

TRADE OF
Industrial Insulation

PHASE 2

Module 4

Insulation – Materials, Science and Application

UNIT: 12

Asbestos

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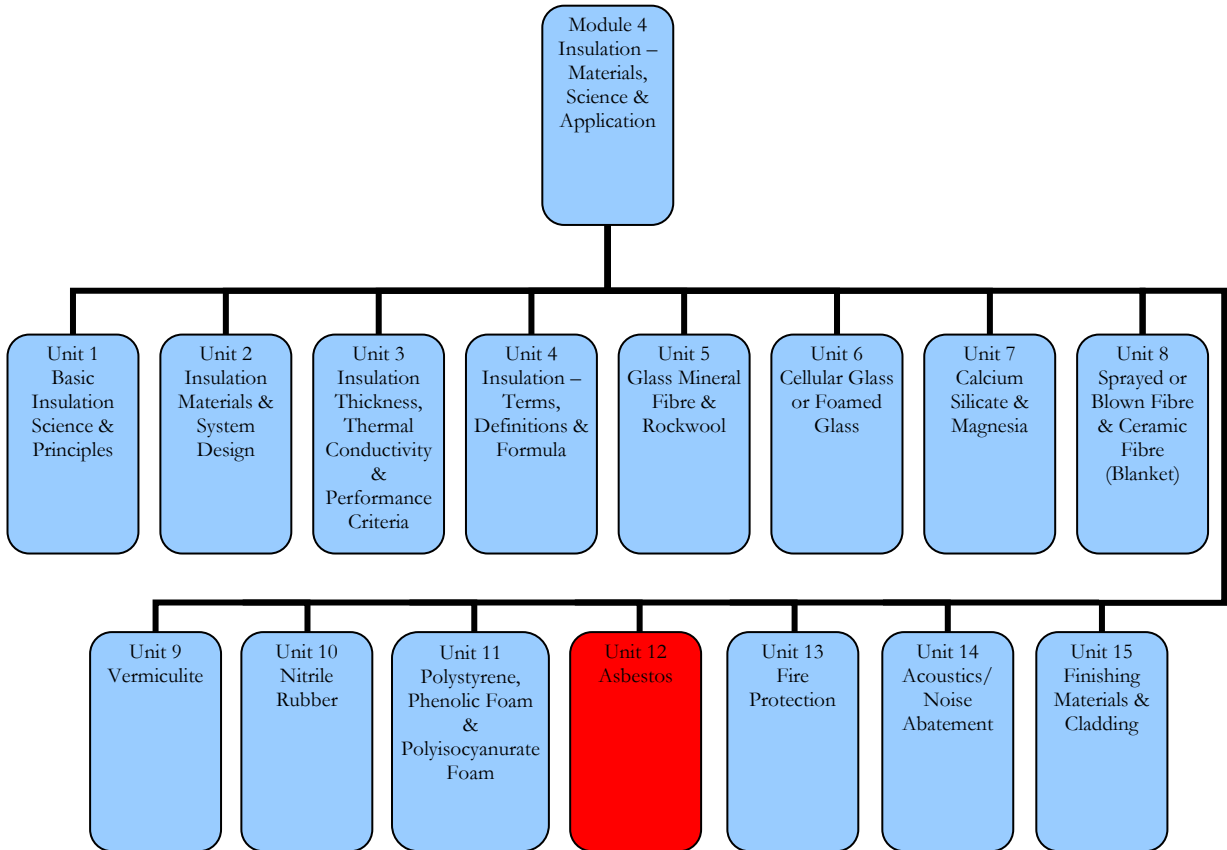
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Introduction

Asbestos is a set of six naturally occurring silicate materials exploited commercially for their desirable physical properties. They all have in common their asbestiform habit, long thin fibrous crystals. Asbestos in some forms can be toxic. The inhalation of asbestos fibres can cause serious illnesses, including malignant lung cancer. The European Union and most other countries have banned all types of utilization of asbestos including extraction, manufacture and processing of asbestos products.



Unit Objective

By the end of this unit *each apprentice* will be able to:

- State the difference between different types of asbestos.
- Identify and explain the dangers and risks associated with asbestos.

1.0 Asbestos

Key Learning Points

- Product/substance identity.
- Applications of asbestos.
- Insulating properties and fire resistance.
- Characteristics of the three main types; White/Crysolite, Brown/Amosite, Blue/Crocidolite.
- Difference between White/Crysolite, Brown/Amosite, Blue/Crocidolite.
- Identification of asbestos insulating materials.

1.1 Product Composition and Characteristics

Asbestos is a naturally occurring silicate mineral with long, thin fibrous crystals. The word asbestos is a borrowed Greek adjective meaning inextinguishable. The Greeks termed asbestos the miracle mineral because of its soft and pliant properties, as well as its ability to withstand heat.

Asbestos is toxic. The inhalation of asbestos fibres can cause serious illnesses, including malignant mesothelioma, lung cancer and asbestosis (a type of pneumoconiosis). Since the mid 1980s, the European Union and most developed countries have banned asbestos.

1.2 Types, Properties, Uses and Applications of Asbestos

Six minerals are defined as “asbestos” including:

- Chrysotile (White)
- Amosite (Brown)
- Crocidolite (Blue)
- Tremolite
- Anthophyllite
- Antinolite

Asbestos became increasingly popular among manufacturers and builders in the late 19th century because of its resistance to heat, electrical and chemical damage, sound absorption and tensile strength. When asbestos is used for its resistance to fire or heat, the fibres are often mixed with cement or woven into fabric or mats. Asbestos was used in some products for its heat resistance, and in the past was used on electric oven and hotplate wiring for its electrical insulation at elevated temperature, and in buildings for its flame-retardant and insulating properties, tensile strength, flexibility and resistance to chemicals.

Other uses and applications included fire retardant coatings, concrete, bricks, pipes and fireplace cement, pipe insulation and roofing sheets.

1.3 Fire Resistance of Asbestos

Asbestos is resistant to heat, is non-flammable and is a flame retardant.

1.4 Differences between the Various Types of Asbestos.

Asbestos has a host of physical properties that make it almost a superstar in the world of industrial chemistry. Its tensile strength surpasses that of steel. It has tremendous thermal stability, thermal and electrical resistance and is non – flammable. It can be subdivided into fine fibres that are strong enough and flexible enough to be spun into material that is a flame retardant, chemically inert thermal and electrical insulator. Note that asbestos binds with better insulating materials to create the ultimate construction materials.

Asbestos fibres have no detectible odour or taste. They are all solids that do not move through soil and are insoluble in water. Its colour will vary according to type, and metallic composition. Crocidolite, which has iron and sodium as its only metallic elements, is the most colourful, adorned in a range of colours including shades of lavender, blue and green. In general, asbestos-containing iron may display a green colour ranging from a hint of green to solid green depending upon the amount of iron present.

Tremolite contains no iron, but is part of a continuous mineral series with actinolite, in which iron and magnesium can freely substitute with each other. As a result, some specimens of tremolite may show a hint of pale green. Chrysotile and tremolite, which in pure form contain no iron, tend to be white, together with actinolite and anthophyllite are grouped together as “white asbestos”. Amosite and crocidolite have been used extensively for commercial use, and are considered to be extremely hazardous. Chrysotile is more flexible and has been considered to be less hazardous than either amosite or crocidolite. Until now, anthophyllite, actinolite and tremolite have been lumped with the “lesser evil” chrysotile under the UN Identification numbering system. Their occurrence in industry has been less extensive. Tremolite has been used in laboratories for filtering chemicals. Actinolite is used for industrial asbestos. There is not much reported use of anthophyllite.

1.5 Identification of Asbestos Insulating Materials

The different types of asbestos are often distinguished by colour. White asbestos (chrysotile), a serpentile, is the most common type of asbestos and is found in 90% to 95% of building commercial products and asbestos types from the amphibole group, such as blue asbestos (crocidolite) and brown asbestos (amosite) are less common.

2.0 Health and Safety

Key Learning Points

- Dangers and diseases associated with asbestos.
- Procedures to be followed when dealing with asbestos in buildings.
- Means of contracting diseases associated with asbestos.
- Use of personnel protective equipment in handling asbestos.
- Regulations governing storage, handling and working with asbestos.
- Professional attitude towards health and safety.
- Environmental awareness towards the safe disposal of asbestos.

2.1 *Dangers and Diseases Associated with Asbestos*

From studies of people who were exposed to asbestos in factories and shipyards, we know that breathing high levels of asbestos fibres can lead to an increased risk of:

- Lung cancer
- Mesothelioma, a cancer of the lining of the chest and the abdominal cavity
- Asbestosis, in which the lungs become scarred with fibrous tissue.

The risk of lung cancer and mesothelioma increases with the number of fibres inhaled. The risk of lung cancer from inhaling asbestos fibres is also greater if you smoke. People who get asbestosis have usually been exposed to high levels of asbestos for a long time. The symptoms of these diseases do not usually appear until about 20 to 30 years after the first exposure to asbestos.

Most people exposed to small amounts of asbestos, do not develop these health problems. However, if disturbed, asbestos material may release asbestos fibres, which can be inhaled into the lungs. The fibres can remain there for a long time, increasing the risk of disease. Asbestos material that would crumble easily if handled, or that has been sawed, scraped, or sanded into a powder, is more likely to create a health hazard.

2.2 Means of Contacting Diseases Associated with Asbestos

One of the main means of contracting diseases associated with asbestos is to disturb it either by hitting, rubbing or handling it, or if it is exposed to extreme vibration or air flow. If you suspect a material, product or installation contain asbestos, don't touch it, but look for signs of wear or damage such as tears, abrasions or water damage. Damaged material may release asbestos fibres.

If asbestos material is more than slightly damaged or if you are going to make changes to a plant installation for example, don't disturb it, but give a professional who will either repair it or have it removed in a safe and professional manner.

2.3 Procedures to be Followed when Dealing with Asbestos in Buildings

You can't tell whether a material contains asbestos simply by looking at it, unless it is labelled. If in doubt, treat the material as if it contains asbestos or have it sampled and analyzed by a qualified professional. A professional should take samples for analysis, since a professional knows what to look for, and because there may be an increased health risk if fibres are released. In fact, if done incorrectly, sampling can be more hazardous than leaving the material alone. Taking samples yourself is not recommended. Material that is in good condition and will not be disturbed (by remodelling, for example) should be left alone. Only material that is damaged or will be disturbed should be sampled.

If the asbestos material is in good shape and will not be disturbed, no nothing! If it is a problem, there are two types of corrections: repair and removal.

Repair usually involves either sealing or covering asbestos material.

- Sealing (encapsulation) involves treating the material with a sealant that either binds the asbestos fibres together or coats the material so fibres are not released. Pipe, furnace and boiler insulation can sometimes be repaired this way. This should be done only by a professional trained to handle asbestos safely.
- Covering (enclosure) involves placing something over or around the material that contains asbestos to prevent release of fibres. Exposed insulated piping may be covered with a protective wrap or jacket.

With any type of repair, the asbestos remains in place. Repair is usually cheaper than removal, but it may make later removal of asbestos, if necessary, more difficult and costly. Repairs can either be major or minor.

2.4 Use of Personnel Protective Equipment

Workers dealing with asbestos must be fully trained and certified to handle asbestos. They must wear approved respirators, gloves and other protective clothing such as overall, head coverings and over-boots.

After use, clothing must be vacuumed, as dusty protective clothing can spread asbestos. This clothing requires special laundering to ensure asbestos decontamination.

2.5 Environmental Awareness Towards the Safe Handling and Disposal of Asbestos

Contact the Environmental Protection Authority (EPA) or local council for waste disposal requirements and approved waste facilities. All waste containing asbestos must be:

- Kept damp (prevent excess runoff of water)
- Collected, labelled and sealed using plastic or leak-proof containers
- Stored at a secure site in labelled, lined bins or a leak-proof container
- Removed from the site as soon as practicable and/or collected and stored in a manner approved by the EPA or an appropriate disposal authority.
- Transported in a covered leak-proof vehicle or a manner approved by the EPA
- Disposed of in a manner and at a site approved by the EPA or an appropriate disposal authority
- Vehicles must be cleaning before leaving the landfill site

2.6 Regulations Governing Storage, Handling and Working with Asbestos

Prior to any work commencing, a risk assessment should be carried out in consultation with employees. A safe work procedure should then be devised that minimises the release of dust and fibres and avoids exposure. Work involving friable (crumbles easily) asbestos is considered to present the greatest risk of exposure to air-borne fibres. Bonded asbestos is unlikely to release airborne fibres unless it is damaged or disturbed.

Specific safety precautions for work involving asbestos are:

1. Wear protective clothing and an approved respirator (see personal protective equipment) Disposable coveralls are recommended
2. Use non-powered hand tools as these generate less dust. Do not use sanders on asbestos-cement products
3. If possible, wet down material to reduce the release of dust or use vacuum attachments fitted with High Efficiency Particulate Air (HEPA) filters.
4. Work in well-ventilated areas if possible
5. Use drop sheets to collect debris

6. Dispose of smaller asbestos pieces and collected dust in plastic bags, which are clearly labelled “asbestos waste”

Personal Protective Clothing

Personal protective clothing given to asbestos workers should include coveralls, head coverings, over boots and gloves.

- Disposal coveralls: A polyester/cotton mix may prove more suitable in warm environment
- Re-usable protective clothing: After use, clothing must be vacuumed, placed in approved “Asbestos” bags and taken to an industrial laundry with facilities for asbestos decontamination
- Dusty protective clothing can spread asbestos. Employees should not try to clean dust off by beating it with hands or using a brush or air-hose to blow it away. An industrial vacuum cleaner can help remove dust from protective clothes.
- Asbestos workers must not take work clothes home to ensure that family members are not exposed to asbestos dust from clothing
- Workers should not wash protective clothing themselves. This clothing requires special laundering to ensure asbestos decontamination.
- Employers should provide a clean area for employees to change and store their own clothes separate from the place for storing protective clothing
- Showers and washbasins must be provided for workers to wash before putting on their own clothes to go home

Refer to section 2.5 above for further information on the safe handling and storing of asbestos.

Summary

Asbestos is a set of six naturally occurring silicate materials. It was very popular among manufacturers and builders in the late 19th century because of its resistance to heat, electrical and chemical damage, sound absorption and tensile strength. It is banned in most countries around the world due to its toxic nature causing such illnesses such as lung cancer and asbestosis (caused by inhalation of asbestos fibres). Asbestos should only be handled by competent and qualified personnel. Asbestos can only be disposed of in a pre-approved EPA landfill site.

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