

of the cyclone or overturn the cyclone, which must remain upright. The worker must be aware of the sampling head fastened in or near the breathing zone, of the pump fastened to the belt, and to the greatest degree possible, attempt to carry out their work in a normal manner.

MSHA regulations require that exposures for airborne contaminants including respirable dust and total dust be controlled insofar as feasible, by prevention of contamination, removal by exhaust ventilation, or by dilution with uncontaminated air.

Personal respiratory protection is not acceptable except when engineering controls are being developed or for occasional entry into hazardous atmospheres to perform maintenance or investigation. When respirators are used in such cases, a respiratory protection program consistent with ANSI Z88.2-1969, American National Standard Practices for Respiratory Protection, is required. The program must include provisions for proper selection, maintenance, training, fitting, supervision, cleaning, and use.

If you have questions about any occupational health matter, contact your local MSHA office or MSHA's national office at (202) 693-9414.

*U.S. Department of Labor
Mine Safety and Health Administration
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January 2006

Mineral Dust Hazard and Sampling (Coal)



Health Hazard Information Card HH-2

The main hazard of exposure to mineral dusts is pneumoconiosis. When very fine dust particles are breathed they can accumulate in the lungs, resulting in disease. Tissue reactions such as fibrosis, or scarring, of lung tissue can result from the inhalation of certain dusts. Pneumoconiosis is a general term for disease of the lungs caused by dusts. There are many kinds of pneumoconiosis such as silicosis, siderosis, etc.

Respirable dust consists of particles which are very fine in size, such that they can enter the innermost parts of the lungs. Respirable dust is not visible to the naked eye. The hazard of breathing mineral dust depends greatly on the composition of the dust, the concentration, particle size, and duration of exposure.

The presence of crystalline free silica, commonly called quartz, can cause silicosis, which is a disabling irreversible pneumoconiosis. Cristobalite and tridymite, which are other forms of free silica, are more toxic than quartz and thus have lower exposure limits.

To evaluate the hazard of exposure to mineral dusts, the content of quartz or

other crystalline form of free silica is first considered. The permissible exposure limit or threshold limit value (TLV), for mineral dust containing crystalline free silica is based on the amount, or percent, of free silica present. This is determined by analysis of a sample of respirable dust.

Under current regulations, the TLV will vary depending on the percentage of free silica in the dust. For the great majority of respirable mineral dusts, the TLV will be in the range of 0.1 - 3.3 milligrams per cubic meter of air (mg/m³). When the percentage of free silica is higher, the TLV will be lower. This means that the amount of silica-bearing dust that a miner can be exposed to will also be lower.

Personal respirable dust sampling determines the concentration of respirable dust in the breathing zone of the worker. The dust sampling unit consists of a battery-operated air pump and a sampling head worn on the worker in the breathing zone. The sampling head contains a filter-cassette in which the respirable dust is collected.

Prior to passing through the filter the sampled air passes through a nylon cyclone, a size-selective device which removes the larger non-respirable particles. As indicated, the purpose is to measure only respirable dust, that is, particles fine enough that they can enter the innermost parts of the lungs. Only the respirable dust collected on the filter is weighed for calculation of the respirable dust concentration. Analysis

of the dust collected on the filter gives the free silica content, which then allows determination of the applicable TLV.

Some dusts are evaluated and sampled in a different way. A sampling unit consisting of a battery-operated air pump and a filter-cassette is still used, but there is no cyclone in the sampling train. All airborne particles, or total dust, are measured. The TLV for dusts evaluated in this way found at metal and nonmetal mining operations is 10 mg/m³. In the event any of these dusts would have associated with it a free silica (or quartz) content of 1% or more, the method of sampling and evaluation would be that for respirable dusts.

For certain dusts consisting of silicates such as mica, soapstone, perlite, and a few others (containing less than 1% free silica), evaluation of the hazard may include sampling by a different method, the midget impinger, and determination of concentration by microscopic counting. For these dusts, the TLV is expressed in millions of particles per cubic foot of air (mppcf).

To determine dust concentration, the inspector will place the dust sampling unit on a worker at the start of a shift and remove it at the end of the shift or when the exposure being measured has ended. When the unit is placed on a worker, he/she must not upset or damage the sampling head or restrict the air flow through the unit. In particular, when sampling is done for respirable dust, the worker should not cover the inlet