Respirable Crystalline Silica from Sand Mining

Sand Mining in Wisconsin

Sand mining is not a new practice in Wisconsin. The recent demand for high-quality quartz sand for a natural gas drilling process called hydraulic fracturing (also known as "*fracking*" or "*fracing*"), however, has greatly increased this activity – especially in Western Wisconsin. While Wisconsin has deposits of sand that are used for the hydraulic fracturing process, the drilling occurs in shale deposits containing oil and natural gas that are found in other states, such as Texas, North Dakota and Pennsylvania. Sand mining operations designed to mine and export 'frac sand' are often much larger in acreage than the smaller, more traditional Wisconsin sand mines that serve mainly local needs for sand. The sand is desirable for fracing and some other uses due to its size, shape, and crystalline silica properties and because the deposits are usually close to the surface and easy to mine. An increase in the number of new requests for mining and processing plant permits has led several communities to raise questions about the possibility for respirable crystalline silica (RCS) to be generated at mine sites, and how RCS might impact the health of nearby residents.

What is respirable crystalline silica (RCS)?

Dust can be made up of visible (larger) and microscopic (smaller) particles. Particulate matter is defined as airborne material (solid or liquid) that is smaller than 100 microns (millionths of a meter) in size. For comparison, human hair is typically between 70 to 100 microns in diameter. The size of the particulate matter affects how long the particles can stay airborne and how far particles can travel before settling out onto surfaces. Smaller particles stay airborne longer and thus can travel further than larger particles.

Respirable crystalline silica (RCS) refers to particles of crystalline silica less than four microns in size, or particulate matter 4 (PM4). PM4-sized particles can penetrate deep into the lungs, where the most critical effects of RCS– silicosis and cancer – are thought to occur.

What are the health effects of RCS exposure?

Inhaled RCS damages lung tissue and can cause a variety of health problems, including silicosis, increased risk of lung infections, obstructive lung disease, and lung cancer. These types of lung problems, especially silicosis, are among the oldest, best documented, and most understood of occupational diseases. Lung damage progresses over time from breathing dust released when rocks are crushed or cut. Silicosis is a chronic, progressive, and inflammatory disease that causes scarring of the lung.

Almost all of the information about the health effects of RCS exposure comes from studies of workers who were exposed to high levels of RCS at work for many years. In certain cases, there have been non-occupational exposures. A 2009 study found high levels of airborne silica (measured as quartz dust) in a village in India from uncontrolled rock cutting and grinding operations in pencil manufacturing facilities. A few published studies have also implicated chronic exposure to windblown desert dust in cases of non-occupational lung disease.

What are the potential sources of RCS during sand mining?

In Wisconsin, most sand is mined by excavating sandstone formations that are near the surface or by dredging deposits of sand. After the sand is mined, it is washed, sorted by particle size, and stored until it is transported off-site. Some sand is also coated with polymers or otherwise treated to improve its properties for hydraulic fracturing applications. If specific dust-reduction controls are not in place at the mines and processing plants as well as during transport, there is the possibility for silica dust and RCS to be released into the air during each of these processes.

Regulations and best management practices are in place in Wisconsin to protect workers, as well as the public, from any dust created during the mining, processing, and transport of sand. Some of those existing control measures are discussed below.

What control measures exist to reduce RCS exposures around mining operations?
The U.S. Mine Safety and Health Administration (MSHA) requires sand mine operators to control and manage worker exposure to silica dust and RCS. The Wisconsin Department of Natural Resources requires a fugitive dust control plan under Wisconsin Administrative Code, Section NR 415.075(2) before the facility begins operation. Although DNR does not specifically regulate RCS, the fugitive dust control plan outlines how a facility will reduce or eliminate all sizes of dust emissions.

Dust control measures that comply with MSHA or DNR requirements might include indoor storage of sand; the use of tarps, covered trucks and rail cars; the application of water or other dust suppressing sprays; and other mechanical control devices. These measures help reduce emissions of silica into the ambient air and limit exposure of workers and the public to RCS.

What other concerns are raised by communities near sand mining operations?
In addition to silica dust and RCS, the transportation of sand may raise other concerns among residents of communities near sand mining operations. New mines are likely to increase truck and rail traffic, and may increase diesel emissions, noise, road congestion and accidents, and road maintenance needs. Water resources and reclamation of the site can also be areas of public interest. Effective communication and cooperative planning between mining companies and local communities is essential.

What can communities do to protect residents' health?
By incorporating best practices into the mine's daily operations on and off-site, mine operators and communities can work together to create a mining operation that is economically viable and protective of the health of workers and the surrounding community. Local agencies have an opportunity to influence sand mining operations primarily through zoning and direct negotiation with mine developers to use best management practices appropriate for the specific location.

For more information:
- To find out more about proposed mine sites and zoning laws in your area, contact your local planning and development department.
- To learn more about dust and particulate matter: http://dnr.wi.gov/topic/AirQuality/Particles.html
- To learn about state regulations of mine sites or to contact the DNR: http://dnr.wi.gov/topic/Mines/silica.html
- To report problems with blowing dust or sand from a sand mine near your home, contact the local mine or your Regional DNR Office: http://dnr.wi.gov/Contact/OfficeLocations.html
- For more information about crystalline silica from the Occupational Safety and Health Administration: http://www.osha.gov/OshDoc/data_General_Facts/crystalline-factsheet.pdf

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