PLAINTIFF'S EXHIBIT

CAP-707

SPECIAL MATERIALS, INC. WISCONSIN
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September 10, 1979

Mr. Horace Beasley
Director of Purchasing
CEMENT ASBESTOS PRODUCTS COMPANY
1400 - 20th Street South
Birmingham, AL 35205

Dear Horace:

Confirming our meeting last week, we are shipping today via UPS samples of ML-6, washed and unwashed blue asbestos. We are also attaching a report from General Mining and a report from the South African Asbestos Producers Advisory Committee (SAAPAC) covering the health and technical aspects of using blue asbestos and washed blue asbestos. This information is extremely valuable and should help you in controlling dust levels in your plant and improving the strength of pipe.

I expect Mr. Pat Hart to be in the United States in the latter part of October. We sincerely hope that your tests could be completed so that the effect on next year's production could be known at that time.

Thank you for your consideration.

Very truly yours,

SPECIAL MATERIALS, INC. WISCONSIN

R. C. Wareham

RCW/ms

Enclosures

cc: Warren T. Whitley, President
S. G. Leyshock, Director of Engineering

Copy to: Messrs. George Sidlo, Bruce Klomfas

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CAPE BLUE ASBESTOS
PREMATURE PREJUDICE?

1. For more than 20 years particular attention has been focused all over the world on potential health hazards associated with Cape blue asbestos.

2. It has been stressed repeatedly at almost every conference since Lyon in 1972 (3, 4, 5, 6) that there is no difference between all the commercial asbestos fibre types in relation to asbestosis and bronchogenic carcinoma. This has also been confirmed at the three latest scientific conferences on health hazards of asbestos, namely, the Johannesburg Asbestos Symposium of October 1977, the Washington Conference in December 1977 of the Society for Occupational & Environmental Health and the Science Week Conferences organised by the New York Academy of Sciences in June 1978.

   2.1 It is only in conjunction with mesothelioma that some countries, e.g. U.K., Ireland, Holland, Japan, Norway and Sweden, accept a higher risk for crocidolite for which assumption to date no conclusive scientific evidence has been produced. (7)

   2.2 It would appear that the known and proved number of primary diffuse mesothelioma cases all over the world is still confined to under 5 000 as indicated by Professor J.C. McDonald at the Johannesburg Asbestos Symposium in October 1977, (8) where he presented an updated version of a paper specially prepared for the 18th International Congress on Occupational Diseases at Brighton in September 1975.

2.2.1 /2.....

2.2.1 In general, this paper did not give additional information to that presented at the Brighton Conference, except for quoting and over-emphasising the incidence of the disease in personnel employed during World War II in two gas-mask factories, one in England and the other in Canada, with high rates of cases at relative low exposure. However, during discussions it was proved that those exposures were not as low as indicated by Professor McDonald, but were in fact very high. Crocidolite was dustier to handle and the gas masks had contained loosely bound pads. (9)

2.2.2 Those 5 000 cases have been reported throughout the world over a period of 15 to 25 years. (McDonald quotes a period of 15 years from 1960 to 1975, whereas other researchers cover up to 25 years). However, the annual incidence of lung cancer amongst males in the U.K. amounts to just over 25 000 (10%) and in the United States of America to more than 50 000 cases (5%). According to Selikoff at the Johannesburg Asbestos Symposium (10, 11) and subsequently confirmed by Dr. R. Saracci for the IARC of Lyon at the Washington Conference, lung cancer is in fact a far bigger risk than mesothelioma, mainly in conjunction with smoking.

2.2.3 Where employment records were available (2 721 cases only) 66% of mesothelioma cases could be attributed to asbestos exposure (12) depending on cohorts examined or reviewed.

2.2.4 However, there was positively no asbestos exposure in 34% of the cases. It seems strange that hardly any attention has been paid to this phenomenon although for several years it had

been /3.....

been known that in two villages of Eastern Anatolia, Turkey, pleural and peritoneal mesothelioma were of higher incidence than reported anywhere else in the world. All soil samples were negative of asbestos. At the New York Conference it was confirmed that recent mineralogical studies established that certain zeolite minerals, namely, erionite and chabazite, were the causative agents for these diseases in that region.

2.2.5 The ecology of mesothelioma is still unknown and there is as yet no reliable method of early diagnosis of the disease. (13)

2.2.6 Looking back one is amazed when realising that it was through scantily deduced and by no means subsequently proven constant association with this still relatively rare tumour that Cape blue asbestos was incriminated as being the most hazardous of all asbestos fibres. This occurred mainly in South Africa where blue asbestos was considered the sole causal agent, but not so in other countries.

2.2.7 Hammond and Selikoff report a high incidence of cases among insulation workers who, they emphasise repeatedly, were exposed largely to chrysotile and amosite. (14) Apparently, crocidolite was not used in the U.S.A. for insulation purposes. The largest asbestos manufacturer in the U.S.A. never used crocidolite for insulation at any time, employing it only in two product lines, namely, AC pipes and packing. (15)

3. The whole concept of asbestos exposure was queried at the Johannesburg and Washington Conferences. According to Dr. George Wright it was intellectual arrogance to speak about asbestos exposure "being characterised solely by the number of fibres of varying sizes present in the environment" of the working place. "In the real world of those exposed in the

workplace /4.....

workplace nothing could be further from the facts". No people anywhere in asbestos mining, milling and/or manufacturing were exposed to asbestos only. There were various risks other than asbestos which, except for the synergistic effects of cigarette smoking, had so far been completely ignored. (16)

4. Past exposure was incredibly high by modern standards, definitely in the hundreds, peak periods in the thousands. (17, 18, 19, 21, 22, 23) Most exposure estimates were vague to the extent that today one should not even bother to consider them.

5. Except in the case of asbestos mining, it is unusual for workers to be exposed to one type of asbestos only in the course of a lifetime, and except for very few and fairly small applications, blue asbestos fibres are never used on their own but mainly in relatively small quantities as supplementary fibres with fibrous mixes of the asbestos-cement industry.

6. Although Cape crocidolite has been used in the asbestos-cement industry all over the world for more than half a century, few confirmed cases of mesothelioma have been reported from these factories.

7. For a number of years before and after World War II, blue asbestos was used extensively in Britain for insulation purposes. Nevertheless, it has been confirmed by Greenberg and Davis that under industrial conditions prevailing in Wales and Englad, the significance of crocidolite in the ecology of mesotheliomas could not be determined. (24)

8. Professors A. and J.C. McDonald maintained that mining

environments /5.....

environments may well be free from carcinogens of the kind found in factories, ports and industrial cities. Moreover, fibre as produced at mills almost certainly differs in length and diameter from that used in application and processing. (25, 26)

9. Many observers completely ignore the fact that in the earlier reports of Wagner there were only a few cases of occupational exposure, the balance being environmental where other pollutants, tubercular scarring, climatic conditions, ethnic factors, etc. could have been the cause of the disease or would have had synergistic effects.

10. On the assumption that mining and milling would undoubtedly have been the heaviest industrial exposure to Cape blue asbestos in South Africa, it is worthwhile to look at Professor Webster's figures as quoted at the Johannesburg Asbestos Symposium in October 1977.

10.1 The South African Asbestos Tumour Reference Panel had 712 cases on its register, which included all the known cases since 1956.

10.2 Occupational exposure had been established in only 420 cases and in 10% of these there was no suggestion of asbestos exposure.

10.3 Actual mining exposure accounted for 33% of these cases, or roughly 20% of the total.

10.4 There were another 20% environmental cases, mainly from the north-western Cape, 20% non-mining industrials and 30% with no knowledge of any exposure or details of occupational history.

11. At /6.....

11. At the New York Conference it was emphasised that :

11.1 Respirable asbestos fibres are ubiquitous anywhere in the world. Many short fibres found in human lungs may have nothing to do with commercial types but may have been completely untreated natural fibres inhaled from the ambient atmosphere.

11.2 There must be an exposure level which can be tolerated otherwise we would have had many more cases of mesothelioma apart from more interstitial fibrosis on mines and mills.

11.3 In British ships much use was made of blue asbestos for the spraying of decks and bulkheads. Thousands of people must have lived constantly under these conditions. One and a half million men have served in the British Navy between World War I and now.

This means there does exist a level of exposure which is safe; unless respirable fibre is released through stripping or demolition,there appears to be no risk.

12. CONCLUSIONS:
The main arguments against crocidolite were and are still being taken from initial South African investigations of limited industrial and mainly environmental exposure. Anywhere else in the world, industrial asbestos exposures were mixed and in most cases extremely heavy. No valid conclusions can, therefore,be drawn regarding the specific involvement of this particular type of asbestos. When summarising the discussions of the special session at Lyon dealing with malignancy and fibre type, Rossitter states that each commercial variety of asbestos fibre, except anthophyllite, has been associated with excessive mesothelioma. (27) This has been confirmed at subsequent conferences.

There /7.....

There are still many serious gaps in the medical knowledge of asbestos-related diseases apart from the fact that many medical evaluations are not internationally comparable by reason of differences in diagnosis and incompatibility of statistical information and documentation.

The absolute carcinogenicity of the various asbestos fibres is unknown. According to Langer the present emphasis on crocidolite is premature. (28)

FB/WA
Johannesburg
2. November, 1978.

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NEW THRESHOLD LIMIT VALUES FOR CROCIDOLITE AND AMOSITE ASBESTOS

proposed by the American Conference of Governmental Industrial Hygienists

A commentary by
Richard Gaze, BSc., PhD., FRIC

I. CROCIDOLITE

The proposal is that the TLV should be 0.2 f/cc - ie one tenth of that proposed for chrysotile. While there is no scientific evidence to justify a one tenth ratio in terms of hazard, there is a general philosophy that crocidolite is the most hazardous form and particularly so far as mesothelioma is concerned.

The evidence for this conclusion originates from Wagner's work in South Africa (1) and the reported lower incidence of mesothelioma in the Canadian chrysotile mines (2). This has been followed by reports of mesothelioma among workers from the Wittenoom mine in Australia (now closed) (3) and among workers in war-time plants assembling gas mask filters containing Australian crocidolite (4).

A difficulty in finding confirmatory evidence has been that in most situations, long term exposure to single asbestos types is very difficult to isolate. Careful analysis of the evidence provided from mixed exposures has provided some confirmation that in such exposures to mixed dusts, the incidence of disease appears to be higher when crocidolite is present. (Newhouse (5); Enterline (6); Weill (7))

This is believed to be the essential evidence indicating that crocidolite is the most dangerous form of asbestos, which view is summarised in the report of the Advisory Committee on Asbestos Cancers to the IRAC in 1972 (8) and by Wagner (9).

Experience of control in the use of asbestos leaves no doubt that a TLV of 0.2 f/cc is equivalent to a ban on the use of crocidolite as a raw material in very nearly all if not all industrial operations.

By far the major use of crocidolite today is in the manufacture of asbestos cement pressure pipe. This is a valuable product, being used throughout the world for water distribution and the handling of sewage. It is of particular importance today since while cast iron and plastic pipes may also be used, asbestos cement pipes have by far the lowest total energy content in their composition and manufacture. A high proportion of manufacturers regard crocidolite as an essential component if these pipes (and particularly those with the higher diameters) are to be produced economically.

If this use is to continue, then a higher TLV must be accepted for crocidolite or an exception made in some way (as in the Benelux countries). The question then arises whether there is in fact any ....

hazard when crocidolite is used for this purpose in modern processes. The following factors should be taken into consideration :

1) The evidence accumulated from the mining and use of crocidolite in the past involved techniques and processes resulting in exposure to dust concentrations at a level which would be entirely unacceptable and indeed unimaginable today. The stripping of crocidolite sprayed insulation from warships for example, produced fibre dust concentrations of many hundreds and indeed thousands of fibres per cc. (10)

2) With one exception (7) these processes are no longer used and can in no way be compared with the wet asbestos cement processes used to manufacture pressure pipes. Weill's account of the history of workers in asbestos cement plants in New Orleans (7) includes measurement of dust concentrations in current operations but not for the past under conditions to which his workers were exposed.

3) It is important to summarise the present evidence available from asbestos cement plants that have been using crocidolite for the past thirty to forty years.

<u>Austria</u>

Haider (11) reports no excess of mesothelioma in the regions in which asbestos cement industries were situated. Austria has the oldest asbestos cement industry in the world, excellent public health records, and has used crocidolite regularly since before the last war.

<u>Switzerland</u>

Rüttner (12) reports that of four cases of mesothelioma identified in Zurich from 1961 to 1976, only one had proven exposure as an asbestos cement worker. This country also has a long history of asbestos cement manufacture and has regularly used crocidolite.

<u>Germany</u>

Robock (13) reports only five cases of mesothelioma from the German asbestos cement industry (also a long term user of crocidolite) and these arise from one factory only where exceptional conditions existed.

Belgium

Lepoutre (14) reports that among current employees in a very large plant - also a long term user of crocidolite and with high dust levels in the past - there is no excess of lung malignancy and only one mesothelioma.

United States

From New Jersey, Borow (15) has reviewed the history of seventy-two cases of mesothelioma among workers at a large plant. The evidence unfortunately cannot be linked clearly with any one process since textiles, insulation and other products were made in addition to asbestos cement. The position is further confused by evidence from a similar plant in Illinois, of similar age and manufacturing similar products (with crocidolite). No comparable excess of mesothelioma has been found at this plant (16).

Weill (7) concludes that workers exposed in the New Orleans asbestos cement plants were subject to higher risks of respiratory malginancy in departments where crocidolite was used. The comparison is not entirely convincing however because the tv processes - one using crocidolite and one not - are different. They use different raw materials and raw material processing methods, different forming techniques and manufacturing different products. Bearing this in mind together with the small overall numbers of those affected and the uncertainties of level of exposure in the past, more evidence is needed before more than a tentative conclusion can be drawn.

United Kingdom

For various technical reasons, crocidolite has not been used to any significant extent in asbestos cement manufacture.

The reputation that crocidolite has acquired in the United Kingdom stems from its use in entirely different processes associated - as we now know - with very high dust levels.

Conclusion

It is clear that the evidence upon which a TLV for crocidolite - equivalent to a ban on its use - is proposed relates almost entirely

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to conditions in the past which do not apply today. Thus none of the excessively dusty processes such as insulation and acoustic spray, gas mask filters, mattress making and lagging now employ crocidolite.

Evidence from the asbestos cement side - the only major remaining use for crocidolite - is by no means as unfavourable and the contention of those who use it that at the same fibre levels, there is no greater risk with crocidolite than with chrysotile, has not been satisfactorily answered.

It must be accepted that under similar conditions crocidolite is liable to produce more dust than chrysotile so that extra precautions may be necessary in order to achieve the same fibre dust levels but there is not yet evidence to indicate that provided this is done in asbestos cement manufacture, there is undue risk.

As has been stated, the only significant use of crocidolite in the United States and elsewhere is in asbestos cement manufacture and so far as the United States alone is concerned, only in the manufacture of asbestos cement pressure pipes.

For use in such processes, there is not adequate justification for the application of a separate standard for crocidolite.

II. AMOSITE

The proposal is that the TLV should be 0.5 f/cc - ie intermediate between that for chrysotile (2.0 f/cc) and that for crocidolite (0.2 f/cc).

This stems from a philosophy that amosite occupies such a position and this has gradually developed over the past ten years, being expressed in the report of the Advisory Committee on Asbestos Cancers to the IARC in 1972 (8), by Wagner (9) and Enterline (6). It is in fact very difficult to find hard evidence for such a conclusion and it is indeed very much more slender than that advanced in connection with crocidolite. In spite of contrary evidence that has been brought forward to indicate a different conclusion, the 'feeling' that amosite should have a special intermediate position has persisted.

The evidence such as it is, is derived from Selikoff's studies of insulators and the workers in the factory where amosite insulation materials were produced (17). Amosite was the preferred fibre for these insulations and working conditions were undoubtedly bad by today's standards. Much of the exposure took place in war-time when there was a tremendous demand for the materials, particularly from the Navy, and precautions were minimal. As is now well known, many workers have suffered, the symptoms appearing a considerable time after exposure to the dust.

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There is virtually no other evidence.

In considering this evidence, the following should be borne in mind :

1) The processes and products with which Selikoff's workers were involved are no longer used. The use of amosite is now confined to wet processes or to other processes where dust levels can be readily controlled.

2) The dust levels developed in manufacture and use (including stripping) of these products were around two orders of magnitude higher than those encountered in asbestos processes today.

3) Over 90% of the world's supply of amosite comes from the Penge mine in South Africa. This mine has operated for over fifty years and in spite of intensive search, and in spite of the fact that conditions must have been bad by today's standards in days gone by, only two cases of mesothelioma related to pure amosite exposure have come to light. (Webster (18))

4) McDonald's examination of miners exposed to fibrous grunerite (amosite) in the Homestake mine did not reveal any excess of pulmonary cancer among miners with long service and regular exposure to this dust. (19)

5) Experiments with animals do not reveal conclusive differences between the toxicity of different fibre types. In these careful experiments, inhalation of amosite dust did not produce a greater incidence of lung cancer or mesothelioma than when other types of asbestos were used. (Davies (20))

Conclusion

The evidence for placing amosite at a TLV of one quarter of that of chrysotile is exceedingly slender and based largely upon a 'feeling'.

The effect of this TLV, if applied to amosite, would be disastrous and few manufacturers would be able to use this valuable raw material. The facts do not justify such an extreme step.

RG/WFG
24.7.1979

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GENERAL MINING & FINANCE CORPORATION LTD.

(AS MANAGERS OF GRIQUALAND EXPLORATION & FINANCE CORP. - G.E.F.C.O.

RECENT DEVELOPMENTS IN THE PRODUCTION AND PACKAGING OF BLUE ASBESTOS FIBRE DIRECTED TOWARDS IMPROVING DUST CONTROL IN CUSTOMERS FACTORIES.

INTRODUCTION.

The world asbestos industry in general and the blue fibre section in particular is under constant pressure from the authorities and media with respect to the health issue. The industry, faced with a multitude of results and often dubious interpretations, has reacted in the only correct manner in calling for an overall improvement in dust control and a general lowering of the dust standards in and around the factories.

General Mining, as a major producer of blue asbestos and in keeping with an overall company policy which treats all mineral dusts as potentially injurious to health, has embarked over the last few years on an intensive campaign to improve conditions not only in its own mills but also to improve the product and its packaging as far as possible so as to facilitate lower dust levels in consumers factories.

Some of the more recent and most significant developments in the last few years are described in the following sections.

1. WASHING OF RUN OF MINE (R.O.M.) ORE TO REDUCE FINE DUST AND MICRO-FINE CONTENT OF THE MILL FEED.

1.1. Background.

Most of the producers in the blue asbestos industry incorporate a rock sorting stage in the recovery process. Because the banded ironstone host rock is so hard it is essential to reduce the tonnage of barren rock milled as much as possible. This not only saves on wear and tear of the machines but also reduces the amount of fibre degradation in the milling process.

In order to carry out the sorting operation, which is essentially a manual activity, as efficiently as possible it is advisable to separate the coarse ore from the R.O.M. fines and to hand sort only the coarse fraction. To further improve efficiency it is desirable to wash the rock so as to make the difference between waste and ore as distinct as possible.

Because of the need to dry the ore fed to the mill the natural tendency has always been to use water as sparingly as possible on the coarse rock and not at all on the R.O.M. fines (minus 25 mm) which were sent straight to the dryers.

Recent experiments carried out under the auspices of the South African Asbestos Producers Advisory Committee (S.A.A.P.A.C.) indicated however that washing of the fines could be carried out and resulted in improved dust control in the milling operation.

General Mining immediately embarked on an intensive test program to study in depth the benefits of washing the total R.O.M. ore as it was apparent that certain hidden benefits could accrue both on the milling side and in the consumers factories. These benefits were expected to be

(a) Easier drying of mud-free fines.

(b) Better removal of micro fibre and rock dust from finished fibre products.

(c) Better dust control in all subsequent handling operations.

(d) A potential improvement in performance of the fibres in asbestos cement products.

(e) Removal of significant percentages of the smaller and allegedly more injurious fine asbestos fractions.

These are discussed further in the following sections.

1.2. <u>The Need for Fines Washing.</u>

From the moment the charge of dynamite explodes in the rock face underground until the mined ore reaches the surface stockpile, the process of producing micro fibre and fine dust continues. The heavy blast required to liberate the fibre from the hard rock creates fines. The ore is transferred in various ways by mechanical loaders or scrapers or shovelled by hand via various ore passes and tips until it finally reaches the main shaft and is hoisted to surface.

All the time the rock and fines are shuffled together creating additional fine material. A further complication is the water in the mine. This arises from both natural underground sources as well as the water introduced during the mining activity i.e. as cooling water for drills, dust suppression etc. This water mixes with the fines and rock and causes mud contamination of all the free fibres in the ore.

With the previous sorting plants this water-logged fines fraction was diverted straight to the dryers for preparation for milling. During the drying process the tendency was to bake the rockdust, mud and micro fibres into the exposed fibres thus necessitating intensive dry dedusting in the milling process. This dry de-dusting process is not only relatively in-efficient but also results in a certain amount of fibre length being discarded with the deduster unders.

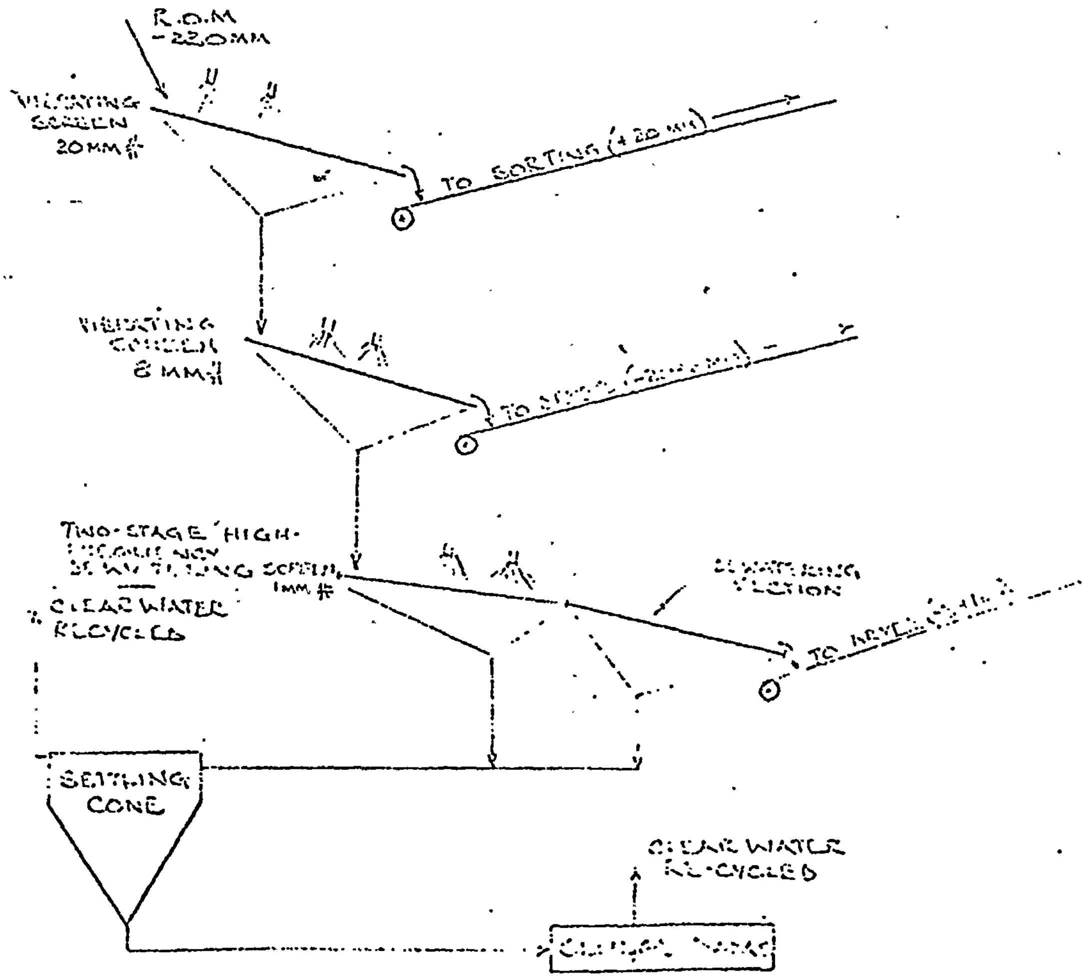
With fines washing, which takes place immediately after the hoisting of the R.O.M. ore and before any drying of the ore takes place, this fine material is washed away from the fine rock and free fibre thus presenting a much cleaner fine fraction to the dryers. Although some dust is obviously generated during the subsequent milling operation the dust content of the final fibre products is reduced.

This aspect will be dealt with in a later section.

1.3. <u>Description of the Washing Plant.</u>

The principle upon which the washing process is based is <u>total</u> exposure. All the hoisted ore is subjected to high pressure water jets on a series of vibrating screens with progressively diminishing apertures. As each oversize fraction is cleared it is removed from the process and passed to the mill either via the sorting plant and/or the dryer. The last screen is a combination washing and dewatering screen where the dust, micro-fibre and excess water are finally removed from the washed fines, with the water being recycled after the contaminants have settled out.

Schematically, the layout is as follows.



1.4. Results and Discussions.

From the outset it must be recorded that the results below are preliminary and based on short experimental before and after plant runs. Variations in the quality of the ore from underground as well as the fact that some unwashed fines are still being milled and the basic fibres recovered from these blended in with current production have prevented a clear picture of the full effect of washing on marketable grades being obtained. However certain positive results have emerged and are commented on below.

The pattern emerging on washed and unwashed basic fibre grades based on McNett analysis is illustrated in table 1 below.

McNETT (PERCENTAGE)

	Basic Grade	Washed 4	14	35	100	-100	Unwashed 4	14	35	100	-1
Mill A	M1	59,4	10,6	4,1	1,8	34,0	50,4	7,1	3,7	2,7	[illegible]
	M2	30,7	32,3	9,2	3,1	24,7	29,8	25,8	6,2	3,7	[illegible]
	M3	25,8	33,7	11,1	2,4	25,8	35,4	32,1	10,5	4,1	37
	M4	19,5	28,6	12,3	4,1	35,5	18,4	22,7	9,8	4,7	45.
	M2Q	59,5	7,0	3,2	1,7	28,6	63,6	5,1	2,8	2,8	[illegible]
Mill B	R1	56,0	8,0	3,5	3,0	29,5	50,0	12,0	5,3	[illegible]	30,
	R2	46,6	21,0	4,6	3,5	27,0	45,2	19,3	5,0	3,5	27,
	R3	55,9	13,5	3,4	2,7	23,5	47,5	12,9	5,3	2,8	31,
	R3F	37,0	31,7	9,1	2,6	19,6	24,5	27,3	12,5	4,9	30,

It is apparent that the reduction in the minus 100 McNett fraction which is a measure of the dust and micro fibre content of the basic fibre is more significant in certain grades of fibre. Thus the M2 and M4 grades on mill A and R3 and R3F grades on mill B show a far greater decrease than the other basic grades.

This is however to be expected as these grades contain most of the free fibre contained in the mill feed and are therefore more prone to contamination from fines. The other grades which are basically milled out of rock would tend to be unaffected by the washing process.

All the basic grades are however blended into the final selling grades at some stage in the fiberization process and an improvement in any of the basic grades must translate into an improvement in the dust and fine fibre content of the fibre sold.

A more in depth investigation is at present being undertaken to establish exactly what fraction of minus 100 material is being removed from the washed fibre. Typical results so far are illustrated below.

	McNETT (PERCENTAGE)					
Grade	4	14	35	100	400	-400
3F washed	35,0	33,8	9,8	3,0	5,1	13,3
unwashed	25,4	27,3	14,4	3,9	6,4	22,6

It is obvious that the biggest reduction in fine dust takes place in a fraction that is finer (by McNett analysis) than 400 mesh. This micro fibre fraction is currently being subjected to microscopic investigation.

Macro and microscopic investigations were also carried out on samples of basic and blended grades in an attempt to highlight the differences between the washed and unwashed fibre. The most successful presentation, which is illustrated photographically later on in the report, was prepared as follows:-

> Equals weights of the two types of fibres were dispersed in a small amount of water in a glass petrie dish and allowed to dry by evaporation. An overhead projector was used to produce an image on a screen and photographs taken. The same dispersed samples were then subjected to microscopic examination at various magnifications and a series of photographs taken of various sections of the samples.

Photographs taken from the overhead projector show a distinct difference between the two samples in the form of a lower concentration of fine dust which appears as a cloud of fine material around the edge of the dish.

The microscopic photographs were taken in the centre of a cloud to confirm that this consisted of micro fibres as well as rock-dust and that the lower cloud concentration would therefore represent a cleaner and more useful fibre.

1.5. Conclusions.

Although as stated earlier the full effect of the washing of R.O.M. fines will not be firmly established until all the sorting plants are modified and existing stockpiles of unwashed ore and basic fibre grades are worked away, there is mounting evidence that the effect of washing will translate into an overall reduction in the minus 100 content of for example RLF grade of between 6 and 7 percent units.

The typical shipment average would then fall around 25% ± 3 instead of the current 35% ± 3. The effect of this on dust levels in an asbestos cement factory as well as the effect on performance in an A/C product will have to be investigated.

2. DEVELOPMENTS IN THE PACKAGING OF BLUE ASBESTOS.

2.1. Background.

Blue asbestos fibre has always been more difficult to bag than Chrysotile asbestos. The inherent physical characteristics of the fibre cause it to recover its original fiberized volume whenever the packing force is removed.

With earlier pressure packing technique the fibre was compressed into a bag and a clamp applied to the top of the bag before the pressure ram was withdrawn. The clamp would then hold the fibre long enough for the bag to be sewn closed. On release of the clamp the fibre would then expand slightly until contained by the bag material itself.

This system was used for many years until it was decided to increase the surface area of Gefco's blended fibre. This change resulted from a decision to offer customers a fibre with a higher degree of opening so that a minimum amount of treatment was required in the customers own plant thus reducing the potential for generating fibre dust in the fibre pretreatment section.

The increased surface area however brought new problems in that the polywoven bags became so stretched that the slightest knock would result in burst bags and exposure of fibre. This was to a certain extent countered by palletizing the bags and covering the unit with a plastic shroud.

The advent of the new regulation in the U.S.A. which specifies containerization for all asbestos shipped into the country brought with it a new problem. With pressure packing the shipping volume of blue fibre could be reduced to around 100 cu ft per ton which enabled around 9 tons to be packed into a standard container. In order to obtain maximum economic benefit this volume had to be reduced by nearly 50% to facilitate the containerization of the required maximum of 18 tons per box.

2.2. Baling.

General Mining embarked on a crash program on new packaging techniques to develop a suitable pack for containerization. This led finally to the development of the baling technique which was subsequently offered to and adopted by the rest of the South African blue fibre producers.

Basically the principle used is a modification of the normal wool baling process and works as follows:

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Finished fibre is loosely screw packed into very strong polywoven bags. 6 Of these bags each containing 50 kg. are stacked on top of each other in the baling chamber.

Two hydraulically operated double action doors "squeeze" the bulky bags into the chamber. The floor of the chamber is then raised via a 102 ton hydraulic ram and presses the six bags up against a fixed chamber head. The bags are kept under pressure and 3 X 5 mm round wire straps are placed around the compressed unit and locked with metal buckles. On releasing the pressure the fibre in the bags recovers slightly and kicks back firmly against the straps thus producing a very rigid bale. Six of these bales are then palletized to form 1,8 ton units. Ten of these units then make up a container load.

Containerization has facilitated the door to door delivery of blue fibre and vastly improved dust control in the shipping, offloading and railing operations.

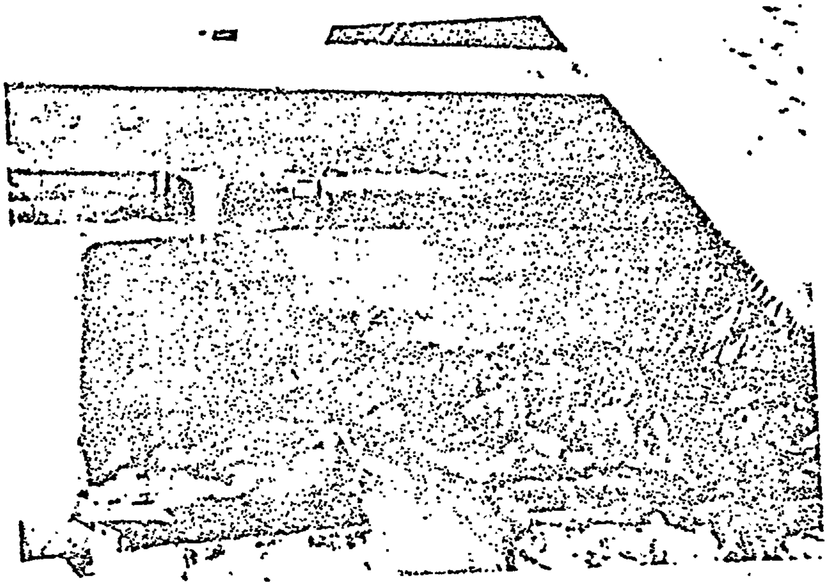
A more recent improvement has been the addition of a 4th wire strap on each bale which decreases the overall height of a palletized load thus making it easier to fit the units into a container. This has reduced the possibility of ripping open the top bale on the ridge above the doors of the container. This was one of the biggest problem areas when loading containers with a fork lift truck.

The attached photographs illustrate the latest baling machines and the units produced. Also included are some comparisons of the old and new type units showing the considerable height and volume savings that have been achieved.

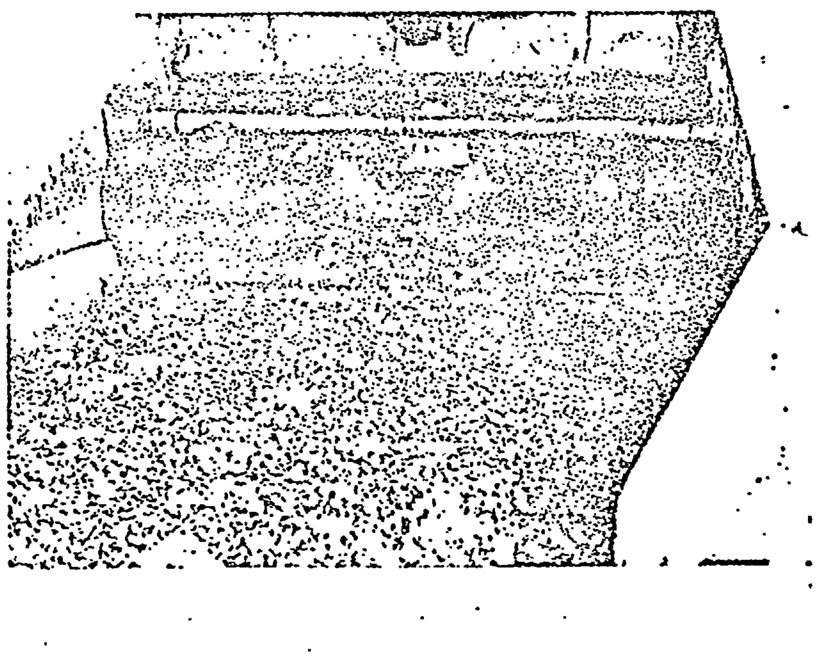
2.3. <u>Packaging Materials.</u>

Work is continuing on the development of superior quality polywoven bags and test shipments of various types of polywoven bags are currently in the pipeline.

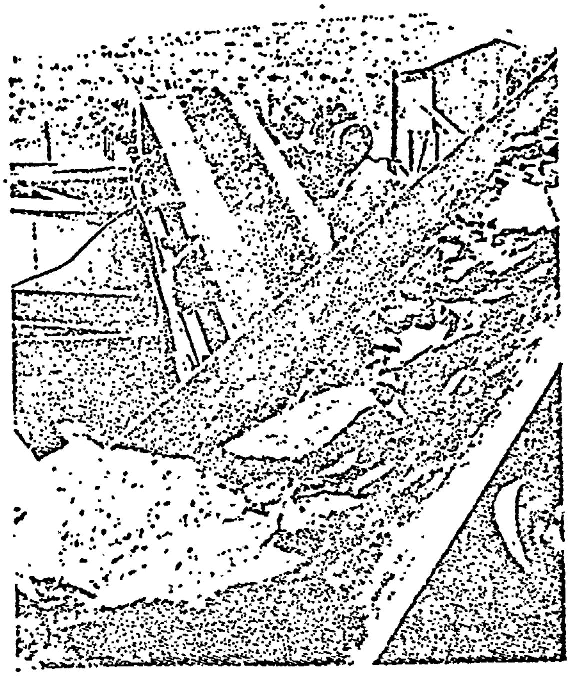
In addition a suitable pulpable paper sack has been developed to withstand the baling process. This will facilitate the containerized shipments of blue asbestos fibre to those customers who wish to dump the sealed bag and bale directly into the hydropulpers. The reduction in dust levels in the incoming fibre sections should be substantial. Test shipments are already in the pipeline.



1ST WASHING
SCREEN
COARSE MATERIAL



WASHING OF FINES



WASHED COARSE
& FINES LEAVING
WASHING PLANT