

# THE ASBESTOS FACTBOOK

Wherein is given in compact form much information concerning asbestos — that amazing, versatile non-metallic mineral.

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"ASBESTOS," Philadelphia, Pa.

Second Edition—Feb. 1st, 1944

# QUALITIES OF ASBESTOS

Durability — Resists..... { Weather  
Corrosion  
Fire  
Heat  
Acid  
Vermin  
Fungi-growth

Insulates against..... { Vibration  
Electricity  
Sound

Binds..... { Fillers  
Magnesia  
Cement  
Rubber

Filters..... { Acids  
Alkalies

Attracts..... { Sludge  
Dust

Printed in the United States

Price — 10c per copy

## FOREWORD

In the compilation of this small book we have taken information from many sources, and have been helped by various executives in the Asbestos Industry. It is impossible to list them all, but to all of them our sincere appreciation is extended.

The Asbestos Factbook is for those who need, for one reason or another the main facts on asbestos without hunting thru many volumes. Those preparing luncheon talks may find it useful; teachers will welcome it; it can be used to answer the many inquiries received by "Asbestos" and by members of the Asbestos Industry for general information about the wonderful non-metallic mineral—Asbestos.

## THE ORIGIN OF ASBESTOS

(Extracted from "The Origin of Asbestos":  
published in "Asbestos," July, 1940)

Chemical and mineralogical studies clearly show that asbestos fibre is not of vegetable or animal origin, but entirely of mineral origin. Taking as an example the chrysotile asbestos mined in Canada, the observed facts lead to the following explanation of its formation.

In the greenstone region of Canada, covering hundreds of square miles, the present surface rock was at one time thousands of feet below its present elevation, and under very great pressure due to the weight of the overlying rock and soil. This rock is a variety of olivine called peridotite and is composed of iron, magnesia and silica. In certain extensive areas this rock was acted on by hot ground waters, under high pressure, and carrying dissolved salts and carbon dioxide. The pressure is easily understood when it is realized that the rock was very far below the earth's surface, and the high temperature is explained by the fact that the temperature of the earth increases about 1°F. for every fifty feet of depth. From depth alone, this would give a temperature increase of at least 20°F. for every

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1000 feet, not to mention the hot intrusive rocks also present. These ground waters gradually changed the original rock from the iron-containing peridotite to the magnesia-silica-water ( $3\text{MgO} \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}$ ) mineral, serpentine. During the alteration the volume of the rock increased, causing innumerable cracks, small and large. These cracks were filled with the hot ground waters, chiefly derived from the slow infiltration of rain or surface waters. This underground water circulated thru the cracks in the rock, descending slowly thru the smaller openings in the rocks and ascending thru the larger openings and cracks. This water at high temperature and containing carbon dioxide under pressure is a very good rock solvent. The water rising in the larger cracks loses pressure and slowly cools, losing some of its solvent power and throwing out a small amount of the dissolved rock. This material deposits on the sides of the crack in the rock thru which the water is flowing, and if suitable mineralizers are present, such as dissolved salts and carbon dioxide, tends to form regular crystal shapes, depositing the molecules in a regular rather than a haphazard manner. Rock salt gives cubes; diamond forms in octahedrons; graphite in six sided plates, gold in octahedrons or cubes. Asbestos forms in easily separable, closely packed filaments, which when teased apart give the workable form in which asbestos is marketed and used.

The theory for the formation of asbestos fibre as given in the foregoing is held by many experts, but may be and is contested in some of its minor details by others, based on slightly different conditions present where they made their observations. In most cases the difference of opinion relates to such details as to how the waters were heated, and what the mineralizers were rather than to the whole of the theory. What has been said above about Canadian asbestos fibre formation holds also for the Vermont chrysotile fibre, Arizona, Russian, Cyprus and South African chrysotile fibre, as well as for some of the other non-chrysotile types.



## TERSE ASBESTOS FACTS

¶ "Asbestos" is not the name of a distinct mineral species, but is a commercial term applied to fibrous varieties of several minerals differing widely in composition, the fibres being diverse in strength, flexibility and consequent usefulness.

¶ The properties of asbestos that give it commercial value are fibrous structure and fire resistance.

¶ Grading of asbestos is on the basis of length rather than quality. Fibres of the same *quality* range in price according to length.

¶ The three varieties of asbestos most used commercially are Chrysotile, Amosite and Crocidolite (blue) the bulk of world production and use, both long and short fibres, is Chrysotile.

¶ The earliest use of asbestos known to the world was over 2000 years ago by the Romans for the wrapping of their dead.

¶ Canadian Asbestos (chrysotile variety) was first "discovered" near St. Joseph, Que., in 1860; the deposits at Thetford and Coleraine were found in 1877; but, according to the story of Benjamin Franklin's purses, asbestos was actually known in Canada, probably by the Indians, as early as 1724.

¶ Blue asbestos was discovered near the Orange River, South Africa, in 1816; the name "crocidolite," meaning "flakey" or "woolly" stone, was applied to it in 1831; exploitation of the material began in 1893.

¶ Amosite (in Central Transvaal) was first known in 1907; the name was given to it in 1918, being taken from the initials of the company most interested in its production—Asbestos Mines of South Africa. Commercial production started in 1916.

¶ Rhodesia first reported production of asbestos (chrysotile variety) in 1908—55 tons.

¶ See March, 1939, "ASBESTOS," page 2, for this story.

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¶ Asbestos in itself does not have low heat conductivity. Its extensive use for heat insulation is because of its fire-proof qualities; the porous structure or air-cell content of asbestos insulation materials accounts for their insulation value.

¶ Italy is called the cradle of the Asbestos Industry because the mining of asbestos and the manufacture of its products began on an industrial scale in that country.

¶ Asbestos was found in the Ural District (Russia) between 1710 and 1720.

¶ Asbestos was discovered in Vermont in 1824, but production was first recorded in 1908.

¶ A patent on engine packing using asbestos was granted as early as 1857 to Richard Lloyd, of England.

¶ Insulation containing asbestos was first used in 1866; it was made of asbestos fibre and silicate of soda and was in sectional form.

¶ Great Britain's asbestos manufacturing industry began in 1871 in a factory founded by the Patent Asbestos Manufacture Limited, of Glasgow, Scotland.

¶ The first known attempt to make asbestos paper was in 1765; it was first made in the United States about 1873.

¶ Cape Asbestos Company were the original spinners of crocidolite or blue asbestos—as early as 1895.

¶ Ludwig Hatschek, an Austrian, invented asbestos-cement shingles in 1900; they were introduced into the United States in 1905 by the Keasbey & Mattison Company.

¶ Asbestos-cement pipe was first used for carrying corrosive salt water for street cleaning and fire-fighting in an Italian seacoast town.

¶ Patents on asbestos-cement pipe were granted in Italy in 1913; the manufacture of such pipe began by Eternit Pietra Artificiale in Genoa, Italy, in 1915; it was introduced into the United States by Johns-Manville in 1929 and the first shipment made by J-M in 1930.

¶ Arizona asbestos is important for electrical insulation because of its low iron content.

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¶ Crocidolite and Amosite asbestos are highly acid resistant, making them valuable for use in chemical plants.

¶ Amosite asbestos was first spun in England in 1924 by the Cape Asbestos Company. The pioneer in the spinning of Amosite was S. Weingarten, of South Africa, who spun Amosite yarns as early as 1909.

¶ Asbestos was first used in brake lining in 1906.

¶ A capital investment of \$22,000,000 is represented in the asbestos mining and milling industry in Canada.

¶ The United States is the largest consumer of asbestos in the world.

## ASBESTOS IS FOUND:

The four largest asbestos producing countries are Canada, Russia, Southern Rhodesia (Africa) and the Union of South Africa. Next in importance are the United States, Cyprus, Italy and Finland.

In spite of the fact that asbestos is found in practically all countries, its occurrence in *satisfactory quality and economic quantity* is not common. Altho deposits are continually being reported, there are very few which upon examination are found to warrant the expense necessary for development. The following tabulation forms an index to the varieties of asbestos produced in the various countries or localities.

### AFRICA:

Southern Rhodesia (chrysotile of excellent quality).  
Swaziland (chrysotile of excellent quality).  
Union of South Africa—Transvaal produces amosite, blue and chrysotile. Cape Province produces the well-known Cape Blue exclusively and extensively. Other occurrences of asbestos (chrysotile) have been reported from Natal.

### AUSTRIA:

Short fibered amphibole known as "micro-asbestos" used, in combination with concrete or asphalt, for road surfacing.

### AUSTRALIA:

Chrysotile of various qualities and lengths is found

in Western Australia, South Australia, Queensland and New South Wales. Blue asbestos is found in South Australia; the deposits of blue in Western Australia are being developed at the present time.

### CANADA:

Chrysotile variety, found principally in the provinces of Quebec and Ontario. Asbestos Mines in Quebec are the best known in the world. Canadian quality and grading are considered as standard the world over.

### CHINA:

Deposits of chrysotile worked to some extent in a number of provinces, the most important being in Chihli (Hopeh) Province and Manchuria.

### CYPRUS:

Good quality of chrysotile; most of the production is of "shingle stock" grade or lower.

### FINLAND:

Produces fair quantities of short anthophyllite.

### INDIA:

Produces both amphibole and chrysotile to some extent. The chrysotile is of excellent quality and low iron content.

### ITALY:

Chrysotile of fair grade and tremolite of excellent quality are produced. Mining and manufacture of asbestos on an industrial scale first began in Italy.

### RUSSIA:

Very extensive deposits of good grade chrysotile are found in the Ural Mountains and have been extensively developed by the U. S. S. R., altho quite large production was recorded previously.

### SOUTH AMERICA:

Deposits of chrysotile in Venezuela are the most important from a commercial standpoint. Other deposits, some chrysotile and some amphibole, are reported in Argentina, Brazil, Chile and Bolivia. Very long blue asbestos, not strong enough for spinning,



is found in Bolivia. So far no commercial use has been found for it.

#### UNITED STATES:

Arizona Mines produce an excellent long fibre chrysotile, valuable for electrical work because of its freedom from iron.

California has deposits of short chrysotile, not being worked to any extent at present. Tremolite asbestos is also being produced in commercial quantities for Gooch Crucible use.

Georgia has been the most consistent producer of amphibole (anthophyllite) asbestos of any of the states. Large deposits are found in Sall Mountain (near Gainesville) and at Hollywood.

Maryland has a deposit of anthophyllite and tremolite, from which filter fibres are made.

Vermont produces good grades of chrysotile ranging from shingle stocks to shorts.

Wyoming, Montana and New York have deposits of good chrysotile asbestos also, but these have not been worked.

Deposits of amphibole (principally anthophyllite) which are being worked to some small extent are found in North Carolina, Idaho, Wyoming, Montana, Oregon and Alaska.

Deposits have also been reported in Maine, New York, Pennsylvania, Virginia, Texas, Michigan, Connecticut, South Carolina, South Dakota, Wisconsin.

#### OTHER COUNTRIES:

Occurrences of asbestos of various types, principally chrysotile or anthophyllite, have been reported from time to time from Albania, Algeria, Bulgaria, Chosen (Korea), Czechoslovakia, Corsica, Cuba, France, Germany, Ireland, Japan, Mexico, Madagascar, Newfoundland, New Zealand, Philippine Islands, Portugal, Spain, Switzerland, Spitzbergen, Syria, Turkey and Turkish Armenia.

## THE USES OF ASBESTOS AND ASBESTOS PRODUCTS

In presenting this list of uses of asbestos and asbestos products, we have included only the basic and more important uses—those which consume the largest volume of asbestos (or the product made therefrom) or those which require small quantities of material but perform a very valuable function.

We have not tried to include in this list the end use of every item, that is the place where the asbestos or asbestos product is used, or the purpose for which it is used, except where that place or purpose is most important, or unique. For instance, asbestos blankets are used for fire fighting in hotels, department stores, laundries, dry cleaning establishments, at airplane hangars, by fire departments; the one designation "Asbestos blankets for fire fighting" covers a multitude of what might be regarded as the "Uses of Asbestos Cloth" if the list were carried out to the nth degree.

There are also innumerable uses of asbestos and asbestos products which may be extremely interesting but are unimportant from the viewpoints mentioned. Most of these have been published at some time or other in "Asbestos" and a complete list, so far as is known, is kept on file.

As an illustration, a certain actor's pockets were made of asbestos cloth<sup>1</sup>, but we do not consider "asbestos pockets" sufficiently important to include in this printed list.

(Several uses have been added in this 2nd Edition.)

#### USES OF RAW ASBESTOS

Yarn  
Thread  
Wick packing  
Rope packing  
Felt  
Paper (plain and corrugated)  
Rollboard  
Millboard  
Insulating wire  
85% Magnesia pipe covering, blocks and locomotive lagging  
High temperature insulation (moulded) (various types)  
Compressed sheet packing  
Compound for encasing of motor windings  
Moulded composition for electrical and other purposes

<sup>1</sup>See page 18, January, 1930, "ASBESTOS."

(Uses of Raw Asbestos — Continued)

Moulded brake lining and brake blocks  
Automobile bodies and railway sleepers (moulded composition)  
Filler in Plastics  
Flooring  
Pottery and sculpture  
Asbestos Cement Products, viz:  
Shingles, siding, tile  
Wall tile and flat sheets  
Corrugated roofing and sheathing  
Decorative panels  
Insulated board  
Floor tile backing  
Pipes  
Miscellaneous articles, such as  
ventilators, flower pots, louvres, etc.  
Asbestos cement for insulation of boilers  
Roofing cement  
Furnace cement  
Plaster and stucco  
Paints, varnishes and fillers  
Sprayed asbestos (acoustical)  
Filling for asbestos mattress insulation  
Insulation of batteries (loose fibre)  
Insulation of walls and floors (loose fibre)  
Insulation in underground conduits (loose fibre)  
In foundations to resist shock  
Packing for explosives or other materials  
Wadding in cartridges and timing devices  
Filter fibres and filter pads  
Platinized asbestos fibre for filtering  
Coating for welding rods  
In cheese making (on which to place spores)  
Pavement in sewer pipe

USES OF ASBESTOS YARN

Cloth  
Tape, electrical and other  
Brake lining  
Clutch facings  
Packing—valve stem, braided and other  
Gaskets and gasket cloth  
Tubing  
Wick for oil burning apparatus  
Rope  
Twine or sewing thread  
Stocking for lead cable  
Electric fixture wire covering

(Uses of Asbestos Yarn — Continued)

Electric cable covering  
Tying gas mantles  
For spark plugs  
Edges for hair felting

USES OF ASBESTOS CLOTH

Packing—sheet, high pressure, folded or wound  
Brake lining, folded and stitched  
Clutch facings  
Gaskets  
Asbestos insulation mattresses  
Substitute for canvas on insulation where temperatures are high  
Clothing, viz:  
Suits  
Helmets  
Gloves and mittens  
Aprons  
Leggings  
Berets  
Tapestry  
Hangings for firestops  
Blankets for fire fighting  
Blankets in electrolyzer cells  
Bags and diaphragms (in oxygen producing)  
Mailbags  
Awnings  
Rugs  
Theatre curtains  
Theatre scenery  
Floor lining in theatres  
Portable motion picture booths  
Motion picture screen  
In acoustical treatment  
In acetylene welding  
Gun grips  
Asbestos faced wipers in commutators  
Facing for dryer felt  
Filtering (fruit juices, acids, etc.)  
Filter in dust collectors  
Oil filter sack (in automobiles)  
Protectors for gas bags in balloons  
Oven insulation  
Lining in motors  
Lining of laboratories, cooling chambers and other rooms  
Lining of automobile footboards



**(Uses of Asbestos Cloth — Continued)**

Padding for laundry presses and mangles  
Padding prison cells  
Wrapping oil tanks and oil lines in engines  
Umbrellas and shields (protecting firemen)  
In various medical test apparatus  
Sand bags (for pressing hats)  
Conveyor belting  
In hay curing to preserve aroma and color  
In cheese making to control temperature  
Insulation against noise and vibration (especially in airplanes)  
Fittings for airplanes

**USES OF ASBESTOS FELT**

In acoustical work  
Protection of underground pipes  
On paper machines  
Noise insulation  
Padding in pianos

**USES OF ASBESTOS TAPE**

Wick for oil burning apparatus  
Belts for conveying hot glass or other articles  
Pull strings for ovens  
Insulating locomotive steam pipes at bends, etc.  
Insulating armatures  
Winding coils  
Winding buss bars  
Insulating underground cables  
Laboratory uses, such as insulation for flasks, test tubes, retorts; tie straps in diffusing materials  
In glass manufacture for wrapping tines of forks to take bottles from ovens; reinforcing paddles for stirring molten glass

**USES OF WICK PACKING**

As packing  
For wiping of wire, armor plate or galvanized materials

**USES OF ASBESTOS PAPER**

Air cell and other pipe coverings  
Boiler jackets  
Asbestos felt roofing  
Asbestos built-up roofing  
Asbestos protected metal roofing  
Gaskets, plain and metallic  
Wick in oil burning apparatus  
Tubes in electrical industry  
Wrapping of electrical wire  
Wrapping of hot air pipes  
Linings of  
Stoves  
Heaters

**(Uses of Asbestos Paper — Continued)**

Linings of  
Filing cabinets  
Cartridges  
Soldiers' helmets  
Carpets  
Auto mufflers  
Radiator covers  
Drum controllers  
Cookers  
Electric appliances  
Armored car roofs  
Auto floorboards  
In enameling ovens to catch drip  
Insulation of ovens and dry kilns  
Diaphragm in electrolytic cell  
Tank covers  
Reinforcing aluminum foil for insulation  
Filtering  
In window glass machinery to guide hot sheets; to shield hot glass from flying fragments  
In welding and other processes for protection from heat  
In annealing (crumpled paper)  
In chemistry and physics in many various ways  
Reinforced with cotton thread for automobile tops  
Covering of rockwool blankets which must be sewed  
Wrapping of wires and cables  
Insulating exhausts on automobiles  
Baking sheets  
Table pads and mats  
Construction of air ducts or lining of paper ducts

**USES OF ASBESTOS MILLBOARD**

Linings of  
Stoves and heaters  
Safes  
Garages  
Motion picture booths  
Electric switch boxes  
Dry cleaning machines  
Garbage incinerators  
Hoods of automobiles  
Bottoms of brooder stoves  
Ovens and dry kilns  
As fireproof wallboard  
Ceiling over boilers, smoke stacks, etc., for fire protection  
Gaskets, plain and metallic



(Uses of Asbestos Millboard — Continued)

Paddles in glass mills  
Washers in electrical apparatus  
Tent shields and stove pipe rings  
In metal clad doors (between outside metal and wood core)  
Table pads and mats  
Stove mats

USES OF ASBESTOS-CEMENT FLAT SHEETS  
AND WALLBOARD

Interior sheathing (of factories, refrigerator rooms, etc.)  
Partitions, movable and fixed  
Exterior sheathing (half-timber effect)  
Brick-type siding  
Portable buildings  
Roofs and sides of small buildings  
Semi-portable motion picture booths  
Fireproof layer on insulated board  
Fire protection around engines  
Lining of fireless cookers  
Backing for dyes (in moulding glass)  
Brake shoes for elevators  
Hoods over machines or vats (from which vapor rises)  
Mounting of test instruments and gauges  
Laboratory table tops  
Switch boards  
Cabinets and panel box work  
Insulators between phases and on arc deflectors  
Electric motor casings  
Spark arresters  
Miscellaneous uses in electrical apparatus  
Lining for bleaching and other tanks and vats  
Backgrounds and cut-outs for window displays  
Blackout or bombproof board

USES OF ASBESTOS CEMENT PIPES

For carrying of water, sewage, gas and special liquids  
As gas vent pipes  
Conduits for electric light wires, etc.  
Purlins, rafters, trusses, etc., for wartime buildings

USES OF ASBESTOS COMPOSITION MATERIAL

Insulation compounds  
Heater cord insulation  
Electric wire insulation  
Lamp sockets, rheostat backings, switch parts, arc deflectors, resistance mountings and other electrical uses

<sup>1</sup>Of many types.

(Uses of Asbestos Composition Material — Continued)

Underground insulation  
Flooring  
Phonograph records, buttons and other small objects made of plastic  
Sealing of percussion caps in large cells

USES OF VARIOUS ASBESTOS PRODUCTS IN MOVIES

To localize fires in location  
To protect nearby buildings when fires are set  
For wall sections in sets to prevent reverberations  
Firebox in fireplaces  
Insulation of camera booths against sound  
Blinders or ears for lights or sun arcs  
Dressing winter scenes as snow  
Dust on cobwebs, old wine kegs, etc.  
Noise insulation  
Insulation for maintaining even temperature

TYPICAL ANALYSES

|                                                | Chrysotile <sup>1</sup> | Blue  | Amosite |
|------------------------------------------------|-------------------------|-------|---------|
| Silica (SiO <sub>2</sub> )                     | 39.05                   | 51.1  | 50.24   |
| Alumina (Al <sub>2</sub> O <sub>3</sub> )      | 3.67                    | ...   | ...     |
| Ferric oxide (Fe <sub>2</sub> O <sub>3</sub> ) | 2.41                    | ...   | 7.80    |
| Ferrous oxide (FeO)                            | 40.07                   | 35.8  | 32.00   |
| Magnesia (MgO)                                 | ...                     | 2.3   | 3.96    |
| Lime (CaO)                                     | ...                     | ...   | ...     |
| Sodium oxide (Na <sub>2</sub> O)               | ...                     | 6.9   | 2.12    |
| Combined water (H <sub>2</sub> O)              | 14.48                   | 3.9   | 3.00    |
|                                                | 99.68                   | 100.0 | 99.12   |

<sup>1</sup>Canadian (Thetford)