

**NOISE**

Noise (unwanted sound) is a form of vibration conducted through solids, liquids, or gases. The effects of noise on humans include the following:

- Psychological effects (noise can startle, annoy, and disrupt concentration, sleep, or relaxation)
- Interference with speech communication and, as a consequence, interference with job performance and safety
- Physiological effects (noise-induced hearing loss, or aural pain when the exposure is severe)

Damage risk criteria. If the ear is subjected to high levels of noise for a sufficient period of time, some loss of hearing may occur. A number of factors can influence the effect of the noise exposure:

- Variation in individual susceptibility
- Total energy of the sound  
Frequency distribution of the sound
- Other characteristics of the noise exposure, such as whether it is continuous, intermittent, or made up of a series of impacts
- Total daily duration of exposure
- Length of employment in the noise environment

Because of the complex relationships of noise and exposure time to threshold shift (reduction in hearing level) and the many contributory causes, establishing criteria for protecting workers against hearing loss is difficult. However, criteria have been developed to protect against hearing loss in the speech-frequency range. These criteria are known as the Threshold Limit Values for Noise.

There are three nontechnical guidelines to determine whether the work area has excessive noise levels:

- If it is necessary to speak very loudly or shout directly into the ear of a person in order to be understood, it is possible that the exposure limit for noise is being exceeded. Conversation becomes difficult when the noise level exceeds 70 decibels (dBA).
- If employees say that they have heard ringing noises in their ears at the end of the workday, they may be exposed to too much noise.
- If employees complain that the sounds of speech or music seem muffled after leaving work, but that their hearing is fairly clear in the morning when they return to work, they may be exposed to noise levels that cause a partial temporary loss of hearing, which can become permanent with repeated exposure.

Permissible levels. The criteria for hearing conservation, required by OSHA, establishes the permissible levels of harmful noise to which an employee may be subjected. The permissible decibel levels and hours (duration per day) are specified. For example, a noise level of 90 dBA is permissible for eight hours, 95 dBA for four hours, etc. The regulations stipulate that when employees are subjected to sound that exceeds the permissible limits, feasible administrative or engineering controls shall be used. If such controls fail to reduce sound exposure within permissible levels, personal protective equipment must be provided and used to reduce sound levels to within permissible levels.

According to the Hearing Conservation, in all cases when the sound levels exceed 85 dBA on an eight-hour time-weighted average (TWA), a continuing, effective hearing conservation program shall be administered.

## **FUNDAMENTALS OF TOXICOLOGY**

Toxicology is the study of the adverse effects of substances on living organisms. Industrial toxicology is concerned with the adverse effects on workers of substances handled in the workplace, although interest usually extends to adverse effects of products on consumers and of workplace effluents on the general public. Historically toxicology was the art and science of poisoning. It is today a discipline which makes use of information developed by a wide range of chemical, physical, biological and medical sciences in order to predict the likely adverse effects on man of an ever-increasing range of substances to which he is exposed.

Every substance is toxic, i.e. capable of producing adverse effects under some condition(s) of exposure. It is possible to kill people by administering large volumes of water (particularly if the person suffers from certain diseases) and high oxygen levels in air can cause blindness in premature infants and lung damage in adults.

Occurrence of toxic effects depends on dose. In general high doses/exposures given over long periods produce a wider range and more intense toxic effects than low doses/exposures given over short periods.

Different forms of exposure to a substance do not necessarily have the same effects. Exposure to high atmospheric concentrations of methylene chloride vapour depresses the nervous system (narcosis), causes heart arrhythmias and liver and kidney damage. More prolonged exposure allows a build up of one of its metabolites carbon monoxide - in the blood, reducing the oxygen carrying ability of the blood.

The toxic effects of a substance depend upon:

- Its physical form.
- The dose.
- The route of entry.
- Its absorption, distribution, metabolism and excretion.

The body's response to toxins depends on several variables:

- Age The elderly and very young tend not to cope well as their metabolic pathways are less efficient than average.
- Sex Women are more vulnerable to fat-soluble toxins because of their greater percentage of fat to lean body mass.
- Underlying Illness Some conditions, for example diarrhoea or reduced lung function will limit toxic effects by reducing absorption. Others, for example anaemia, would compromise even further the body's response to lead or carbon monoxide.
- Medication Drugs can affect enzyme systems, increasing or decreasing the effects of toxic substances.
- Alcohol May compromise liver function and thus detoxification processes.
- Smoking Smoking potentiates the action of some substances like asbestos.
- Individual People vary enormously in their responses to external agents, from noise to coal dust, and allergens to chemicals. This is probably a genetic effect.

Type of response

- Local effects at the point of entry e.g. irritation, burns.
- Allergic reactions e.g. dermatitis, asthma.
- Effects on target organs.
- Cancer.
- Reproductive effects e.g. sterility, abortions.
- Teratogenesis - congenital birth defects.
- Childhood tumors in offspring of those exposed.

### **Material Safety Data Sheets**

The interpretation of toxicological reports should be left to those who are trained and experienced in such activities. Much of the work involved in assessing workplace hazards can be carried out by accessing Materials Safety Data Sheets (MSDS), sometimes also called Safety Data Sheets (SDS). The MSDS is a standard way of communicating toxicology and other relevant information about substances.

The content of the MSDS will vary depending upon local legislative requirements but it is likely to contain the following information :

1. Composition/Data on components: This gives details of the different chemicals contained within the material. It will often list the Chemical Abstracts Service (CAS) number for each chemical it contains. The CAS number is a unique number which is assigned to most of the chemicals used in industry.
2. Identification of substance: This includes the trade name, as well as manufacturer/supplier details. It may also give emergency information such as contact names and telephone numbers.
3. Hazards identification: The material will be classified under a number of categories and described with pictograms.
4. First aid measures: Advice about how to deal with workers who have been exposed under different circumstances.
5. Fire fighting measures: Dos and don'ts of fire extinguishing e.g. what type of fire extinguisher to use.
6. Accidental release measures: The procedures to be followed in case of accidental release of the chemical, including methods to be used to clean up spills.
7. Handling and storage: Giving information on the precautions such as flammables cabinets and temperature limitations.
8. Exposure controls and personal protection: Outlines requirements such as Personal Protective Equipment and ventilation.
9. Physical and chemical properties: e.g. the form (solid/liquid/gas), colour, odour, melting and boiling points.
10. Stability and reactivity: Properties such as thermal decomposition and conditions to be avoided.
11. Toxicological information: Details such as acute and chronic effects on man and animals.
12. Ecological information: How the material might affect the environment if it is released beyond the workplace.
13. Disposal considerations: Any special requirements associated with disposal of the material.
14. Transport information: generally as a list of codes indicating the dangers associated with the chemical.
15. Regulations: Relevant legislation for the country in which the material is used.
16. Other information: Any information which is relevant.