

HEALTH HAZARDS INVOLVED IN THE USE OF
ASBESTOS CEMENT PIPE
IN
THE KINGDOM OF SAUDI ARABIA

BY

DONALD J. HERNANDEZ .

WHO

SANITARY ENGINEER ADVISOR

WITH

THE KINGDOM OF SAUDI ARABIA
MINISTRY OF MUNICIPALITIES AND RURAL AFFAIRS
DEPARTMENT OF PUBLIC UTILITIES

7 R THANI 1402

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ABSTRACT

Asbestos is known to cause disease in man when inhaled in large quantities, and is a well known occupational health hazard. Certain occupational hazards are present in the Kingdom of Saudi Arabia with respect to asbestos delivery and pipe manufacturing. Lesser potential hazards may also be present in the installation and maintenance of asbestos cement pipe. Ingestion of water passed through asbestos cement pipe should present no significant health hazard, and there is presently no reason to restrict the use of A/C pipes if the transmitted water is non-corrosive to cement. Good engineering practice also indicates that asbestos cement pipe should not be used to transmit corrosive waters.

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HEALTH HAZARDS INVOLVED IN THE USE OF
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SAUDI ARABIA

A. INTRODUCTION

In recent years the Kingdom of Saudi Arabia has been advancing rapidly in all areas with special emphasis in the industrial, agricultural, and social sectors. In all of these areas the provision of safe, adequate water supplies is one of the critical needs. In order to provide such supplies the Kingdom has undertaken an extensive program involving water resource development, and construction of treatment plants and distribution systems. The proper design of distribution systems is dependant upon many variables including economics, geological formations, topography, size of area served, chemical characteristics of the water to be transported, and the physical and chemical nature of the soil in the area. Consideration of these variables often results in the use of water pipe made from a number of materials, including iron, steel, plastic, cement, and asbestos-cement. All of these materials are currently being used in the Kingdom, and are also being used throughout other areas of the world. Many of these pipe materials have potential health problems related to their use, but if properly used, all of these materials are considered to be acceptable for the transport of water. (1,2,3,4,5,6). However, a question has recently arisen within the Kingdom regarding possible health hazards to the consumer due to the use of asbestos-cement (A/C) pipe. This paper is intended to address that question. In addition it will look at occupational health hazards which may be present due to the asbestos.

B. BACKGROUND ON USE OF ASBESTOS-CEMENT PIPE

Asbestos-cement pipe has been used extensively (7,8) and was first used to a significant extent, in Europe in the late 1920's, primarily in Italy. Although it is manufactured with various percentages of asbestos, a typical pipe may have 80% cement and as high as 20% asbestos.(3) The asbestos fibers are not free, but are an intimate part of the cement, being bound in the cement in much the same manner as a reinforcing bar. (2)

This pipe was introduced into the United States of America (U.S.A) about 1931 and steadily gained acceptance. It is particularly desirable because of its resistance to scaling and corrosion, it's light weight, and cost. The American Water Works Association (AWWA) approved its first standard for A/C pipe in 1953. (1) Since that date the standard(s) has been expanded and improved a number of times and there are currently standards dealing with the pipe itself, pipe selection, and pipe installation. Since its introduction into the U.S.A. there have been more than 330,000 kilometers (4,8) (200,000 miles) of A/C water pipe installed, and currently approximately one third of all water pipe sold in the USA is A/C pipe. (8) This extensive use is also being experienced in many other countries.

C. HEALTH HAZARDS ATTRIBUTED TO ASBESTOS

Asbestos is a generic term, (9) includes a number of fibrous silicate materials, and is not a specific chemical compound. Small deposits are found world wide with the largest deposits in North America and South Africa. It is used extensively in many industrial materials and fibers are commonly found in water, being introduced naturally or due to industrial operations. (9) In addition it is often found in soft drinks and other beverages.

It is an accepted fact that most major forms of asbestos can cause disease in man if inhaled in large quantities. (6,9,10) This usually occurs due to occupational exposures (9) such as mining, crushing, and product manufacturing. Because of this known hazard the Occupational Safety and Health Administration (OSHA) in the U.S.A. has established regulations (6,9,10) to protect workers against airborne asbestos. Exposures not to be exceeded are:

1. Eight hour time weighted average: two fibers longer than 5μ m per cubic meter of air (It was planned to reduce this to 0.5 fibers.)
2. Ceiling concentration: less than ten fibers longer than 10μ m per cubic meter of air.

Diseases which can be caused (6,8,9) include skin corns, fibrosis of the lung (asbestosis), carcinoma of the lung, malignant mesothelioma of the pleura and peritoneum, and

increased incidence has been found among certain occupational workers and it has been hypothesized that these workers breathed in the asbestos fibers which then became entrained in saliva and were swallowed (3,6,8). Therefore, the cause was due to heavy concentrations of airborne asbestos. However, in the U.S.A. and other countries, this led to the question as to whether the use of A/C water pipe introduced asbestos fibers into the water, and whether these fibers might also be causing cancer of the digestive system.(9,11).

D. POTENTIAL HEALTH HAZARDS IN SAUDI ARABIA

When considering possible health hazards due to asbestos cement pipe one can consider the following areas (9,10) mining and processing, asbestos delivery and pipe manufacturing, installation and maintenance of the pipe, and consumption of the delivered water.

1. Mining and Processing of Asbestos. This is probably the most hazardous area with respect to health of the worker, and is extremely hazardous. Proper techniques must be used to minimize the hazard. I am informed that no mines are open in the Kingdom of Saudi Arabia, so this hazard should not exist.

2. Asbestos Delivery and Pipe Manufacturing. Normally large quantities of asbestos are delivered in bulk, smaller quantities in bags. Both methods can be hazardous to the worker if not properly carried out. Also, the manufacturing process can be hazardous as asbestos fibers may be airborne and inhaled in large numbers unless proper precautions are taken.

3. Installation and Maintenance of Asbestos Cement Pipe. Very little asbestos-cement dust is present during the shipping and handling of A/C pipe, and consequently there is little or no health hazard to the worker (10).

There could be significant dust generated locally in the cutting, machining and tapping of A/C pipe. (10) However, these are limited operations and a worker is not continuously exposed to them for an entire eight hour day. There are recommended methods for conducting all of these operations, (2,10) and if they are reasonably adhered to there is essentially no health problem for the worker. (10) Use of proper methods will also

4. Ingestion of Water Passed Through Asbestos Cement Pipe.

It was initially believed that A/C pipe stabilized and was not subject to attack. However, it is now accepted that aggressive waters can attack A/C pipe, (2,3,4,5,6,7,8) dissolve the cement, and release asbestos fibers. The number of such fibers taken in by the ingestion of such waters, as compared to the number taken in by occupational workers is relatively insignificant (11).

Many studies have been made in an attempt to correlate increased disease incidence with the consumption of water which has passed through asbestos-cement pipe. As yet, no significant correlation has been found (11,12). A joint United States Environmental Protection Agency (USEPA), State of Connecticut Study (12) stated, "The preliminary findings of the epidemiological study did not show any excess in cancer incidence for stomach, colon, or rectum in Connecticut townships during 1935-1973 that could be related to the use of asbestos-cement pipe for drinking water."

An AWWA committee (11) evaluated the problem of asbestos in water and determined, "No firm evidence shows that the proper use of asbestos-cement pipe poses a hazard to health by reason of ingestion of asbestos fibers. Calculations comparing the probable ingestion exposure in occupational groups to that likely to occur as a result of ingestion of potable water from asbestos-cement pipe systems suggests that the probability of risk to health from the use of such systems is small - approaching zero."

A recent paper from the Eastern Mediterranean Regional Office (World Health Organization) (2) states: "The asbestos fibers of A/C pipes are usually surrounded by cement and not easily released into the water unless the conducted water is corrosive. Therefore, there is presently no reason to restrict the use of A/C pipes if the transmitted water is non corrosive to cement". This view (3,4,6,7,11) has previously been expressed by the American Water Works Association, the United States Environmental Protection Agency, and by Manufacturers of asbestos cement pipe. Good engineering practice also indicates this, as the expected life of the asbestos cement pipe transmitting a corrosive water could be very low (7).

E. CONCLUSION

Every chemical known to man can conceivably cause some form of disease if it is misused. Therefore, very few studies of chemical hazards can make the unqualified statement that "No health hazard exists to man in the use of this chemical." However, from a practical standpoint we can reach the point where we can state that the potential harm is minimal and is offset by the known benefits.

Based upon this review the following conclusions are reached regarding health hazards within the Kingdom of Saudi Arabia due to the use of asbestos-cement pipe.

1. Mining and Processing of Asbestos presents no health hazard, since reportedly this is not carried out in the Kingdom.

2. Asbestos Delivery and Pipe Manufacturing presents a distinct health hazard to the worker involved in this process, and proper precautions must be taken.

3. Installation and Maintenance of Asbestos-Cement Pipe presents a minimal potential health hazard to the worker, due to potential dust (and fiber) generation. However, if proper procedures are followed (2,10), no health hazard should exist.

4. Ingestion of Water Passed Through Asbestos-Cement Pipe should present no significant health hazard. As summarized by the Eastern Mediterranean Regional Office (WHO), (2) "Therefore, there is presently no reason to restrict the use of A/C pipes if the transmitted water is non-corrosive to cement." Good engineering practice (7,10) indicates that asbestos-cement pipe should not be used to transmit corrosive water, as it can cause serious pipe destruction and greatly reduce the life of the pipe, but there is no reason to restrict the use of A/C pipes if the transmitted water is non-corrosive to cement. Therefore the use of A/C pipe for the transmission of non-corrosive water is good engineering practice and also should present no significant health hazard to the user.

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