




# MATERIAL SAFETY DATA SHEET

MSDS No: 5001  
Date of last revision: 02/18/2002

## 1. PRODUCT AND COMPANY IDENTIFICATION

Product Group: REFRACTORY CERAMIC FIBER PRODUCT  
 Chemical Name: VITREOUS ALUMINOSILICATE FIBER  
 Synonym(s): RCF, ceramic fiber, synthetic vitreous fiber (SVF), man-made vitreous fiber (MMVF), man-made mineral fiber (MMMF)  
 Trade Names: PYROLITE; PYROBOARD; PYROBOARD GH; PYROWOOL; FORMCAST 60; FORMCAST 75; FORMCAST 110  
 Manufacturer/Supplier:   
 P.O. Box 980  
 Fowlerville, MI 48836

For additional information or MSDSs, call Rex Roto Customer Service at (517) 223-3787.

## 2. COMPOSITION / INFORMATION ON INGREDIENTS

CAS NUMBER	% BY WEIGHT	COMMENTS
142844-00-6	40-95	Refractories, Fibers, Aluminosilicate
7631-86-9	0-60	Amorphous Silica
56780-58-6	0-10	Starch
1344-28-1	0-40	Alumina

(See Section 8 "Exposure Controls / Personal Protection" for exposure)

T00287 xx  
 T00288 xx  
 T00289 xx  


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 T00286 xx  
 T00291 xx  
 T00274 xx

T0023460 C-301

Pyrolite (file only) H&E

LX

### 3. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW

WARNING!  
POSSIBLE CANCER HAZARD BY INHALATION.

(See Section 11 for more information)

#### CHRONIC EFFECT

There has been no increased incidence of respiratory disease in studies examining occupationally exposed workers. Long-term, high-dose exposure to specially prepared fibers which are respirable by rodents has resulted in fibrosis, lung cancer, and mesothelioma in rodents (rats or hamsters).

TARGET ORGANS:
Respiratory Tract (nose & throat), Eyes, Skin
<b>RESPIRATORY TRACT (nose &amp; throat) IRRITATION:</b> If inhaled in sufficient quantity, may cause temporary, mild mechanical irritation to respiratory tract. Symptoms may include scratchiness of the nose or throat, cough, or chest discomfort.
<b>EYE IRRITATION:</b> May cause temporary, mild mechanical irritation. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.
<b>SKIN IRRITATION:</b> May cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.
<b>GASTROINTESTINAL IRRITATION:</b> Unlikely route of exposure.
<b>MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:</b> Pre-existing medical conditions, including dermatitis, asthma, or chronic lung disease, may be aggravated by exposure; individuals who have a history of allergies may experience greater amounts of skin and respiratory irritation.

#### HAZARD CLASSIFICATION

Although studies, involving occupationally exposed workers, have not identified any increased incidence of respiratory disease, results from animal testing have been used as the basis for hazard classification:

The International Agency for Research on Cancer (IARC) classified ceramic fiber, fibrous glass wool and mineral wool (rock wool & slag wool) as possible human carcinogens (Group 2b) based on sufficient evidence of carcinogenicity in animals, but insufficient data in humans.

The Seventh Annual Report on Carcinogens (1994), prepared by the National Toxicology Program (NTP), classified respirable RCF and glass wool as substances reasonably anticipated to be carcinogens.

The American Conference of Governmental Industrial Hygienists (ACGIH) has classified RCF as "A2-Suspected Human Carcinogen."

The Commission of The European Communities (DG XI) has classified RCF as a substance that should be regarded as if it is carcinogenic to man.

The State of California, pursuant to Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986, has listed "ceramic fibers (airborne fibers of respirable size)" as a chemical known to the State of California to cause cancer.

The Canadian Environmental Protection Agency (CEPA) has classified RCF as "probably carcinogenic" (Group 2).

The Canadian Workplace Hazardous Materials Information System (WHMIS) - RCF is classified as Class D, 2, A - Materials Causing Other Toxic Effects

The Hazardous Materials Identification System (HMIS) - Health: 1\* Flammability: 0 Reactivity: 0 Personal Protection Index: X (Employer Determined)

### 4. FIRST AID MEASURES

#### FIRST AID PROCEDURES

**RESPIRATORY TRACT (nose & throat) IRRITATION:**  
 If respiratory tract irritation develops, move the person to a dust free location. Get medical attention if the irritation continues. See Section 8 for additional measures to reduce or eliminate exposure.

**EYE IRRITATION:**  
 If eyes become irritated, flush immediately with large amounts of lukewarm water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Do not rub eyes. Get medical attention if irritation persists.

**SKIN IRRITATION:**  
 If skin becomes irritated, remove soiled clothing. Do not rub or scratch exposed skin. Wash area of contact thoroughly with soap and water. Using a skin cream or lotion after washing may be helpful.

**GASTROINTESTINAL IRRITATION:**  
 If gastrointestinal tract irritation develops, move the person to a dust free environment.

**NOTES TO PHYSICIANS:**  
 Skin and respiratory effects are the result of temporary, mild mechanical irritation; fiber exposure does not result in allergic manifestations.

### 5. FIRE FIGHTING MEASURES

NFPA Codes: Flammability: 0 Health: 1 Reactivity: 0 Special: 0

NFPA Unusual Hazards:

Flammable Properties:

Flash Point:

Unusual Fire and Explosion Hazard:

Extinguishing Media:

None  
 None  
 None  
 None

Use extinguishing media suitable for type of surrounding fire.

### 6. ACCIDENTAL RELEASE MEASURES

#### SPILL PROCEDURES

Avoid creating airborne dust. Dust suppressing cleaning methods such as wet sweeping or vacuuming should be used to clean the work area. If vacuuming, the vacuum must be equipped with a HEPA filter. Compressed air or dry sweeping should not be used for cleaning.

## 7. HANDLING AND STORAGE

### STORAGE

Store in original container in a dry area. Keep container closed when not in use. Avoid unnecessary disturbance of the product.

### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Frequently clean the work area with HEPA filtered vacuum or wet sweeping to minimize the accumulation of debris. Do not use compressed air for clean-up.

### EMPTY CONTAINERS

Product packaging may contain residue. Do not reuse.

## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE GUIDELINES

COMPONENTS	
OSHA PEL	SUPPLIER REG
Retractories, Fibers, Aluminosilicate	None Established*
Amorphous Silica	80 mg/m <sup>3</sup> / % SiO <sub>2</sub>
Starch	5 mg/m <sup>3</sup> (resp.), 15 mg/m <sup>3</sup> (total)
Alumina	5 mg/m <sup>3</sup> (resp.), 15 mg/m <sup>3</sup> (total)
	N/A
	N/A
	0.5 f/cc, 8-hr. TWA**

\* There is no specific regulatory standard for RCF in the U.S. OSHA's "Particulate Not Otherwise Regulated (PNOR)" standard (29 CFR 1910.1000, Subpart Z, Air Contaminants) applies generally; Total Dust 15 mg/m<sup>3</sup>; Respirable Fraction 5 mg/m<sup>3</sup>.

\*\* The Refractory Ceramic Fibers Coalition (RCFC) has sponsored comprehensive toxicology and epidemiology studies to identify potential RCF-related health effects [see Section 11 for more details]. Consulted experts familiar with fiber and particle science, conducted a thorough review of the RCF-related scientific literature, and further evaluated the data in a state-of-the-art quantitative risk assessment. Based on these efforts and in the absence of an OSHA PEL, RCFC has adopted a recommended exposure guideline, as measured under NIOSH Method 7400 B. The manufacturers' REG is intended to promote occupational health and safety through prudent exposure control and reduction, and it reflects relative technical and economic feasibility as determined by extensive industrial hygiene monitoring efforts undertaken pursuant to an agreement with the U.S. Environmental Protection Agency.

### OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)

RCF-related occupational exposure limits vary internationally. Regulatory OEL examples include: Australia - 0.5 f/cc; Austria - 0.5 f/cc; Canada - 0.5 to 1.0 f/cc; Denmark - 1.0 f/cc; France - 0.6 f/cc; Germany - 0.5 f/cc; Netherlands - 1.0 f/cc; New Zealand - 1.0 f/cc; Norway - 2.0 f/cc; Poland - 2.0 f/cc; Sweden - 1.0 f/cc. The objectives and criteria underlying each of these OEL decisions also vary. The evaluation of occupational exposure limits and determining their relative applicability to the workplace is best performed, on a case-by-case basis, by a qualified Industrial Hygienist.

Amorphous Silica 10 mg/m<sup>3</sup> (ACGIH TLV)  
 Starch 10 mg/m<sup>3</sup> (ACGIH TLV)  
 Alumina 10 mg/m<sup>3</sup> (ACGIH TLV)

## ENGINEERING CONTROLS

Use engineering controls such as local exhaust ventilation, point of generation dust collection, down draft work stations, emission controlling tool designs, and materials handling equipment designed to minimize airborne fiber emissions.

## PERSONAL PROTECTION EQUIPMENT

### Respiratory Protection – RCF:

When engineering and/or administrative controls are insufficient, the use of appropriate respiratory protection, pursuant to the requirements of OSHA Standards 29 CFR 1910.134 and 29 CFR 1926.103, is recommended. The following information is provided as an example of appropriate respiratory protection for amorphous silica fibers. The evaluation of workplace hazards and the identification of appropriate respiratory protection is best performed, on a case by case basis, by a qualified Industrial Hygienist.

SUPPLIER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirable Airborne Fiber Concentration	Respirator Recommendation*
Less than 0.5 f/cc	No specific recommendation. User preference based upon conditions present
0.5 f/cc – 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH approved P100 particulate filter cartridge
5.0 f/cc – 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH approved P100 particulate filter cartridge

\* The P100 recommendation is a conservative default choice; in some cases, solid arguments can be made that other respirator types (e.g., N95, R99, etc.) may be suitable for some tasks or work environments. The P100 recommendation is not designed to limit informed choices, provided that respiratory protection decisions comply with 29 CFR 1910.134.

### Other Information:

- Concentrations based upon an eight-hour time weighted average (TWA) as determined by air samples collected and analyzed pursuant to NIOSH method 7400 (B) for airborne fibers.

- The manufacturer recommends, at a minimum, the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during fumace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica.

- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist; the selection of appropriate respiratory protection and air monitoring depend upon the conditions present in the work environment.

### Skin Protection:

Wear gloves, head coverings, and full body clothing as necessary to prevent skin irritation. Washable or disposable clothing may be used. If possible, do not take unwashed clothing home. If soiled work clothes must be taken home, employees should ensure employees are thoroughly trained on the best practices to minimize or avoid non-work dust exposure (e.g., vacuum clothes before leaving the work area, wash work clothing separately, rinse washer before washing other household clothes, etc.).

### Eye Protection:

Wear safety glasses with side shields or other forms of eye protection in compliance with appropriate OSHA standards to prevent eye irritation. The use of contact lenses is not recommended, unless used in conjunction with appropriate eye protection. Do not touch eyes with soiled body parts or materials. If possible, have eye-washing facilities readily available where eye irritation can occur.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**ODOR AND APPEARANCE:** White, gray, or tan board or shape/No odor  
**CHEMICAL FAMILY:** Vitreous Aluminosilicate Fibers  
**BOILING POINT:** Not Applicable  
**WATER SOLUBILITY (%):** Not Soluble in Water  
**MELTING POINT:** 1760° C (3200° F)  
**SPECIFIC GRAVITY:** 2.50 - 2.75  
**VAPOR PRESSURE:** Not Applicable  
**pH:** Not Applicable  
**VAPOR DENSITY (Air = 1):** Not Applicable  
**% VOLATILE:** Not Applicable  
**MOLECULAR FORMULA:** Al<sub>2</sub>O<sub>3</sub>·SiO<sub>2</sub>

## 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Stable under conditions of normal use.  
**INCOMPATIBILITY:** Soluble in hydrofluoric acid, phosphoric acid, and concentrated alkali.  
**CONDITIONS TO AVOID:** None.  
**HAZARDOUS DECOMPOSITION PRODUCTS:** Thermal decomposition of binder from fires or from first heat of product may release smoke, carbon monoxide, and carbon dioxide. Use adequate ventilation or other precautions to eliminate exposure to resultant vapors. Exposure to thermal decomposition fumes may cause respiratory tract irritation, bronchial hyper-reactivity, or an asthmatic-type response.  
**HAZARDOUS POLYMERIZATION:** Not Applicable.

## 11. TOXICOLOGICAL INFORMATION

There has been no increased incidence of respiratory disease or other significant health effects in occupationally exposed workers. In animal studies, long-term, high-dose inhalation exposure resulted in the development of respiratory disease in rats and hamsters.

## EPIDEMIOLOGY

The University of Cincinnati is conducting an ongoing epidemiologic investigation. The evidence obtained from employees in U. S. RCF manufacturing facilities is as follows:

- 1) There is no evidence of any fibrotic lung disease (interstitial fibrosis) from evaluations of chest X-rays.
- 2) There is no evidence of an elevated incidence of lung disease among RCF manufacturing employees.
- 3) An early statistical "trend" was observed, in the exposed population, between RCF exposure duration and some measures of lung function. The observations were clinically insignificant. If these observations were made on an individual employee, the results would be interpreted as being within the normal (predicted) respiratory range. A more recent longitudinal study of employees with 5 or more pulmonary function tests found that there was no effect on lung function associated with RCF production experience.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. The best evidence to date indicates that pleural plaques are a marker of exposure only. Under most circumstances, pleural plaques are not associated with pulmonary impairment. The pathogenesis of pleural plaques remains incompletely understood; however, the mechanism appears to be an inflammatory response caused by inhaled fibers.

5) Initial data (circa 1987) seemed to indicate an interactive effect between smoking and RCF exposure; more recent data, however, found no interactive effect. Nevertheless, to promote good health, RCF employees are still actively encouraged not to smoke.

## TOXICOLOGY

A number of toxicological studies designed to identify any potential health effects from RCF exposure have been completed. In one study, conducted by the Research and Consulting Company, (Geneva, Switzerland), rats and hamsters were exposed to 30 mg/m<sup>3</sup> (about 200 fibers/cc) of specially-prepared RCF for 6 hours/day, 5 days/week, for up to 24 months. In rats, a statistically significant increase in lung tumors was observed; two mesotheliomas (cancer of the pleural lining between the chest wall and lung) were also identified. Hamsters did not develop lung tumors; however, interstitial fibrosis and mesothelioma was found. Some, in the scientific community, have concluded that the "maximum tolerated dose" was exceeded and that significant particle contamination was a confounding issue; therefore, this study may not represent an accurate assessment of the potential for RCF to produce adverse health effects.

In a related multi-dose study with a similar protocol, other rats were exposed to doses of 16 mg/m<sup>3</sup>, 9 mg/m<sup>3</sup>, 3 mg/m<sup>3</sup> which corresponds to about 15, 75, and 25 fibers per cubic centimeter respectively. This study found no statistically significant increase in lung cancer. Some cases of pleural and parenchymal fibrosis were seen in the 16 mg/m<sup>3</sup> dose group. Some cases of mild fibrosis and one mesothelioma were observed in the 9 mg/m<sup>3</sup> group. No acute respiratory effects were seen in the rats in the 3 mg/m<sup>3</sup> exposure group, which suggests that there may be a dose/response threshold, below which irreversible respiratory impacts do not occur.

Other toxicological studies have been conducted which utilized non-physiological exposure methods such as intraperitoneal and intratracheal implantation or injection. Some of these studies have found that RCF is a potential carcinogen. Some experts, however, suggest that these tests have limited relevance because they bypass many of the biological mechanisms that prevent fiber deposition or facilitate fiber clearance.

To obtain more epidemiology or toxicology information, please call the toll free telephone number for the Unifrax Corporation Product Stewardship Program found in Section 16 - Other Information.

## 12. ECOLOGICAL INFORMATION

No ecological concerns have been identified.

## 13. DISPOSAL CONSIDERATIONS

### WASTE MANAGEMENT

To prevent waste materials from becoming airborne during waste storage, transportation and disposal, a covered container or plastic bagging is recommended.

### DISPOSAL

RCF, as manufactured, is not classified as a hazardous waste according to Federal regulations (40 CFR 261). Any processing, use, alteration or chemical additions to the product, as purchased, may alter the disposal requirements. Under Federal regulations, it is the waste generator's responsibility to properly characterize a waste material, to determine if it is a "hazardous" waste. Check local, regional, state or provincial regulations to identify all applicable disposal requirements.

### EUROPEAN UNION

Waste from this product is not classified as "hazardous" or "special" under European Union regulations. Disposal is permitted at landfills licensed for industrial waste.

European Union: European Directive 97/69/EC classified RCF as a Category 2 carcinogen; that is it "should be regarded as if it is carcinogenic to man."

Canada: Canadian Workplace Hazardous Materials Information System (WHMIS) - RCF is classified as Class D, 2, A - Materials Causing Other Toxic Effects Canadian Environmental Protection Act (CEPA) - All substances in this product are listed, as required, on the Domestic Substance List (DSL)

**INTERNATIONAL REGULATIONS**

Other States: RCF products are not known to be regulated by states other than California; however, state and local OSHA and EPA regulations may apply to these products. If in doubt, contact your local regulatory agency.

California: "Ceramic fibers (airborne particles of respirable size)" is listed in Proposition 65, The Safe Drinking Water and Toxic Enforcement Act of 1986 as a chemical known to the State of California to cause cancer.

OSHA: Comply with Hazard Communication Standards 29 CFR 1910.1200 and 29 CFR 1926.59 and the Respiratory Protection Standards 29 CFR 1910.134 and 29 CFR 1926.103.

EPA: Superfund Amendments and Reauthorization Act (SARA) Title III - This product does not contain any substances reportable under Sections 302, 304, 313, (40 CFR 372). Sections 311 and 312 (40 CFR 370) apply (delayed hazard). Toxic Substances Control Act (TSCA) - All substances in this product are listed, as required, on the TSCA inventory. RCF has been assigned a CAS number; however, it is a simple mixture and therefore not required to be listed on the TSCA inventory. The components of RCF are listed on the inventory. Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and the Clean Air Act (CAA) : RCF contains fibers with an average diameter greater than one micron and thus is not considered a hazardous air pollutant.

**UNITED STATES REGULATIONS**

**15. REGULATORY INFORMATION**

Canadian TDG Hazard Class & PIN: Not regulated  
 Not classified as dangerous goods under ADR (road), RID (train) or IMDG (ship).

**INTERNATIONAL**

Hazard Class:	Not Regulated	United Nations (UN) Number:	Not Applicable
Labels:	Not Applicable	North America (NA) Number:	Not Applicable
Placards:	Not Applicable	Bill of Lading:	Product Name

**U.S. DEPARTMENT OF TRANSPORTATION (DOT)**

**14. TRANSPORT INFORMATION**



## 16. OTHER INFORMATION

### RCF DEVITRIFICATION

As produced, all RCF fibers are vitreous (glassy) materials which do not contain crystalline silica. Continued exposure to elevated temperatures may cause these fibers to devitrify (become crystalline). The first crystalline formation (mulite) begins to occur at approximately 985° C (1805° F). Crystalline silica (cristobalite) formation may begin at temperatures of approximately 1200° C (2192° F). The occurrence and extent of crystalline phase formation is dependent on the duration and temperature of exposure, fiber chemistry and/or the presence of fluxing agents. The presence of crystalline phases can be confirmed only through laboratory analysis of the "hot face" fiber.

IARC's evaluation of crystalline silica states "Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1)" and additionally notes "carcinogenicity in humans was not detected in all industrial circumstances studied" (IARC Monograph Vol. 68, 1997). NTP lists all polymorphs of crystalline silica amongst substances which may "reasonably be anticipated to be carcinogens".

IARC and NTP did not evaluate after-service RCF, which may contain various crystalline phases. However, an analysis of after-service RCF samples obtained pursuant to an exposure monitoring agreement with the USEPA, found that in the furnace conditions sampled, most did not contain detectable levels of crystalline silica. Other relevant RCF studies found that (1) simulated after-service RCF showed little, or no, activity where exposure was by inhalation or by intraperitoneal injection; and (2) after-service RCF was not cytotoxic to macrophage-like cells at concentrations up to 320 µg/cm<sup>2</sup> - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 µg/cm<sup>2</sup>).

### RCF AFTER-SERVICE REMOVAL

Respiratory protection should be provided in compliance with OSHA standards. During furnace tear-out operations where overhead work is required, a FULL FACE RESPIRATOR (at a minimum) is recommended to reduce inhalation exposure along with eye and respiratory tract irritation. A specific evaluation of workplace hazards and the identification of appropriate respiratory protection is best performed, on a case by case basis, by a qualified industrial hygiene professional.

### PRODUCT STEWARDSHIP PROGRAM

The Unifrax Corporation, a manufacturer of Refractory Ceramic Fiber, has established a program to provide customers with up-to-date information regarding the proper use and handling of refractory ceramic fiber. In addition, Unifrax Corporation has also established a program to monitor airborne fiber concentrations at customer facilities. If you would like more information about this program, please call the Unifrax Corporation Product Stewardship Information Hotline at 1-800-322-2293.

As of the date of preparation of this document, the foregoing information is believed to be accurate and is provided in good faith to comply with applicable Federal and State laws. However, no warranty or representation, expressed or implied, is made as to the accuracy or completeness of the foregoing data. In addition, no responsibility can be assumed by the vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices, or from any hazards inherent in the nature of the product.