Crudes and fibers (metric tons) | 908 | 364 | 896 | 296 | 1,039 | 851 |
| Sand and refuse (do.) | 68 | 10 | 68 | 10 | 116 | 20 |
| Total (do.) | 976 | 374 | 964 | 306 | 1,155 | 871 |
| Products: | | | | | | |
| Gaskets (do.) | (1) | (1) | NA | 37 | -- | -- |
| Packing and seals (do.) | (1) | (1) | NA | 20 | 4 | 109 |
| Insulation (do.) | NA | NA | NA | 1 | -- | -- |
| Other articles, n.s.p.f (do.) | (1) | (1) | NA | 103 | NA | 68 |
| Brake linings and disc brake pads (do.) | 179 | 197 | NA | 683 | NA | 2,492 |
| Clutch facings and linings (number) | 662 | 7 | NA | 230 | NA | 52 |
| Other articles of asbestos (metric tons) | (1) | (1) | -- | -- | NA | 22 |
| Total | XX | XX | XX | 1,074 | XX | 2,743 |

NA Not available. XX Not applicable.

[1]TSUS numbers and grouping changed in 1978; no comparable data available for 1977.


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Canada remains the largest user of U.S. asbestos and products. Thirty-six percent of the value realized from these products in 1978 came from there. In 1979, Canada purchased 37% of the U.S. fibers and products sold abroad. Saudi Arabia was second in receiving U.S. asbestos and products. This country provided 9% of the U.S. export dollars in 1978 and 8% in 1979.

Other major buyers of U.S. asbestos and products were Mexico, the Federal Republic of Germany, Japan, Venezuela, and the United Kingdom, Australia, Colombia, and the Netherlands.

Canada provided 95% of the asbestos fiber imported into the United States in 1978 and 97% in 1979. The Republic of South Africa provided 4% of the imports in 1978 and 3% in 1979. Included was all of the amosite and crocidolite and most of the crudes imported. Several countries provided the remainder. Chrysotile again dominated the imported types with 97% of the total for both years. The dollar value of imported fiber in 1978 was above that of 1977, but in 1979 it was below that of 1978.

**Table 6.—U.S. imports for consumption of asbestos from specified countries, by grade**

(Metric tons)

| Grade | Canada | Republic of South Africa | Southern Rhodesia |
|---|---|---|---|
| 1977: | | | |
| Chrysotile: | | | |
| Crude | 122 | 3,456 | 2,224 |
| Spinning fibers | 6,065 | 3,415 | -- |
| All other | 509,833 | 2,141 | 313 |
| Crocidolite (blue) | 64 | 10,857 | -- |
| Amosite | 1 | 528 | -- |
| Total | 516,085 | 20,397 | 2,537 |
| 1978: | | | |
| Chrysotile: | | | |
| Crude | 38 | 5,219 | -- |
| Spinning fibers | 7,292 | 50 | -- |
| All other | 535,754 | 1,753 | -- |
| Crocidolite (blue) | 131 | 16,734 | -- |
| Amosite | 18 | 1,152 | -- |
| Total | 543,233 | 24,908 | -- |
| 1979: | | | |
| Chrysotile: | | | |
| Crude | 138 | 378 | -- |
| Spinning fibers | 8,070 | -- | -- |
| All other | 487,499 | 2,235 | -- |
| Crocidolite (blue) | -- | 13,618 | -- |
| Amosite | -- | 461 | -- |
| Total | 495,707 | 16,692 | -- |


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**Table 7.—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 (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) | Quantity (metric tons) | Value (thousands) |
| 1977 | | | | | | | | |
| Canada | 187 | $90 | 6,065 | $6,224 | 509,833 | $124,940 | 516,085 | $131,254 |
| Mexico | -- | -- | -- | -- | 3,280 | 139 | 3,280 | 139 |
| Rhodesia, Southern | 2,224 | 2,368 | -- | -- | 313 | 199 | 2,537 | 2,567 |
| South Africa, Republic of | 14,842 | 7,721 | 3,415 | 309 | 2,141 | 1,273 | 20,398 | 9,303 |
| Sweden | -- | -- | -- | -- | 1 | (1) | 1 | (1) |
| Taiwan | -- | -- | -- | -- | 283 | 7 | 283 | 7 |
| U.S.S.R | -- | -- | 1,987 | 443 | 6,122 | 1,433 | 8,109 | 1,876 |
| Total | 17,253 | 10,179 | 11,467 | 6,976 | 521,973 | 127,991 | 550,693 | 145,146 |
| 1978 | | | | | | | | |
| Canada | 187 | 105 | 7,292 | 6,491 | 535,754 | 133,146 | 543,233 | 139,742 |
| India | -- | -- | -- | -- | 39 | 17 | 39 | 17 |
| Italy | 383 | 32 | -- | -- | 164 | 21 | 547 | 53 |
| Mexico | -- | -- | -- | -- | 183 | 10 | 183 | 10 |
| South Africa, Republic of | 23,105 | 12,919 | 50 | 41 | 1,753 | 1,205 | 24,908 | 14,165 |
| Sweden | -- | -- | -- | -- | 20 | 8 | 20 | 8 |
| U.S.S.R | -- | -- | -- | -- | 1,010 | 324 | 1,010 | 324 |
| Yemen, People's Democratic Republic of | -- | -- | -- | -- | 44 | 29 | 44 | 29 |
| Yugoslavia | -- | -- | -- | -- | 36 | 3 | 36 | 3 |
| Total | 23,675 | 13,056 | 7,342 | 6,532 | 539,003 | 134,763 | 570,020 | 154,351 |
| 1979 | | | | | | | | |
| Australia | -- | -- | -- | -- | 36 | 4 | 36 | 4 |
| Austria | -- | -- | -- | -- | 20 | 4 | 20 | 4 |
| Canada | 138 | 28 | 8,070 | 7,008 | 487,499 | 116,577 | 495,707 | 123,613 |
| Germany, Federal Republic of | -- | -- | -- | -- | 21 | 42 | 21 | 42 |
| India | -- | -- | -- | -- | 222 | 62 | 222 | 62 |
| Italy | 16 | 4 | -- | -- | 15 | 4 | 31 | 8 |
| Mexico | -- | -- | -- | -- | 22 | 5 | 22 | 5 |
| Norway | -- | -- | -- | -- | 44 | 7 | 44 | 7 |
| Romania | -- | -- | -- | -- | 20 | 4 | 20 | 4 |
| South Africa, Republic of | 13,996 | 9,568 | -- | -- | 2,696 | 1,735 | 16,692 | 11,303 |
| South-West Africa, Territory of (Namibia) | 209 | 143 | -- | -- | -- | -- | 209 | 143 |
| Spain | -- | -- | -- | -- | 20 | 4 | 20 | 4 |
| United Kingdom | -- | -- | -- | -- | 20 | 4 | 20 | 4 |
| Yemen, People's Democratic Republic of | -- | -- | -- | -- | 20 | 8 | 20 | 8 |
| Total | 14,359 | 9,743 | 8,070 | 7,008 | 490,655 | 118,460 | 513,084 | 135,211 |

[1]Less than 1/2 unit.

## WORLD REVIEW

A 1978 article in Industrial Minerals said that the market for mineral fibers is growing rapidly except for asbestos.[2] The constant search for asbestos substitutes was mentioned along with the legislative restrictions on its use, which effectively reduce the economic reasons for asbestos use.

The review of the 1978 world market in a Canadian trade journal attributed a 7.5% decrease in world production mainly to reduced shipments from the U.S.S.R. and the Republic of South Africa.[3] The same article predicted a 1% to 2% growth in demand over the next few years, with the growth coming mainly from the developing countries. These data on world production are shown in Figure 2.


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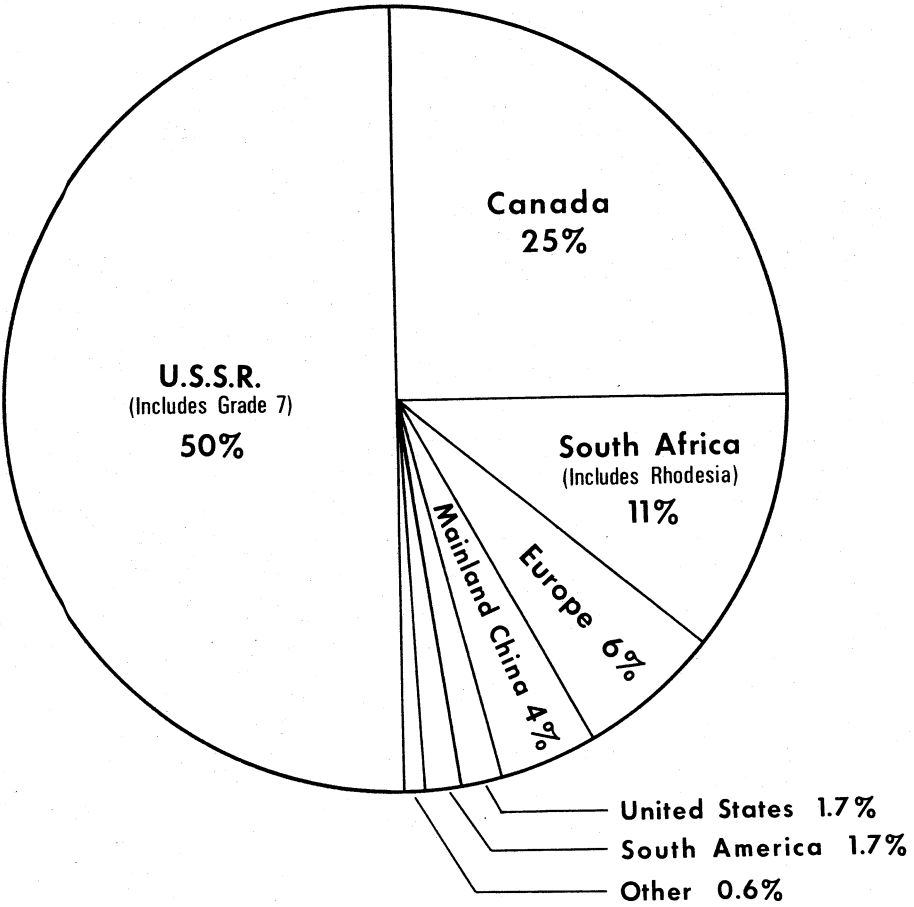



**Figure 2.—World asbestos production, 1978.**
**(Data from work cited in footnote 3.)**


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**Australia.**—The Woodsreef Mines, Ltd., asbestos mine gained a respite from its financial problems when, at the recommendation of the Australian Industries Assistance Commission, the Cabinet extended a A$1.4 million grant. The grant is conditional on one of A$2 million from the New South Wales Government. Woodsreef Mines and its parent company, Woodsreef Minerals Corp. of Canada, are marketing a new wet milling process. A prototype mill has been proposed for February 1980 startup.

**Canada.**—Although Quebec shipments to over 80 countries rose 2.7% in 1978 over those in 1977, Canadian total production declined 6% during that year, only to rise nearly 9% in 1979. Cassiar Asbestos Corp.'s 3-month strike in British Columbia and the closure of their Yukon mine were contributing factors to the 1978 decline. The values received for Canadian fibers also decreased in 1978 from Can$520 million to Can$509 million. In 1979 the asbestos sold for Can$641 million. The average received per metric ton was Can$363 in 1977, Can$379 in 1978, and Can$427 in 1979.

The Quebec Asbestos Mining Association (QAMA) officially changed its name to L'Association des Mines D'Amiante du Quebec (AMAQ).

At yearend 1979, the second bill passed by the Quebec National Assembly allowing expropriation of the 54.6% of Asbestos Corp. owned by the U.S. firm General Dynamics had not been exercised. There was an injunction by the Quebec Court of Appeals against it and an appeal before the Supreme Court of Canada by General Dynamics. The Quebec Government wants to obtain this property to incorporate it into its Société National de l'Amiante.

Exploration continued at the Abitibi asbestos project near Amos in northwestern Quebec. Brinco, Ltd., the majority owner, and others including Asarco, Inc., are continuing talks that could lead to a Can$400 million facility to produce 226,800 metric tons per year.

Asbestos Corp. is still making plans for the Penhale property underground below the closed Normandie property, and is evaluating the possibility of going underground at the Asbestos Hill property on the Ungava Peninsula. The corporation announced a Can$122 million expansion and modernization program to be accomplished by 1984.

Cassiar Asbestos Corp. closed its Clinton mine in the Yukon during August of 1978 owing to depletion of reserves. There was a 3-month strike at its Cassiar pit in British Columbia beginning in September. The White Pass and Yukon Railway—for 80 years the only overland link between White Horse, Yukon, and Skagway, Alaska—may have to close because of the loss of its principal client, Cassiar's Clinton mine.

Johns-Manville Canada, Inc., is the new name of the former Canadian Johns-Manville, Ltd. The 1978 measurements of its Jeffrey pit at Asbestos, Quebec, showed it to be 1.98 kilometers east to west, 1.83 kilometers north to south, and 308 meters deep.

United Asbestos, Inc., has ended its receivership by repaying some debts and arranging a loan to cover the rest. Work on reopening the mine and mill at Midlothian, Ontario, is expected to be delayed by winter weather, postponing the reopening until the summer of 1980.

**Greece.**—Construction started in April of 1978 on the Zidani asbestos mine and mill near Kozani. Completion of the 100,000-ton-per-year chrysotile facility is scheduled for July 1980. There is a possibility of Arabian investment in the mine. Initial financing is by the Government's Hellenic Industrial Development Bank (ETVA) and management, by a company under its control.

**Japan.**—Examination of Japanese imports of asbestos for a recent 3-year period, shown in the following table, reveals a small decrease (8%) in 1977 and a major one (22%) in 1978. The reasons are not apparent. Canada remains the largest source, with the Republic of South Africa second. It appeared that the U.S.S.R. was getting ready to claim a large share of this market when its share rose to 24% in 1977, but the large drop to just 8% in 1978 leaves this premise in doubt.

| Country of origin | 1976 | | 1977 | | 1978 | |
|---|---|---|---|---|---|---|
| | Metric tons | Percent | Metric tons | Percent | Metric tons | Percent |
| Canada | 144,150 | 44 | 119,551 | 40 | 111,000 | 47 |
| South Africa, Republic of | 96,645 | 30 | 82,181 | 27 | 80,873 | 34 |
| U.S.S.R. | 54,335 | 17 | 71,109 | 24 | 17,811 | 8 |
| United States | 10,094 | 3 | 9,247 | 3 | 11,784 | 5 |
| Australia | 4,351 | 1 | 9,503 | 3 | 7,346 | 3 |
| Other | 15,771 | 5 | 9,045 | 3 | 6,087 | 3 |
| Total | 325,346 | 100 | 300,636 | 100 | 234,901 | 100 |


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ACL Doc 11016 · Page 11 of 14
asbestosclaims.law/library/11016/11

**Mexico.**—Among the major investments announced by Industrias Penoles was the $44 million Pegaso asbestos plant in Oaxaca State. Johns-Manville Corp. will have a 40% equity in the joint venture.

**South Africa, Republic of.**—The asbestos industry of this nation had a mixed but generally down year in 1978 based on preliminary (10-month) data. Amosite production dropped more than 40% to about 40,000 tons; chrysotile, more than 30% to about 77,000 tons; and Cape Blue crocidolite, about 30% to 140,000 tons. Transvaal Blue crocidolite production rose nearly 67% to about 150 tons. No anthophyllite was produced. The total value of exported asbestos decreased over 17% from 1977 to 1978, but that sold locally increased by 33%.

Cape Industries, Ltd., completed the expansion and moderization of the mining and milling facilities at Pomfret in 1978. The new R10 million mill can produce 70,000 tons per year of fiber, and the mine has been expanded to produce sufficient ore for this. The future of their older Koegas mine is in doubt, and will be decided by the new owners, Transvaal Consolidated Land and Exploration, Ltd. (TCL). This company now owns all of the asbestos mines acquired by Cape Industries since it started mining in the Republic of South Africa in 1893.

In 1979, the South Africa Geological Survey revised its asbestos reserve estimate up to 22 million tons, an increase of over 180%.

**Sudan.**—Johns-Manville Corp. has been awarded two asbestos exploration concessions. Only one, in Qala-el-Nahl near the Ethiopian border is believed to have commercial possibilities. Other partners in the venture are the Sudan Textile Industry (Sudanese Government-owned) and the Gulf International Group of Kuwait. It is hoped that a $120 million facility yielding 100,000 tons per year will result with the Sudanese Government getting 49% of the profits.

**Turkey.**—A recent estimate put Turkey's asbestos reserves at nearly 5 million tons.

**United Kingdom.**—Imports of asbestos into the United Kingdom in 1978 were only 93% of those in 1977. Most of the decrease was in fiber from Swaziland, which went from 12% to 1% of the total. Canada and

**Table 8.—Asbestos: World production, by country**

(Metric tons)

| Country[1] | 1976 | 1977 | 1978[p] | 1979[e] |
|---|---|---|---|---|
| North America: | | | | |
| Canada (shipments) | 1,536,091 | 1,517,360 | 1,421,808 | [2]1,501,000 |
| Mexico | 1 | -- | -- | -- |
| United States (sold or used by producers) | [r]104,873 | 92,256 | 93,097 | [2]93,354 |
| South America: | | | | |
| Argentina | 889 | 686 | 697 | 700 |
| Brazil | 92,703 | 92,773 | 122,815 | 120,000 |
| Europe: | | | | |
| Bulgaria[e] | [r]300 | [r]500 | 500 | 500 |
| Italy | [r]164,788 | 149,327 | 135,402 | 130,000 |
| U.S.S.R.[e] | 2,290,000 | [r]2,400,000 | 2,435,000 | 2,470,000 |
| Yugoslavia | [r]12,830 | 9,036 | 10,360 | 10,500 |
| Africa: | | | | |
| Egypt | 1,096 | 478 | 349 | 350 |
| Rhodesia, Southern[e] | 165,000 | 200,000 | 225,000 | 250,000 |
| South Africa, Republic of | 369,840 | 380,164 | 257,325 | [2]249,187 |
| Swaziland[3] | 41,847 | 38,046 | 36,951 | 38,000 |
| Asia: | | | | |
| Afghanistan | 13,260 | [e]13,000 | [e]13,000 | 4,000 |
| China: | | | | |
| Mainland[e] | [r]150,000 | 200,000 | 250,000 | 250,000 |
| Taiwan | 853 | 673 | 2,031 | 2,000 |
| Cyprus | 34,518 | 36,684 | 34,342 | 36,000 |
| India | [r]24,119 | 22,177 | 19,100 | 20,000 |
| Japan | 7,703 | 6,719 | [e]6,720 | 8,000 |
| Korea, Republic of | 4,762 | 6,180 | 13,616 | 14,000 |
| Thailand | 15 | 4 | -- | -- |
| Turkey | [r]9,941 | 3,975 | 13,372 | 10,000 |
| Oceania: Australia | [r]60,642 | 50,601 | 62,383 | 70,000 |
| Total | [r]5,086,071 | 5,220,639 | 5,153,868 | 5,277,591 |

[e]Estimate. [p]Preliminary. [r]Revised.

[1]In addition to the countries listed, Czechoslovakia, North Korea, and Romania also produce asbestos, but output is not officially reported, and available general information is inadequate for the formulation of reliable estimates of output levels.

[2]Reported figure.

[3]Exports.


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ACL Doc 11016 · Page 12 of 14
asbestosclaims.law/library/11016/12

the Republic of South Africa furnished 93% of the imports in 1978. Late in 1979, the United Kingdom Advisory Committee on Asbestos published its third and final report. The report recommended a "control limit" for human exposure at the level of 1 fiber per milliliter of air for chrysotile, 0.5 fiber for amosite, 0.1 fiber for crocidolite, and a statutory ban on the importation of crocidolite.

**U.S.S.R.**—Work began in 1978 on the Kiyembay asbestos mining and enrichment combine, and production started in 1979. This facility in Orenburg, Oblast, has a design capacity of 250,000 tons per year of fiber. The new V. I. Lenin combine in the Tuva A.S.S.R. commenced production in 1979, and probably produced 120,000 tons in that year.

**Yugoslavia.**—With the investment of about Din300 million in new facilities, the asbestos mine at Bosansko Petrovo Selo, Bosnia-Hercegovina, raised its fiber output from 5,000 to 26,000 tons per year.

## TECHNOLOGY

In 1978 and 1979, as in the previous few years, the majority of the research connected with asbestos had to do with health effects. Only preliminary results are available from the National Institute of Environmental Health Sciences (NIEHS) study on the carcinogenicity of ingested asbestos. These suggest that ingested asbestos is less dangerous than inhaled asbestos.

A special committee on asbestosis of the Quebec Workmen's Compensation Board studied the medical files of 6,785 workers employed by the asbestos mining companies during the 15 months preceding December 31, 1976. The committee reported asbestosis in varying degrees in 161 workers, or 2.37%. AMAQ, in further analyzing the data, said that the incidence of asbestosis is related to exposure, and that the workers who had it had worked for decades under the more primitive asbestos extraction processes that prevailed earlier. AMAQ concluded that new technology and industrial hygiene programs are resulting in generally improved health conditions.

In an article in *Nature* magazine, researchers demonstrated a probable reason why cigarette smoking and asbestos exposure are synergistic in promoting lung cancer.[4] They report that a carcinogen found in cigarette smoke, benzo(a)pyrene, is readily adsorbed on asbestos. It remains there in the more soluble and more dangerous "structured" form, rather than linking with other molecules in the "structureless," less soluble "excimer" form.

In April of 1978, Battelle Institute was given an EPA grant to evaluate sealants to inhibit asbestos fibers from entering the atmosphere, and in May of that year Mt. Sinai Medical School's Environmental Health Laboratory had finished a project for NIEHS that demonstrated that water-based vinyl polymer coatings would effectively inhibit asbestos fibers from entering the atmosphere from walls and ceilings.

An article in an international publication describes in detail the durability of asbestos-cement pipe.[5] Sewer pipe laid in Dieppe, France, in 1932 and dug up in 1975, had lost 2 millimeters of wall thickness along the inside bottom, showed no traces of wear or chemical attack on the outside, and still exceeded current standards. Pressure pipe used in the Graz, Austria, water system between 1933 and 1973 increased in strength and safety during that periods due to a combination of factors. Forty-two-year old pressure pipe recovered in Heilbronn, Germany, was unimpaired and strength values exceeded current standards.

**Substitutes.**—The environmental problems associated with asbestos continue to exert pressure from the marketplace for substitutes. A recent article looked at the whole mineral fiber picture; included with asbestos was rockwool, fiberglass, and alumino-silicate fibers.[6] The article concluded that the mineral fiber market (with the exception of asbestos) is growing rapidly, and that asbestos was losing some of its asbestos-cement market to the alkali-resistant glass fibers and alternative products such as glass-fiber-reinforced plastics. The article included a table illustrating the growth of mineral fiber production in Europe that showed a 13% growth from 1975 to 1976.

There were two different approaches to using polypropylene fibers as asbestos substitutes. Shell International Chemical Corp. announced their fibers "Carifil" that has mineral additives such as clays, chalks, barium sulfate, titanium dioxide or diatomites partially imbedded in the surface of the branched fibers. Shell hopes to capture some of the asbestos building product mar-


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ket. A research team at Surrey University in the United Kingdom claims that its polypropylene-reinforced cement invention produces a material as strong and durable as asbestos-cement products and economically comparable. However, the material cannot be made on conventional asbestos-cement machinery.

Rockwool International AJS of Denmark has developed an alkali-resistant inorganic fiber reportedly excellent reinforcing properties. PPG Corp. has developed a texturized glass fiber for which it claims improved breaking strength and better retention of strength under heat than asbestos textiles.

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[1]Physical scientist, Section of Nonmetallic Minerals.
[2]Industrial Minerals (London). Mineral Fibres—A Review. No. 133, October 1978, pp. 19-31.
[3]Bulletin, L'Association des Mines D'Amiante du Quebec, v. 3, No. 1, January/February 1979, p. 5.
[4]Lakowicz, J. R. and J. L. Hyden. Nature. V. 275, September/October 1978, p. 446.
[5]International Asbestos Cement Review. Asbestos Cement Conduits After Forty Years. V. 23, No. 7, July 1978, pp. 71-72.
[6]Work cited in footnote 2.


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