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What Asbestos Is: How And Where It Is Used

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What Asbestos Is: How and Where It Is Used

"Asbestos" is derived from an ancient Greek word meaning "inextinguishable." In reality, mineral asbestos is non-flammable even at extremely high temperatures, it inhibits certain types of chemical reactions, and is extremely flexible and durable. All these qualities combine to make it especially suitable for a wide variety of demanding uses, particularly those that protect human life and property. Asbestos is unique because its primary function is to save lives.

What Asbestos Is

Asbestos is the generic name given to a group of hydrated silicate minerals that can be separated into relatively soft, silky fibers which have great tensile strength. Certain grades can be carded, spun and woven. Others can be pressed or laid to form paper.

Chrysotile, crocidolite (or blue fiber), and amosite are the three varieties of asbestos that are commercially significant today. Each differs from the others both physically and chemically (See Appendix A for chemical breakdowns).

Chrysotile is a flexible white magnesium silicate which can be attacked by acids. It differs from other asbestos minerals in that it has a positive rather than a negative electrical charge in water. Chrysotile now accounts for 97 percent of all asbestos used annually in the United States. This high percentage of use is due in part to industry awareness of medical studies that show amosite and crocidolite to be more potentially hazardous to health than chrysotile. Canada and the Soviet Union are the leading producers of chrysotile fiber, but small deposits are also found in the United States, Italy, South Africa, Rhodesia and China.

Crocidolite, characterized by a deep blue color, is a ferrous sodium silicate that is acid resistant but less flexible than chrysotile. The bulk of the world's supply comes from South Africa. Crocidolite was a strategic material during World War

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II, when it was used as the filtering element in gas mask cannisters. It can be spun or woven into materials and fabrics used in acid-resistant packings and flame-resistant clothing.

Amosite, which is mined commercially only in the Transvaal district of South Africa, is a brown ferrous magnesium silicate that occurs in the same type of iron-rich sedimentary rock as does crocidolite. It is brittle and not as acid resistant as crocidolite. Amosite is used principally in the manufacture of heat insulating materials.

Properties and Advantages

It is estimated that as many as 3000 different products in daily use throughout the world contain some asbestos. While in certain products the percentage of asbestos may be small, the unique properties of asbestos usually are responsible for the functioning of the product in a demanding application.

The heat-resistant properties and fibrous structure of asbestos make it extremely desirable as a fireproofing and insulating material, an application which already has saved countless lives and prevented billions of dollars of property damage. Typically, asbestos is used wherever fire and excessive heat are a threat to safety.

The wide range of applications for asbestos indicates the incredible demands which any substitute material would have to satisfy. At this time, there is no one material (available at a reasonable price) which can outperform asbestos in all these applications, especially where high temperatures are critical.

Companies now are looking at fibrous glass, plastics, ceramics, and various synthetic materials as possible replacements for asbestos in certain applications. However, there generally is no one adequate substitute material available since increased costs, poor performance and weight factors often make their replacement for asbestos unattractive.

The general feeling in industry continues that asbestos fiber can be used safely and effectively, if efficient dust control methods and organized programs of preventive plant maintenance are implemented according to the standards set by the Environmental Protection Agency and OSHA (U.S. Department of Labor).

How Asbestos Is Used

Asbestos fibers can be classified into two types: spinning and non-spinning. Spinning fibers comprise the longer grades of chrysotile and crocidolite; non-spinning fibers include the shorter grades of chrysotile and crocidolite, plus the long and short grades of amosite. Use of a specific grade of fiber depends greatly upon application, and to a lesser extent on price and availability.

Longer-grade chrysotile fibers can be carded, spun and woven to make textile products such as rovings, yarn, tape and cloth. Asbestos textiles are used to make fireproof clothing, friction materials, packings and gaskets, lagging cloth, and laps that provide electrical and thermal insulation. Spinning-grade asbestos fibers also are used in such non-spinning applications as compressed sheet packings and gaskets. They also are an ingredient of strong asbestos paper used in tape form to wrap electrical wires and cable.

The shorter-grade (non-spinning) chrysotile fibers make up the great majority of chrysotile used in the U.S. These fibers go into numerous asbestos-cement products, including pipe, roofing shingles, flat and corrugated siding, millboard, cements and fillers, and insulation paper. Short chrysotile fibers are used extensively in brake linings and automatic transmission friction materials.

More than 90 percent of the asbestos fiber used annually in the United States is incorporated into finished products where the fiber is entrapped, or locked in, and not free to serve as a possible contaminant in the atmosphere. Asbestos can be locked into a product with a binder, saturant, coating or bonding agent so that normal handling, application and use will not generate significant quantities of asbestos dust. Asbestos-cement products are examples of "locked-in" materials whereas many insulating materials and spray-on fireproofing compounds are so-called "non-locked-in" materials.

Where Asbestos Is Used

The total annual world production of asbestos is approximately four million tons. Canadian production accounts

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for about 30 percent of the total; production in the United States accounts for about 3 percent.

Use of asbestos fiber in the United States increased after World War II. By 1950, the use of asbestos reached a plateau, and during the last 20 years usage in the U.S. has remained fairly constant. Asbestos consumed in the United States in 1972 amounted to slightly over 800,000 tons (See Appendix B for 1971 breakdown, the last year for which detailed figures are available), and was valued at $85 to $90 million. Gross sales of finished products containing asbestos in 1971 amounted to nearly $1 billion (See Appendix C for sales breakdown). These products were manufactured in over 400 different facilities, large and small, that employ approximately 30,000 people with a total payroll of $300 million.

Products Containing Asbestos

Asbestos is used in over 3000 different products throughout the world either because it inhibits combustion, because it is acid-resistant, or because the great tensile strength and light weight of asbestos fibers enhances their use as a filler or binder in a wide range of products.

Fire prevention and retardation is a feature of asbestos-containing products like protective (safety) clothing, thermal, electrical and acoustical insulating materials, roof shingles, siding and flooring, space-vehicle heat shields, theatre curtains, boiler jackets, welding screens and blankets, gaskets for spark plugs, motor casings and insulating tapes for wire and cable.

Fireproofing plus protection against abrasive wear and tear (including the caustic action of acids) are qualities of asbestos which combine to make it useful in products like vinyl and asphalt floor tile, asbestos-cement pipe, asphalt paving, friction materials, packings and gaskets, asbestos-cement building materials, paper, felts and many textile products.

The adhesive and binding properties of asbestos fibers make asbestos a useful ingredient in products like reinforced plastics, paints, varnishes, roofing cements, wicks, rope, twine, protective coatings and felts used in paper manufacturing.

The spinning and weaving capability of asbestos fibers is

basic to the asbestos textile industry. Asbestos fibers also are used in filters which collect dust and other air pollutants, and in filtration systems used in the processings of beverages, liquids and drugs.

It should be remembered that in approximately 90 percent of these products, the asbestos fibers are solidly locked into the product so there is no danger of dust generation during normal use and handling of the product.

APPENDIX A

There are six common varieties of asbestos — actinolite, amosite, anthophyllite, chrysotile, crocidolite and tremolite. Chrysotile, which accounts for more than 97 percent of the asbestos used in this country, is a member of the Serpentine group of minerals that consist essentially of a hydrous magnesium silicate compound. The five other varities — none of which has the commercial significance that chrysotile has — are members of the Amphibole group of minerals. They have similar crystalline structures and generally consist of three or four ions — magnesium, sodium, iron and silicon.

These six major types of asbestos minerals are distinguished chemically as follows:

Chrysotile	$3MgO\ 2SiO_2\ 2H_2O$
Actinolite	$(Ca.Mg.Fe)_8\ Si_8O_{22}(OH)_2$
Amosite	$1.5MgO\ 5.5FeO\ 8SiO_2\ H_2O$
Anthophyllite	$7MgO\ 8SiO_2\ H_2O$
Crocidolite	$Na_2O\ Fe_2O_3\ 3FeO\ 8SiO_2\ H_2O$
Tremolite	$2CaO\ 5MgO\ 8SiO_2\ H_2O$

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APPENDIX B

Following is a listing of major product lines containing asbestos and the tonnage used in each in the United States in 1971:

Product Lines	Tonnage
Vinyl-Asbestos Floor Tile	145,000 tons
Asbestos-Cement Pipe	140,000
Felt and Paper	110,000
Friction Materials	80,000
Asbestos-Cement Building Materials	50,000
Packing Materials	25,000
Textiles	22,000
Asbestos Insulation	16,000
Spray-on Asbestos Materials	15,000
All Other Asbestos Products	147,000
TOTAL	750,000 tons

APPENDIX C

Following is a listing of product lines containing asbestos and a breakdown in sales in the United States for 1971:

Product Line	Sales in Millions of Dollars
Vinyl-Asbestos Floor Tile	$190.3
Asbestos-Cement Pipe	147.1
Brake Linings	135.3
Packings and Gaskets	99.5
Asbestos Paper	75.0
Asbestos-Cement Building Materials	70.4
Other Friction Materials	43.8
Asbestos Insulations	40.9
Textiles	38.2
Asbestos Felts	35.2
Asbestos Reinforced Plastics	12.1
All Other Asbestos Products	104.8
TOTAL	$992.6

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