

Industrial sand and gravel

Thomas P. Dolley, U.S. Geological Survey mineral commodity specialist, has compiled the following information on industrial sand and gravel.

With many diverse uses, industrial sand and gravel, also known as silica sand, is one of the most important nonmetallic minerals in the world. Industrial sand and gravel is a mining industry term used for sands that have a very high percentage of silicon dioxide, or greater than 95 percent quartz. Deposits of industrial sand and gravel can be found virtually everywhere on Earth, but are less widespread than deposits of common construction sand and gravel. Industrial sand and gravel is distinctive in grain size, hardness, inertness and resistance to high temperature and chemical action. Beverage containers, fiberglass insulation, fiber-optic cables and light bulbs are just some of today's many products produced from industrial sand and gravel.

Industrial sand and gravel has been used to manufacture glass since antiquity. Today, this mineral is most used in abrasives, ceramics, chemicals, fillers, filtration, foundry, glassmaking, hydraulic fracturing (frac) and silicon applications. The gravel component of industrial sand and gravel is primarily used for filtration, nonmetallurgical flux and as feedstock for the production of silicon metal.

In 2005, worldwide production of industrial sand and gravel was estimated to be 118 million metric tons with the United States being the world's leading producer at 30.6 million metric tons. In almost all cases, industrial sand and gravel is mined via open pit or dredging methods with standard mining equipment. Except for temporarily disturbing the immediate area while operations are active, sand and gravel mining usually has limited environmental impact.

Thirty-four states produced industrial sand and gravel in 2005. Movable deposits of industrial sand and gravel occur throughout the country; however, the highest-quality deposits exist in the East and Midwest because of their geologic history. For example, in the Midwest, successive cycles of erosion, sorting and redeposition have greatly improved the quality of the sands and gravels there. In some cases, consuming industries are located near a specific industrial sand and gravel resource.

Of the 28.4 million metric tons of industrial sand and gravel sold or used in the United States in 2005, 35 percent was consumed as glassmaking sand and 18 percent as foundry sand. Frac sand and sand for well packing and cementing (in the petroleum industry) consumed 14 percent of industrial sand and gravel sold or used. Other important uses were building products and abrasive sand. Combined, ceramics, chemicals, metallurgical uses, recreational uses and water filtration accounted for 22 percent of industrial sand and gravel sold or used.

One of the most important issues affecting the industrial sand and gravel industry in recent years has been the potential effect of crystalline silica on human health. Long-term exposures to crystalline silica can cause the lung disease silicosis. Central to the ongoing debate has been the understanding of the regulations and the implementation of measurements and actions taken to mitigate exposure to crystalline silica and, most significantly, appreciation of its impact on the future of many industries. The U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) has created a permissible exposure limit that stipulates the maximum

amount of crystalline silica to which workers may be safely exposed during an eight-hour work shift. OSHA also presents guidelines and training for the proper handling of crystalline silica. No guidelines have been established yet on consumption or use, however.

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Quartz sandstone, a source of industrial sand and gravel. Image from *Minerals in Your World*.