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7.1 M0090 Fiberfrax® QF Cements

maximize rodent respirability.



**MATERIAL SAFETY DATA SHEET**

MSDS No. M0090 Effective Date: 03/09/2004

**1. CHEMICAL 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:** FIBERFRAX® QF CEMENTS  
 QF-150 Cement, QF-180 Cement, QF-180-AB Cement, QF-180 Blue Cement  
**Manufacturer/Supplier:** Unifrax Corporation  
 2351 Whirlpool St.  
 Niagara Falls, NY 14305-2413

**Product Stewardship Information Hotline**  
 1-800-322-2293 (Monday - Friday 8:00 a.m. - 4:30 p.m. EST)

For additional MSDSs, visit our web page, <http://www.unifrax.com>, or call Unifrax Customer Service at (716) 278-3872

**CHEMTREC Assist:** CHEMTREC will provide assistance for chemical emergencies. Call 1-800-424-9300

**2. COMPOSITION / INFORMATION ON INGREDIENTS**

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-6	40-60
Water	7732-18-5	20-50
Silica (amorphous)	7631-86-9	10-15
Hydrated magnesium aluminum silicate mineral	12199-37-0	1-3

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

**3. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**

CAUTION! MAY BE HARMFUL IF SWALLOWED.  
 MAY CAUSE SKIN AND EYE IRRITATION.  
 DRIED, ABRADED PRODUCT MAY CAUSE RESPIRATORY TRACT IRRITATION AND 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. In animal studies, long-term laboratory exposure to doses hundreds of times higher than normal occupational exposures has produced fibrosis, lung cancer, and mesothelioma in rats or hamsters. The fibers used in those studies were specially sized to

**OTHER POTENTIAL EFFECTS**

**TARGET ORGANS:** Respiratory Tract (nose & throat), Eyes, Skin  
**RESPIRATORY TRACT (nose & throat) IRRITATION:** If dried, airborne product is 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.  
**EYE IRRITATION:** May cause temporary, mild mechanical irritation. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.  
**SKIN IRRITATION:** Exposure to dried product may cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.  
**GASTROINTESTINAL IRRITATION:** Unlikely route of exposure. Small amounts swallowed incidental to normal handling operations are not likely to cause injury.  
**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** 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. In each of the following cases, the conclusions are qualitative only and do not rest upon any quantitative analysis suggesting that the hazard actually may occur at current occupational exposure levels.

In October 2001, the **International Agency for Research on Cancer (IARC)** confirmed that Group 2b (possible human carcinogen) remains the appropriate IARC classification for RCF.

The Seventh Annual Report on Carcinogens (1994), prepared by the **National Toxicology Program (NTP)**, classified respirable RCF and glasswool 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 D2A – Materials Causing Other Toxic Effects

The Hazardous Materials Identification System (HMIS) –

Health 1\* Flammability 0 Reactivity 0 Personal Protection Index: X (Employer Determined)

(\* denotes potential for chronic effects)

#### 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: None

Flammable Properties: None

Flash Point: 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 vapors resulting from thermal decomposition of

binder. Exposure to thermal decomposition fumes may cause respiratory tract irritation, bronchial hyper-reactivity or an asthmatic-type response.

Unusual Fire and Explosion Hazard: None

Extinguishing Media: 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

Normal conditions of use and application are not expected to release respirable particulates of airborne fibers. Removal of used product, sanding, scraping, or otherwise destroying the integrity of the dried product may result in the release of particulates and fibers. During such operations where fibers could possibly be released, appropriate respiratory protection should be provided as discussed below and/or in Section 8 under Respiratory Protection.

##### STORAGE

Store in original container in a dry area. Keep container closed when not in use.

##### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. 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 – RCF

COMPONENTS	OSHA PEL	MANUFACTURER REG
Refractories, Fibers, Aluminosilicate	None Established*	0.5 /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, RCF 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; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV 0.2 f/cc; RCF REG 0.5 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.

**EXPOSURE GUIDELINES – OTHER INGREDIENTS**

COMPONENTS	OSHA PEL	MANUFACTURER REG
Water	None established	None established
Silica (amorphous)	20 mppcf or 80 mg/m <sup>3</sup> / %	None established
Hydrated magnesium aluminum silicate mineral	SiO <sub>2</sub> 5 mg/m <sup>3</sup> PEL (resp. fraction), 15 mg/m <sup>3</sup> PEL (total dust) as PNOR	None established

**OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)**

Non-regulatory OEL examples include: ACGIH TLVs (TWAs): Water – None established. Silica (amorphous) – 10 mg/m<sup>3</sup>. Hydrated magnesium aluminum silicate mineral, as PNOC – 10 mg/m<sup>3</sup> (total dust), 3 mg/m<sup>3</sup> (respirable fraction)

**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 to maintain workplace concentrations within the 0.5 f/cc REG, 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 aluminosilicate 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.

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirable Airborne Fiber Concentration (levels are 8-hr. time-weighted averages)	Respirator Recommendation <sup>†</sup>
Not yet determined but expected to be below 5.0 f/cc based on operation	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
"Reliably" less than 0.5 f/cc	Optional
0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
5.0 f/cc to 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge or PAPR
Greater than 25 f/cc	PAPR with light-fitting full facepiece or a supplied air respirator in continuous flow mode
When individual workers request respiratory protection as a matter of personal comfort or choice where exposures are "reliably" below 0.5 f/cc	A NIOSH certified respirator, such as a disposable particulate respirator, or respirators with filter cartridges rated N95 or better

<sup>†</sup>The P100 recommendation is a conservative default choice; in some case, 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 the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during furnace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica. If exposure levels are known, the respiratory protection chart provided above may be applied.
- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring

**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 clothing must be taken home, employers 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

<b>ODOR AND APPEARANCE</b>	White, odorless, fibrous material
<b>CHEMICAL FAMILY</b>	Vitreous Aluminosilicate Fibers
<b>BOILING POINT:</b>	Not Applicable
<b>WATER SOLUBILITY (%):</b>	Not Soluble in Water
<b>MELTING POINT:</b>	1760° C (3200° F)
<b>SPECIFIC GRAVITY:</b>	QF-150 Cement -- 1.681 - 1.633 QF-180 Cement -- 1.648 - 1.708 QF-180-AB & QF-180 Blue Cement -- 1.456 - 1.520
<b>VAPOR PRESSURE</b>	Not Applicable
<b>pH:</b>	Not Applicable
<b>VAPOR DENSITY (Air = 1):</b>	Not Applicable
<b>% VOLATILE</b>	Not Applicable
<b>MOLECULAR FORMULA:</b>	Not Applicable

### 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 vapors resulting from thermal decomposition of binder. Exposure to thermal decomposition fumes may cause respiratory tract irritation, bronchial hyper-reactivity or an asthmatic-type response.

#### HAZARDOUS

Not Applicable.

#### POLYMERIZATION:

### 11. TOXICOLOGICAL INFORMATION

Normal conditions of use and application are not expected to release respirable particulates of airborne fibers. Removal of used product, sanding, scraping, or otherwise destroying the integrity of the dried product may result in the release of particulates and fibers. The toxicological information below applies to the aluminosilicate fiber portion of the dried product.

### HEALTH DATA SUMMARY

Epidemiological studies of RCF production workers have indicated no increased incidence of respiratory disease nor other significant health effects. 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) In early studies, an apparent 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. 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.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. Some studies appear to show a relationship between the occurrence of pleural plaques on chest radiographs and the following variables: (a) years since RCF production hire date; (b) duration of RCF production employment; and (c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. 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.

### 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, these study findings 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 115, 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 intrapleural, 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.

**14. TRANSPORT INFORMATION**

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

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

**INTERNATIONAL**

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

**15. REGULATORY INFORMATION**

**UNITED STATES REGULATIONS**

**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.

**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.

**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.

**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.

**INTERNATIONAL REGULATIONS**

**Canada:** Canadian Workplace Hazardous Materials Information System (WHMIS) - RCF is classified as Class D2A - 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)

**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."

**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 (mullite) begins to occur at approximately 985° C (1805° F). Crystalline phase silica may begin to form at temperatures of approximately 1200° C. The 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 circum 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 g/cm<sup>2</sup> - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 g/cm<sup>2</sup>).

#### **RCF AFTER-SERVICE REMOVAL**

Respiratory protection should be provided in compliance with OSHA standards. During removal operations, a full face respirator is recommended to reduce in-nation 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 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.

On February 11, 2002, the Refractory Ceramic Fibers Coalition (RCFC) and the U.S. Occupational Safety and Health Administration (OSHA) introduced a voluntary worker protection program entitled PSP 2002, a comprehensive, multi-faceted risk management program designed to control and reduce workplace exposures to refractory ceramic fiber (RCF). Unifrax Corporation, as a member of RCFC, is participating in this highly acclaimed product stewardship program. For more information regarding PSP 2002, please call the Unifrax Corporation's Product Stewardship Information Hotline at 1-800-322-2293 or refer to the RCFC web site, <http://www.rcfc.net>.

#### **DEFINITIONS**

**ACGIH:** American Conference of Governmental Industrial Hygienists  
**ADR:** Carriage of Dangerous Goods by Road (International Regulation)  
**CAA:** Clean Air Act  
**CAS:** Chemical Abstracts Service  
**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act  
**DSL:** Domestic Substances List  
**EPA:** Environmental Protection Agency  
**EU:** European Union  
**f/cc:** Fibers per cubic centimeter  
**HEPA:** High Efficiency Particulate Air  
**HMIS:** Hazardous Materials Identification System  
**IARC:** International Agency for Research on Cancer

**IATA:** International Air Transport Association  
**IMDG:** International Maritime Dangerous Goods Code  
**mg/m<sup>3</sup>:** Milligrams per cubic meter of air  
**mmpcf:** Million particles per cubic meter  
**NFPA:** National Fire Protection Association  
**NIOSH:** National Institute for Occupational Safety and Health  
**OSHA:** Occupational Safety and Health Administration  
**OSHA Respiratory Protection Standards**  
**OSHA Hazard Communication Standards**  
**1926.103:** OSHA Hazard Communication Standards  
**29 CFR 1910.134 & 1926.59:** OSHA Hazard Communication Standards  
**PEL:** Permissible Exposure Limit (OSHA)  
**PIN:** Product Identification Number  
**PNOC:** Particulates Not Otherwise Classified  
**PNOR:** Particulates Not Otherwise Regulated  
**PSP:** Product Stewardship Program  
**RCFC:** Refractory Ceramic Fibers Coalition  
**RCRA:** Resource Conservation and Recovery Act  
**REG:** Recommended Exposure Guideline (RCFC)  
**REL:** Recommended Exposure Limit (NIOSH)  
**RID:** Carriage of Dangerous Goods by Rail (International Regulations)  
**SARA:** Superfund Amendments and Reauthorization Act  
**SARA Title III:** Emergency Planning and Community Right to Know Act  
**SARA Section 302:** Extremely Hazardous Substances  
**SARA Section 304:** Emergency Release  
**SARA Section 311:** MSDS/List of Chemicals and Hazardous Inventory  
**SARA Section 312:** Emergency and Hazardous Inventory  
**SARA Section 313:** Toxic Chemicals and Release Reporting  
**STEL:** Short Term Exposure Limit  
**SVF:** Synthetic Vitreous Fiber  
**TDG:** Transportation of Dangerous Goods  
**TLV:** Threshold Limit Value (ACGIH)  
**TSCA:** Toxic Substances Control Act  
**TWA:** Time Weighted Average  
**WHMIS:** Workplace Hazardous Materials Information System (Canada)

**Revision Summary:** Minor modification to devitrification section. Replaces 11/19/03 MSDS.

**MSDS Prepared By:** UNIFRAX RISK MANAGEMENT DEPARTMENT

#### **DISCLAIMER**

The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Material Safety Data Sheet. Employers may use this MSDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this MSDS. Therefore, given the summary nature of this document, Unifrax Corporation does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.

7.2 M0042 Fiberfrax® Duraboard®



**MATERIAL SAFETY DATA SHEET**

MSDS No. M0042 Effective Date: 03/09/2004

**1. CHEMICAL 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: FIBERFRAX® DURABOARD® LD Duraboard® LD-RG, Duraboard® LD-HT  
 Manufacturer/Supplier: Unifrax Corporation  
 2351 Whirlpool St.  
 Niagara Falls, NY 14305-2413  
 Product Stewardship Information Hotline  
 1-800-322-2293 (Monday - Friday 8:00 a.m. - 4:30 p.m. EST)  
 For additional MSDSs, visit our web page, <http://www.unifrax.com>, or call Unifrax Customer Service at (716) 278-3872

CHEMTREC Assist: CHEMTREC will provide assistance for chemical emergencies. Call 1-800-424-9300

**2. COMPOSITION / INFORMATION ON INGREDIENTS**

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-6	70-85
Silica (amorphous)	112926-00-8	10-15
Starch	9005-25-8	5-10

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

**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. In animal studies, long-term laboratory exposure to doses hundreds of times higher than normal occupational exposures has produced fibrosis, lung cancer, and mesothelioma in rats or hamsters. The fibers used in those studies were specially sized to maximize rodent respirability.

**OTHER POTENTIAL EFFECTS**

**TARGET ORGANS:**  
 Respiratory Tract (nose & throat), Eyes, Skin

**RESPIRATORY TRACT (nose & throat) IRRITATION:**  
 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.

**EYE IRRITATION:**  
 May cause temporary, mild mechanical irritation. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

**SKIN IRRITATION:**  
 May cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.

**GASTROINTESTINAL IRRITATION:**  
 Unlikely route of exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:**  
 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. In each of the following cases, the conclusions are qualitative only and do not rest upon any quantitative analysis suggesting that the hazard actually may occur at current occupational exposure levels.

In October 2001, the **International Agency for Research on Cancer (IARC)** confirmed that Group 2b (possible human carcinogen) remains the appropriate IARC classification for RCF.

The **Seventh Annual Report on Carcinogens (1994)**, prepared by the **National Toxicology Program (NTP)**, classified respirable RCF and glasswool 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 D2A – Materials Causing Other Toxic Effects

The Hazardous Materials Identification System (HMIS) –

Health 1\* Flammability 0 Reactivity 0 Personal Protection Index: X (Employer Determined)

(\* denotes potential for chronic effects)

#### 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: None

Flammable Properties: None

Flash Point: 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 vapors resulting from thermal decomposition of binder. Exposure to thermal decomposition fumes may cause respiratory tract irritation, bronchial hyper-reactivity or an asthmatic-type response.

**Unusual Fire and Explosion Hazard:** None

**Extinguishing Media:** 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.

##### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. 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 – RCF

COMPONENTS	OSHA PEL	MANUFACTURER REG
Refractories, Fibers, Aluminosilicate	None Established*	0.5 f/cc, 8-hr, TWVA**

\* 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

respiratory protection is best performed, on a case by case basis, by a qualified Industrial Hygienist.

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirable Airborne Fiber Concentration (levels are 8-hr, time-weighted averages)	Respirator Recommendation†
Not yet determined but expected to be below 5.0 f/cc based on operation	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
"Reliably" less than 0.5 f/cc	Optional
0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
5.0 f/cc to 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge or PAPR
Greater than 25 f/cc	PAPR with tight-fitting full facepiece or a supplied air respirator in continuous flow mode
When individual workers request respiratory protection as a matter of personal comfort or choice where exposures are "reliably" below 0.5 f/cc	A NIOSH certified respirator, such as a disposable particulate respirator, or respirators with filter cartridges rated N95 or better

† The P100 recommendation is a conservative default choice; in some case, 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 the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during furnace start-up events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica. If exposure levels are known, the respiratory protection chart provided above may be applied.
- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring.

**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.

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; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV 0.2 f/cc; RCFC REG 0.5 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.

**EXPOSURE GUIDELINES – OTHER INGREDIENTS**

COMPONENTS	OSHA PEL	MANUFACTURER REG
Silica (amorphous)	20 mppcd or 80 mg/m <sup>3</sup> / % SiO <sub>2</sub>	None established
Starch	5 mg/m <sup>3</sup> PEL (resp. dust) 15 mg/m <sup>3</sup> PEL (total dust)	None established

**OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)**

Non-regulatory OEL examples include: ACGIH TLVs (TWAs): Silica (amorphous) -- 10 mg/m<sup>3</sup>. Starch – 10 mg/m<sup>3</sup>.

**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 to maintain workplace concentrations within the 0.5 f/cc REG, 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 aluminosilicate fibers. The evaluation of workplace hazards and the identification of appropriate

If soiled work clothing must be taken home, employers 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, odorless, fibrous material  
**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:** Not Applicable

### 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 vapors resulting from thermal decomposition of binder. 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

#### HEALTH DATA SUMMARY

Epidemiological studies of RCF production workers have indicated no increased incidence of respiratory disease nor other significant health effects. 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) In early studies, an apparent 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. 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.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. Some studies appear to show a relationship between the occurrence of pleural plaques on chest radiographs and the following variables: (a) years since RCF production hire date, (b) duration of RCF production employment, and (c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. 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.

### 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, these study findings 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 115, 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 intrapleural, 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.

**14. TRANSPORT INFORMATION**

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

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

**INTERNATIONAL**

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

**15. REGULATORY INFORMATION**

**UNITED STATES REGULATIONS**

**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.

**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.

**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.

**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.

**INTERNATIONAL REGULATIONS**

**Canada:** **Canadian Workplace Hazardous Materials Information System (WHMIS)** - RCF is classified as Class D2A - 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)

**European Union:** **European Directive 91/89/EEC** classified RCF as a Category 2 carcinogen; that is it "should be regarded as if it is carcinogenic to man."

**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 (mullite) begins to occur at approximately 985° C (1805° F). Crystalline phase silica may begin to form 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 fusing 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 g/cm<sup>2</sup> - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 g/cm<sup>2</sup>).

#### RCF AFTER-SERVICE REMOVAL

Respiratory protection should be provided in compliance with OSHA standards. During removal operations, a full face respirator 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 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.

On February 11, 2002, the Refractory Ceramic Fibers Coalition (RCFC) and the U.S. Occupational Safety and Health Administration (OSHA) introduced a voluntary worker protection program entitled PSP 2002, a comprehensive, multi-faceted risk management program designed to control and reduce workplace exposures to refractory ceramic fiber (RCF). Unifrax Corporation, as a member of RCFC, is participating in this highly acclaimed product stewardship program. For more information regarding PSP 2002, please call the Unifrax Corporation's Product Stewardship Information Hotline at 1-800-322-2293 or refer to the RCFC web site: <http://www.rcfc.net>.

#### DEFINITIONS

**ACGH:** American Conference of Governmental Industrial Hygienists  
**ADR:** Carriage of Dangerous Goods by Road (International Regulation)  
**CAA:** Clean Air Act  
**CAS:** Chemical Abstracts Service  
**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act  
**DSL:** Domestic Substances List  
**EPA:** Environmental Protection Agency  
**EU:** European Union  
**f/cc:** Fibers per cubic centimeter  
**HEPA:** High Efficiency Particulate Air  
**HMS:** Hazardous Materials Identification System  
**IARC:** International Agency for Research on Cancer  
**IATA:** International Air Transport Association  
**IMDG:** International Maritime Dangerous Goods Code  
**mg/m<sup>3</sup>:** Milligrams per cubic meter of air  
**mmpcf:** Million particles per cubic meter  
**NFPA:** National Fire Protection Association  
**NIOSH:** National Institute for Occupational Safety and Health  
**OSHA:** Occupational Safety and Health Administration  
**29 CFR 1910.134 & 1926.103:** OSHA Respiratory Protection Standards  
**29 CFR 1910.1200 & 1926.59:** OSHA Hazard Communication Standards

**PEL:** Permissible Exposure Limit (OSHA)  
**PIN:** Product Identification Number  
**PNOC:** Particulates Not Otherwise Classified  
**PNOR:** Particulates Not Otherwise Regulated  
**PSP:** Product Stewardship Program  
**RCFC:** Refractory Ceramic Fibers Coalition  
**RCRA:** Resource Conservation and Recovery Act  
**REG:** Recommended Exposure Guideline (RCFC)  
**REL:** Recommended Exposure Limit (NIOSH)  
**RID:** Carriage of Dangerous Goods by Rail (International Regulations)  
**SARA:** Superfund Amendments and Reauthorization Act  
**SARA Title III:** Emergency Planning and Community Right to Know Act  
**SARA Section 302:** Extremely Hazardous Substances  
**SARA Section 304:** Emergency Release  
**SARA Section 311:** MSDS/List of Chemicals and Hazardous Inventory  
**SARA Section 312:** Emergency and Hazardous Inventory  
**SARA Section 313:** Toxic Chemicals and Release Reporting  
**STEL:** Short Term Exposure Limit  
**SVF:** Synthetic Vitreous Fiber  
**TDG:** Transportation of Dangerous Goods  
**TLV:** Threshold Limit Value (ACGIH)  
**TSCA:** Toxic Substances Control Act  
**TWA:** Time Weighted Average  
**WHMIS:** Workplace Hazardous Materials Information System (Canada)

**Revision Summary:** Minor modification to devitrification section. Replaces 2/11/02 MSDS.

**MSDS Prepared By:** UNIFRAX RISK MANAGEMENT DEPARTMENT

#### DISCLAIMER

The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Material Safety Data Sheet. Employers may use this MSDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this MSDS. Therefore, given the summary nature of this document, Unifrax Corporation does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.

7.3 M0001 Fiberfrax® Refractory Ceramic Fiber



**MATERIAL SAFETY DATA SHEET**

MSDS No. M0001 Effective Date: 03/09/2004

**1. CHEMICAL 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:** FIBERFRAX® CERAMIC FIBER PRODUCTS, INCLUDES:  
**FIBERS**  
 FIBERFRAX® HIGH PURITY FIBERS: HP-0DB, Module Trim, MT-HP, HP-Chopped, H Bulk, Regular Bulk, Spun Bulk, Fiberfrax FPP Fiber.  
 FIBERFRAX® 6000 SERIES FIBERS: All bulk fibers from 6000-AAA to 6100-ZZZ, 6900-70A to 6900-99Z.  
 FIBERFRAX® 7000 SERIES FIBERS: 7000-AA to 7100-ZZ.  
 FIBERFRAX® MILLED FIBERS: EF-119; HP Ball Milled A, HP Ball Milled B, HP Ball Milled C/D.  
 FIBERFRAX® HIGH INDEX FIBERS: W-657; W-707; W-758; HS-95C; MX-135-CW; MX-400-CW; HS-70; HS-70C.  
 FIBERFRAX® HSA™ FIBERS: HSA-K; HSA-HP  
 FIBERFRAX® KAOLIN FIBERS: K-Chopped; KMTX; MT; MTX; MT-T; MX-150.

**BLANKETS**  
 Durablanket® AC; Durablanket® HP; Durablanket® HP-S; Durablanket® S; Durablanket® Strip; Duraback® S; Tank Car Insulation; TCB; SMB; QSB600; QSB800; FIBERMAT®, LO-CON™ BLANKET

**PAPERS**  
 FIBERFRAX® BINDERLESS PAPERS: 972-AH; 972-FH; 972-JH; 882-FH; 882-JH; HSA-F without binder; HSA-J without binder.  
**Manufacturer/Supplier:** Unifrax Corporation  
 2351 Whirlpool St.  
 Niagara Falls, NY 14305-2413

**Product Stewardship Information Hotline**  
 1-800-322-2293 (Monday - Friday 8:00 a.m. - 4:30 p.m. EST)  
 For additional MSDSs, visit our web page, <http://www.unifrax.com>, or call Unifrax Customer Service at (716) 278-3872

**CHEMTREC Assist:** CHEMTREC will provide assistance for chemical emergencies. Call 1-800-424-9300

**2. COMPOSITION / INFORMATION ON INGREDIENTS**

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-6	100

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

**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. In animal studies, long-term laboratory exposure to doses hundreds of times higher than normal occupational exposures has produced fibrosis, lung cancer, and mesothelioma in rats or hamsters. The fibers used in those studies were specially sized to maximize rodent respirability.

**OTHER POTENTIAL EFFECTS**

**TARGET ORGANS:**  
 Respiratory Tract (nose & throat), Eyes, Skin

**RESPIRATORY TRACT (nose & throat) IRRITATION:**  
 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.

**EYE IRRITATION:**  
 May cause temporary, mild mechanical irritation. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

**SKIN IRRITATION:**  
 May cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.

**GASTROINTESTINAL IRRITATION:**  
 Unlikely route of exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:**  
 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. In each of the following cases, the conclusions are qualitative only and do not rest upon any quantitative analysis suggesting that the hazard actually may occur at current occupational exposure levels.

In October 2001, the **International Agency for Research on Cancer (IARC)** confirmed that Group 2b (possible human carcinogen) remains the appropriate IARC classification for RCF.

The Seventh Annual Report on Carcinogens (1994), prepared by the **National Toxicology Program (NTP)**, classified respirable RCF and glasswool 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 D2A – Materials Causing Other Toxic Effects

The **Hazardous Materials Identification System (HMIS)** –

Health 1\* Flammability 0 Reactivity 0 Personal Protection Index: X (Employer Determined)

(\* denotes potential for chronic effects)

#### 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: None

Flammable Properties: None

Flash Point: None

Hazardous Decomposition Products: None

Unusual Fire and Explosion Hazard: None

Extinguishing Media: 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.

##### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. 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	MANUFACTURER REG
Refractories, Fibers, Aluminosilicate	None Established*	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 – 0.5 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; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV 0.2 f/cc; RCFC REG 0.5 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.

**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 to maintain workplace concentrations within the 0.5 f/cc REG, 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 aluminosilicate 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.

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirable Airborne Fiber Concentration (levels are 8-hr, time-weighted averages)	Respirator Recommendation <sup>†</sup>
Not yet determined but expected to be below 5.0 f/cc based on operation	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
"Reliably" less than 0.5 f/cc	Optional
0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
5.0 f/cc to 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge or PAPR
Greater than 25 f/cc	PAPR with tight-fitting full facepiece or a supplied air respirator in continuous flow mode
When individual workers request respiratory protection as a matter of personal comfort or choice where exposures are "reliably" below 0.5 f/cc	A NIOSH certified respirator, such as a disposable particulate respirator, or respirators with filter cartridges rated N95 or better

<sup>†</sup>The P100 recommendation is a conservative default choice; in some case, 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 the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during furnace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica. If exposure levels are known, the respiratory protection chart provided above may be applied.
- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring.

**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 clothing must be taken home, employers 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, odorless, fibrous material
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:	Not Applicable

### 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:	None.
HAZARDOUS POLYMERIZATION:	Not Applicable.

### 11. TOXICOLOGICAL INFORMATION

#### HEALTH DATA SUMMARY

Epidemiological studies of RCF production workers have indicated no increased incidence of respiratory disease nor other significant health effects. 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) In early studies, an apparent 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. 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.

4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. Some studies appear to show a relationship between the occurrence of pleural plaques on chest radiographs and the following variables: (a) years since RCF production hire date; (b) duration of RCF production employment; and (c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. 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.

#### 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, these study findings 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 115, 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 intrapleural, 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.

**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.

**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.

**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.

**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.

**INTERNATIONAL REGULATIONS**

**Canada:** Canadian Workplace Hazardous Materials Information System (WHMIS) – RCF is classified as Class D2A – 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)  
European Directive 97/59/EC classified RCF as a Category 2 carcinogen; that is it "should be regarded as if it is carcinogenic to man."

**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 (mullite) begins to occur at approximately 985° C (1805° F). Crystalline phase silica may begin to form 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

**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.

**14. TRANSPORT INFORMATION**

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

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

**INTERNATIONAL**

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

**15. REGULATORY INFORMATION**

**UNITED STATES REGULATIONS**

injection; and (2) after-service RCF was not cytotoxic to macrophage-like cells at concentrations up to 320 g/cm<sup>2</sup> - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 g/cm<sup>2</sup>).

#### **RCF AFTER-SERVICE REMOVAL**

Respiratory protection should be provided in compliance with OSHA standards. During removal operations, a full face respirator 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 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.

On February 11, 2002, the Refractory Ceramic Fibers Coalition (RCFC) and the U.S. Occupational Safety and Health Administration (OSHA) introduced a voluntary worker protection program entitled PSP 2002, a comprehensive, multi-faceted risk management program designed to control and reduce workplace exposures to refractory ceramic fiber (RCF). Unifrax Corporation, as a member of RCFC, is participating in this highly acclaimed product stewardship program. For more information regarding PSP 2002, please call the Unifrax Corporation's Product Stewardship Information Hotline at 1-800-322-2293 or refer to the RCFC web site: <http://www.rcfc.net>.

#### **DEFINITIONS**

**ACGIH:** American Conference of Governmental Industrial Hygienists  
**ADR:** Carriage of Dangerous Goods by Road (International Regulation)  
**CAA:** Clean Air Act  
**CAS:** Chemical Abstracts Service  
**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act  
**DSL:** Domestic Substances List  
**EPA:** Environmental Protection Agency  
**EU:** European Union  
**f/cc:** Fibers per cubic centimeter  
**HEPA:** High Efficiency Particulate Air  
**HMIS:** Hazardous Materials Identification System  
**IARC:** International Agency for Research on Cancer  
**IATA:** International Air Transport Association  
**IMDG:** International Maritime Dangerous Goods Code  
**mg/m<sup>3</sup>:** Milligrams per cubic meter of air  
**mmpcf:** Million particles per cubic meter  
**NFPA:** National Fire Protection Association

**NIOSH:** National Institute for Occupational Safety and Health  
**OSHA:** Occupational Safety and Health Administration  
**29 CFR 1910.134 & 1926.103:** OSHA Respiratory Protection Standards

**29 CFR 1910.1200 & 1926.59:** OSHA Hazard Communication Standards

**PEL:** Permissible Exposure Limit (OSHA)  
**PIN:** Product Identification Number

**PNOC:** Particulates Not Otherwise Classified  
**PNOR:** Particulates Not Otherwise Regulated

**PSP:** Product Stewardship Program

**RCFC:** Refractory Ceramic Fibers Coalition  
**RCRA:** Resource Conservation and Recovery Act  
**REC:** Recommended Exposure Guideline (RCFC)

**REL:** Recommended Exposure Limit (NIOSH)  
**RID:** Carriage of Dangerous Goods by Rail (International Regulations)

**SARA:** Superfund Amendments and Reauthorization Act  
**SARA Title III:** Emergency Planning and Community Right to Know Act

**SARA Section 302:** Extremely Hazardous Substances  
**SARA Section 304:** Emergency Release

**SARA Section 311:** MSDS/List of Chemicals and Hazardous Inventory  
**SARA Section 312:** Emergency and Hazardous Inventory

**SARA Section 313:** Toxic Chemicals and Release Reporting  
**STEL:** Short Term Exposure Limit

**SVF:** Synthetic Vitreous Fiber  
**TDG:** Transportation of Dangerous Goods

**TLV:** Threshold Limit Value (ACGIH)  
**TSCA:** Toxic Substances Control Act

**TWA:** Time Weighted Average  
**WHMIS:** Workplace Hazardous Materials Information System (Canada)

**Revision Summary:** Minor modification to declassification section. Replaces 06/10/03 MSDS.

**MSDS Prepared By:** UNIFRAX RISK MANAGEMENT DEPARTMENT

#### **DISCLAIMER**

The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Material Safety Data Sheet. Employers may use this MSDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this MSDS. Therefore, given the summary nature of this document, Unifrax Corporation does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.

7.4 M0055 Fiberfrax® High Purity Papers



**MATERIAL SAFETY DATA SHEET**

MSDS No. M0055

Effective Date: 03/09/2004

**1. CHEMICAL 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:** FIBERFRAX® HIGH PURITY PAPERS  
 550-F, 550-J, 550-K, 880-F, 880-J, 970-A, 970-F, 970-J, 970-K, Rollboard, HSA-F with binder, HSA-J with binder, QSP100, QSP300, QSP500, QSP1000.  
**Manufacturer/Supplier:** Unifrax Corporation  
 2351 Whirlpool St.  
 Niagara Falls, NY 14305-2413

**Product Stewardship Information Hotline**  
 1-800-322-2293 (Monday - Friday 8:00 a.m. - 4:30 p.m. EST)

For additional MSDSs, visit our web page, <http://www.unifrax.com>, or call Unifrax Customer Service at (716) 278-3872

**CHEMTREC Assist:** CHEMTREC will provide assistance for chemical emergencies. Call 1-800-424-9300

**2. COMPOSITION / INFORMATION ON INGREDIENTS**

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-6	85-95
Acrylic latex (See Section 8 "Exposure Controls / Personal Protection" for exposure guidelines)	MIXTURE	5-15

**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. In animal studies, long-term laboratory exposure to ~~hundreds~~ hundreds of times higher than normal occupational exposures has produced fibrosis, lung cancer, and mesothelioma in rats or hamsters. The fibers used in those studies were specially added to maximize rodent respirability.

**OTHER POTENTIAL EFFECTS**

**TARGET ORGANS:**  
 Respiratory Tract (nose & throat), Eyes, Skin

**RESPIRATORY TRACT (nose & throat) IRRITATION:**  
 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.

**EYE IRRITATION:**  
 May cause temporary, mild mechanical irritation. Fibers may be abrasive; prolonged contact may cause damage to the outer surface of the eye.

**SKIN IRRITATION:**  
 May cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.

**GASTROINTESTINAL IRRITATION:**  
 Unlikely route of exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:**  
 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. In each of the following cases, the conclusions are qualitative only and do not rest upon any quantitative analysis suggesting that the hazard actually may occur at current occupational exposure levels.

In October 2001, the **International Agency for Research on Cancer (IARC)** confirmed that Group 2b (possible human carcinogen) remains the appropriate IARC classification for RCF.

The **Seventh Annual Report on Carcinogens (1994)**, prepared by the **National Toxicology Program (NTP)**, classified respirable RCF and glasswool 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 D2A – Materials Causing Other Toxic Effects

The Hazardous Materials Identification System (HMIS) –

Health 1\* Flammability 0 Reactivity 0 Personal Protection Index: X (Employer Determined)

(\* denotes potential for chronic effects)

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: None

Flammable Properties: None

Flash Point: None

**Hazardous Decomposition Products:** Thermal decomposition of binder from fires or from first heat of product may release smoke, carbon monoxide, carbon dioxide, oxides of nitrogen and small amounts of aromatic and aliphatic hydrocarbons. Use adequate ventilation or other precautions to eliminate exposure to vapors resulting from thermal decomposition of binder. Exposure to thermal decomposition fumes may cause respiratory tract irritation, bronchial hyper-reactivity or an asthmatic-type response.

**Unusual Fire and Explosion Hazard:** None

**Extinguishing Media:** 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.

## 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:

## 7. HANDLING AND STORAGE

### STORAGE

Store in original container in a dry area. Keep container closed when not in use.

### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. 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 – RCF

COMPONENTS

OSHA PEL

MANUFACTURER REG

Refractories, Fibers, Aluminosilicate	None Established*	0.5 f/cc, 8-hr, TWA**
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\* There is no specific regulatory standard for RCF in the U.S. OSHA's "Particulate Not Other 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 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 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, RC has adopted a recommended exposure guideline, as measured under NIOSH Method 7400 E. 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 – 1.0 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; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV 0.2 f/cc; RCFC REG 0.5 f/cc. The objectives and criteria underlying each these OEL decisions also vary. The evaluation of occupational exposure limits and determine their relative applicability to the workplace is best performed, on a case-by-case basis, by a qualified Industrial Hygienist.

**EXPOSURE GUIDELINES – OTHER INGREDIENTS**

COMPONENTS	OSHA PEL	MANUFACTURER REG
Acrylic latex	None established	None established

**OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)**

Non-regulatory OEL examples include: ACGIH TLVs (TWAs): Acrylic latex – None established

**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 to maintain workplace

concentrations within the 0.5 f/cc REG, 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 aluminosilicate 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.

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirable Airborne Fiber Concentration (levels are 8-hr, time-weighted averages)	Respirator Recommendation†
Not yet determined but expected to be below 5.0 f/cc based on operation	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
"Reliably" less than 0.5 f/cc	Optional
0.5 f/cc to 5.0 f/cc	Half-face, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge
5.0 f/cc to 25 f/cc	Full-facepiece, air purifying respirator equipped with a NIOSH certified P100 particulate filter cartridge or PAPR
Greater than 25 f/cc	PAPR with tight-fitting full facepiece or a supplied air respirator in continuous flow mode
When individual workers request respiratory protection as a matter of personal comfort or choice where exposures are "reliably" below 0.5 f/cc	A NIOSH certified respirator, such as a disposable particulate respirator, or respirators with filter cartridges rated N95 or better

† The P100 recommendation is a conservative default choice; in some case, 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 the use of a full-facepiece air purifying respirator equipped with an appropriate particulate filter cartridge during furnace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica. If exposure levels are known, the respiratory protection chart provided above may be applied.
- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring.

**HEALTH DATA SUMMARY**

**Epidemiological studies of RCF production workers have indicated no increased incidence of respiratory disease nor other significant health effects. 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) In early studies, an apparent 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. 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.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. Some studies appear to show a relationship between the occurrence of pleural plaques on chest radiographs and the following variables: (a) years since RCF production hire date; (b) duration of RCF production employment; and (c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. 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.

**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, these study findings 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 115, 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

**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 clothing must be taken home, employers 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, odorless, fibrous material

**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:** Not Applicable

**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, carbon dioxide, oxides of nitrogen and small amounts of aromatic and aliphatic hydrocarbons. Use adequate ventilation or other precautions to eliminate exposure to vapors resulting from thermal decomposition of binder. 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**

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, intratracheal 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.

### 14. TRANSPORT INFORMATION

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

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

#### INTERNATIONAL

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

### 15. REGULATORY INFORMATION

#### UNITED STATES REGULATIONS

**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.

**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.

**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.

**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.

#### INTERNATIONAL REGULATIONS

**Canada:**

**Canadian Workplace Hazardous Materials Information System (WHMIS)** - RCF is classified as Class D2A - 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)

**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."

### 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 (mullite) begins to occur at approximately 985° C (1905° F). Crystalline phase silica may begin to form 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 g/cm<sup>2</sup> - by comparison, pure quartz or cristobalite were significantly active at much lower levels (circa 20 g/cm<sup>2</sup>).

#### **RCF AFTER-SERVICE REMOVAL**

Respiratory protection should be provided in compliance with OSHA standards. During removal operations, a full face respirator 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 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.

On February 11, 2002, the Refractory Ceramic Fibers Coalition (RCFC) and the U.S. Occupational Safety and Health Administration (OSHA) introduced a voluntary worker protection program entitled PSP 2002, a comprehensive, multi-faceted risk management program designed to control and reduce workplace exposures to refractory ceramic fiber (RCF). Unifrax Corporation, as a member of RCFC, is participating in this highly acclaimed product stewardship program. For more information regarding PSP 2002, please call the Unifrax Corporation's Product Stewardship Information Hotline at 1-800-322-2293 or refer to the RCFC web site: <http://www.rcfc.org>.

#### **DEFINITIONS**

**ACGIH:** American Conference of Governmental Industrial Hygienists  
**ADR:** Carriage of Dangerous Goods by Road (International Regulation)  
**CAA:** Clean Air Act  
**CAS:** Chemical Abstracts Service  
**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act  
**DSL:** Domestic Substances List  
**EPA:** Environmental Protection Agency  
**EU:** European Union  
**ficc:** Fibers per cubic centimeter  
**HEPA:** High Efficiency Particulate Air  
**HMS:** Hazardous Materials Identification System  
**IARC:** International Agency for Research on Cancer  
**IATA:** International Air Transport Association  
**IMDG:** International Maritime Dangerous Goods Code  
**mg/m<sup>3</sup>:** Milligrams per cubic meter of air  
**mmpcf:** Million particles per cubic meter  
**NFPA:** National Fire Protection Association

**NIOSH:**  
**OSHA:**  
**29 CFR 1910.134 & 1926.103:**  
**29 CFR 1910.1200 & 1926.59:**

National Institute for Occupational Safety and Health  
 Occupational Safety and Health Administration  
 OSHA Respiratory Protection Standards

OSHA Hazard Communication Standards

Permissible Exposure Limit (OSHA)

Product Identification Number

Particulates Not Otherwise Classified

Particulates Not Otherwise Regulated

Product Stewardship Program

Refractory Ceramic Fibers Coalition

Resource Conservation and Recovery Act

Recommended Exposure Guideline (RCFC)

Recommended Exposure Limit (NIOSH)

Carriage of Dangerous Goods by Rail (International Regulations)

Superfund Amendments and Reauthorization Act

Emergency Planning and Community Right to Know Act

Extremely Hazardous Substances

Emergency Release

MSDS/List of Chemicals and Hazardous Inventory

Emergency and Hazardous Inventory

Toxic Chemicals and Release Reporting

Short Term Exposure Limit

Synthetic Vitreous Fiber

Transportation of Dangerous Goods

Threshold Limit Value (ACGIH)

Toxic Substances Control Act

Time Weighted Average

Workplace Hazardous Materials Information System (Canada)

**Revision Summary:** Minor modification to devittrification section. Replaces 2/1/02 MSDS.

**MSDS Prepared By:** UNIFRAX RISK MANAGEMENT DEPARTMENT

#### **DISCLAIMER**

The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Material Safety Data Sheet. Employers may use this MSDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this MSDS. Therefore, given the summary nature of this document, Unifrax Corporation does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.

7.5 Kaowool® Insulation MSDS 203

MSDS No: 203 Date Prepared: 08/01/1987 Current Date: 4/13/2006 Last Revised: (04/13/2006)

**CHRONIC EFFECT**  
There has been no increased incidence of respiratory disease in studies examining occupationally exposed workers. In animal studies, long term laboratory exposures to doses hundreds of times higher than normal occupational exposures has produced fibrosis, lung cancer and mesothelioma in rats or hamsters. The fibers used in those studies were specially sized to maximize rodent respirability.

**OTHER POTENTIAL EFFECTS**  
Respiratory Tract (nose and throat), Eyes, Skin

**RESPIRATORY TRACT (nose and throat) IRRITATION:**  
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.

**EYE IRRITATION:**  
May cause temporary, mild mechanical irritation. Fibers may be abrasive, prolonged contact may cause damage to the outer surface of the eye.

**SKIN IRRITATION:**  
May cause temporary, mild mechanical irritation. Exposure may also result in inflammation, rash or itching.

**GASTROINTESTINAL IRRITATION:**  
Unlikely route of exposure.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:**  
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. In each of the following cases, the conclusions are qualitative only and do not rest upon any quantitative analysis suggesting that the hazard actually may occur at current occupational exposure levels.

The International Agency for Research on Cancer (IARC) confirmed in October 2001 that Group 2B (possible human carcinogen based on sufficient evidence of carcinogenicity in animals but inadequate evidence in humans) continues to be the appropriate classification for refractory ceramic fiber.

The Seventh Annual Report on Carcinogens (1994), prepared by the National Toxicology Program (NTP), classified respirable RCF and glasswool 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 D2A - Materials Causing Other Toxic Effects.

The Hazardous Materials Identification System (HMIS) –  
Health 1\* Flammability 0 Reactivity 0 Personal Protection Index X (Employer Determined)  
(\* denotes potential for chronic effects)



**MATERIAL SAFETY DATA SHEET**

MSDS No: 203 Date Prepared: 08/01/1987 Current Date: 4/13/2006 Last Revised: (04/13/2006)

**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

**Product Group:** REFRACTORY CERAMIC FIBER PRODUCT  
**Chemical Name:** VITREOUS ALUMINOSILICATE FIBER  
**Synonyms:** RCF, ceramic fiber, synthetic vitreous fiber (SVF), man-made vitreous fiber (MMVF), man-made mineral fiber (MMMF) PADS/FELTS/WRAP/S MODULES SLEEVES  
**Trade Names:** Pyro-Bloc® Plus XT Kaowool® Riser  
Pyro-Bloc® Plus IT Kaowool® RIS-A Cer-Wool® Wet Wrap, Wet Wrap HT

BOARDS and SHAPES  
Kaowool® 12C, M, Rigidized M, HP, PM, HT, 2300R, 2300H, VF, 399E  
Ceracorm®: 102, 103, 140, 141, Custom Molded  
FireMaster®: FireMaster® NS  
TM 2300  
Thermolec®: HT, HP, LD, A, AR

**Manufacturer/Supplier:** Thermal Ceramics Inc.  
P. O. Box 923; Dept. 300  
Augusta, GA 30903-0923

For Product Stewardship and Emergency Information -  
Hotline: 1-800-722-5681  
Fax: 708-568-4064

For additional MSDSs and to confirm this is the most current MSDS for the product, visit our web page [www.thermalceramics.com].

**2. COMPOSITION / INFORMATION ON INGREDIENTS**

COMPONENTS	CAS NUMBER	% BY WEIGHT
Refractories, Fibers, Aluminosilicate	142844-00-5	85 - 90
Silica, amorphous	7631-86-9	5 - 15
Starch	9005-25-9	4 - 8

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

**3. HAZARDS IDENTIFICATION**

**EMERGENCY OVERVIEW**  
WARNING!  
POSSIBLE CANCER HAZARD BY INHALATION  
(See Section 11 for more information)

MSDS No: 203 Date Prepared: 08/01/1987 Current Date: 4/13/2006  
Last Revised: (04/13/2006)

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### EXPOSURE GUIDELINES

MAJOR COMPONENT	OSHA PEL	MANUFACTURER'S REG.
Refractories, Fibers, Aluminosilicate	None Established*	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 (REG), as measured under NIOSH Method 7400 B. The manufacturers' REG is intended to promote occupational health and safety through feasible exposure controls and reductions as determined by extensive industrial hygiene monitoring efforts undertaken voluntarily and 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 (0.25 f/cc for new installations); 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; United Kingdom – 2.0 f/cc. Non-regulatory OEL examples include: ACGIH TLV – 0.2 f/cc; RCFC REG – 0.5 f/cc. The objectives and criteria underlying each of these OEL decisions also vary. The evaluation of occupational exposure limits and their relative applicability to the workplace is best performed, on a case-by-case basis, by a qualified Industrial Hygienist.

OTHER COMPONENTS	OSHA PEL	MANUFACTURER'S REG.
Silica, amorphous	(80 mg/m <sup>3</sup> = % SiO <sub>2</sub> ) or 20 mgpcf	None Established
Starch	15 mg/m <sup>3</sup> (total); 5 mg/m <sup>3</sup> (respirable)	None Established

- % SiO<sub>2</sub> = Percent of crystalline silica.

### OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL)

International occupational exposure levels (OELs), both regulatory and non-regulatory, for the other ingredients in this product may vary. Contact the appropriate, local regulatory authority for current limits. The evaluation of occupational exposure limits and the determination of their relative applicability to the workplace are best performed, on a case-by-case basis, by a qualified Industrial Hygienist.

Non-regulatory OEL examples include: ACGIH TLVs (8 hr., TWA): Silica, amorphous – 10 mg/m<sup>3</sup>; Starch – 10 mg/m<sup>3</sup>.

### ENGINEERING CONTROLS

Use feasible 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 to maintain workplace exposures within the 0.5 f/cc REG, 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 aluminosilicate 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.

MSDS No: 203 Date Prepared: 08/01/1987 Current Date: 4/13/2006  
Last Revised: (04/13/2006)

## 4. FIRST AID MEASURES

### RESPIRATORY TRACT (nose and throat) IRRITATION:

If respiratory tract irritation develops, move the person to a dust free location. 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.

### 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.

- If the above symptoms persist, seek medical attention. -

### 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: None  
Flammable Properties: None  
Flash Point: None  
Hazardous Decomposition Products: None  
Unusual Fire and Explosion Hazard: None  
Extinguishing Media: 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 should 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.

### HANDLING

Handle ceramic fiber carefully. Limit use of power tools unless in conjunction with local exhaust. Use hand tools whenever possible. 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.

MSDS No: 203 Date Prepared: 08/01/1987 Current Date: 4/13/2006  
Last Revised: (04/13/2006)

MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS	
Respirator Recommendation 1:	
Respirable Airborne Fiber Concentration	Respirator Recommendation 1:
Not yet determined but expected to be below 5.0 floc based on operation	Half-face, air-purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge.
"Reliably" less than 0.5 floc	See recommendation below for individual worker requests.
0.5 floc -- 5.0 floc	Half-face, air-purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge.
5.0 floc -- 25 floc	Full-facepiece, air-purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge or PAPR.
Greater than 25 floc	PAPR with tight-fitting full facepiece or a supplied air respirator in continuous flow mode.
When individual workers request respiratory protection as a matter of personal comfort or choice and exposures are "reliably" below 0.5 floc (8-hr., TWA)	A NIOSH-certified respirator, such as a disposable particulate respirator or respirators with filter cartridges rated N95 or better.

1. Note: 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 the use of a full-facepiece, air purifying respirator equipped with an appropriate particulate filter cartridge during furnace tear-out events and the removal of used RCF to control exposures to airborne fiber and the potential presence of crystalline silica. If exposure levels are known, the respiratory protection chart provided above may be applied.
- Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring.
- In the absence of other objective data or when concentrations are unknown, the manufacturer recommends the use of a half-face, air-purifying respirator equipped with a NIOSH-certified P-100 particulate filter cartridge (See above note).

**Skin Protection:**

Wear gloves (e.g. cotton), 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 work clothing home. If soiled work clothing must be taken home, employers should ensure employees are 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.

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**9. PHYSICAL AND CHEMICAL PROPERTIES**

**ODOR AND APPEARANCE:** Fiber shapes  
Vitreous Aluminosilicate Fibers  
**CHEMICAL FAMILY:** Not Applicable  
**BOILING POINT:** Not Soluble in Water  
1760° C (3200° F)  
**MELTING POINT:** 2.50 - 2.75  
**SPECIFIC GRAVITY:** Not Applicable  
**VAPOR PRESSURE:** Not Applicable  
**pH:** Not Applicable  
**VAPOR DENSITY (Air = 1):** Not Applicable  
**% VOLATILE:** Not Applicable  
**MOLECULAR FORMULA:** Not Applicable

**10. STABILITY AND REACTIVITY**

**CHEMICAL STABILITY:** Stable under conditions of normal use  
**INCOMPATIBILITY:** None  
**CONDITIONS TO AVOID:** None  
**HAZARDOUS DECOMPOSITION PRODUCTS:** Oxides of carbon and trace of ammonia may be released from starch during initial heating of this product  
**HAZARDOUS POLYMERIZATION:** Not Applicable

**11. TOXICOLOGICAL INFORMATION**

**HEALTH DATA SUMMARY:**

Epidemiological studies that include most people who have ever worked in domestic RCF production have indicated 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.

**EPIDEMOLOGY:**

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) In early studies an apparent statistical "trend" within the exposed population was observed 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 reflects the earlier observations, finding no effect on lung function associated with RCF production experience. 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.
- 4) Pleural plaques (thickening along the chest wall) have been observed in a small number of RCF employees. Some studies appear to show a relationship between the occurrence of pleural plaques on chest radiographs and the following variables: (a) years since RCF production hire date; (b) duration of RCF production employment; and (c) cumulative RCF exposure. The best evidence to date indicates that pleural plaques are a marker of exposure only. 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.

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#### 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, these study findings 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 115, 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 intrapleural, 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.

Silica, amorphous: Toxic effects described in animals from single inhalation exposures of amorphous silica include upper respiratory irritation, lung congestion, bronchitis, and emphysema. Repeated inhalation exposures at concentration of 50 or 150 mg/m<sup>3</sup> produced increased lung weights and lung changes. No progressive pulmonary fibrosis was seen and the observed lung changes were reversible. No adverse effects were observed in this study at 10 mg/m<sup>3</sup>. No animal test reports are available to define the carcinogenic, mutagenic, or reproductive effects.

To obtain more epidemiology or toxicology information, please call the toll free telephone number for the Thermal Ceramics 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). As manufactured, RCF was tested using EPA's Toxicity Characteristic Leaching Procedure (TCLP). Results showed there were no detectable contaminants or detectable leachable contaminants that exceeded the regulatory levels. 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.

#### 14. TRANSPORT INFORMATION

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

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

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#### INTERNATIONAL

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

#### 15. REGULATORY INFORMATION

##### UNITED STATES REGULATIONS

**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)** - RCF has been assigned a CAS number; however, it is not required to be listed on the TSCA 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.

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.

**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.

**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.

##### INTERNATIONAL REGULATIONS

**Canada:** **Canadian Workplace Hazardous Materials Information System (WHMIS)** - RCF is classified as Class D2A - Materials Causing Other Toxic Effects

**Canadian Environmental Protection Act (CEPA)** - All substances in this product are listed, as required, on the Domestic Substances List (DSL)

**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."

#### 16. OTHER INFORMATION

##### RCF DEWITRIFICATION:

As produced, all RCF fibers are vitreous (glassy) materials that do not contain crystalline silica. Continued exposure to elevated temperatures may cause these fibers to devitrify (become crystalline). The first crystalline formation (mullite) 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 "in making the overall evaluation, the Working Group noted that carcinogenicity in humans was not detected in all industrial circumstances studied. Carcinogenicity may be dependent on inherent characteristics of the crystalline silica or on external factors affecting its biological activity or distribution of its polymorphs." (IARC Monograph Vol. 68, 1997). NTP lists all polymorphs of crystalline silica amongst substances which may "reasonably be anticipated to be carcinogens."

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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 EPA, 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 the Product Stewardship Program and OSHA standards. During removal operations, a FULL FACE RESPIRATOR 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. For more information, call the Thermal Ceramics Product Stewardship Hotline (800-722-5681).

**PRODUCT STEWARDSHIP PROGRAM:**  
 Morgan Thermal Ceramics has established a program to provide customers with up-to-date information regarding the proper use and handling of RCF. In addition, Thermal Ceramics has established a program to monitor airborne fiber concentrations at customer facilities. If you would like more information about this program, please call your local supplier or visit one of the following web sites:

- Thermal Ceramics - Global [www.thermalceramics.com](http://www.thermalceramics.com)
- Refractory Ceramic Fibers Coalition (USA) [www.RCFC.net](http://www.RCFC.net)
- ECFIA (Europe) [www.ecfia.org](http://www.ecfia.org)

**LABELING:**  
 As product information labels may be required on RCF packages, check local destination regulations before shipping.

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**ACGIH:** American Conference of Governmental Industrial Hygienists  
**ADR:** Carriage of Dangerous Goods by Road (International Regulation)  
**CAA:** Clean Air Act  
**CAS:** Chemical Abstracts Service  
**CERCLA:** Comprehensive Environmental Response, Compensation and Liability Act  
**DSL:** Domestic Substances List  
**EPA:** Environmental Protection Agency  
**EU:** European Union  
**f/cc:** Fibers per cubic centimeter  
**HEPA:** High Efficiency Particulate Air  
**HMS:** Hazardous Materials Identification System  
**IARC:** International Agency for Research on Cancer  
**IATA:** International Air Transport Association  
**IMDG:** International Maritime Dangerous Goods Code  
**mg/m<sup>3</sup>:** Milligrams per cubic meter of air  
**mmppc:** Million particles per cubic meter  
**NFPA:** National Fire Protection Association  
**NIOSH:** National Institute for Occupational Safety and Health  
**OSHA:** Occupational Safety and Health Administration  
**29 CFR 1910.134 & 1926.103:** OSHA Respiratory Protection Standards  
**29 CFR 1910.1200 & 1926.59:** OSHA Hazard Communication Standards  
**PEL:** Permissible Exposure Limit (OSHA)  
**PIN:** Product Identification Number  
**PNOC:** Particulates Not Otherwise Classified  
**PNOR:** Particulates Not Otherwise Regulated  
**PSP:** Product Stewardship Program  
**RCFC:** Refractory Ceramic Fibers Coalition  
**RCRA:** Resource Conservation and Recovery Act  
**REG:** Recommended Exposure Guideline (RCFC)  
**REL:** Recommended Exposure Limit (NIOSH)  
**RID:** Carriage of Dangerous Goods by Rail (International Regulations)  
**SARA:** Superfund Amendments and Reauthorization Act  
**SARA Title III:** Emergency Planning and Community Right to Know Act  
**SARA Section 302:** Extremely Hazardous Substances  
**SARA Section 304:** Emergency Release  
**SARA Section 311:** MSDS/List of Chemicals and Hazardous Inventory  
**SARA Section 312:** Emergency and Hazardous Inventory  
**SARA Section 313:** Toxic Chemicals and Release Reporting  
**STEL:** Short Term Exposure Limit  
**SVF:** Synthetic Vitreous Fiber  
**TDG:** Transportation of Dangerous Goods  
**TLV:** Threshold Limit Value (ACGIH)  
**TSCA:** Toxic Substances Control Act  
**TWA:** Time Weighted Average  
**WHMIS:** Workplace Hazardous Materials Information System (Canada)

**Revision Summary:**  
 Section 1: The following products have been added:  
 Thermolec® HT, HP, LD, A, AR, Cer-Wool® Wet Wrap, Wet Wrap HT.

**MSDS Prepared By:**  
 THERMAL CERAMICS ENVIRONMENTAL, HEALTH & SAFETY DEPARTMENT

**DISCLAIMER**  
 The information presented herein is presented in good faith and believed to be accurate as of the effective date of this Material Safety Data Sheet. Employers may use this MSDS to supplement other information gathered by them in their efforts to assure the health and safety of their employees and the proper use of the product. This summary of the relevant data reflects professional judgment; employers should note that information perceived to be less relevant has not been included in this MSDS. Therefore, given the summary nature of this document, Thermal Ceramics does not extend any warranty (expressed or implied), assume any responsibility, or make any representation regarding the completeness of this information or its suitability for the purposes envisioned by the user.

## 7.6 MSDS 0732 RTV Silicone 732

## Material Safety Data Sheet

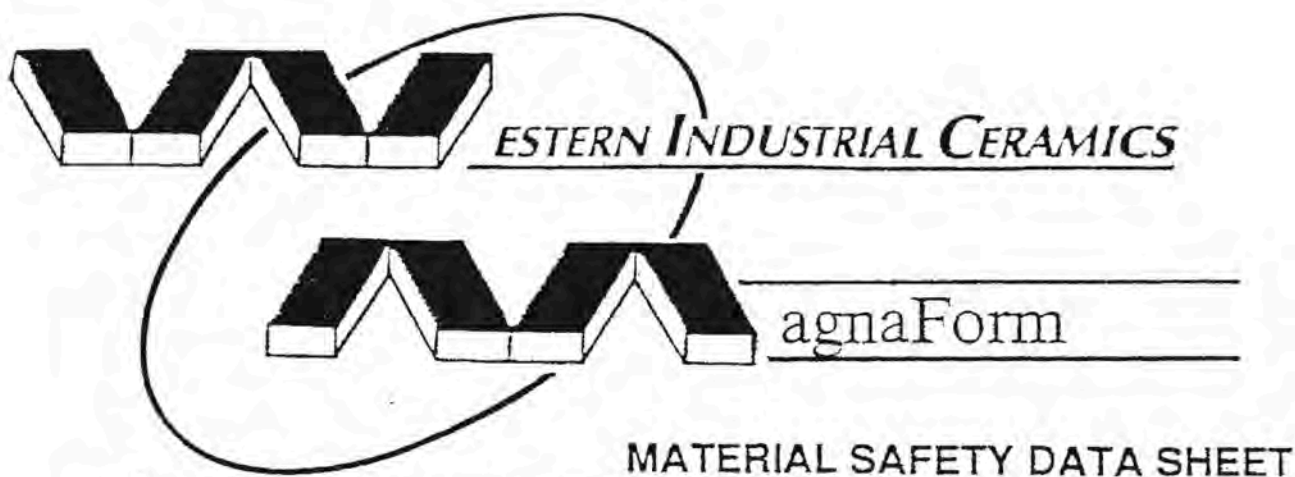
RTV SILICONE 732  
RED HI-TEMP

<b>IDENTITY</b> (as used on label and list)		SAF-T-LOK RTV SILICONE 732	
Manufacturer's name		Emergency Telephone Number	
SAF-T-LOK CHEMICAL CORPORATION		Chemtrec 1-800-424-9300	
300 EISENHOWER LANE NORTH		Telephone Number for Information	
LOMBARD, ILLINOIS, USA 60148		630-495-2001	
Date Prepared			
NOVEMBER 01, 2005			
<b>Section II—Hazardous Ingredients/Identity Information</b>			
Hazardous Components (Specific Chemical Identity, Common Name(s))		OSHA PEL	ACGIH TLV
• Acetoxysilane			10ppm
• TLV based on acetic acid formed during curing			
All components of this product are listed on the Toxic Substance Control Act (TSCA) inventory of chemical substances maintained by the U.S. Environmental Protection Agency.			
<b>Section III—Physical/Chemical Characteristics</b>			
Boiling Point	>300°F	Specific Gravity (H <sub>2</sub> O = 1)	1.05
Vapor Pressure (mm Hg)	@ 77°F	Melting Point	N/A
Vapor Density (AIR = 1)	<5 mm	Evaporation Rate (Butyl Acetate = 1)	<1
Solubility in Water	Less than 0.1%		
Appearance and Odor	Semi-solid material with acetic acid odor. Red color.		
<b>Section IV—Fire and Explosion Hazard Data</b>			
Flash Point (Method Used)	Open cup >250°F	Flammable Limits	LEL N/A UEL N/A
Extinguishing Media	Water, water fog, Carbon Dioxide, dry chemical, foam.		
Special Fire Fighting Procedures	Self contained breathing apparatus and protective clothing should be worn in fighting fires involving chemicals.		
Unusual Fire and Explosion Hazards	None Known.		
<b>Section V—Reactivity Data</b>			
Stability	Unstable	Conditions to Avoid	
	Stable	Exposure to air until ready to use.	X
Incompatibility (Materials to Avoid)	Oxidizing material can cause a reaction.		
Hazardous Decomposition or Byproducts	Silicon Dioxide, Carbon Dioxide and traces of incompletely burned carbon products.		
Hazardous Polymerization	May Occur	Conditions to Avoid	N/A

Polymerization	Will not Occur	X
<b>Section VI—Health Hazard Data</b>		
Route(s) of Entry:	Inhalation? Yes	Ingestion? Yes
Health Hazards (Acute and Chronic)	Yes	Yes
EYES: Direct contact may burn eyes, irritate severely or permanently injure depending on exposure. SKIN: May cause irritation. INHALATION: May cause drowsiness & irritate nose and throat. Vapors may injure blood, lungs, liver and nervous systems. INGESTION: Small amounts should not injure. Inhaling liquid while vomiting can injure lungs seriously.	UAC: Monographs?	OSHA Regulated
Carcinogenicity: N/A	NTP?	
Signs and Symptoms of Exposure	Vary according to degree of exposure. Minimal exposure should not injure. See above for symptoms of prolonged exposure.	
Medical Conditions Generally Aggravated by Exposure	Prolonged toluene overexposure may aggravate existing eye, skin & respiratory disorder.	
Emergency and First Aid Procedures	EYES: Flush with water for 15 minutes, get medical attention. SKIN: Wash with soap and water. INHALATION: Remove to fresh air. INGESTION: Get immediate medical attention if a large amount is swallowed.	
<b>Section VII—Precautions for Safe Handling and Use</b>		
Steps to be Taken in Case Material is Released or Spilled	Use absorbent material to collect and contain for salvage or disposal. Remove all source of ignition and wear proper protection equipment.	
Waste Disposal Method	Dispose in accordance with State, Federal, and local anti-pollution and waste disposal regulations.	
Precautions to be Taken in Handling and Storing	Keep container closed and away from heat, sparks and open flame.	
Other Precautions	Static electricity may accumulate and create fire hazard. Ground fixed equipment.	
<b>Section VIII—Control Measures</b>		
Respiratory Protection (Specify Type)	Organic vapor type.	
Ventilation:	Local Exhaust	Recommended Special
	Mechanical (General)	Recommended Other
Protective Gloves	Rubber or plastic	Eye Protection
Other Protective Clothing or Equipment	Aprons, boots	
Work/Hygiene Practices	Wash promptly upon any detectable contact	

The information on this data sheet represents our current data and best opinion as to the proper use in handling of this product under normal conditions. Any use of the product which is not in conformance with this data sheet or which involves using the product in combination with any other product or any other process is the responsibility of the user.

7.7 MSDS MagnaForm Boards



MANUFACTURER/SUPPLIER: WESTERN INDUSTRIAL CERAMICS, INC.  
 ADDRESS: 10725 S.W. TUALATIN - SHERWOOD RD., TUALATIN, OREGON 97062  
 EMERGENCY PHONE: 1 - 800 - 727 - 9424  
 1 - 503 - 692 - 3770

**SECTION I: PRODUCT IDENTIFICATION:**

TRADE NAME:  
**MAGNAFORM BOARDS & SHAPES**

CAS NUMBER:	MIXTURE
SYNONYM(S):	CERAMIC FIBER; REFRACTORY FIBER; REFRACTORY CERAMIC FIBER; MMVF; R.C.F.
CHEMICAL FAMILY;	VITREOUS ALUMINOSILICATE FIBERS
MOLECULAR FORMULA:	NA
MOLECULAR WEIGHT:	NA
PRODUCT CODE:	NA HIERARCHY: NA

COMMENTS: MAGNAFORM BOARDS & SHAPES are made of bulk refractory fiber from several manufactures, inorganic binders, and additionally, in some compositions from starches, mineral wool, or polycrystalline alumina fiber

**SECTION II: PRODUCT HAZARD SUMMARY:**

HEALTH:	WARNING! POSSIBLE CANCER HAZARD BY INHALATION MAY BE HARMFUL IF INHALED (hazard depends on duration and level of exposure) MAY BE IRRITATING TO SKIN, EYES, AND RESPIRATORY TRACT
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FLAMMABILITY:	NON-COMBUSTIBLE
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REACTIVITY:	STABLE
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ND = NO DATA  
 NA = NOT APPLICABLE