U. S. SILICA COMPANY

MATERIAL SAFETY DATA SHEET

SILICA SAND SOLD UNDER VARIOUS NAMES •
ASTM TESTING SANDS • MYSTIC WHITE® • F–SERIES FOUNDRY SANDS •
PENN SAND® • Q–MIX™ • Q–ROK® • GRAVEL PACK •
SIL–CO–SIL® • HYDRAULIC FRACING SANDS • SUPERSIL® •
MIN–U–SIL®

Dated February 1, 1995

MATERIAL SAFETY DATA SHEET

SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Names/Trade Names: Silica Sand sold under various names, ASTM TESTING SANDS, MYSTIC WHITE®, F-SERIES FOUNDRY SANDS, PENN SAND®, Q-MIX™, Q-ROK®, GRAVEL PACK, SIL-CO-SIL®, HYDRAULIC FRACING SANDS, SUPERSIL®, MIN-U-SIL®

Synonyms/Common Names: Sand, Silica Sand, Quartz, Crystalline Silica, Flint, Ground Silica.

Manufacturer's Name:
U. S. Silica Company
P. O. Box 187
Berkeley Springs, WV 25411

Emergency Telephone Number:
304-258-2500
304-258-8295 (fax)

Date Prepared: February 1, 1995

SECTION 2 - COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredient: Crystalline silica (quartz), typically 99.2% to 99.9%

Chemical Formula: SiO_2 **CAS#:** 14808-60-7

OSHA PEL: Exposure to airborne crystalline silica shall not exceed an 8-hour time-weighted average limit as stated in 29 CFR § 1910.1000 Table Z-1-A, Air Contaminants, specifically: $\frac{10\ mg/m^3}{\%SiO_2+2}$

ACGIH TLV: Crystalline Quartz
TLV—TWA = 0.1 mg/M³ (Respirable Crystalline Quartz)
See Threshold Limit Value and Biological Exposure Indices for American Conference of Governmental Industrial Hygienists (latest edition).

Other Recommended Limits: National Institute for Occupational Safety and Health (NIOSH). Recommended standard maximum permissible concentration=0.05 mg/M³ (respirable free silica) as determined by a full-shift sample up to 10-hour working day, 40-hour work week. See NIOSH Criteria for a Recommended Standard Occupational Exposure to Crystalline Silica.

SECTION 3 — HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:

Respirable crystalline silica (quartz) can cause silicosis, a fibrosis (scarring) of the lungs. Crystalline silica (quartz) is classified as a probable human carcinogen.

Crystalline silica (quartz) is not flammable, combustible or explosive. It does not cause burns or severe skin or eye irritation. A single exposure will not result in serious adverse health effects. Crystalline silica (quartz) is not an environmental hazard.

POTENTIAL HEALTH EFFECTS:

Inhalation:

a. Silicosis — Exposure to respirable crystalline silica (quartz) can cause silicosis, a fibrosis (scarring) of the lungs. Silicosis may be progressive; it may lead to disability and death.

b. Cancer — There is evidence that respirable crystalline silica is a carcinogen.

c. Scleroderma — There is evidence that exposure to respirable crystalline silica or the disease silicosis is associated with the increased incidence of scleroderma, an immune system disorder manifested by a fibrosis (scarring) of the lungs, skin and other internal organs.

d. Tuberculosis — Individuals with silicosis are predisposed to develop tuberculosis.

e. Nephrotoxicity — There are several recent studies suggesting exposure to respirable crystalline silica or the disease silicosis is associated with the increased incidence of kidney lesions.

NOTE: Crystalline silica exists in several forms, the most common of which is quartz. If crystalline silica (quartz) is heated to more than 870°C it can change to a form of crystalline silica known as trydimite, and if crystalline silica (quartz) is heated to more than 1470°C, it can change to a form of crystalline silica known as cristobalite. Crystalline silica as trydimite and cristobalite are more fibrogenic than crystalline silica as quartz. The OSHA PEL for crystalline silica as trydimite and cristobalite is one-half the PEL for crystalline silica (quartz); the ACGIH TLV for silica - crystalline trydimite and cristobalite is one-half the TLV for silica - crystalline quartz.

Eye Contact: Crystalline silica (quartz) may cause abrasion of the cornea.

Skin Contact: Not applicable.

Ingestion: Not applicable.

Chronic Effects: The adverse health effects – silicosis, cancer, scleroderma and tuberculosis -- are chronic effects.

Signs and Symptoms of Exposure: There are generally no signs or symptoms of exposure to crystalline silica (quartz). The symptoms of chronic or ordinary silicosis, if present, are shortness of breath, wheezing, cough and sputum production. The symptoms of acute silicosis are the same; additionally, weight loss and fever are associated with acute silicosis. The symptoms of scleroderma include thickening and stiffness of the skin, particularly in the fingers, shortness of breath, difficulty swallowing and joint problems.

Medical Conditions Generally Aggravated by Exposure: The condition of individuals with lung disease (e.g., bronchitis, emphysema, chronic obstructive pulmonary disease) can be aggravated by exposure.

See Section 11, Toxicological Information, for additional detail on potential adverse health effects.

SECTION 4 — FIRST AID MEASURES

Inhalation: No specific first aid necessary since the adverse health effects associated with exposure to crystalline silica (quartz) result from chronic exposures. If there is a gross inhalation of crystalline silica (quartz), remove the person immediately to fresh air, give artificial respiration as needed, seek medical attention as needed.

Eye Contact: Wash immediately with water. If irritation persists, seek medical attention.

Skin Contact: Not applicable.

Ingestion: Not applicable.

SECTION 5 — FIRE FIGHTING MEASURES

Flammability:	Crystalline silica (quartz) is non-flammable and non-explosive	**Extinguishing Media:**	None required.
Flash Point:	None	**Special Firefighting Procedures:**	N/A
Flammable Limits:	None	**Unusual Fire and Explosion Hazards:**	None

SECTION 6 — ACCIDENTAL RELEASE MEASURES

Spills: Use dustless methods (vacuum) and place into closable container for disposal, or flush with water. Do not dry sweep. Wear protective equipment specified below.

Waste Disposal Method: See Section 13.

SECTION 7 — HANDLING AND STORAGE

Precautions In Handling and Storing: Avoid breakage of bagged material or spills of bulk material. See control measures in Section 8.

Precautions During Use: Use dustless systems for handling, storage, and clean up so that airborne dust does not exceed the PEL. Use adequate ventilation and dust collection. Practice good housekeeping. Do not permit dust to collect on walls, floors, sills, ledges, machinery, or equipment. Maintain, clean, and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Wash or vacuum clothing which has become dusty. See also control measures in Section 8.

U. S. Silica Company materials should not be used for sandblasting.

The OSHA Hazard Communication Standard, 29 CFR Sections 1910.1200, 1915.99, 1917.28, 1918.90, 1926.59, and 1928.21, and state and local worker or community "right to know" laws and regulations should be strictly followed. WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS-USERS IN CASE OF RESALE) BY POSTING AND OTHER MEANS OF THE HAZARDS AND OSHA PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT THE OSHA PRECAUTIONS.

See also American Society for Testing and Materials (ASTM) standard practice E 1132-86, "Standard Practice for Health Requirements Relating to Occupational Exposure to Quartz Dust."

SECTION 8 — EXPOSURE CONTROLS/PERSONAL PROTECTION

Local Exhaust: Use sufficient local exhaust to reduce the level of respirable crystalline silica to the PEL. See ACGIH "Industrial Ventilation, A Manual of Recommended Practice" (latest edition).

Respiratory Protection: The following chart specifies the types of respirators which may provide respiratory protection for crystalline silica.

CONDITION Particulate Concentration	MINIMUM RESPIRATORY PROTECTION*
5 x PEL or less	Any dust respirator.
10 x PEL or less	Any dust respirator, except single-use or quarter-mask respirator. Any fume respirator of high efficiency particulate filter respirator Any supplied-air respirator. Any self-contained breathing apparatus.
50 x PEL or less	A high efficiency particulate filter respirator with a full facepiece. Any supplied-air respirator with a full facepiece, helmet, or hood. Any self-contained breathing apparatus with a full facepiece.
500 x PEL or less	A powered air-purifying respirator with a high efficiency particulate filter. A Type C supplied-air respirator operated in pressure-demand or other positive pressure or continuous-flow mode.
Greater than 500 x PEL or entry and escape from unknown concentrations	Self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode. A combination respirator which includes a Type C supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure continuous-flow mode and an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive pressure mode.
***Only NIOSH-approved or MSHA-approved equipment should be used. (See 29 CFR §1910.134).**	

See also ANSI standard Z88.2 (latest revision) "American National Standard for Respiratory Protection"

Permissible Exposure Levels: See Section 2.

SECTION 9 — PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	White or tan sand; granular, crushed, or ground		
Boiling Point:	4046°F	**Odor:**	None
Vapor Pressure (mm Hg.):	None	**Specific Gravity (H_2O = 1):**	2.65
Vapor Density (AIR = 1):	None	**Melting Point:**	3110°F
Solubility in Water:	Insoluble in water	**Evaporation Rate (Butyl Acetate = 1):**	None

SECTION 10 — STABILITY AND REACTIVITY

Stability: Crystalline silica (quartz) is stable.

Incompatibility (Materials to Avoid): Contact with powerful oxidizing agents such as fluorine, chlorine trifluoride, oxygen difluoride, may cause fires.

Hazardous Decomposition or Byproducts: Silica will dissolve in hydrofluoric acid and produce a corrosive gas - silicon tetrafluoride.

Hazardous Polymerization: Will not occur.

SECTION 11 — TOXICOLOGICAL INFORMATION

A. SILICOSIS

The major concern associated with exposure to respirable crystalline silica is silicosis, caused by the inhalation and retention of respirable crystalline silica dust. Silicosis can exist in several forms, chronic or ordinary, accelerated or acute.

Chronic or Ordinary Silicosis is the most common form of silicosis, and can occur after many years of exposure to relatively low levels of airborne respirable crystalline silica dust. It is further defined as either simple or complicated silicosis.

Simple silicosis is characterized by lung lesions (shown as radiographic opacities) less than 1 centimeter in diameter, primarily in the upper lung zones. Often, simple silicosis is not associated with symptoms or disability.

Simple silicosis may be progressive and may develop into complicated silicosis or progressive massive fibrosis (PMF). Complicated silicosis and PMF are characterized by lung lesions greater than 1 centimeter in diameter. The symptoms are shortness of breath, wheezing, cough and sputum production. Complicated silicosis and PMF can result in pulmonary heart disease. PMF may be disabling and may lead to death.

Accelerated Silicosis can occur with exposure to high concentrations of respirable crystalline silica over a relatively short period; the lung lesions can appear within five (5) years of the initial exposure. The progression can be rapid. Accelerated silicosis is similar to chronic or ordinary silicosis, except that the lung lesions appear earlier and the progression is more rapid.

Acute Silicosis can occur with exposures to very high concentrations of respirable crystalline silica over a very short time period, sometimes as short as a few months. The symptoms of acute silicosis include progressive shortness of breath, fever, cough and weight loss. Acute silicosis is fatal.

B. CANCER

IARC The International Agency for Research on Cancer, in Volume 42, published in 1987, concluded that there was sufficient evidence of the carcinogenicity of crystalline silica to experimental animals, but that there was limited evidence of the carcinogenicity of crystalline silica to humans. Group 2A.

NTP The National Toxicology Program, in its Sixth Annual Report on Carcinogens, concluded that "silica, crystalline (respirable)" may reasonably be anticipated to be a carcinogen, based on sufficient evidence in experimental animals and limited evidence in humans.
The carcinogenicity of crystalline silica (quartz) is a matter of controversy. A number of studies support an association between silica and cancer. Some are based on work with experimental animals, and there are uncertainties in extrapolating animal data to humans. Also, it appears that the positive animal studies are limited to single species, rats, and that studies using other rodent species have been negative. The results of the numerous epidemiological studies assessing the carcinogenicity of silica in humans are positive and negative. The limitations in the epidemiological studies result from: 1) inadequate silica exposure assessments; 2) possible confounding by exposure to other occupational carcinogens; 3) possible confounding from cigarette smoking. The issues regarding silica, silicosis and lung cancer are set forth in the following materials (among others): Current Pulmonology, Chapter 8, entitled "Occupational Lung Disease", Gee, J. Bernard (1992). Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994). Do Silica and Asbestos Cause Lung Cancer?, Arch. Pathol. Lab. Med., Vol. 116, No. 1, pp. 16-19 (1992). Silica: is it a carcinogen, J. Occup. Health & Safety - Aust. NZ, Vol. 6, No. 6, pp. 481-490 (1990). Silica and lung cancer: a controversial issue, Eur. Respir. J., Vol. 4, pp. 730-744 (1991).

C. SCLERODERMA

There is evidence that exposure to respirable crystalline silica or the disease silicosis is associated with the increased incidence of scleroderma, an immune system disorder manifested by a fibrosis (scarring) of the lungs, skin and other internal organs. The following may be consulted for additional information on silica, silicosis and scleroderma (also known as progressive systemic sclerosis): Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994). Silica, Silicosis, and Progressive Systemic Sclerosis, British Journal of Industrial Medicine, Volume 42, Number 12, pp. 838-843 (1985). Diseases Associated with Exposure to Silica and Nonfibrous Silicate Minerals, Arch. Pathol. Lab. Med., Volume 112, Number 7, pp. 673-720 (1988).

D. TUBERCULOSIS

Individuals with silicosis are predisposed to develop tuberculosis. The following may be consulted for further information: Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994).

E. NEPHROTOXICITY

There are several recent studies suggesting exposure to respirable crystalline silica or the disease silicosis is associated with the increased incidence of kidney lesions. The following may be consulted for additional information on silica, silicosis and nephrotoxicity: Occupational Lung Disorders, Third Edition, Chapter 12, entitled "Silicosis and Related Diseases", Parkes, W. Raymond (1994). A study of silica nephrotoxicity in exposed silicotic and non-silicotic workers, British Journal of Industrial Medicine, Vol. 49, No. 1, pp. 35-37 (1992). Further evidence of human silica nephrotoxicity in occupationally exposed workers, British Journal of Industrial Medicine, Volume 50, Number 10, pp. 907-912 (1993).

SECTION 12 — ECOLOGICAL INFORMATION

Crystalline silica (quartz) is not ecotoxic, i.e., there is no data which suggests that crystalline silica (quartz) is toxic to birds, fish, invertebrates, microorganisms or plants. For additional information on crystalline silica (quartz), see sections 9 (physical and chemical properties) and 10 (stability and reactivity) of this MSDS.

SECTION 13 — DISPOSAL CONSIDERATIONS

General: The packaging and material may be landfilled; however, material should be covered to minimize generation of airborne dust.

RCRA: Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR 261 et seq.

The above applies to materials as sold by U.S. Silica Company. The material may be contaminated during use, and it is the responsibility of the user to assess the appropriate disposal of the used material.

SECTION 14 — TRANSPORT INFORMATION

Crystalline silica (quartz) is not a hazardous material for purposes of transportation under the U. S. Department of Transportation Table of Hazardous Materials, 49 CFR 172.101.

SECTION 15 — REGULATORY INFORMATION

UNITED STATES (FEDERAL AND STATE)

TSCA No.: Crystalline silica (quartz) appears on the EPA TSCA inventory under the CAS No. 14808-60-7.

RCRA: Crystalline silica (quartz) is not classified as a hazardous waste under the Resource Conservation and Recovery Act, or its regulations, 40 CFR 261 et seq.

CERCLA: Crystalline silica (quartz) is not classified as a hazardous substance under regulations of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), 40 CFR 302.

Emergency Planning and Community Right to Know Act: Crystalline silica (quartz) is not an extremely hazardous substance under Section 302 and is not a toxic chemical subject to the requirements of Section 313.

Clean Air Act: Crystalline silica (quartz) mined and processed by U.S. Silica Company was not processed with or does not contain any Class I or Class II ozone depleting substances.

FDA: Silica is included in the list of substances that may be included in coatings used in food contact surfaces, 21 CFR 175.300(b)(3)(xxvi).

NTP: Respirable crystalline silica (quartz) is classified as a probable carcinogen.

OSHA Carcinogen: Crystalline silica (quartz) is not listed.

California Proposition 65: Crystalline silica (quartz) is classified as a substance known to the state of California to be a carcinogen.

CANADA

Domestic Substances List: U. S. Silica Company products, as naturally occurring substances, are on the Canadian DSL.

WHMIS Classification: D-2A

OTHER

EINECS No.: 231-545-4

EEC Label (Risk/Safety Phrases): R 48/20, R 40/20, S22, S38

IARC: Crystalline silica (quartz) is classified in IARC Group 2A.

National, state, provincial or local emergency planning, community right to know or other laws, regulations or ordinances may be applicable–consult applicable national, state, provincial or local laws.

SECTION 16 — OTHER INFORMATION

Hazardous Material Information System (HMIS):

Health	*
Flammability	0
Reactivity	0
Protective Equipment	E

* For further information on health effects, see sections 3 and 11 of this MSDS.

National Fire Protection Association (NFPA):

Health	0
Flammability	0
Reactivity	0

Warning Label Text:

WARNING!

Contains Silica Dust That Can Be Harmful If Inhaled.
Avoid Breathing Dust.

HAZARDS

- Contains silica dust that can cause severe and permanent lung damage and other diseases.
  - Breathing silica dust can cause silicosis, a lung disease that can cause serious breathing difficulties and death.
  - Breathing silica dust may cause cancer.
  - Breathing silica dust may cause scleroderma, a scarring of the skin and internal organs.
- Breathing silica dust may not cause noticeable injury or illness, even though permanent lung damage may be occurring.

PRECAUTIONS

- Avoid breathing dust.
- Wear a respirator approved for silica dust when using, handling, storing or disposing of this product or bag.
  - Do not rely on your sight to determine if dust is in the air. Silica may be in the air without a visible dust cloud.
- Use with adequate ventilation and dust collection systems to keep silica dust below permissible limits.
- Avoid creating dust when using, handling, storing or disposing of this product or bag.
  - Do not dry sweep product. Wet product with water or use a dustless method (vacuum) to clean spills.
  - Do not allow dust to collect, on floors, sills, ledges, machinery, or equipment.
- DO NOT USE FOR SANDBLASTING!

See U.S. Silica Company Material Safety Data Sheet
in Your Employer's Possession for More Information on Hazards and Precautions

CAS #14808-60-7

U. S. SILICA COMPANY DISCLAIMER

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