



Dusts (Particulates)

Dusts

(Total Dust, OR-OSHA particulates not otherwise regulated, "PNOR")

(Inhalable Dust, ACGIH particulates not otherwise specified, "PNOS", <100 microns in size)

(Respirable Dust, OSHA <3.5 microns in size; ACGIH <4 microns in size)

Background Information

Airborne dusts are solids formed by disintegration processes like crushing, grinding, blasting, and drilling. Particles are small replicas of the parent material and the size can be submicroscopic to visible. For classifying dusts found in the workplace, there is no simple system based on their nature, toxic effects or size. All are important for different reasons. The three main factors for assessing the potential impact of inhaled dusts in the workplace are:

- Chemical composition of the dust
- Particle size and shape
- Exposure concentration and duration

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This publication provides practical loss control and safety information to assist you in making your workplace safer. It is not legal advice. SAIF Corporation has made every effort to bring significant Oregon Occupational Safety and Health Administration (OR-OSHA) regulations to your attention. Nonetheless, compliance with OR-OSHA remains your responsibility. You should read and understand all relevant OR-OSHA regulations that apply to your job site(s). You may want to consult with your own attorney regarding aspects of OR-OSHA that may affect you.

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These factors are interrelated in the way an inhaled dust may affect an employee because they govern how much of a material actually enters the body, where it finally lodges, and what type of effect(s) it may have. Many times airborne dusts generated from industrial processes carry respective occupational exposure limits (e.g., Occupational Safety and Health Division Permissible Exposure Limits, PELs, American Conference of Governmental Industrial Hygienists Threshold Limit Values, TLVs, National Institute for Occupational Safety and Health Recommended Exposure Limits, RELs). Always reference the Material Safety Data Sheet or research the composition of the dust to determine if it contains contaminants that carry occupational exposure limits. Such dust concentrations should be controlled below these limits.

OR-OSHA (Particulates Not Otherwise Regulated)

Occupational exposure to all “inert or nuisance” dusts, whether mineral, inorganic, or organic that do not have an assigned PEL, contain <1% quartz and do not contain asbestos, are regulated under “Particulates Not Otherwise Regulated (PNOR)” by Oregon OSHA. The total dust concentration analyzed gravimetrically and sampled using a pre-weighed 37 millimeter polyvinyl chloride (PVC) filter in a cassette with a carefully calibrated personal air sampling pump, should not exceed 10 mg/m³.

Respirable sized particles (OSHA defined as less than 3.5 microns in size) that meet the same criteria and sampled with specialized equipment should be controlled to less than 5 mg/m³.

ACGIH (Particulates Not Otherwise Specified)

The American Conference of Governmental Industrial Hygienists (ACGIH), an organization devoted to the administrative and technical aspects of occupational and environmental health, is progressively moving towards size-selective sampling for airborne particulate matter. This move is to help define the particle sizes most closely associated with health effects of concern. There is also considerable evidence to suggest that “total dust” sampling by conventional means underestimates the concentrations of “inhalable particles,” or those particles that may be hazardous when deposited anywhere in the respiratory tract. Inhalable particles are also measured by specialized equipment, different from the “total dust” measurements.

The ACGIH believes that even biologically inert, insoluble, or poorly soluble particles may have adverse effects and recommends that airborne concentrations of dusts be controlled to 10 mg/m³ (inhalable fraction) and respirable particles (ACGIH/ISO/European Standard Committee defined as particles less than 4 micron in size) be kept below 3 mg/m³.

The ACGIH suggests that these limits be carefully applied to particles that do not have an applicable TLV, are insoluble or poorly soluble in water (or aqueous lung fluid) and have low toxicity (i.e., are not toxic to cells, not damaging to DNA, or

otherwise chemically reactive with lung tissue, do not emit ionizing radiation, cause immune sensitization, or cause toxic effects either than by inflammation or the mechanism of "lung overload").

Controlling Dust

There are several strategies for controlling occupational exposures to airborne dusts. A brief discussion of these strategies can be referenced below:

Containment and Ventilation

Containment consists of placing a physical barrier between the substance and people, for example putting a process inside a box (think "inside" the box). It is usually necessary to have a ventilation system that keeps the enclosure under negative pressure, so that there is no emission at cracks or at point where the material moves in or out of the enclosure.

Partially enclosing a process (e.g., having an opening at the front of an enclosure for the operator to reach in) may also help control dust emissions. When using this strategy it is important that the employee's breathing zone never be between the contaminant source and the hood. Effective design is difficult, because the flow of air into the opening must be sufficient to prevent escape of the airborne material, even when people move by/across the opening.

Local exhaust ventilation (LEV) is the removal of airborne contaminants close to their source of generation or release, before they can spread and reach the worker's breathing zone. Important facets of local exhaust ventilation include the minimum air velocity required to capture an airborne contaminant, having the hood face as close as possible to the point of dust generation, and provisions for cleaning and maintenance.

General ventilation is usually desirable to control temperature and humidity of the environment, and a properly designed system can act as a back-up control of exposure to airborne substances, by providing continual dilution of any accidental emissions. Typically, general ventilation is recommended for use in controlling widely disseminated, low-toxicity contaminants.

Wet Methods

"Wet methods" mean spraying water over a dusty surface to keep dust down, or mixing water with the material used to prevent dust from being created. Another is using a water jet for drilling and mining and quarrying instead of dry drilling. These methods reduce the amount of dust in the air.

Work Practices

The manner in which an employee performs a task can appreciably affect exposure, so it is important to train workers in good work practices. Work practices which may affect exposure include the manner in which containers are handled and lids

removed; the care taken in transferring dusty materials, work speed; and the way in which empty containers are handled.

Personal Protective Equipment (PPE)

Every attempt should be made to avoid or minimize exposures by other methods before resorting to PPE, especially respiratory protection. A respirator is not easy to wear for long periods of time, may be uncomfortable (especially in hot or cramped conditions), and employees may be tempted to remove it. In addition, uncontrolled dust may spread and affect employees who are at a distance from the task who are not wearing respirators, so it is more beneficial to control dust at the source.

Nevertheless, there may be some operations where respiratory protection is absolutely necessary or otherwise desired for additional protection. Where these conditions exist, it is important to select, issue, fit, and use respiratory protection in accordance with a respiratory protection program. Oregon OSHA covers this requirement in 1910.134. Gloves and other skin protection are necessary if the dust may pose a hazard via skin absorption or direct skin contact. Proper eye protection is also necessary to prevent dust contact with the eyes.

Fire/Explosion Issues

In sufficient concentrations, many types of common dust can cause either a fire or explosion when mixed with air to form a cloud and exposed to an ignition source.

Standard industrial practice and materials can generate the dust either deliberately or as a waste product of the process. Sources of dust include timber saw milling and processing, coal mining and handling, milk spray drying, grain handling and flour milling. Other industrial processes include chemical and pharmaceutical manufacture.

This list is not exhaustive and the product being handled or processed needs to be investigated as to whether a dust hazard does or can exist and at what concentration and under what conditions a fire or explosion could occur. Prevention measures include good housekeeping to prevent build-up of dust deposits, prevention of ignition, provision of explosion relief valves, dusting with non-flammable dusts, or confinement in controlled low-oxygen environments.

References

American Conference of Governmental Industrial Hygienists, 2004. Documentation of the Threshold Limit Values and Biological Exposure Indices – Appendix B. Cincinnati, OH.

US Department of Labor, Occupational Safety and Health Administration (OSHA) Dust Control Handbook. Washington, D.C.