

SAFETY DATASHEET

(Following Regulations (EC) No 1907/2006 & (EC) No 1272/2008)

SDS Number: 260

Date of first issue: 15 December 1994

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1 - Identification of product

Tradenames: Kaowool 14C Boards and Shapes, Kaowool 15C Boards and Shapes, Kaowool 2600 Boards and Shapes, Kaowool 2600R Boards and Shapes, Kaowool 3000 Boards and Shapes, Kaowool 80 Boards and Shapes, Kaowool HT Boards and Shapes, Kawool 17C Boards and Shapes, Thermotect 80 Boards, Unifelt 14C Boards and Shapes,

Product Group

REFRACTORY CERAMIC FIBER PRODUCT

Chemical Name

Vitreous Aluminosilicate Fiber

Intended Release

Use of the products is restricted to professional users for application as thermal insulation, heat shields, heat containment, gaskets and expansion joints at temperatures up to 1400°C in industrial furnaces, ovens, kilns, boilers and other process equipment and in the aerospace and automotive industries. Products are not intended for direct sale to the general public

- Primary Use: Manufacture of fiber (this use refers to the initial production of the fiber and is therefore not relevant to the downstream user)
- Secondary Use: Conversion into wet and dry mixtures and articles
- Tertiary Use: Installation, removal (industrial and professional) / Maintenance and service life (industrial and professional)

Uses Advised Against
Spraying of the product

Synonyms

RCF, ceramic fiber, synthetic vitreous fiber (SVF), man-made vitreous fiber (MMVF), man-made mineral fiber (MMMF)

Trade Names

Kaowool® 2600, 2600R, 3000, 14C, 15C, 17C, 80:
Boards, Modules, Sleeves, Shapes
Unifelt® 14C, XT, 3000(HT):
Boards, Modules, Veneering Modules, Sleeves, Shapes
Thermotect® 80: Boards

Company

Morgan Advanced Materials

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For Product Stewardship and Emergency Information:

Hotline - 1-800-722-5681

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For additional SDSs and to confirm this is the most current SDS for the product, visit our web page www.morganthermalceramics.com or send a request to MT.NorthAmerica@morganplc.com

2 - Hazard Identification

Emergency Overview

POSSIBLE CANCER HAZARD BY INHALATION.

(See Section 11 for more information)

Chronic Effects

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.

Possible Health Effects

Target Organs: Respiratory Tract (nose and throat), Eyes, Skin

Respiratory Tract 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 Info

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)

3 - Composition / Information On Ingredients

| COMPONENTS | CAS NUMBER | % BY WEIGHT |
|---------------------------------------|-------------|-------------|
| Refractories, Fibers, Aluminosilicate | 142844-00-6 | Up to 70 |
| Aluminum Oxide (fibrous form) | 1344-28-1 | Up to 50 |
| Aluminum Oxide | 1344-28-1 | Up to 30 |
| Silica Amorphous | 7631-86-9 | 8 - 15 |
| Starch ⁽¹⁾ | 9005-25-8 | 0 - 10 |
| Latex ⁽²⁾ | NONE | 5 - 15 |

(1) **Starch** is not in 2600R, Unifelt 14C, XT and 3000(HT).

(2) **Latex** is only in Unifelt 14C, XT and 3000(HT).

(3) For SARA Title III reporting purposes, the **aluminum oxide** (fibrous form) content is

| | |
|---------------------------------------|----------|
| - Kaowool® 2600 | 10 - 20% |
| - Kaowool 2600R, 14C and Unifelt® 14C | 5 - 15% |
| - Kaowool 3000, 15C, 17C | 40 - 50% |
| - Unifelt XT and 3000(HT) | 45 - 59% |

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

4 - First-Aid measures

4.1 - Eyes

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.

4.2 - Skin

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.

4.3 - Respiratory Tract

If respiratory tract irritation develops, move the person to a dust free location. See Section 8 for additional measures to reduce or eliminate exposure.

4.4 - Gastrointestinal

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

5.1 - NFPA Codes

Flammability: 0 Health: 1 Reactivity: 0 Special: 0

5.2 - NFPA Unusual Hazards

None

5.3 - Flammable Properties

None

5.4 - Flash Point

None

5.5 - Hazardous decomposition products

None

5.6 - Unusual Fire and explosion hazard

None

5.7 - Extinguishing media

Use extinguishing media suitable for type of surrounding fire

6 - Accidental Release Measures

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

7.1 - 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.

7.2 - Storage

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

Product packaging may contain residue. Do not reuse.

8 - Risk Management Measures / Exposures Controls / Personal Protection

Exposure Limit/Guidelines Table

| EXPOSURE GUIDELINES | | | |
|--|--|---------------------|-----------------------|
| MAJOR COMPONENT | OSHA PEL | ACGIH TLV | MANUFACTURER'S REG |
| Refractories, Fibers, Aluminosilicate | None Established* | 0.2 f/cc, 8-hr. TWA | 0.5 f/cc, 8-hr. TWA** |
| Latex*** | None Established | None Established | NONE |
| Aluminum Oxide | 15 mg/m ³ (total dust) 5 mg/m ³ (respirable dust) | None Established | NONE |
| Aluminum Oxide (fibrous form) | NONE | None Established | 1 f/cc, 8-hr, TWA |
| Starch | 15 mg/m ³ (total dust) 5 mg/m ³ (respirable dust) | None Established | NONE |
| *Except of in the state of California, 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 ³ ; Respirable Fraction 5 mg/m ³ . The PEL for RCF in California is 0.2 f/cc, 8-hr TWA | | | |
| **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. | | | |
| ***Trace amounts of formaldehyde may release from latex during initial heating of this product. The current OSHA PELs for formaldehyde are: 0.75 ppm (8hr.TWA) and 2 ppm (STEL). | | | |
| OTHER OCCUPATIONAL EXPOSURE LEVELS (OEL) RCF-related occupational exposure limits vary internationally. Regulatory OEL examples include: Canada – 0.2 to 1.0 f/cc; United Kingdom – 1.0 f/cc. Non-regulatory OEL examples include: 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. | | | |

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.

PPE - Skin

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.).

PPE - Eye

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.

PPE - Respiratory (general text)

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.

| MANUFACTURER'S RESPIRATORY PROTECTION RECOMMENDATIONS WHEN HANDLING RCF PRODUCTS | |
|--|--|
| Respirable Airborne Fiber Concentration | Respirator Recommendation ¹ |
| Not yet determined but expected to be below REG/PEL/OEL based on operation | Half-face, air-purifying respirator equipped with a NIOSH-certified P100 particulate filter cartridge. |
| "Reliably" less than REG/PEL/OEL | See recommendation below for individual worker requests. |

| | |
|---|--|
| Up to 10 times of REG/PEL/OEL | Half-face, air-purifying respirator equipped with a NIOSH – certified P100 particulate filter cartridge. |
| Up to 50 times of REG/PEL/OEL | Full-facepiece, air-purifying respirator equipped with a NIOSH –certified P100 particulate filter cartridge or PAPR. |
| Greater than 50 times of REG/PEL/OEL | 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 REG/PEL/OEL (8-hr.,TWA) | A NIOSH-certified respirator, such as a disposable particulate respirator or respirators with filter cartridges rated N95 or better. |
| <p>¹Note: 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.</p> <p>Other Information:</p> <p>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.</p> <p>The manufacturer recommends the use of a full-face piece, 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.</p> <p>Potential exposure to other airborne contaminants should be evaluated by a qualified Industrial Hygienist for the selection of appropriate respiratory protection and air monitoring.</p> <p>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).</p> | |

9 - Physical and chemical properties

| | |
|--------------------------------|--------------------------------|
| ODOR & APPEARANCE | Fiber shapes |
| CHEMICAL FAMILY | Vitreous Aluminosilicate Fiber |
| 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

Incompatibilities

None

Conditions to avoid

None

Hazardous decomposition products

Carbon monoxide, carbon dioxide, oxides of nitrogen and trace amounts of aromatic and aliphatic hydrocarbons may be released from burning of latex polymer.

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.

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" 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 refutes 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.

Toxicology

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/m³ 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/m³. 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

13.1 - Waste Management

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

13.2 - 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

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), IATA (air) or IMDG (ship).

15 - Regulatory information

UNITED STATES REGULATIONS

EPA: Superfund Amendments and Reauthorization Act (SARA) Title III – Some of these products contain aluminum oxide (fibrous forms) which is reportable under Section 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.

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 Substances 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

Trace amounts of formaldehyde, acrylonitrile may be released from latex polymer during initial heating. Under normal conditions of handling, processing and use it is reasonable to expect the amount of acrylonitrile released to be below 1.0 ppm. Consult OSHA Standards on acrylonitrile and formaldehyde (29 CFR 1910.1045 and 29 CFR 1910.1048 respectively) for specific requirements if the exposure level is beyond the threshold levels.

Devitrification

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 (respirable size) amongst substances "known to be a human carcinogen".

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 microg/cm² - by comparison, pure quartz or cristobalite were significantly active at much lower levels circa 20 microg/cm².

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.

Morgan Thermal Ceramics - Global www.morganthermalceramics.com

Refractory Ceramic Fibers Coalition (USA) www.RCFC.net

ECFIA (Europe) www.ecfia.eu

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

SARATITLE III HAZARD CATEGORIES

Acute Health: No Pressure Hazard: No

Chronic Health: Yes Reactivity Hazard: No

Fire Hazard: No

TECHNICAL DATASHEETS

514-700, 514-507

Revision Summary

Section 16: Disclaimer Updated

SDS prepared by

SDS Prepared By: MORGAN 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 Safety Data Sheet. Employers may use this SDS 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 SDS. Therefore, given the summary nature of this document, Morgan 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.