TABLE II. SELECTED INDUSTRIAL MINERAL DUSTS

Substance	Description and Uses	Threshold Limit In Million Particles per Cubic Foot of Air*
	CRYSTALLINE FREE SILICA (SiO_2, including microcrystalline forms)	
Chalcedony	A heat-resistant, chemically inert form of microcrystalline quartz. A decorative material. Rare in industry.	Calculate from formula:** $\frac{250}{\% SiO_2 + 5}$
Chert	A microcrystalline form of silica. An impure form of flint used in abrasives.	
Cristobalite	A crystalline form of free silica, extremely hard and inert chemically; very resistant to heat. Quartz in refractory bricks and amorphous silica in diatomaceous earth are altered to cristobalite when exposed to high temperatures (calcined). Cristobalite is extensively used in precision casting by the hot wax process, dental laboratory work, and certain specialty ceramics.	
Flint	A microcrystalline form of native quartz, more opaque and granular than chalcedony. Used as an abrasive and in ceramics.	
Jasper	A microcrystalline impure form of silica similar to chert. Used for decorative purposes. Rare in industry.	
Quartz	Vitreous, hard chemically resistant free silica, the most common form in nature. The main constituent in sandstone, igneous rocks, and common sands.	
Tridymite	Vitreous, colorless form of free silica. Formed when quartz is heated to 870 C (1,598 F).	
Tripoli (Rottenstone)	A porous, siliceous rock, resulting from the decomposition of chert or siliceous limestone. Used as a base in soap and scouring powders, in metal polishing, as a filtering agent, and in wood and paint fillers. A cryptocrystalline form of free silica.	
	AMORPHOUS FREE SILICA (Noncrystalline)	
Diatomaceous earth	A soft, gritty amorphous silica composed of minute siliceous skeletons of small aquatic plants. Used in filtration and decolorization of liquids, insulation, filler in dynamite, wax, textiles, plastics, paint, and rubber. Calcined and flux-calcined diatomaceous earth contains appreciable amounts of cristobalite, and dust levels should be the same as for cristobalite.	Amorphous = 20 mppcf Calcined = use formula: $\frac{250}{\% SiO_2 + 5}$
Silica gel	A regenerative absorbent consisting of the amorphous silica manufactured by the action of HCl on sodium silicate. Hard, glossy, quartz-like in appearance. Used in dehydrating and in drying and as a catalyst carrier.	20 mppcf
	SILICATES (Compounds made up of silicon, oxygen, and one or more metals with or without hydrogen. These dusts cause nonspecific dust reactions, but generally do not interfere with pulmonary function or result in disability.)	
Asbestos	A hydrated magnesium silicate in fibrous form. The fibers are believed to be the more hazardous component of asbestos dust.	5 mppcf†
Clays	A great variety of aluminum—silicate bearing rocks, plastic when wet, hard when dry. Used in pottery, stoneware, tile, bricks, cements, fillers, and abrasives. Kaolin is one type of clay. Some clay deposits may include appreciable quartz. Commercial grades of clays may contain up to 20 per cent quartz.	50 mppcf
Feldspar	Most abundant group of materials, composed of silicates of aluminum with sodium, potassium, calcium, and rarely barium. Most economically important mineral. Used for ceramics, glass, abrasive wheels, cements, insulation, and fertilizer.	50 mppcf

*These threshold limit values were adopted by the American Conference of Governmental Industrial Hygienists in 1962.

**Threshold limit values obtained from formula apply to all the substances in "Crystalline Free Silica" group.

†Threshold limits given for substances in "Silicates" group are for compounds containing *less* than 1 per cent crystalline silica. For compounds containing more than 1 per cent silica, calculate threshold limit from formula: $\frac{250}{\% SiO_2 + 5}$

TABLE II. SELECTED INDUSTRIAL MINERAL DUSTS (Continued)

Substance	Description and Uses	Threshold Limit In Million Particles per Cubic Foot of Air*
	SILICATES (Compounds made up of silicon, oxygen, and one or more metals with or without hydrogen. These dusts cause nonspecific dust reactions, but generally do not interfere with pulmonary function or result in disability.)	
Fuller's earth	A hydrated silica—alumina compound, associated with ferric oxide. Used as a filter medium and as a catalyst and catalyst carrier and in cosmetics and insecticides.	50 mppcf†
Kaolin	A type of clay composed of mixed silicates and used for refractories, ceramics, tile, and stoneware.	50 mppcf†
Mica	A large group of silicates of varying composition, but similar in physical properties. All have excellent deavage and can be split into very thin sheets. Used in electrical insulation.	20 mppcf†
Portland cement	Fine powder containing compounds of lime, alumina, silica, and iron oxide. Used as construction material.	50 mppcf†
Silicon carbide. (Carborundum)	Bluish-black, very hard crystals. Used as abrasive and refractory material.	50 mppcf†
Talc	A hydrous magnesium silicate (used in ceramics, cosmetics, paint, and pharmaceuticals, and as a filler in soap, putty, and plaster.	20 mppcf†
Vermiculite	An expanded mica (hydrated magnesium-aluminum-iron silicate). Used in lightweight aggregates, insulation, fertilizer, and soil conditioners, as a filler in rubber and paints, and as a catalyst carrier.	50 mppcf†

†Threshold limits given for substances in "Silicates" group are for compounds containing *less* than 1 per cent crystalline silica. For compounds containing more than 1 per cent silica, calculate threshold limit from formula: $\frac{250}{\% SiO_2 + 5}$

ing anthrax spores or wood bark or grain dust containing parasitic fungi.

f. Irritation of the nose and throat, which is caused by acid, alkali, or other irritating dusts or mists. Some dusts such as soluble chromate dusts may cause ulceration of the nasal passages or even lung cancer.

g. Damage to internal tissues, which may result from inhaled radioactive materials such as radium and its daughter products and from other radioisotopes that emit highly ionizing radiation.

Pneumoconioses

34. *Pneumoconiosis* comes from three Greek words that mean "lung," "dust," and "abnormal condition." The present generally accepted meaning of the word is merely "dusty lung." The kind of dust inhaled determines the type of condition or injury. A number of organic dusts are capable of producting lung diseases, but not all these diseases are classified as pneumoconioses because they are not all a "dusty condition" of the lung.

35. In very rare cases, enough dust had been inhaled to cause mechanical blockage of the air spaces. Flour dust has been known to cause this condition. Some dusts may be essentially inert and remain in the lungs indefinitely with no recognizable irritation, and a few like limestone dust may be gradually dissolved and eliminated without harm.

Silicosis

36. The most important lung disease caused by the inhalation of mineral dust is *silicosis*—well-known in industries where crystalline free silica dust is present, such as foundries, glass manufacturing, granite cutting, mining, and tunneling in quartz rock. It is found throughout the world, and in the past it has had many names, such miner's asthma, grinder's consumption, miner's phthisis, potter's rot, and stonemason's disease. The same occupational disease, however, is meant by all these names, and it is caused by dust from crystalline free silica, usually quartz (*see Table II*).

37. Although considerable progress has been made in dust control in industry, men still develop silicosis in plants and on jobs where dust control is not adequate. Engineering control is still the basic means of preventing this disease, and dust control equipment and procedures must be carefully maintained.

38. *Definition.* Silicosis has been defined as "a disease due to breathing air containing silica (SiO_2) characterized *anatomically* by generalized fibrotic changes and the development of miliary nodulation in both lungs, and *clinically* by shortness of breath, decreased chest expansion, lessened capacity for work, absence of fever, increased susceptibility to tuberculosis (some or all of which symptoms may be present), and by characteristic X-ray findings."*

39. *Factors of influence.* Silicosis has been known to manifest itself after widely differing periods of exposure to silica dust. Apparently, development of the disease depends upon:

a. The amount and kind of dust inhaled.
b. The percentage of free silica contained in the dust.
c. *The form of the silica.*
d. The size of the particles inhaled.
e. The duration of the exposure.

—*Continued on page 95*

*"Report (Joint) of the Committee on Pneumoconiosis and the Committee on Standard Practices in Compensation of Occupational Diseases," *Year Book*, 1933. American Public Health Association, 1790 Broadway, New York 19. p 100.