

Goal

This program is designed to provide a general overview of industrial hygiene.

What is Industrial Hygiene?

Industrial hygiene is the science of anticipating, recognizing, evaluating, and controlling workplace conditions that may cause workers' injury or illness. It can be described as knowing the hazards present to workers in your industry, and using methods available to control potential health hazards. For example, those that work in mines might implement mine ventilation and provide education to prevent diseases associated with mining occupations, such as silicosis.

What Do Industrial Hygienists Do?

Industrial hygienists, or IHs, are trained to anticipate, recognize, evaluate, and recommend controls for environmental and physical hazards that can affect the health and well-being of workers.

Worksite Analysis

A worksite analysis is an essential first step that helps an industrial hygienist determine what jobs and work stations are the sources of potential problems. During the worksite analysis, the industrial hygienist measures and identifies exposures, problem tasks, and risks. The most effective worksite analyses include all jobs, operations, and work activities. The industrial hygienist inspects, researches, or analyzes how the particular chemicals or physical hazards at that worksite affect worker health. If a situation hazardous to health is discovered, the industrial hygienist recommends the appropriate corrective actions.

Controls

Industrial hygienists recognize that engineering, work practice, and administrative controls are the primary means of reducing employee exposure to occupational hazards, so they may suggest any of these types of controls after performing their worksite analysis.

- **Engineering Controls** – These minimize employee exposure by either reducing or removing the hazard at the source or isolating the worker from the hazards. They include eliminating toxic chemicals and replacing harmful toxic

materials with less hazardous ones, enclosing work processes or confining work operations, and installing general and local ventilation systems.

- **Work Practice Controls** – These controls change how a task is performed. Some fundamental and easily implemented work practice controls include (1) following proper procedures that minimize exposures while operating production and control equipment; (2) inspecting and maintaining process and control equipment on a regular basis; (3) implementing good house-keeping procedures; (4) providing good supervision and (5) mandating that eating, drinking, smoking, chewing tobacco or gum, and applying cosmetics in regulated areas be prohibited.
- **Administrative Controls** – These include controlling employees' exposure by scheduling production and workers' tasks, or both, in ways that minimize exposure levels. For example, the employer might schedule operations with the highest exposure potential during periods when the fewest employees are present.

Other controls include respiratory equipment, personal protective equipment such as gloves, safety goggles, helmets, safety shoes, and protective clothing. If selected as a control, all must be properly fitted, worn correctly, regularly maintained, and replaced as necessary.

Job Hazards

Major job risks can include air contaminants, and chemical, biological, physical, and ergonomic hazards.

1. **Air Contaminants** are commonly classified as either particulate or gas and vapor contaminants. The most common particulate contaminants include dusts, fumes, mists, aerosols, and fibers. Dusts are solid particles that are formed or generated from solid organic or inorganic materials by reducing their size through mechanical processes such as crushing, grinding, drilling, abrading or blasting.
 - Fumes are formed when material from a volatilized solid condenses in cool air. In most cases, the solid particles resulting from the condensation react with air to form an oxide.

- Mists are finely divided liquids suspended in the atmosphere. Mists are generated by liquids condensing from a vapor back to a liquid or by breaking up a liquid into a dispersed state such as by splashing, foaming or atomizing. Aerosols are also a form of a mist characterized by highly respirable, minute liquid particles.
 - Fibers are solid particles whose length is several times greater than their diameter.
 - Gases are formless fluids that expand to occupy the space or enclosure in which they are confined. Examples are welding gases such as acetylene, nitrogen, helium, and argon; and carbon monoxide generated from the operation of internal combustion engines or by its use as a reducing gas in a heat-treating operation. Another example is hydrogen sulfide which is formed wherever there is decomposition of materials containing sulfur under reducing conditions.
 - Liquids change into vapors and mix with the surrounding atmosphere through evaporation. Vapors are the volatile form of substances that are normally in a solid or liquid state at room temperature and pressure. Vapors are the gaseous form of substances which are normally in the solid or liquid state at room temperature and pressure. They are formed by evaporation from a liquid or solid and can be found where parts cleaning and painting takes place and where solvents are used.
2. **Chemical Hazards** can be toxic through inhalation and some of them irritate the skin on contact; some can be toxic by absorption through the skin or through ingestion, and some are corrosive to living tissue.
- Harmful chemical compounds in the form of solids, liquids, gases, mists, dusts, fumes, and vapors exert toxic effects by inhalation (breathing), absorption (through direct contact with the skin), or ingestion (eating or drinking). Airborne chemical hazards exist as concentrations of mists, vapors, gases, fumes, or solids.
 - The degree of worker risk from exposure to any given substance depends on the nature and potency of the toxic effects and the magnitude and duration of exposure.
 - Information on the risk to workers from chemical hazards is available in the SDS supplied by the manufacturer or importer of each hazardous material.
3. **Biological Hazards** include bacteria, viruses, fungi, and other living organisms that can cause acute and chronic infections by entering the body either directly or through breaks in the skin.
- Occupations that deal with plants or animals or their products or with food and food processing may expose workers to biological hazards.
 - Laboratory and medical personnel also can be exposed to biological hazards. Any occupations that result in contact with bodily fluids pose a risk to workers from biological hazards.
 - Effective personal hygiene, particularly proper attention to minor cuts and scratches, especially those on the hands and forearms, helps keep worker risks to a minimum.
4. **Physical Hazards** include excessive levels of ionizing and nonionizing electromagnetic radiation, noise, vibration, illumination, and temperature.
- When ionizing radiation is present, tools to use include time exposed, distance, and shielding.
 - i. Danger from radiation increases with the amount of time one is exposed to it; hence, the shorter the time of exposure the smaller the radiation danger.
 - ii. Distance also is a valuable tool in controlling exposure to both ionizing and non-ionizing radiation. Radiation levels from some sources can be estimated by comparing the squares of the distances between the worker and the source.
 - iii. With shielding, the greater the protective mass between a radioactive source and the worker, the lower the radiation exposure.

- Noise can be reduced by installing equipment and systems that have been engineered, designed, and built to operate quietly; by enclosing or shielding noisy equipment; by making certain that equipment is in good repair and properly maintained with all worn or unbalanced parts replaced; by mounting noisy equipment on special mounts to reduce vibration; and by installing silencers, mufflers, or baffles. Substituting quiet work methods for noisy ones is another significant way to reduce noise, for example, welding parts rather than riveting them. Also, treating floors, ceilings, and walls with acoustical material can reduce reflected or reverberant noise. In addition, erecting sound barriers at adjacent work stations around noisy operations will reduce worker exposure to noise generated at adjacent work stations. It is also possible to reduce noise exposure by increasing the distance between the source and the receiver, by isolating workers in acoustical booths, limiting workers' exposure time to noise, and by providing hearing protection.
 - Radiant heat exposure in factories such as steel mills, can be controlled by installing reflective shields and by providing protective clothing.
5. **Ergonomic Hazards** such as excessive vibration and noise, eye strain, repetitive motion, and heavy lifting problems can cause ergonomic issues.
- Primary avoidance is achieved by the effective design of a job or jobsite and better designed tools or equipment that meet workers' needs in terms of physical environment and job tasks.

For more information on industrial hygiene and other topics see the Service Lloyds website. In Risk Control's Training Materials section, we have additional resources including:

- Hurry Up Can Hurt – Toolbox Talk
 - On the Job Safety – Toolbox Talk
 - Risk Control Plan – Sample Safety Program
- Remember to practice Safety; don't learn it by accident.

*For additional assistance, please contact
 RiskControl@ServiceLloyds.com
 P.O. Box 26850, Austin, Texas 78755
 (512) 212-7064
 www.servicelloyds.com*