

Airborne Exposure to Heavy Metals and Total Particulate During Abrasive Blasting Using Copper Slag Abrasive

Abrasive blasting

Abrasive blasting is the use of high-pressure air to project abrasive particles at high velocity to clean metal and other surfaces. The common abrasives used to clean metal surfaces are silica sand, metal shot, metallurgic slags, and synthetic abrasives. Silica sand has traditionally been the most commonly used abrasive due to its availability, effectiveness, and low cost.



National Institute for
Occupational Safety and Health (NIOSH) and Burgess

What are the health risks associated with Slags and heavy Metals?

Occupational health studies performed by the National Institute for Occupational Safety and Health (NIOSH) and Burgess suggests a causal link between abrasive blasting with silica sand and the **manifestation of silicosis**. In 1983, Shaman estimated that more than one million U.S. workers were at risk of developing **silicosis**, and more than 100,000 of these workers were employed as sandblasters. Silicosis is **a form of occupational lung disease caused by inhalation of crystalline silica dust**, and is marked by inflammation and scarring in forms of nodular lesions in the upper lobes of the lungs.

Due to its potential health hazards, NIOSH has recommended that the use of silica sand (or substances) containing more than 1% crystalline silica be prohibited from use as a blasting abrasive and that less hazardous materials be used as substitutes. As a part of this recommendation, NIOSH identified metallurgical slag abrasives, such as copper slag, as an acceptable substitute for silica sand. Although NIOSH reported metallurgic slags as being utilized in only 3.1 percent of the facilities conducting abrasive blasting, its increasing use has been acknowledged in other literature.

Copper slag abrasives can be commercially purchased under the trade names Apache, Green Diamond, Kleen Blast, Blast Off, Diamond K, Nevada Black, and Best Grit. Blair and Gesell have reported that these slags are being used as replacements for silica sand because of their reported low free silica content, availability, and desirable physical properties. **Even so, Mackay et al. have shown the potential for copper slag abrasive to contain hazardous elements such as beryllium, chromium, lead, and arsenic.**

Even though metallurgic slag abrasives are thought to be less toxic than silica sand, Stettler, Donaldson, and Grant reported their potential to contain high concentrations of heavy metals. These finding led NIOSH to issue a warning in 1992 stating that no comprehensive studies have been conducted to evaluate the health effects of silica sand substitutes such as metallurgic slag abrasive.



Research by OSHA on Airborne Exposure to Heavy
Metals and Total Particulate During Abrasive
Blasting Using Copper Slag Abrasive

The Results:

Research on this investigates occupational exposure to metal and total particulate aerosols during abrasive blasting operations using one substitute abrasive, copper slag. Results from this research indicate that abrasive blasting operations using copper slag abrasive can generate, in a relatively short time, **total particulate, lead, arsenic, and chromium** exposures that exceed permissible exposure limits (Peels) set by the **Occupational Safety and Health Administration (OSHA)**. Results of this research allow occupational health and safety professionals to make a more informed determination of the degree of health risk posed to workers during abrasive blasting operations using commercially obtained copper slag abrasive.