# LITERATURE REVIEW

# INTRODUCTION

## Background

Based on the data from Indonesian Statiscal Board (Badan Pusat Statistik), In 2016, there are 45.5 million female workers in Indonesia. Thirty percent (13.7 million) are working in Agriculture, Forestry, Hunting and Fishery while 6.9 million are working in manufacture.[1] Typical manufacturing industries that may involve asbestos are asbestos gaskets, sheets, cigarette filters, cosmetics, electrical cloth and electrical panel partition, fire proofing and prevention materials, fume hoods and laboratory hoods, plastics, talcum powder, vinyl products, textile cloths and textile garments, insulation, asbestos felt roofing and flooring.[2]

Although it seems that female workers in Indonesia are less likely to be exposed to asbestos from occupational setting, it still can happen since the exposure towards women primarily occur in three ways, namely: occupational exposure, environmental exposure, and secondary exposure, that is when women exposed towards asbestos when their friend, family member, or loved ones brings asbestos fibers into the home (usually on work clothes) from an exterior setting, thus still putting them towards asbestos exposure and its consequences.[3]

## Asbestos

Asbestos is a generic term for a group of six naturally-occurring, fibrous silicate minerals that have been widely used in commercial products. Asbestos minerals fall into two groups or classes, serpentine asbestos and amphibole asbestos. It should be noted that serpentine and amphibole minerals also occur in nonfibrous or nonasbestiform forms. These nonfibrous minerals, which are not asbestos, are much more common and widespread than the asbestiform varieties. Serpentine asbestos, which includes the mineral chrysotile, a magnesium silicate mineral, possesses relatively long and flexible crystalline fibers that are capable of being woven. Amphibole asbestos, which includes the minerals amosite, crocidolite, tremolite, anthophyllite, and actinolite, form crystalline fibers that are substantially more brittle than serpentine asbestos and is more limited in being fabricated. This group can form a variety of polymeric structures through formation of Si-O-Si bonds. For the amphibole class of asbestos (amosite, crocidolite, tremolite, anthophyllite, and actinolite), the polymeric structure consists of a linear double chain, as shown in Figure 1.0 top. These chains crystallize into long, thin, straight fibers, which are the characteristic structure of this type of asbestos. For the serpentine class (chrysotile), the polymeric form is an extended sheet. This extended sheet tends to wrap around itself forming a tubular fiber structure. These fibers are usually curved ("serpentine"), in contrast to the straight morphometry of the amphiboles.[4]

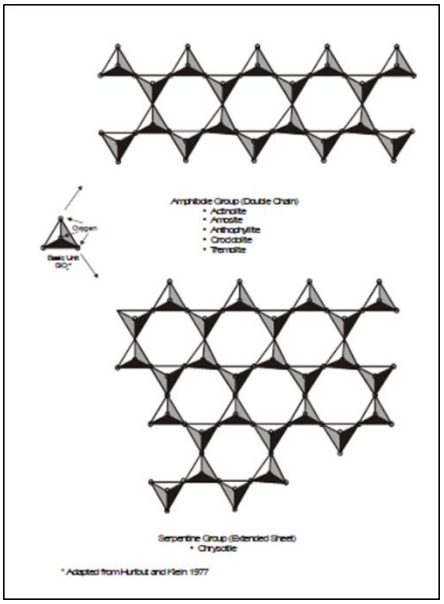


*Figure 1.0 Basic Polysilicate Structure of Asbestos.*[8]

## Human Exposure of Asbestos

Inhalation and ingestion are the primary routes of exposure to asbestos. Dermal contact is not considered a primary source, although it may lead to secondary exposure to fibres, via ingestion or inhalation. The degree of penetration in the lungs is determined by the fibre diameter, with thin fibres having the greatest potential for deep lung deposition.[5]

Environmental exposure

Inhalation of asbestos fibres from outdoor air, and to a lesser degree in indoor air, is the primary route of exposure for the non-smoking general population. Exposure may also occur via ingestion of drinking-water, which has been contaminated with asbestos through erosion of natural deposits, erosion of asbestos-containing waste sites, corrosion of asbestos-containing cement pipes, or filtering through asbestos-containing filters. Families of asbestos-workers may be exposed via contact with fibres carried home on hair or on clothing ("secondary exposure").[5]

In studies of asbestos concentrations in outdoor air, chrysotile is the predominant fibre detected. Low levels of asbestos have been measured in outdoor air in rural locations (typical concentration, 10 fibres/m3[f/m3 ]). Typical concentrations are about 10-fold higher in urban locations and about 1000 times higher in close proximity to industrial sources of exposure (e.g. asbestos mine or factory, demolition site, or improperly protected asbestos-containing waste site). In indoor air (e.g. in homes, schools, and other buildings), measured concentrations of asbestos are in the range of 30–6000 f/m3. Measured concentrations vary depending on the application application in which the asbestos was used (e.g. insulation versus ceiling or floor tiles), and on the condition of the asbestos-containing materials (i.e. good condition versus deteriorated and easily friable). [5]

Occupational Exposure

Exposure by inhalation, and to a lesser extent ingestion, occurs in the mining and milling of asbestos (or other minerals contaminated with asbestos), the manufacturing or use of products containing asbestos, construction, automotive industry, the asbestos-abatement industry (including the transport and disposal of asbestos-containing wastes). [5]

Dietary exposure

The general population can be exposed to asbestos in drinking-water. Asbestos can enter potable water supplies through the erosion of natural deposits or the leaching from waste asbestos in landfills, from the deterioration of asbestos-containing cement pipes used to carry drinking-water or from the filtering of water supplies through asbestos-containing filters. In the USA, the concentration of asbestos in most drinking-water supplies is less

than 1 f/ mL, even in areas with asbestos deposits or with asbestos cement water supply pipes. However, in some locations, the concentration in water may be extremely high, containing 10–300 million f/L (or even higher). The average person drinks about 2 litres of water per day. Risks of exposure to asbestos in drinking-water may be especially high for small children who drink seven times more water per day per kg of body weight than the average adult. [5]

**Asbestos Regulation and Ban**

Since its categorization as Notation A1 (carcinogenic in human) for lung cancer and mesothelioma, some countries have banned the use of asbestos.[6,7]

In Indonesia, the threshold limit value of asbestos is confined at 0.1 fiber/mL. The number is similar to the Threshold Limit Value (TLV) instituted by American Conference of Governmental Industrial Hygienists (ACGIH).[6,8]

## REFERENCES


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