PLAINTIFF'S EXHIBIT

CAP-1147

A/C Pipe
Producers Association

Internal Correspondence

TO Public Affairs Committee
International Affairs Committee

FROM J. F. Welch
J. F. Welch, Vice President

DATE April 2, 1982

SUBJECT Sweden - Study of Asbestos in Drinking Water

ACTION REQUIRED: Review for information

Enclosed is a report funded by the Product Control Board of the Swedish Department of Nature Conservation. Although the document is dated December, 1980, it only recently came to AACPP's attention via the Asbestos International Association. Please note that the report does not represent the official views of the Department of Nature Conservation.

The document is seventy-five pages so only the salient portions are forwarded for your review. These include:

- Title page
- Foreword
- Contents
- Summing up
- Proposal for measures

Some portions of the report have an all too familiar ring. For example, the section entitled "Notable new installations during recent years" makes the following observations:

> The public, the local political parties or "action groups" have questioned the suitability from a health point of view of installing A/C pipes for the transport of drinking water, and in this connection, the local authorities have consulted central authorities for advice and directions.
>
> * * *
>
> The matter developed into an important political question and a local councilman caused a politican to put a question in Parliament regarding the use of A/C pipes as pipelines for water.
>
> * * *
>
> Finally, in the Spring of 1980, an extraordinary meeting of the (Halmstad) Borough Council decided that A/C pipes would not be used in the pipeline, and that sections of pipes already installed would be replaced. This measure is probably unique, and no similar case is known in Sweden or abroad.

Considering the extensive references to studies of the U.S. Environmental Protection Agency, it is no surprise that the author recommends that asbestos levels in drinking water "should be kept as low as possible" and that "asbestos cement is not a suitable material for pipelines for aggressive drinking water." However, the report does go so far to say that the excavation and replacement of A/C pipelines "does not appear justifiable."

If you have any questions or want full copies of the report, please do not hesitate to call.

JFW/ajb

Enclosure

cc: A. Kahn, Esq.
Brian Commins, Ph.D. (full report)

copies to:

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This report is based on work carried out with financial support from the Product Control Board at the Department of Nature Conservation.

The author assumes the sole responsibility for the contents of the report which, therefore, may not be referred to as representing the views of the Department for Nature Conservation.

Solna, December 1980.
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Research office

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ASBESTOS IN DRINKING WATER
Literature Review and Pilot Study of Swedish Drinking Waters

17 Project leader/Author of report

Gunnar Guzikowski

18 Summary of report

This report includes a literature review on asbestos in drinking waters and associated problem areas. The aim is to provide background material to be used in discussions of the health risks connected with asbestos in drinking water and of the need for hygienic limit values. Special emphasis has been put on the presentation of the material dealing with asbestos cement pipes and their relevance to the asbestos content. Thus the report will also provide a basis for an assessment of the need for and the possible form of advice and instructions for the use of asbestos cement pipes in water mains.

The report describes an investigation into the asbestos content of three municipal water distribution systems using asbestos cement pipes. The asbestos analyses have been carried out with the use of electronic microscopy. A significant asbestos content was found in one of the distribution systems.

The report includes assessments of research results obtained to date and also discusses the need for further Swedish studies. Finally, it contains proposals for measures to be taken concerning asbestos cement pipes in drinking water mains (100 ref.).

English summary.

19 Summary by The Author

FOREWORD

The Product Control Board classified asbestos as a dangerous substance in 1976. Since then the investigation into the asbestos question has continued within the Product Control Bureau connected to the Department for Nature Conservation. The aim is to identify the situations in which asbestos is spread and to take measures to limit this spread. Funds have been allocated by the Product Control Board for obtaining working material for the analysis of asbestos in air and water. The pilot investigation of asbestos in drinking waters described in this report has been financed by the above-mentioned funds.

The question whether it is advisable to use asbestos cement pipes for the distribution of drinking water has been discussed for some time. The discussion reached its peak in 1979/80 in connection with a number of municipal new installations of asbestos cement pipes. The question was discussed in Parliament where the Minister for Agriculture expressed a wish for the preparation of special advice and instructions for the operation of water supply plants using asbestos cement pipes.

As a step in the continued investigation into the asbestos question, and for the purpose of providing working material for the preparation of possible advice and instructions for the use of asbestos cement pipes, we present below a summary of the research during recent years into and associated with asbestos in drinking water. In addition, there are proposals for further suitable measures to be taken in this question.

The summary was prepared by Gunnar Guzikowski, second secretary at the Product Control Bureau of the Department for Nature Conservation, in close collaboration with Tore Stenström, a chemist from the section for environmental hygiene at the Department for Nature Conservation.

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12. SUMMING UP

Occurrence and spread of asbestos

Asbestos and similar mineral fibres are found in the rock and through erosion, high fibre contents may occur in water catchment areas.

Asbestos occurs only in a few known places in the Swedish rock. Knowledge of the full occurrence of asbestos is incomplete.

The risk of spreading of asbestos to drinking water from natural deposits, waste tips and discharge from industry and mining has not yet been studied in Sweden.

Asbestos cement pipes

Sweden has at least 1500 kilometres - possibly up to 6000 kilometres - asbestos cement pipes for the distribution of drinking water.

Using the total length of pipelines as a basis for calculation, the share of asbestos cement pipes is small in Sweden, but because the pipes are often used in coarse main pipelines for both raw-water and purified water, many people consume drinking water which has passed through asbestos cement pipes.

New installations of asbestos cement pipes have almost entirely ceased in Sweden because of professional restrictions.

In Sweden there are at least five makes of asbestos cement pipes for distribution of drinking water.

Corrosion of asbestos cement pipes

Investigations carried out so far indicate that measurable fibre contents may be released from asbestos cement pipes only if the pipes are exposed to internal attacks by corrosion.

Corrosion of asbestos cement pipes used for drinking water has been found in several places in Sweden.

The risk of corrosion is particularly great during transport of sour and soft water.

The calculation of the so called aggression index often provides a good guide to the assessment of the corrosion risk. Water with an aggression index of at least 11.0 is normally expected not to attack asbestos cement pipes.

Whether an asbestos cement pipeline has been attacked by corrosion is best assessed by examining samples from the pipeline.

The following conditions may indicate the existence of corrosion on an asbestos cement pipeline:

- If measurings taken on a number of subsequent occasions show increased fibre contents in water which has been transported through the asbestos cement pipeline.

- If measurings on a number of consecutive occasions show higher values with regard to pH, alkalinity and hardness in the water which has passed through the pipeline.

- If corrosion problems connected with other pipe materials in the distribution system are already known.

Precipitates of e.g. iron may form on the inside of the asbestos cement pipes and protect against corrosion attacks.

The risk of corrosion may be reduced by increasing the dosage of alkali already in the water (causting solution, soda or calcium).

During work on asbestos cement pipelines, e.g. drilling and threading in connection with new connections, released fibres may enter and spread in the distributed water.

Analysis of asbestos

Analyses of asbestos in water are complicated and costly and require access to specialised equipment.

The facilities for carrying out advanced asbestos analyses are restricted in Sweden, and the necessary experience of this type of analyses is not available at the present time.

Analyses of asbestos in water have been carried out in some West European countries, in addition to USA and Canada. In all investigations, drinking water containing asbestos has been found. The asbestos content varies considerably.

In an investigation of the asbestos content in three Swedish drinking water systems where aggressive water is transported through asbestos cement pipes, statistically significant quantities of asbestos were found in one of the systems.

Biological effects and epidemiology

On the basis of experiments on animals carried out to date, it is impossible to draw a definite conclusion whether asbestos entering the stomach and intestinal canal via drinking water may cause tumours.

It has been proved that asbestos fibres are capable of penetrating the walls of the stomach and intestinal canal.

Asbestos is cytotoxic in experiments with cell cultures.

Extensive epidemiological studies of the connection between asbestos in drinking water - or the use of asbestos cement pipes - and the occurrence of tumours in the stomach and the intestinal canal have been carried out on four location in USA and Canada. In one of these studies a positive connection was shown.

Risk assessment

The debate in USA on health risks in connection with drinking water has mainly concentrated on asbestos fibres originating from industrial discharge or natural erosion processes.

The intake of asbestos with drinking water should be assessed in relation to intake with other sources, such as environmental air, food and drink. The knowledge of the occurrence of asbestos in these sources is today insufficient.

The necessity for as well as the size of a hygienic limit value for asbestos in drinking water is at present difficult to assess. A limit value of this kind cannot be controlled today in Sweden.

The health effects of asbestos during industrial exposure to air have been used as the basis for assessing the hygienic risks of asbestos in drinking water and for calculating the suitable level for a limit value applicable to water-borne asbestos.

In a critera proposal from American authorities (EPA), an asbestos content of 0.3 mill. fibres per litre of drinking water is considered to constitute a risk for one case of tumour per 100 000 persons exposed during a lifetime.

The lack of basic knowledge about the occurrence of asbestos in different sources - particularly raw-water - means that it is difficult to determine the importance of an addition of asbestos fibres from an asbestos cement pipeline in relation to all other exposure to asbestos. The advisability of using asbestos cement pipelines for drinking water and the need for advice and instructions on how to operate such pipelines therefore become matters which are difficult to assess.

Even if measures against asbestos in drinking water are not justified from a health point of view at the present time, they may become necessary in order to avoid "psychological" effects, i.e. the reluctance of consumers to use drinking water containing asbestos.

Filtration of asbestos

Asbestos fibres may be removed from raw-water at water works by intensifying treatment methods already known.

13. PROPOSALS FOR MEASURES

A collective assessment of theoccurrence of asbestos fibres in the Swedish rock and knowledge of the natural spread of fibres to air and water are not available at the present time. Nor is it known whether, in connection with human activities, e.g. mining and waste disposal, there are discharges which may pollute drinking water.

Such basic knowledge is essential for the continued discussions of health risks associated with asbestos in drinking water and of the need for hygienic limit values for asbestos. This knowledge would also provide a helpful background to how serious the problem of loose asbestos fibres from asbestos cement pipelines should be regarded. It is possible that in Sweden, regionally, there are high background levels of asbestos in drinking water - caused naturally or by human factors - where even very small additions of fibres from asbestos cement pipes in drinking water pipelines may be of marginal importance.

In order to obtain the basic knowledge discussed above, a continued investigation is necessary, and this could include the following items.

1. A survey of existing geological maps for the purpose of establishing areas in Sweden where the rock is high in asbestos minerals.

2. Valuation of these maps. Where required, random samples for asbestos analysis of drinking water, mining discharges etc. could be taken at locations where a higher occurrence of asbestos may be expected.

3. Valuation with recommendations about further measures in boroughs and industries concerned.

Although so far there is no clear-cut evidence that asbestos in drinking water constitutes health risks, the contents in drinking water should be kept as low as possible, as asbestos is known in other connections as a material which may cause tumours and has no fixed level of no effect. Thus asbestos cement is not a suitable material for pipelines for aggressive drinking water, as this type of water may attack the pipes resulting in higher fibre contents.

If asbestos cement pipes are used in new installations, the water to be transported should be treated in such a way that any aggressive properties are eliminated. To dig up and replace, because of fear of health risks, asbestos cement pipelines which are in operation and function well from a technical point of view, does not appear justifiable, judging from research results available so far. On the other hand, any corrosion problems which may exist on existing pipelines should be traced, controlled and reduced.

In this report there are examples which show that Swedish asbestos cement pipelines may be attacked by aggressive drinking water. The extent of the problem is not fully known. Further investigations of asbestos cement pipelines should therefore be carried out. The investigations should be undertaken at local government level under the direction and coordination of a central authority and may include the following points.

1. Existence of asbestos cement pipes in the local distribution system.

2. An assessment of whether the distributed water may be aggressive against asbestos cement, from a theoretical pointof view or on the basis of other information.

3. In boroughs where attacks on pipes are suspected, further examinations should be carried out for the purpose of establishing the occurrence of corrosion on pipes.

4. A summary and valuation of the local authority investigations. Drawing up suitable measures to be taken by the boroughs to deal with the corrosion problems (advice and directions).

The following indications that water is attacking asbestos cement pipes may be used at the present time.

A. The aggression index of the water is less than 11.0.

B. It is known that other pipeline materials are attacked by the water.

C. The pH, alkalinity and hardness of the water increases during the passage through the pipeline

(such increases may occur temporarily during a short period or after a new pipeline has come into operation, and may not mean corrosion attacks).

The continued research in thisfield will probably give more specific and reliable indications than those mentioned above.

If there are indications of corrosion, this may be controlled by

- firstly, examining samples from the pipeline, which should be done by or in consultation with the central drinking water laboratory,

- secondly, analysing a series of water samples from the pipeline with regard to asbestos content.

If corrosion of asbestos cement occurs in a pipeline for purified water, attempts may be made to reduce the corrosion by raising the aggression index of the water with the help of a dosage of alkali. The choice of (a) suitable chemical(s) will depend on the composition of the water, but one of the well known additives causting solution, soda, calcium, calcium-carbon dioxide etc. should be suitable. It should be pointed out that a higher dosage of alkali may lead to problems of a technical nature, such as precipitates of calcium in the distribution system. Dosage proposals should therefore be prepared by experts in the field.

If the damages from corrosion are extensive, the above-mentioned "traditional" additives may be insufficient to prevent continuing release of fibres. Theoretically, there is then the possibility of coating the inside of the pipes in coarse pipelines with calcite or some other protective material. Even the dosage of the water with some material (e.g. phosphate or zinc), providing a protective skin may be a possibility. Hopefully, the current American research projects will show if any of these"rehabilitation methods" are applicable in practice.

Asbestos in raw-water, whether occurring naturally or originating from attacked asbestos cement pipes, may be removed at water works. The conventional treatment methods reduce the fibre content and it is possible to filtrate away more than 99 o/o of the fibres by intensifying water purification methods already known.

The future will probably show a growing demand for advanced asbestos analyses, not only on water samples but also on samples of environmental air, drinks and foods. For practical and economic reasons, a Swedish laboratory therefore ought to build up competence, staff and equipment geared to asbestos analyses. In the long term, with access to a laboratory of this kind, a nationwide investigation based on the Canadian model (see section 6) could be carried out to provide a good insight into the exposure of the population to asbestos in drinking water. The laboratory could also be used for analyses of asbestos in drinks, foods and industrial air samples.

Knowledge of asbestos in drinking water and associated problem areas is available to a large extent abroad, particularly in USA and Canada, and extensive research is still going on. It is important that Swedish researchers and authorities follow the research work continuously, keep in touch with the appropriate foreign authorities and keep themselves informed about any measures taken by authorities.