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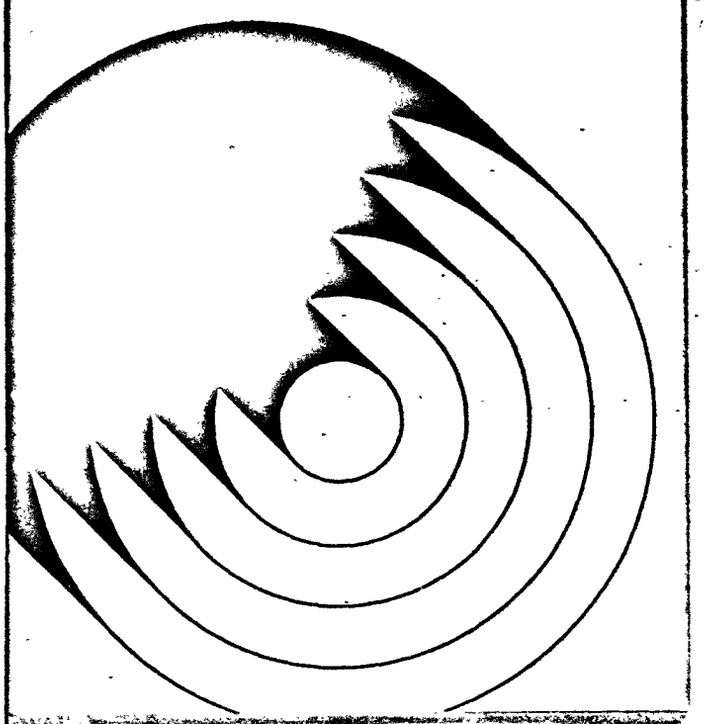
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THE TARGET HEALTH HAZARDS

U. S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration
OSHA 2051



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ABOUT THIS BOOKLET

Focusing upon the need to create healthful working conditions, the Occupational Safety and Health Administration, in January 1972, initiated the Target Health Hazards Program. The emphasis is on five hazardous workplace substances.

1. **ASBESTOS**
2. **LEAD**
3. **SILICA**
4. **COTTON DUST**
5. **CARBON MONOXIDE**

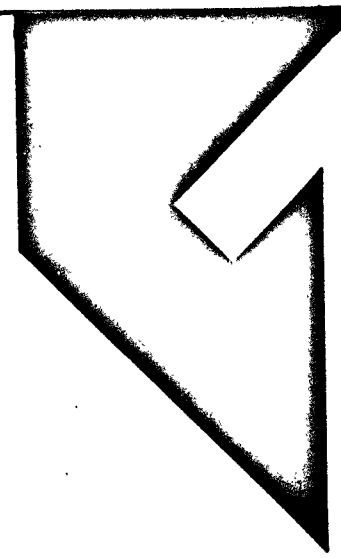
The approach is the ancient one—first to understand the exact nature of the dangers, then to control, and finally to prevent them. It is an objective within reach, for occupational diseases can be prevented.

If understanding will lead to control and prevention, perhaps the following facts about these five hazardous workplace substances will help

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ASBESTOS

WHAT IS IT? Asbestos is a general term used to describe several fibrous mineral silicates that occur as white, grayish or greenish masses, either compact or of long silky fibers. The most important types are: Chrysolite—a simple magnesium silicate: amosite—a complex magnesium iron silicate; crocidolite—a complex sodium iron silicate. Some 95 percent of the world asbestos production comes from chrysolite.

WHERE IS IT? The heat-resistant properties of asbestos have led to many uses—for example, as protection against fire, as insulation, brake and clutch linings, building materials, as a filter and in plastics. The raw material and end-products are found nearly everywhere.

WHAT IS THE HAZARD? More than 200,000 employees face risks from asbestos. The principal danger is caused by inhaling asbestos fibers. Recent studies have shown the presence of asbestos fibers in the lungs of persons having no industrial exposure—probably due to their presence in the atmosphere near construction sites. Prolonged inhalation of asbestos fibers between 5 and 50 microns (one-millionth of a meter) long can produce a lung disease known as asbestosis. The lungs cannot eliminate asbestos fibers, so the fibers coat the tissues. If this process continues over a period of 10 to 20 years, with significant quantities of asbestos present, the tissue reaction progresses until a generalized, diffuse fibrosis occurs, causing severe respiratory disability. There have been reports of increased incidence of lung cancer in persons with asbestosis

HOW IS IT CONTROLLED? Enclosure and local exhaust ventilation applied to equipment and/or operations are the principal means of preventing employee exposure to dangerously high concentrations. U S Bureau of Mines-approved dust respirators may be worn by employees as protection in some operations

WHAT ARE APPROVED LEVELS? OSHA's permissible level is 5 fibers per milliliter greater than 5 microns in length for an eight-hour, time-weighted average airborne concentration. This may be increased to 10 such fibers per milliliter for no more than 15 minutes per hour, up to five hours per eight-hour day. Imminent danger situations are generally not applicable. Any exposure greater than permissible levels for unprotected or improperly protected workers is considered a serious violation.

HOW IS IT MEASURED? Asbestos dust will be collected with a personal sampling pump Fibers will be counted microscopically at 400-450 magnification using phase contrast illumination.

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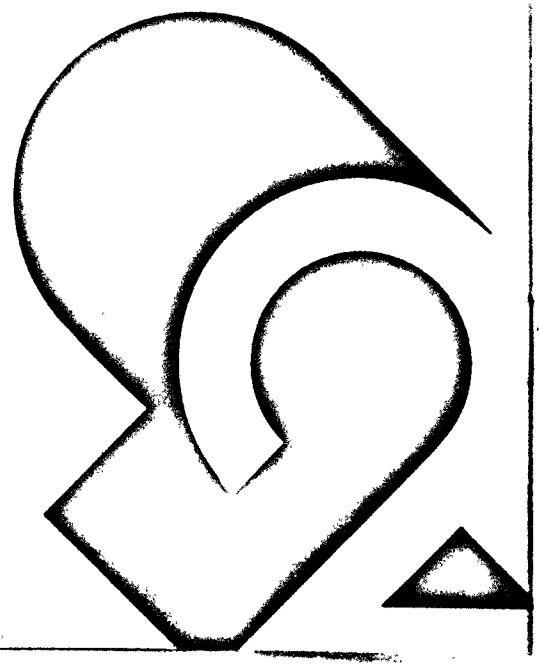
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WHAT IS IT? Lead is a soft, dense, malleable, heavy metal with a low melting point. It is gray in color and, because of its characteristics, has a wide application of uses.

WHERE IS IT? Lead is used to make printing type and plumbing, shield telephone and power cables and to protect against radiation hazards. As an alloy, lead mixed with steel makes excellent bearings. As solder, lead alloy is vital in the electrical and electronic industries. Lead compounds are used to make paints and ammunition, and lead oxides are used in car batteries.

LEAD



WHAT IS THE HAZARD? More than 1.6 million employees in nearly every industrial manufacturing process and in many service industries are exposed to the poisoning effect of lead. Lead can enter the body by inhalation, absorption through the skin or by ingestion. In sufficient quantities, the result is the same—severe gastrointestinal, blood and central nervous system disorders. Inhalation of lead dust or fumes is the most frequent means of entry and results in most of the industrial health problems involving this metal. Lead is a cumulative poison. A part of a small daily dose is not eliminated, but is stored in the body. Eventually, a point is reached where symptoms and disability —even death—occur.

HOW IS IT CONTROLLED? Since the primary route of industrial lead poisoning is inhalation, enclosure and local exhaust ventilation are the principal means of control. Daily wet or vacuum cleaning of all lead dust, personal hygiene, prohibition of food and beverages in the work area and use of U. S. Bureau of Mines-approved respirators are other means that can help control exposure.

WHAT ARE APPROVED LEVELS? OSHA's permissible level is 0 2 milligrams per cubic meter of air for an eight-hour, time-weighted average airborne concentration Imminent danger situations are not generally applicable Any exposure above 0 6 milligrams per cubic meter of air for an eight-hour, time-weighted average is considered a serious violation. Levels above 0 2 and less than 0.6 are considered regular or nonserious violations.

HOW IS IT MEASURED? The sample is collected for a minimum of 60 minutes by a personal sampling pump on a millipore filter. The filter is subsequently dissolved in nitric acid taking the lead into solution. The solution is then introduced into an atomic absorption unit for analysis.

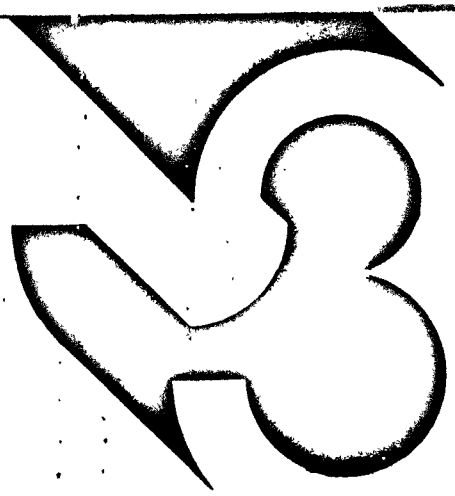
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SILICA

WHAT IS IT? Silica is an oxide of silicon and is the characteristic ingredient of a great variety of minerals, including quartz, cristobalite, tridymite, amethyst and sand. It is widely used in cores for metal casting operations, ceramics, decorative materials, insulation, building materials and glass.

WHERE IS IT? Silica is found throughout industry in various manufacturing processes, such as iron and mineral processing plants, mining, abrasive soap production, glass manufacturing, potteries, foundries, abrasives use and manufacturing, in stone cutting and finishing industries.

WHAT IS THE HAZARD? More than 1.1 million employees are exposed to the hazard created by inhalation of silica dust. Inhalation of these particles can produc[illegible]idly-developing (acute) or chronic silicosis—a disabling lung disease. Typically, the lung tissue reacts to the presence of silica particles by forming fibrous matter around the particle. Evidence suggests that particles below one micron (one-millionth of a meter) in size may be the most dangerous since they may penetrate deeper into the lungs in high concentrations. In rapidly-developing silicosis, symptoms appear eight to 18 months after the first exposure. Chronic silicosis, the type usually encountered in industry, generally, is produced only after years of silica inhalation. The symptoms for either type are the same—slowly increasing difficulty in breathing under exertion. In some workers, large masses of dense fibrous tissue develop in the upper portion of the lungs, leading to severe respiratory crippling. Tuberculosis is a frequent complication of silicosis.

HOW IS IT CONTROLLED? The best method is substitution of another material, for example, use of steel shot or alumina grit in place of sand-blasting operations. Other methods include enclosure of operations, local exhaust ventilation, segregation of operations, wetting, and ordinary good-housekeeping practices.

WHAT ARE APPROVED LEVELS? For respirable quartz particles, OSHA's permissible level is 10 milligrams per cubic meter of air, divided by the percent of free silica plus 2, as shown in this formula: $\frac{10 mg/m^3}{\%SiO_2+2}$.

For respirable cristobalite and tridymite, the limits are one-half the value for quartz. Imminent danger situations generally are not applicable. Any eight-hour, time-weighted average greater than four times the limit is considered a serious violation. Exposure to concentrations between the limit and four times the limit are considered a regular or nonserious violation.

HOW IT IS MEASURED? Personal sampling pumps with filters are used to collect dust samples for worker exposure. The collected dust then is weighted for a given volume of air. Similar procedures are used to determine the percentage of silicia in the air.

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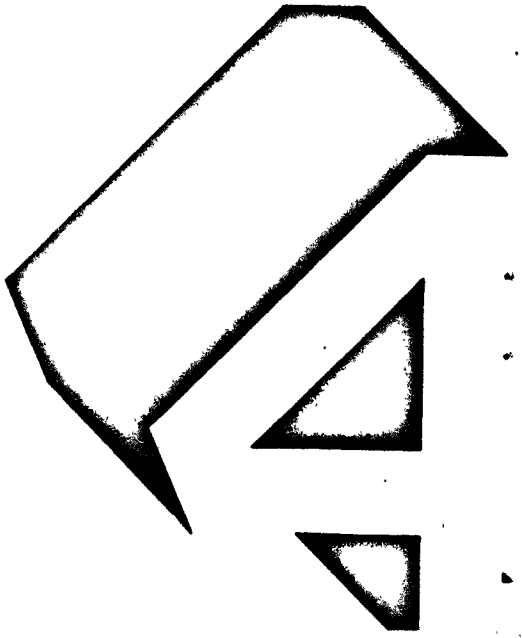
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WHERE IS IT? Cotton dust occurs throughout the textile industry and affects cotton, flax and soft hemp workers. The greatest exposure to cotton dust generally occurs during the carding of cotton—an operation that combs out cotton fibers and sets them parallel by drawing them between toothed cylinders. However, machinery throughout the cotton mill must be cleaned frequently, and much exposure to cotton dust occurs then.

COTTON DUST



WHAT IS THE HAZARD? More than 800,000 employees in cotton processing operations of all types are exposed to cotton dust. While the exact effects of cotton dust are not known, prolonged exposure to heavy air concentrations can cause a disabling lung disease known as byssinosis. Materials adhering to cotton fibers, such as unwanted leaf, stem and boll trash, when inhaled, elicit an allergic reaction or response. Byssinosis generally advances through three recognizable stages. The first is commonly called "Monday fever" and begins only after exposure of more than 10 years. Workers develop an irritating cough, tightness of the chest and breathlessness. The attacks usually come on Monday, or after a period of absence from the plant and last only a day or so; hence the name "Monday fever." In the second stage, these symptoms extend over more days in the week and finally become permanent. If exposure to cotton dust is ended at this stage, recovery can occur. In the third stage, the tightness of the chest and labored breathing become so distressing the worker must leave the industry. The disease can progress then to chronic bronchitis and emphysema.

HOW IS IT CONTROLLED? Enclosure of machinery in all operations and local exhaust ventilation are the principal means of preventing employee exposure. Pretreatment of the cotton in early processing stages may also be helpful.

WHAT ARE APPROVED LEVELS? OSHA's permissible level is 1 milligram per cubic meter of air for an eight-hour, time-weighted average airborne concentration. Imminent danger situations are generally not applicable. Concentrations of 3 milligrams per cubic meter, are considered serious violations; concentrations between 1 and 3 milligrams per cubic meter for an eight-hour, time-weighted average, are considered regular or nonserious violations.

HOW IS IT MEASURED? A personal sampler is attached to a workman's clothing with the uncovered filter facing down, usually for a six hour sample.

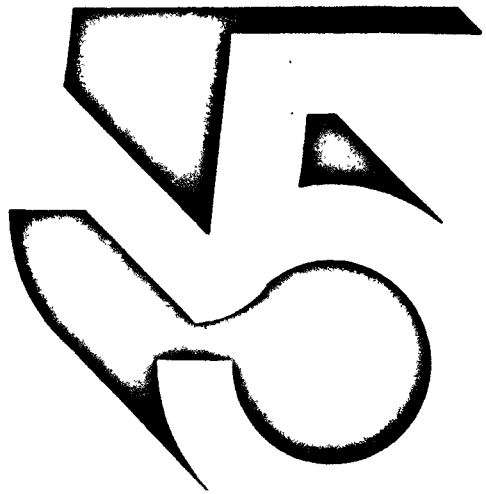
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CARBON MONOXIDE

WHAT IS IT? Carbon monoxide is a colorless, almost odorless, tasteless, nonirritating gas. It is produced by the incomplete combustion of fuels, such as wood, gas, coal, oil and gasoline. Miners refer to it as "white damp." It also is commonly called "coal gas."

WHERE IS IT? Carbon monoxide is found anywhere carbonaceous fuels are used. It can be found in everyday activities as well as in industrial situations —near incorrectly vented gas heaters, near gasoline-powered machinery and around automobiles run indoors, blast furnaces; and catalytic reduction operations.

WHAT IS THE HAZARD? Because it is found so widely, nearly everyone, at one time or another, is exposed to carbon monoxide. The danger lies in inhalation of gas. Carbon monoxide enters the blood stream through the lungs in the same manner as oxygen, but it displaces oxygen in the blood because it has approximately 210 times greater affinity for hemoglobin in the blood than oxygen. As a result, the blood cannot transport oxygen, causing suffocation even in an atmosphere containing ample oxygen. Over a period of time, as little as 700 parts per million of carbon monoxide will saturate 50 percent of the blood hemoglobin— while a few breaths at concentrations of 10,000 parts per million may cause 60 to 80 percent saturation and death. Fortunately, regardless of how high the percentage of saturation of the blood has been, practically all carbon monoxide is eliminated by the body within 8 to 10 hours after exposure ends.

HOW IS IT CONTROLLED? In general adequate ventilation will prevent carbon monoxide poisoning. Enclosure, general or dilution ventilation and local exhaust ventilation, as well as isolation of hazardous operations are the principal means of preventing employee exposure to dangerous concentrations. Automated detection alarm systems also are useful control measures.

WHAT ARE APPROVED LEVELS? OSHA's permissible level is 50 parts per million parts of air for an eight-hour, time-weighted, average airborne concentration Concentration above 500 parts per million for any length of time are considered to be imminent danger situations Concentrations above 150 parts per million for a total of one hour or more are considered to be serious violations. Concentrations above 50 parts per million, but below 150 parts per million for an eight-hour, time-weighted average are considered regular or nonserious violations

HOW IS IT MEASURED? The primary method is a carbon monoxide portable, Hopcalite-reagent type meter. The secondary method is certified detector tubes.

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