AHERA

Contractor / Supervisor

U.S. EPA and Cal-OSHA Accredited

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by The Asbestos Institute

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TABLE OF CONTENTS

CHAPTER 2

BACKGROUND INFORMATION ON ASBESTOS

OBJECTIVE: To become familiar with the history and uses of asbestos.

LEARNING TASKS: Information in this section should enable participants to:

1. Recognize the characteristics and various types of asbestos
2. Become acquainted with various types of asbestos containing materials (ACM) found in building applications

BACKGROUND INFORMATION ON ASBESTOS

HISTORICAL PERSPECTIVE

The word asbestos is derived from a Greek adjective meaning inextinguishable. The “miracle mineral” as it was referred to by the Greeks, was admired for its soft and pliant properties, as well as its ability to withstand heat. Asbestos was spun and woven into cloth in the same manner as cotton. It was also utilized for wicks in sacred lamps. Romans likewise recognized the properties of asbestos and it is thought that they cleaned asbestos tablecloths by throwing them into the flames of a fire.

From the time of the Greeks and Romans in the first century until its reemergence in the eighteenth century, asbestos received little attention or use. It was not available in large amount until extensive deposits were discovered in Canada in the nineteenth century (late 1800s). Following this discovery, asbestos emerged as an insulating component in thermal insulation for boilers, pipes and other high temperature applications and as a reinforcement for a variety of products.

CHARACTERISTICS OF ASBESTOS

Asbestos is a naturally occurring mineral. It is distinguished from other minerals by the fact that its crystals form long, thin fibers. Deposits of asbestos are found throughout the world historically. Primary sites of commercial production have been: Canada, the Soviet Union and South Africa. Asbestos has also been mined commercially in the United States.

Asbestos minerals are divided in two groups: serpentine and amphibole. The distinction between groups is based upon its crystalline structure; serpentine minerals have a sheet or layered structure, amphiboles have a chain like crystal structure.

Chrysotile, the only mineral in the serpentine group, is the most commonly used type of asbestos and accounts for approximately 95% of the asbestos found in buildings in the United States. Chrysotile is commonly known as “white asbestos” so named for its natural color.

Many types of asbestos are found in the amphibole group. Amosite, the second most likely type to be found in buildings, is often referred to as "brown asbestos". As you might assume, in its natural state amosite is brown in color. Crocidolite, “blue asbestos” is also an amphibole. Crocidolite was used in high temperature insulation applications.

Some of the remaining types of asbestos in the amphibole group are: anthophyllite, tremolite and actinolite. These are rare and of little commercial value. However, they may be found as

contaminants in asbestos containing materials and other products. If a product contains greater than 1% of any of these asbestos minerals, it is considered “Asbestos Containing Material” (ACM).

Once extracted from the earth, asbestos containing rock is crushed, milled (ground) and graded. This produces long, thread like fibers of material. What actually appears as a fiber is an agglomeration of hundreds or thousands of fibers, each of which can be divided even further into microscopic fibrils.

USES OF ASBESTOS

Asbestos has been used in literally thousands of products. Collectively, these are frequently referred to as asbestos containing material (ACM). Asbestos gained wide spread use because it is plentiful, readily available and low in cost. Because of its unique properties — fire resistant, high tensile strength, poor heat and electric conductor and generally impervious to chemical attacks, asbestos proved well suited for many uses in the construction trades.

One of the most common uses for asbestos is as a fireproofing material. It was sprayed on steel beams, columns and decking that were used in construction of multi storied buildings. This application prevented these structural members warping or collapsing in the event of a fire. Chrysotile was the most commonly used asbestos constituent in sprayed on fireproofing. Asbestos comprised 5-95% of the fireproofing mixture and was used in conjunction with materials such as vermiculite, sand, cellulose fibers, gypsum and a binder such as calcium carbonate. These materials are soft and may be fluffy in appearance and to the touch. They vary in color from white to dark gray, and occasionally they have been painted or encapsulated with a clear or colored sealant. The material may be exposed or concealed behind a suspended ceiling. Application to structural members (beams and columns) often resulted in some material being sprayed on walls and ceilings as well. This is referred to as overspray.

Asbestos is added to a variety of building materials to enhance strength. It is found in concrete and concrete like products. Asbestos containing cement products generally contain Portland cement, aggregate and Chrysotile fibers. The asbestos content may vary up to 50% by weight depending on the use of the product. Asbestos cement products are used as siding and roofing shingles; as wallboards; as corrugated and flat sheets for roofing, cladding and partitions; and as pipes. Asbestos cement products are generically referred to as “transite”.

Asbestos has also been added to asphalt, vinyl and other materials to make products like roofing felts, exterior siding, floor tile, joint compounds and adhesives.

Fibers in asbestos cement, asphalt and vinyl are usually bound in the cement and will be released only if the material is mechanically damaged, for example by drilling, cutting or sanding. Roofing shingles and siding may also slow deterioration due to weathering.

As an insulator, asbestos received wide spread use for thermal insulation and condensation control. It was usually spray applied, trowel applied or factory installed on or within equipment.

Asbestos proved valuable as a component of acoustical plaster. The material was applied by trowel or by spraying on ceilings and sometimes walls. It varies in color from white to gray rarely was it painted as a noticeable loss of acoustical value occurs. Similarly as a decorative product, asbestos was mixed with other materials and sprayed on ceilings and walls to produce a soft, textured appearance.

From the end of World War II until about 1980, asbestos was used as a constituent of most manufactured construction products. It has been estimated that between 3,000 and 3,600 different products have contained asbestos.

FRIABLE VS NON FRIABLE ACM

The U.S. Environmental Protection Agency (EPA) and others distinguish between friable and nonfriable forms of ACM. Friable ACM contains more than 1% asbestos and can be “crumbled or reduced to powder by hand pressure”. Other things being equal, friable ACM is thought to release fibers into the air more readily than non-friable; however, many types of nonfriable ACM can also release fibers if disturbed.

CATEGORIES OF ASBESTOS CONTAINING BUILDING MATERIALS

EPA identifies three categories of ACM used in buildings:

- Surfacing materials — ACM sprayed or troweled on surfaces (walls, ceilings, structural members) for acoustical, decorative or fireproofing purposes. This includes plaster and fireproofing insulation.

- Thermal System Insulation (TSI) — insulation used to inhibit heat transfer or prevent condensation on pipes, boilers, tanks, ducts and various other components of hot and cold water systems and heating, ventilation and air conditioning (HVAC) systems. This includes pipe lagging, pipe wrap, block, batt and blanket insulation, cements and plaster on fittings.

- Miscellaneous Materials — Other products and materials such as floor tile, ceiling tile, roofing felt, concrete pipe, outdoor siding, drywall and fabrics. Miscellaneous materials are all materials other than TSI or Surfacing.

OSHA has also classified all asbestos materials into categories for applicability under the construction asbestos standard. The OSHA categories are TSI, Surfacing and anything that is not TSI or Surfacing. TSI is defined the same under both agencies, but "Surfacing" is altogether different. Under OSHA, Surfacing includes ONLY what we would call "friable" surfacing. OSHA refers to it as "loosely bound" surfacing. Do not confuse the term when working with the 2 regulations. OSHA surfacing is a Class 1 material, and very heavily regulated for work practices. Non-friable surfacing (Class 2 material) is comparatively lightly regulated under OSHA for work practices.

Determinations that a material does not contain asbestos can only be made by instrumental analysis. The EPA requires that the asbestos content of suspect materials be determined by collecting bulk samples and analyzing them by polarized light microscopy (PLM) at a minimum. The PLM technique determines both the percent and type of asbestos in the bulk material.