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Asbestos

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Introduction to Asbestos

- Used extensively from the mid 1900's until the early 1980's for fireproofing, thermal and acoustic insulation requirements
- Over 3,500 different asbestos products have been manufactured

Introduction to Asbestos

- It is hoped that this presentation will give a valuable tool to property owners & managers plus those engineers, technicians and others who may have some association with asbestos to assist in how they approach waste loads containing asbestos material, this will include:
  - Basic asbestos awareness
  - Safe operating procedures

Introduction to Asbestos

What is Asbestos?

- Naturally occurring mineral
- Hydrated silicate minerals (fibrous)
- 30 different types of asbestos

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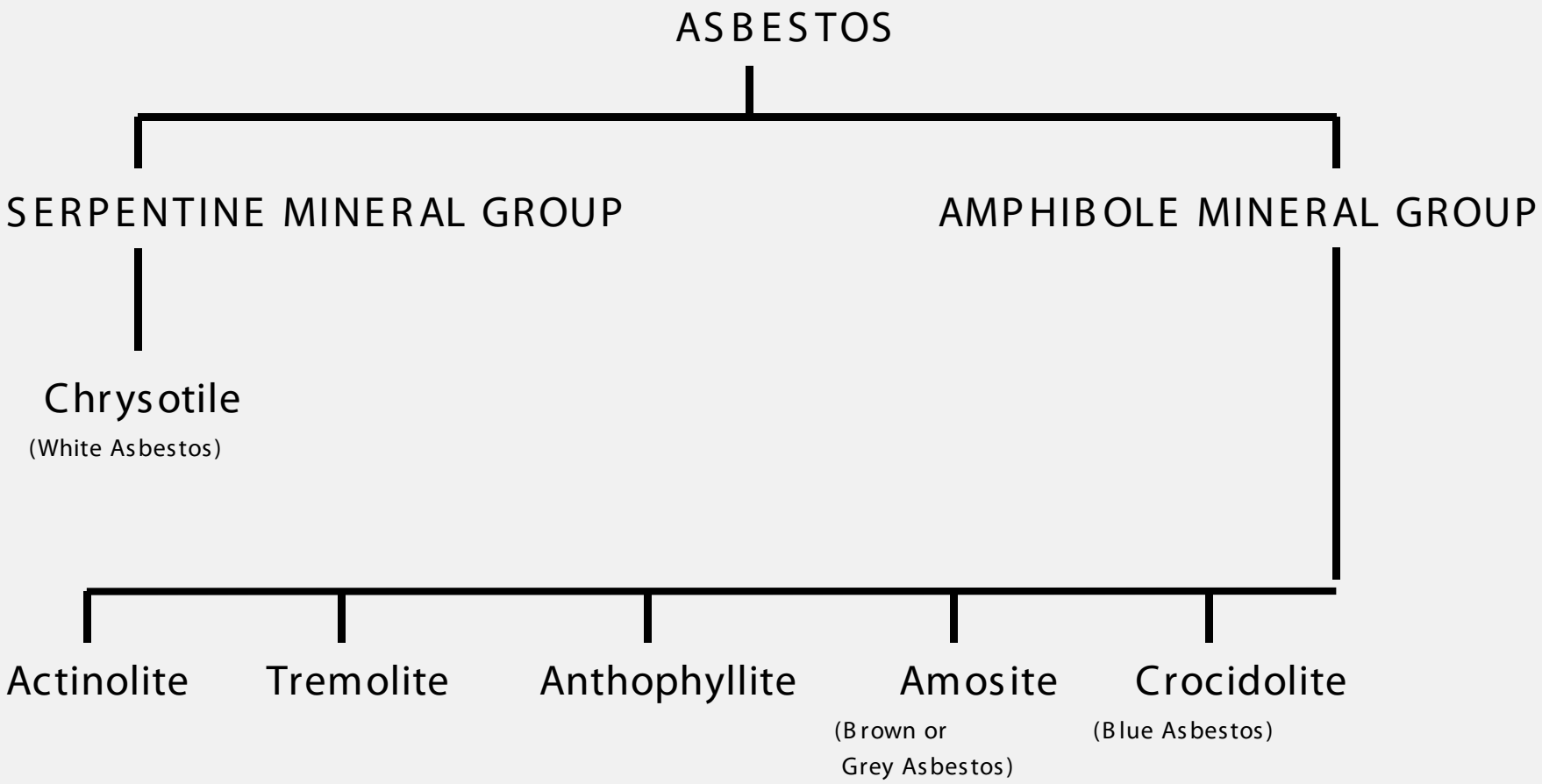
Introduction to Asbestos



Introduction to Asbestos

- Only three common : **Chrysotile**, Amosite and Crocidolite
- Chrysotile constituted 95% of the total world production

Chrysotile

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Amosite

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Crocidolite

What is Asbestos?

- **Chrysotile** has different morphology or fibre shape
- They are longer, softer, parallel but curly fibres vs. straight, parallel needle-like structures and usually feel coarse or prickly.

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World Production of Asbestos

Year	Chrysotile	Crocidolite	Amosite	Anthophyllite	Total
1920	184 100	2 801	727	Nil	187 628
1950	928 500	28 500	37 850	11 350	1 006 000
1977	4 961 000	178 000	60 000	2 000	5 223 000
Countries of Origin	Canada	South Africa	South Africa	Finland	
	USA	Australia		South Africa	
	Europe				
	USSR				
	China				
	Australia				

*All the figures indicate metric tonnes

Taken from Occupational Lung Disorders, W. Raymond Parkes; Butterworth
[By Courtesy of Cape Industries Ltd]

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Property of Asbestos

- Fibrous nature woven into fabrics ropes

Property of Asbestos

- High tensile strength
- High resistance to chemical attack (except Chrysotile)
- high resistance to heat and fire
- good thermal insulation properties (low thermal conductivity)
- good acoustic absorbance

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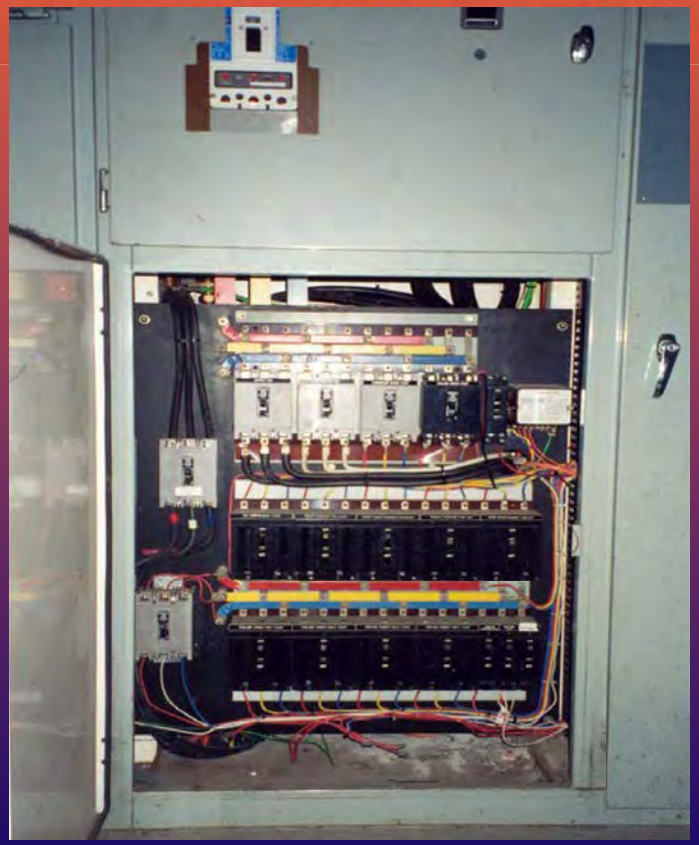
Property of Asbestos

and high electrical resistance



Problems

- Unique property in that it splits along the length of fibre into numerous fibres of much smaller diameter
- Totally different to that of synthetic mineral fibre.
- The aerodynamic properties of the long thin fibres means that they travel well in air streams.

Typical Application

- Thermal and acoustic insulation

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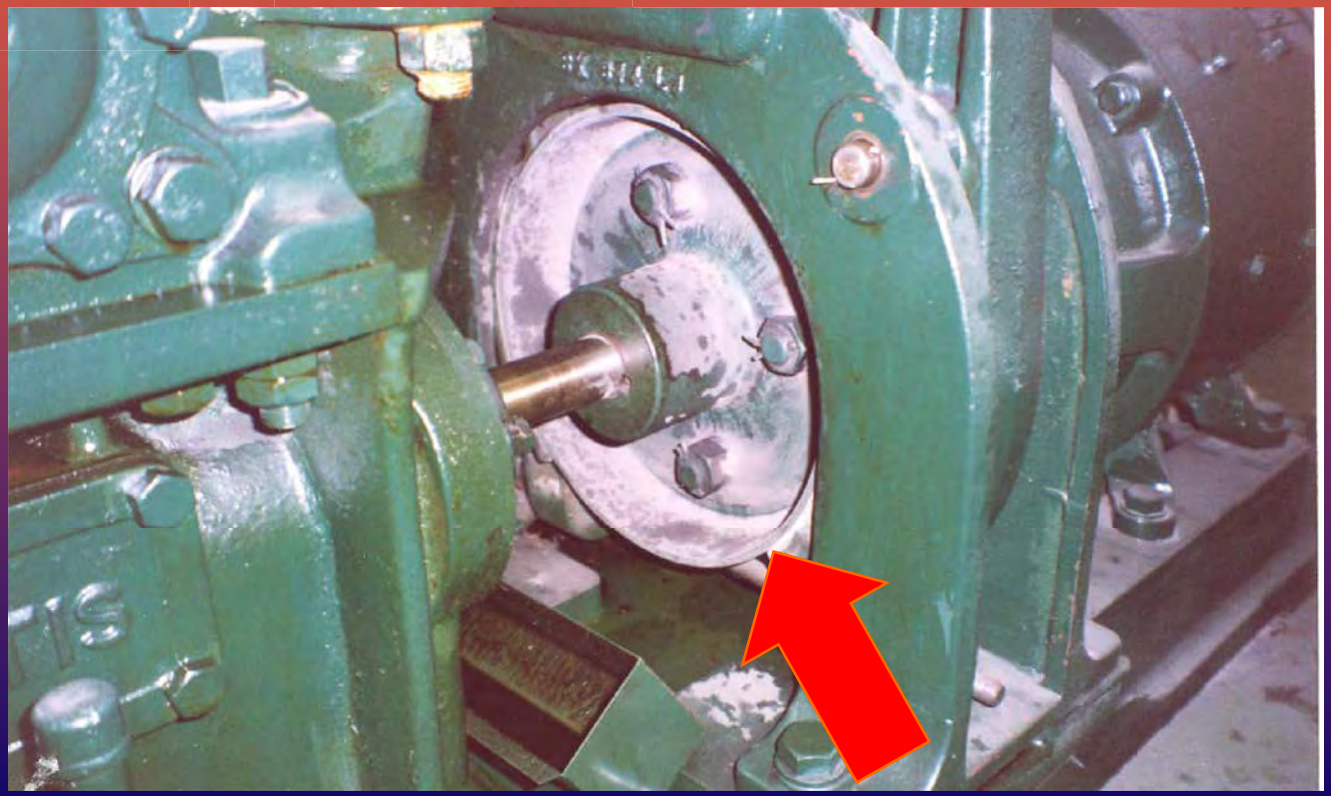
Typical Application

- Fireproofing
- Friction materials



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Typical Application

- Binders of fillers in other products

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Typical Application

- Asbestos Sheet Products

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Health Effects

- Inhalation of respirable size fibres
- Respirable as defined as fibres greater than five microns in length and less than 3 microns in diameter (aspect ratio of 3:1).
- Fibres in the optimum aerodynamic characteristics for penetration deep into the small airways of the lungs
- Its greatest health impact is its fibrous nature and durability in the lung

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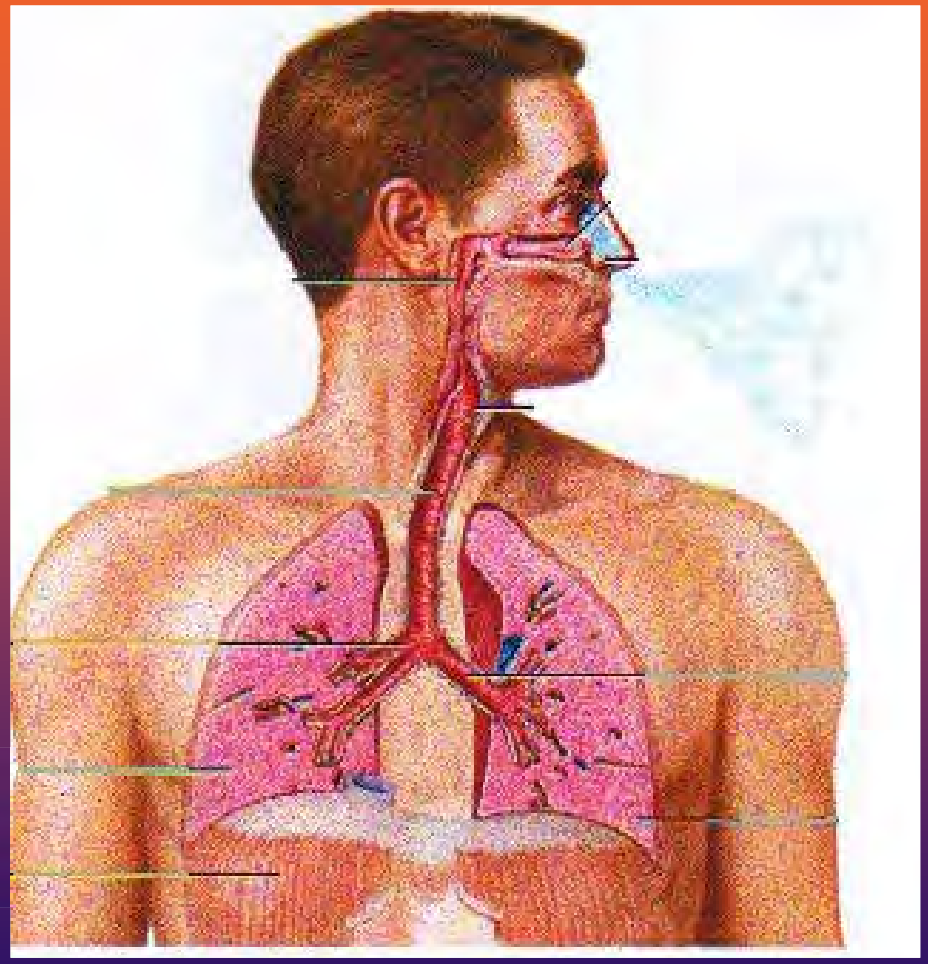
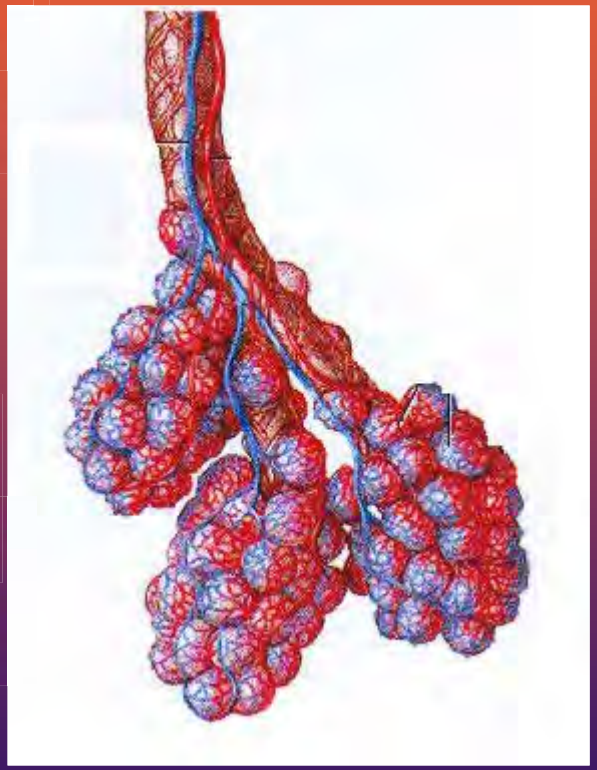
Structure of Lung



- **Basically balloons or bellows containing several hundred million alveoli (air sacs)**

Structure of Lung

- Purpose is to supply oxygen from inhaled air to blood and removal of waste gas including carbon dioxide (via diffusion process) in the alveoli.



Blue
Oxygen
Deficient

Red
Plentiful
Oxygen

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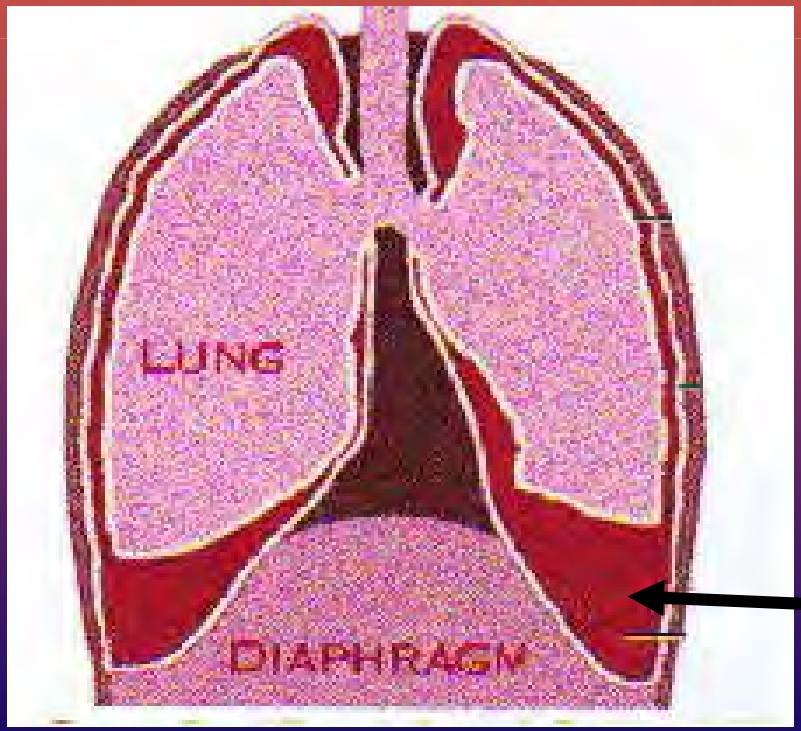
Structure of Lung

- Lung separated from the chest wall via a lubricating membrane called pleura (thickness of cigarette paper and similar feel to mucous).

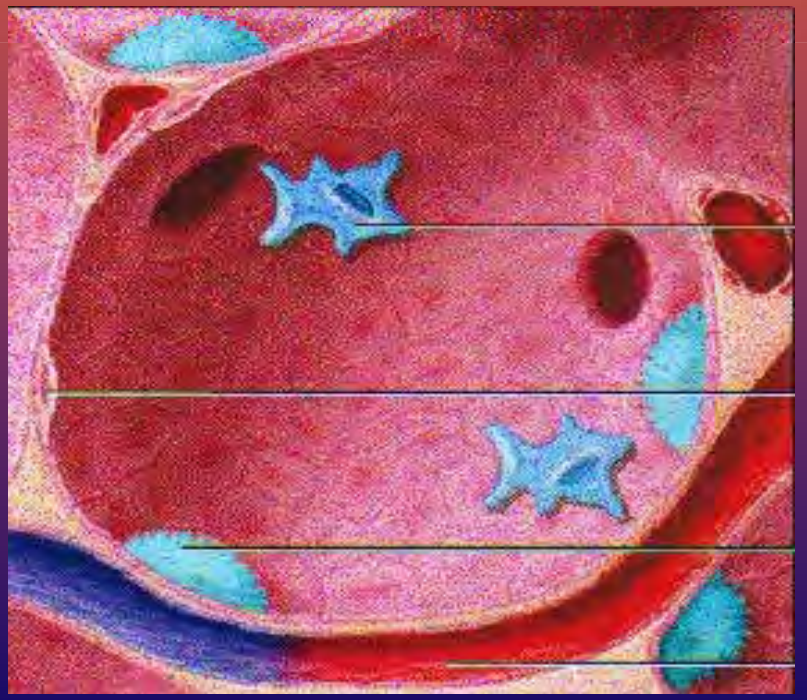


Pleural Cavity

Asbestos Related Illness

Asbestosis

- progressive scarring of the lungs (damage to alveoli)
- reduces lung's elasticity hence a feeling of breathlessness



Asbestos Related Illness

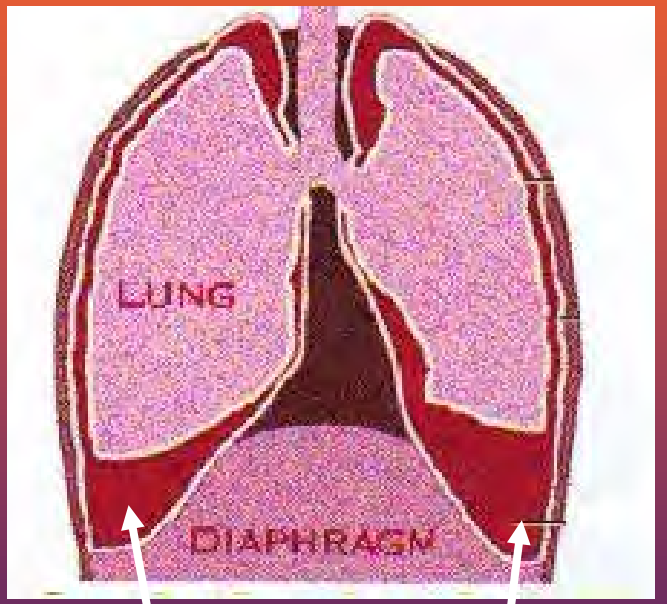
Lung Cancer

- cancer of the larger and medium sized airways (similar to that caused by cigarette smoking)
- combination of asbestos and smoking has a synergistic effect (i.e. increase risk of lung cancer)

Asbestos Related Illness

Mesothelioma

- cancer of the lubricating lining membrane of the chest (pleura) or abdomen (peritoneum)
- the lining thickens to form hard calcified sheet (0.5 – 1.0 cm thick) encasing and compressing lung to the point of collapse

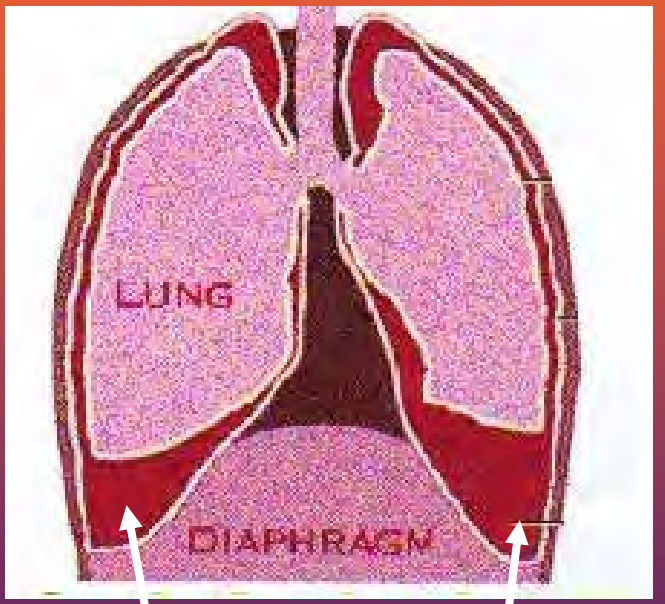


Pleural Cavity

Asbestos Related Illness

Mesothelioma

- blue asbestos is potent in inducing mesothelioma and brown asbestos to a lesser extent
- initial exposure to onset of disease : 15 years and up
- may be triggered by one relatively brief but very high exposure



Pleural Cavity

Two schools of thought regarding asbestos diseases:

- Deals specifically with the risk of cancer to that of asbestosis.
- One hit hypothesis
  - one fibre striking the right place at the right time

Two schools of thought regarding asbestos diseases:

Threshold hypothesis

- recognise the existence of complex defence mechanisms in the body
- hence unless high exposure is encountered or threshold of tolerance is exceeded, then cancer is induced

- Epidemiological studies support the threshold hypothesis in general

Exposure Standards

- The greater the dose the greater the risk
- 8 hours time weighted average concentration
  - Chrysotile 0.5 fibre/ml
  - Amosite 0.1 fibre/ml
  - Crocidolite 0.1 fibre/ml
  - Any mixture or unknown type 0.1 fibre/ml

Exposure Standards

- These values have been defined for fibres longer than 5 microns, width less than 3 microns and with an aspect ratio of not less than 3:1 as measured by the membrane filter method at 400 - 650X magnification and Phase Contrast Illumination.
- Measurable fibres defined

Legislation & Codes of Practice

Commonweath Work Health and Safety Act & Regulation has been adopted by NSW.

Legislation & Codes of Practice

- Chapter 8 Asbestos
  - 8.1 prohibitions & exemptions
  - 8.2 Airbourne exposure
  - 8.3 & 8.4 Management
  - 8.5 Monitoring, Training, control.
  - 8.6 Demolition & Refurbishment
  - 8.7 Asbestos removal
  - 8.8 Class A Licencing
  - 8.9 working with asbestos
  - 8.10 Asbestos removal and licenced assessors

Legislation & Codes of Practice

- Acts and associated Regulations which has since been superseded in NSW concerning asbestos containing materials include:
  1. Construction Safety Regulations 1950, Regulations 84A-J made under the Construction Safety Act 1912.
  2. Factories (Health & Safety - Asbestos Processes) Regulations 1984 made under the Factories, Shops and Industries Act 1962.
  3. Occupational Health and Safety Act 1983 and 2010.

Legislation & Codes of Practice

Worksafe Australia, Asbestos : Code of Practice and Guidance Notes

The three sections this Code of Practice is divided into are:

1) Guide to Control of Asbestos Hazards in Building & Structures.
2) Code of Practice for the Safe Removal of Asbestos.
3) Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust.

Legislation & Codes of Practice

The **Code of Practice for the Safe Removal of Asbestos** provides a broad outline of the general requirements for the removal of asbestos based materials.

Code of Practice for the Safe Removal of Asbestos

It outlines the following:

1. Planning and Programming considerations.
2. Preparation of the removal site for a major removal programme.
3. Equipment for asbestos removal.

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Code of Practice for the Safe Removal of Asbestos

4. Removal techniques for buildings and structures.
    1. including techniques for small removal jobs.
5. General hygiene requirements.
    1. decontamination procedures

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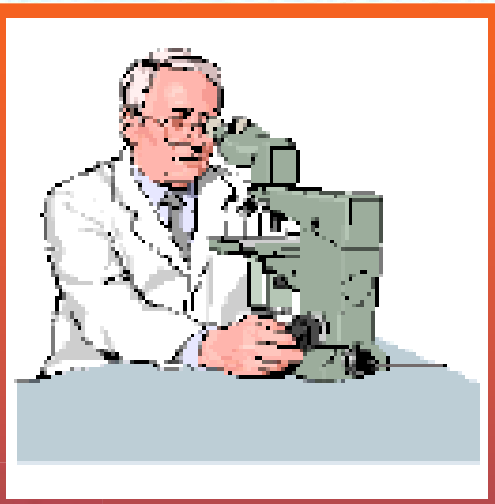
Code of Practice for the Safe Removal of Asbestos

6. Personal protective equipment.
7. Environmental monitoring at the removal site.
8. Handling and removal of asbestos cement (AC) products.

Guidance Note



The **Guidance Note on the Membrane Filter Method for Estimating Airborne Asbestos Dust** outlines the basic technical requirements for measurement of airborne asbestos levels. The method specifies the use of Phase Contrast Microscopy for analysis of the samples.

Additional Information

- Workcover Authority
- Victorian Asbestos Removal Industry Consultative Committee (VARICC) – very prescriptive document

Asbestos survey

- Requires a basic understanding of the construction techniques and the applications in which asbestos and its materials were used.
  - Consists of three main components:
    - review of the construction records and construction drawings for references to asbestos.
    - Consultation with building manager and or maintenance personnel.
    - Visual Inspection of the building.

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Asbestos survey

- The aim of the building survey is to identify and record the locations of all the sources of asbestos in the structure under consideration. However, as the survey is a visual inspection and sampling process, in reality only those asbestos materials that are physically accessible to the inspector can be identified, sampled and recorded.
- Next phase is to evaluate the risk of those asbestos identified.

Asbestos Monitoring

Typical Results

Commercial Building Operation	Fibres/Ml
Sweeping & general clean up	4~5
Ceiling fitter	1~2
Electrician- removing old cables	1~2
installing new cables	0.2
Sprinkler fitter	1.0
Plumber	1.0

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Asbestos Monitoring

Typical Results

Minor disturbance encountered	**Fibres/Ml**
Asbestos cement sheet removal	2~4
Friable lagging	4~20
Wet stripping with minor dry stripping Operations	Up to 180
Dry stripping with minor wet stripping Operations	Up to 500

Asbestos Monitoring

Typical Results

Landfill Site	Fibres/Ml
Burying Operation (after hours)	0.09
Lunch (no dumping but wind affected)	0.05~0.13
Landfill operation (normal working hours)	0.05~0.11

Standard Operating Procedures

- Removal and Disposal of Protective Equipment used for Asbestos related tasks
- Removal of SVRC Bins Containing Asbestos Wastes
- Burial of co-disposed asbestos cement products

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