File · Raw Mat'l Asbestos, Finn

HUXLEY DEVELOPMENT CORPORATION

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WESTOFF NEW YORK

TIME & LIFE BUILDING
ROCKEFELLER CENTER
NEW YORK 20, N.Y.

March 18th, 1964

PLAINTIFF'S EXHIBIT
BIR-172

Mr. L. Weaver
Research Department
Bird & Son, Inc.
East Walpole, Mass.

Dear Mr. Weaver:

Thank you for the courtesy extended during my recent visit.

Pursuant to our discussion, we are forwarding you a sample of the high density chrysotile material which we discussed as a possible additive to the asphalt roof coating areas.

We are also attaching herewith, certain pieces of literature which we discussed. We hope these pieces of literature will be of value to you, and that we will get together again in the near future.

Very truly yours,

HUXLEY DEVELOPMENT CORPORATION

W.I. Duym

W.I. Duym

WID:jj

Encs.

cc:. Mr. C. Hinds

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TIME & LIFE BUILDING
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TELEPHONE:
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CABLE ADDRESS
WESTOFF, NEW YORK

May 3, 1962

Bird & Son, Inc.
East Walpole,
Mass.

Attention: Mr. H. W. Church,
Assistant Purchasing Agent

Gentlemen:

We acknowledge receipt of your letter dated May 1st, and are sorry to note that the literature covering the Finnish Asbestos Fibre was inadvertently not included with our letter of April 28th. We are, therefore, attaching hereto, the Technical Bulletins which were omitted.

We regret any inconvenience caused you in this matter, and remain

Very truly yours,
HUXLEY DEVELOPMENT CORPORATION

A. Novak

Vice President

A.NOVAK:CL/ej

Encls.

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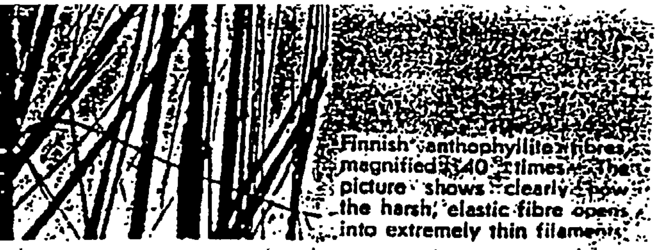
ANTOPHYLLITE



Finnish anthophyllite fibres magnified 340 times. The picture shows clearly how the harsh, elastic fibre opens into extremely thin filaments.

The industrial use of asbestos is continually expanding The excellent physical and chemical properties of asbestos have not been equalled by any other known material. As the use of asbestos has increased, a better knowledge has been gained, and greater utilization made, of the individual varieties of fibres which in the nature state occur in the form of several different minerals.

Asbestiform minerals include a class belonging to the mineral group of amphiboles. The characteristic crystalline structure of the amphiboles consists of double-chains built up of silica, oxygen and various metals. The shape of the ribbon-like crystal lattice lends itself to the formation of long, prismatic crystals. Where geological conditions have been favourable for the formation of fibres, the result has been a fairly harsh asbestos made up of extremely thin filaments. The best known among the fibrous amphiboles are crocidolite, or blue asbestos, and amosite. Amphibole, with a rich magnesium content, crystallises in the rhombic system and is called anthophyllite. Fine-fibre anthophyllite owing to its composition and crystal structure, has its own special properties which set it apart from other varieties of asbestos. Therefore it has its own advantageous technical fields of use.

Finnish anthophyllite asbestos is richer in magnesium than most known minerals in this group. The iron contained therein mainly occurs in the crystal lattice in the non-conductive ferrous state, replacing magnesium in the structure. These factors, combined with the low water content and the well-formed and finely opened fibrous structure, give it several properties of value for manyfold technical uses. Among the most important characteristics could be listed: the pure white colour, the excellent resistance to high temperatures, the excellent acid resistance, and the low electrical conductivity. As to mechanical properties the fibre is harsh and rather brittle, but it has a wide surface area and, by careful processing, can be opened into extremely thin filaments.

Anthophyllite asbestos has been found in various parts of the world but greatest use has been made of the deposits, known for their excellent quality, which are found in the heart of Finland at Paakkila in the lake-dotted province of Savo. Asbestos has been mined there since as far back as the beginning of this century. The reserves of ore have been found to be sufficient for several decades to come and there is a mill which has recently been modernized and brought fully up-to-date. Production in the mines and shipment from the harbours in Southern Finland continues all the year round, despite the heavy snowfalls during the winter. The owners of the deposits, a private company called Finska Mineral Ab — asbestos producers since 1917, — operate the mine and market the products through their head office in Helsinki. Asbestos from Paakkila is exported regularly to many countries, including most of the countries of Europe.

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Use of Anthophyllite Asbestos as filler for plastics

Asbestos ranks amongst the most commonly used fillers in the plastics industry. Apart from the generally known facts that usually apply to inorganic fibrous fillers, the following points have to be borne in mind when using anthophyllite asbestos:

1. Anthophyllite is the most acid-resistant asbestos fibre and is therefore suitable for all plastics which must have high chemical resistance.
2. Anthophyllite has a very low pH value which makes it suitable e.g. for urea and melamine compounds.
3. The combined water quantity in anthophyllite is extremely low, and it is constant even at high temperatures (up to 900° C). Thus, unlike chrysotile asbestos, it will not blister in high temperatures and is therefore recommended for applications requiring high thermal resistance.
4. Since anthophyllite has a low magnetite iron content, its electrical conductivity is lower than that of most other asbestos varieties.
5. The mechanical strength of anthophyllite is lower than that of chrysotile asbestos. It is not recommended to use anthophyllite alone in applications requiring a high degree of tenacity, but as an additional filler, contributing the good properties of this fibre type.
6. Anthophyllite asbestos contains, as an incidental component, talc which in some processes is noxious. On the other hand, talc makes the fibre softer, reducing the wear of moulds and equipment and increasing the speed of pressing of the mixture. Further, the finely divided talc improves the surface properties of the products.
7. Long inconvenient "whiskers" seldom appear in anthophyllite fibres. Lumps in the fibres open up more easily than in chrysotile.
8. The price of anthophyllite is most competitive owing to the yield percentage of the products.

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For use in plastic products standard qualities PT 1, PT 3 and MT 1 are recommended. In addition there are many special qualities which either already exist or can be developed when required.

The mixing of asbestos in plastic binders is usually carried out during the process of manufacturing the plastic itself, since the production of homogenous molding compounds is then easiest. In some cases, however, the filler is added at the time of the manufacutre of the product, as e.g. in the production of vinyl floor tiles or of such usually cold-moulded thermosetting plastics which, owing to difficulites in storing the moulding compound, necessitate the mixing and manufacture of the product in the same factory.

The main field of application for asbestos fillers is in the various kinds of thermoplastics. Cold-moulded thermoplastics, in which the binder may be different bitumens, pitches, polymerizable oils and phenol resins, often contain up to 80-85% asbestos. Asbestos adds considerably to their mechanical strength as well as to heat and flame resistance. In hot-moulded plastics, too, the use of asbestos is common. The most usual binders in this group are different phenol resins and furan resin, melamine and urea formaldehyde. The quantity and quality of the asbestos varies according to the desired use. Mixing is usually done at the time of the manufacturing process of the resin. In the manufacture of urea formaldehyde it has to be remembered that this will not tolerate alkaline additives; for this reason anthophyllite asbestos is particularly suitable for this purpose.

In thermoplastics the use of filler is usually less. The addition of asbestos is possible, however, when it is desired to improve the hardness, heat resistance, burning rate, compressive strength or arcing resistance of the product. Such plastics include ethyl cellulose, vinyl chloride acetate, vinyl chloride and polyethylene. The largest field of application for anthophyllite asbestos within this group is vinyl-based floor tiles and covering. The mixing of asbestos in thermoplastics may take place either with the dry binder using suitable mixers, or by laminating it in hot rolls with the plastic binder sheet.

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Use of anthophyllite in acid-resistant cements, compounds and plastics.

Acid-resistant cements, compounds and plastics contain, in addition to the binder proper, various acid-resisting mineral additives such as quartz, diathomaceous earth, andesite, and asbestos. The purpose of asbestos fibre is to strengthen the material and to prevent cracking. It is of utmost importance that the asbestos used in such compounds and cements is acid-resistant, since otherwise the acid will, by corrosion penetrate the entire thickness of the material through capillary passages. The active surface of the acid is thus considerably extended, resulting in greater danger of corrosion and penetration. Equally dangerous are the minute capillary cracks which occur easily if the compound or cement contains no reinforcing component. For these reasons, acid-resistant anthophyllite asbestos - e.g. grades A 1 and PT 1 - are chiefly used as reinforcing additives in such products.

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Use of Anthophyllite Asbestos in floor tiles and flooring compounds

The purpose of asbestos fibres used in vinyl and other plastic floor coverings is to increase the mechanical strength and resistance to wear of the tiles. Best suitable for this purpose are short, well opened fibre products with a loose volume weight of 300 kgs/m^3 or less. Suitable anthophyllite fibres are PT 1, PT 3 and MT 1. The hardness of anthophyllite asbestos, about 5.5 (Mohs's scale) is somewhat greater than that of chrysotile (3-4), and therefore its use as filler will give greater resistance to wear.

Anthophyllite asbestos is particularly well suited as a binder for so-called sorel cement flooring. Sorel cement is formed through a reaction of magnesium chloride with magnesium oxide. Since sorel cement, particularly in the moulding stage or when wetted, shows acid reaction, the use of an acid- resistant asbestos is most appropriate. Shorter, well opened grades give sorel cement a softish warm lustre; short harsher fibre types such as AA 1 are excellent fillers which considerably reduce material costs, as well as increasing wear resistance and lessening the danger of cracking.

Anthophyllite asbestos fibre can also be successfully used in plastic-based flooring compounds (so-called Spachtelbelag) which are manufactured from plastic emulsions and mineral filler and dyeing materials. A suitable quantity of anthophyllite asbestos fibre will increase the strength and wear resistance of such flooring compounds and prevent them from cracking.

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Use of Anthophyllite Asbestos in foundries

The use of asbestos as a foundry sand additive has been described in detail in the September, 1948, issue of "The American Foundryman". In an american non-ferrous foundry (The Slack-Homer Brass Mfg Co., Denver, Colo.), the use of asbestos as a foundry sand additive has proved advantageous to the extent that the foundry regularly uses an addition of about 10 % asbestos in all sands. The benefits thus gained are primarily the following:

1) Shrink cracks in complex castings of varying thicknesses have been eliminated. The metal remained molten in the risers twice as long as when ordinary sand was used.
2) The moulds retained their shape better. Also large, smooth surfaces, which previously had to be skin-dryed, remained straight without drying. This was ascribed to the reinforcing effect of asbestos on sand.
3) The refractory quality of the moulds was improved and "burning in" prevented.
4) In aluminium castings as smoother surface was achieved than when using sand alone.
5) Asbestos sand can contract a little without cracking. This is of value in the casting of thin, hollow objects. A too rigid core may cause cracking in the casting, especially in aluminium.
6) The useful life of the foundry sand was prolonged when asbestos was used. Asbestos also made possible the use of a cheaper local sand. Without asbestos the service life of this sand was not sufficiently long, but with a small addition of asbestos itcould be prolonged four-fold.
7) In the manufacture of cores, too, good results were obtained in some cases with asbestos. These include their great strength, light weight, absence of minute fissures, and collapsibility.

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Use of Anthophyllite Asbestos in the paint industry.

Anthophyllite asbestos is used as a filler in various paints, putties and adhesives. The fibrous structure of the filler is of considerable advantage since it improves the toughness and elasticity of the product and prevents excessive solidification and, by improving suspension, sedimentation. In addition, anthophyllite asbestos, owing to its non-combustibility and good heat insulation properties, is a valuable filler in fire-resistant paints. In adhesives, its fibres lower viscosity, resulting in better spreading properties and consequently in lower consumption. The fibrous filler also improves the drying of the adhesive by making the adhesive film to some extent porous.

In filling paints, putties, adhesives and similar products, short grades, such as PT 1, PT 3, MT 1, AA 1 and AAA 1 are used. In priming paints, filling paints and mat finish paints anthophyllite asbestos is also used in a micro-ground form (about 5 μ). The fibre then improves the structure of the product and lends it a mat finish.

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Use of Anthophyllite Asbestos in drilling mud

The purpose of the mud used in drilling through soft stone and soils is to carry drilling cuttings up to the surface, to cool the bit and to keep the hole open through blocking up leaks and preventing the walls from collapsing and getting washed away. The mud must be of the correct viscosity, it must not cause wear of the pipes and equipment, and it must be re-usable after removing the drilling cuttings through sieving.

Asbestos is used in drilling mud because, owing to its fibrous structure, it remains very well suspended and effectively plasters up cracks and leaks. Anthophyllite asbestos is suitable for this purpose, and compared to other asbestos varieties it has the advantage of having considerably higher resistance to corrosive materials.

Drilling mud is principally used in rotary drilling for oil. Also in core drilling and churn drilling mud containing asbestos can be used for cementing cracks and blocking up leaks. For drilling muds the anthophyllite grade MT 31 is recommended.

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Use of Anthophyllite Asbestos in bitumen products

Fillers for bitumen products fulfil a variety of purposes. They are used for lowering the viscosity of bitumens to make them solid even at high temperatures and within considerably wider temperature limits than, for instance, bitumen hardened by distillation. In addition fillers slow down the ageing of bitumen and increase its adhesive surface. Further, they can shorten the drying time of bitumens applied by brush.

Through the use of fibrous asbestos fillers, a significantly higher degree of toughness and strength is achieved, particularly against tension, bending and impacts. Thus capillary cracks, from which the decay of bitumen products begins, can be avoided. Bitumen products are also to a large extent used for various acid resistant purposes, and here the use of acid resistant fillers is of paramount importance.

Among the anthophyllite fibre grades suitable for various bitumen products the following could be mentioned:

Bitumen putties, used in concrete constructions for filling in expansion seams, cracks and caverns, for sealing window and door frames of steel, for chassis protection of motor vehicles etc. are usually made from asphalt, short asbestos filler and longer, reinforcing asbestos fibres. Suitable grades for fillers are MT 3 and AAA 1, and for reinforcing A 1, PT 1 or AA 1.

Bitumen lacquers contain as additives chiefly short dust grades such as MT 3 and PT 3. Bitumen lacquers are used for corrosion protection of iron structures and steel pipes to be buried underground, and for making concrete surfaces acid resistant.

Bitumen products made by pressing, such as battery boxes, floor tiles and various brake and gasket articles, contain a relatively large amount of reinforcing fibre. For this purpose the grades A 1, AA 1 and PT 1 can be used.

In moulded asphalt, e.g. in roof coatings and the outer coating in roof felt, short filler-type fibre grades are used, such as MT 3 and AAA 1 On the upper and lower surfaces of roof felt coarse or fine powdered asbestos is often sprinkled, e.g. HJ, HJHJ or AAA 1. Such a coating facilitates handling of the felt, increases its weather resistance and reduces fire risk.

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Classification, Quality Control and Sampling of Finnish Anthophyllite Asbestos

Commercial classification

The classification of asbestos fibres according to the length is generally carried out by sieving in the Quebec Standard Testing Machine. For short grades the Rotap-Testing Machine is also often used. A sieve test is a relatively quick method of analysis and, if carried out correctly, can be reproduced reasonably well. Its value as a measure of the absolute fibre lengths is, however, highly questionable, since the sieving results greatly depend on the special characteristics of the fibre, such as the way in which the fibres form balls, how easily they "dive" through the sieve mesh, to what extent longer fibres carry with them shorter ones and dust, etc. The test conditions, too, such as humidity, the condition of the machine and the sieves etc., can have a considerable influence on the sieving results. The true lengths of asbestos fibres can be measured with reasonable degree of accuracy only by very laborious scientific methods.

In the classification and quality control of Finnish anthophyllite asbestos the Quebec Standard Testing Machine is used. The producer endeavours by all possible means to maintain his own machines so as to conform the test results as accurately as possible with the standards of the Quebec Asbestos Mining Association. In comparing the sieving results for anthophyllite with, for instance, those for chrysotile, it must be noted that the anthophyllite fibre has a greater tendency to "dive" through the sieve mesh.

Shipping test.

The shipping test for each shipment of fibre to the customer is the average of the tests of the composite samples of the shipment.

The composite samples are to be taken as follows:

Composite samples and tests

a) Long grades (1_{41} and corresponding or longer fibres):

Out of each and every lot of 100 sacks, a handful of fibre is taken from every fifth sack. The sample thus obtained (20 handfuls) is mixed and divided up, and the test is carried out.

b) Medium and short grades (A 11 and corresponding of shorter):

Out of each and every lot of 200 sacks, a handful of fibre is taken from every tenth sack. The sample thus obtained (20 handfuls) is mixed and divided up, and the test is carried out.

Whenever possible the sample has to be taken from the middle of the sack.

The samples must be well mixed, the lumps broken up, the samples halved and allowed to adapt themselves to the temperature and humidity in the testing room before the test is made.

Minimum shipping tests

The producer of Finnish anthophyllite controls each shipment by comparing it with the minimum specifications of the Quebec Standard Test which have been set out, separately for each grade, in Bulletin No 18. The sampling is presumed to have been carried out as explained above. The minimum grade requirement consists of the minimum value of the sieve fraction which remains on the first and second test sieve, and the maximum value of the fraction which remains on the bottom of the series of sieves.

Special tests

The producer carries out several special tests at the mill. The mill quality control has been extended beyond the minimum requirements for each shipment mentioned above, since a sample is taken from every sack, and the composite sample of 20 sacks is tested. For customers using fibres in small quantities such detailed control is of great value. It is natural, however, that the sieving results cannot be obtained for every sack separately.

In addition to the Quebec Standard Test, a 15 min., 100 gr. Rotap test is made for each shipment. This is particularly used for checking the quantity of the powdery matter which has penetrated all sieve meshes. If

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desired by the customer, the Rotap test can be more widely applied for selecting of producing the correct product according to the requirements of the customer.

For each batch to be delivered, the internal quality control system of the mine further comprises testing of the following properties:

Grit content
Density
Wet volyme
Settling speed
Colour

and in special cases:

Filtering properties
Wet sieving results
Acid solubility
Openness.

The results of theses test are for internal control, and their publication without detailed test specifications serves no useful purpose. The mill is, however, prepared to carry out on behalf of its customers various checks on fibre properties, naturally provided the costs of these remain within reasonable limits.

Report on Moisture Absorption by Chrysotile and Anthophyllite Asbestos

For the test chrysotile asbestos grade 5 and Finnish anthophyllite grade A 1 were used. When the samples had passed through a drying oven, they were stored over various saturated solutions of salt. The temperature was kept at a constant +20° C. The moisture absorption was measured when the weight remained unchanged.

Technical data:

Salt	Relative humidity	Moisture content of chrysotile	Moisture content of A 1
KNO_3	96 %	2.53 %	0.92 %
$Mg(NO_3)2$	55 %	1.01 %	0.38 %
$Li\ Cl \cdot 2H_2O$	14 %	0.72 %	0.32 %

The moisture absorption for anthophyllite asbestos was thus found to be considerably smaller than for chrysotile asbestos.

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The Length of Fibre of Finnish Anthophyllite

The exact average length of fibre for a given grade of asbestos can be determined only by very detailed scientific methods. It is of greater technological interest to know the sieving analysis of the product which is obtained by different standardized sieving methods. Anyhow as from the part of consumers an approximate length of fibre is often asked for and other suppliers of asbestos have also stated such values for their products we would recommend giving the figures stated below as an average length of fibre of the different grades of Finnish Anthophyllite.

Grade	Average length of fibre, mm
I 41	6.5
A 11	4
A 1	3
PT 2	1.2
PT 1	1.0
PT 3	0.7
MT 1	0.5
AA 1	0.7

The guiding values give above have no importance from the point of view of quality control and no guarantee for their exactness can be given.