# KEEPING EMPLOYEES SAFE FROM SILICA AND OTHER HAZARDOUS DUST, PER OSHA NEW STANDARD

*By Brian Foss, Mechanical Engineer*

## New Permissible Exposure Limit

Since September 2017, the Occupational Safety and Health Administration (OSHA) has required all construction employers to meet new respirable crystalline silica dust exposure limit standards. **In the United States today, over 2 million workers are exposed to silica dust each day.** This includes construction workers who drill, cut, crush or grind silica-containing materials such as concrete and stone, and 300,000 workers in general industry operations such as brick manufacturing, foundries and hydraulic fracturing, also known as fracking. Silica dust is also found in many common manufacturing processes.

Exposure to high levels of silica dust can cause silicosis. Silicosis is an irreversible damage to the lungs that does not allow the lungs to dissolve oxygen properly. This can lead to other health issues or even fatal on its own. The new OSHA standards for silica dust will reduce the number of those workers exposed to dangerous levels of the substance on a regular basis, saving an estimated 600 lives each year.

The updated OSHA crystalline dust regulations establish a new, more stringent, permissible (or maximum) exposure limit (PEL) of respirable crystalline silica dust that any one person should experience in the workplace. The new PEL set by OSHA is 50 micrograms per cubic meter of air. This value is set as an average exposure amount over a typical eight-hour working shift. At the PEL or greater, an employer must act to reduce the employee's exposure to below the PEL. Any worker who is exposed to average levels equal to or greater than 25 micrograms per cubic meter is above the "action level," or the level at which actions must be taken to monitor the exposure levels and employee health on a regular basis.

Construction and manufacturing processes can typically use or generate levels of respirable silica dust above the action level, so many industrial environments are currently at risk of non-compliance with the new OSHA guidelines. Non-compliance could result in heavy fines, downtime and loss of revenue. On construction sites, many of the activities that take place have engineering controls to keep employees below the PEL.

So how does someone know if their facility complies with the new requirements and is keeping their employees safe? A simple air quality test can be implemented to test the levels of dust in the area where an employee is working.

| Testing Methods | |
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| **AIR SAMPLING** | Air sampling testing is a two-part process, involving samples of both total and respirable air quality.<br><br>Total air sampling evaluates exposure levels to a variety of dusts, using pre-weighed PVC filters to determine the total mass of dust collected during the sampling period.<br><br>Respirable dust sampling uses a cyclone to separate and capture only those particles in the size range that would be deposited in the gas exchange region of the lung (which include crystalline silica dust). |
| **BULK MATERIALS OR SETTLED DUST** | Bulk materials or settled dust testing involves the capture and evaluation of settled dust samples for categorization and hazard identification. |
| **SURFACE WIPE OR MICROVAC** | Surface wipe or microvac testing yields data on qualitative silica presence and quantitative contamination amounts, reported in mg/area sampled. |
| **WATER** | Water testing determines silica presence and contamination levels in water in terms of mg/liter. |

## Silica Dust Remediation

When air quality testing results expose levels of silica dust greater than the action level, employers are required to remediate the dust through implementation of engineering controls. One engineering control is the use of respirators. An employer can require the use of respirators for employees who work in areas above the action level, and ensure those employees are properly fitted for the equipment and trained on its proper use and maintenance.

In addition, for special applications where the dust is localized and space is available, local dust collection units can provide the solution needed to maintain a safe work environment; many companies have installed a variety of dust collection units throughout their operations. For larger scale, limited space, or multi-point-use operations; however, a single, centralized dust collection system is the optimal solution.

| Key Advantages of Single Dust Collection System | |
|---|---|
| 1 | The unit can be in a mechanical room or outside to provide local exhaust ventilation at each point of use |
| 2 | Such systems can help regulate a variety of air contaminants, including silica dust |
| 3 | The flexibility of design of the units ensures the system works well for each environment, contaminants and levels |

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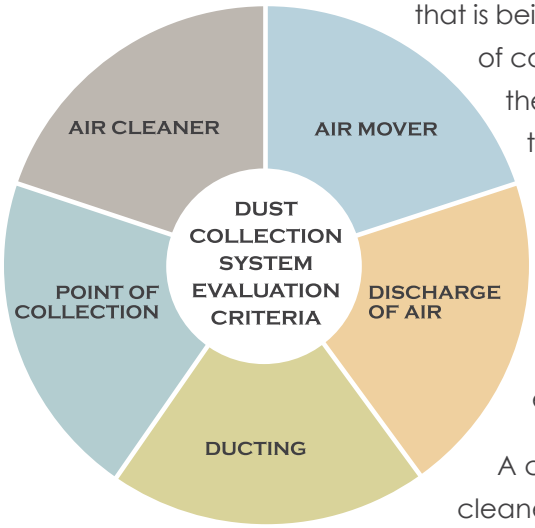
## Remediation System Design

The evaluation and design of a dust collection system should consider the dust that is being collected, the density, the dispersion, points of collection and other factors. Key components of the system to evaluate include the air cleaner, the air mover, discharge of air, ducting and point of collection methods. Single point of use, standalone units are selected and purchased as a complete system. In a facility that has multiple locations of high dust density, a single central unit might be a more economical solution.




A central system can contain the air mover and air cleaner in a single unit. These units are sized and selected to move the appropriate amount of air, maintain air velocity, and filter the dust to meet each specific application. These types of systems require that the air mover is ducted from the central unit to each point of use.

The duct work should be designed and laid out to maintain the correct air velocity, air pressure and reduce any build-up within the duct. An efficient duct layout with appropriate fittings, install and sealing will provide the proper delivery of dust to the air cleaner from the capture locations. An inefficient duct routing will increase the air mover being selected to compensate for a larger static pressure drop. Poor duct layout and design can also cause dust to collect in the duct, restricting the cross-sectional area and causing a higher static pressure. As the pressure increases in the ductwork, the volume of air getting delivered to the air cleaner will decrease and will no longer provide sufficient capture volume or velocity at the point of use.

Depending on the dust, silica or other hazardous partials being collected, build-up can still occur. Maintaining access for regular cleaning and inspection should always be kept in mind when designing a system.

## Capture Location Considerations

Although the air cleaner, air mover, and ductwork are the larger components in system, the capture locations/point of dust collection is perhaps the foremost consideration in the grand scheme of a centralized dust collection system. A well-designed system may be rendered ineffective if it lacks good design at the point of capture. The capture velocity at a location with average dispersion from an activity such as container filling should be 100-200 Ft/min. Any activity with a higher dispersion rate should be designed to have a capture rate of 200-500 Ft/min. When using a circular duct with no hood attached to the end, the air flow rate will fall to about 10% of the in-duct flow rate at one diameter distance from the opening.

Many common engineering control capture methods use snorkels or hoods. Hood design and placement is important, since enclosing the area where dust is generated can greatly

decrease the amount of air flow required to capture the dust. The hood should be located close to the point of generation and should be placed optimally per the type of dust involved and immediate conditions. For example, if heavy dust (which tends to settle) is involved, low placement may be the best option. However, under certain conditions, heavy dust may rise out of a production vessel toward an employee; in this case the low point of dust collection would not be optimal and a more local exhaust should be considered. Employee and workstation proximity to the hood should also be considered; the hood should be to the side-not behind or directly in front of-the employee.

## Outlook

The new OSHA guidelines for crystalline silica dust levels will ensure a healthier workplace for many U.S. employees. The challenge to employers is implementing a system that will keep the levels of silica and other hazardous dust within the acceptable range most effectively and efficiently. With good air quality testing and a little foresight when purchasing and implementing a dust containment unit or system, your operations will be a healthier and more productive environment for employees—and the overall business—for years to come.

## References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For additional information on OSHA silica dust standards and remediation options in your facility, call or email **Brian Foss** at **440.544.2238** or **Brian.Foss@theaustin.com**.

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