

# BAROTHERM<sup>®</sup> GOLD

*By Halliburton*

---

## PRODUCT SUBMITTAL

- Data Sheet
- MSDS Sheet



GHP Systems, Inc.  
1000 32<sup>nd</sup> Avenue  
Brookings, SD 57006  
[www.ghpsystems.com](http://www.ghpsystems.com)

(605) 697-7867 tel  
(605) 697- 9118 fax  
888-447-7757 toll-free



# BAROTHERM<sup>®</sup> GOLD

## Two-Part Thermally Conductive Grout

**Description** BAROTHERM<sup>®</sup> GOLD thermally conductive grout is a bentonite material designed for use in grouting boreholes containing ground source heat loops, and related applications. BAROTHERM GOLD thermally conductive grout when combined with silica sand at various concentrations yields a grout with thermal conductivity values ranging between 0.4 and 1.2 BTU/hr-ft.<sup>°F</sup> (0.69 – 2.08 watts/m.<sup>°C</sup>).

### Applications/Functions

*The use of BAROTHERM GOLD thermally conductive grout assists and promotes the following:*

- A thermally conductive grout medium with low permeability for sealing ground source heat loops

### Advantages

- Promotes efficient heat transfer
- Creates a low permeability seal
- Develops a permanent, flexible seal to prevent commingling between aquifers
- No heat of hydration
- No Portland or aluminum cement added
- No gypsum added
- NSF/ANSI Standard 60 Certified

### Typical Properties

- |                                  |  |
|----------------------------------|--|
| • Appearance                     | Beige to tan powder  |
| • Specific gravity               | 2.6  |
| • Thermal Conductivity (k) range | 0.4 – 1.2 BTU/hr-ft. <sup>°F</sup><br>0.69 – 2.08 watts/m. <sup>°C</sup> |
| • Yield Volume range             | 17.6– 41.8 gal/batch<br>66.7 – 158.2 liters/batch                        |
| • Grout Weight range             | 10.1 – 15.0 lb/gal<br>1.21 – 1.80 SG                                     |
| • Permeability                   | < 1.0 x 10 <sup>-7</sup> cm/sec  |

### Recommended Treatment

The recommended treatment is based on the desired thermal conductivity value or k. Please refer to the treatment tables below.

k Btu/hr-ft. <sup>°F</sup>	Silica Sand lb/50 lb	Water gal/50 lb	Slurry Volume Yield (gallons)	Density lb/gal	Total Solids
0.4	0	15.3	17.6	10.1	28.1%
0.69	100	15.3	22.2	12.5	54.0%
0.76	150	16.3	25.5	13.2	59.5%
0.88	200	17.3	28.8	13.7	63.4%
1	250	18.3	32.1	14.1	66.3%
1.1	350	20.0	38.5	14.7	70.6%
1.2	400	21.0	41.8	15.0	72.0%

**Recommended Treatment (continued)**

<b>k watts/m.°C</b>	<b>Silica Sand kg/22.7 kg</b>	<b>Water liters/22.7kg</b>	<b>Slurry Volume Yield (liters)</b>	<b>Density SG</b>	<b>Total Solids</b>
0.69	0	57.9	66.7	1.21	28.1%
1.19	45.4	57.9	84.0	1.50	54.0%
1.32	68.0	61.7	96.5	1.58	59.5%
1.52	90.7	65.5	109.0	1.64	63.4%
1.73	113.4	69.3	121.5	1.69	66.3%
1.90	158.8	75.7	145.7	1.76	70.6%
2.08	181.4	79.5	158.2	1.80	72.0%

**Recommended Mixing Procedure**

- Using a mixing device, blend one sack of BAROTHERM® GOLD thermally conductive grout into water. Rate of addition should be about 20 to 30 seconds per 50-lb (22.7 kg) bag. Mix adequately, typically 30 to 90 seconds, depending on the mixer. Add sand at a rate of 20 to 30 seconds per sack and pump.
- Dry sand ranging between 50 and 70 mesh and containing greater than 99% silica is recommended.
- Blend, do not over mix and do not use a centrifugal pump. Place through a 1.25 inch (32 mm) minimum I.D. tremie into hole without delay.
- Bentonite grouts may not be appropriate for formation water chemistries where total hardness is greater than or equal to 500 parts per million and/or the chloride content is greater than or equal to 1500 parts per million. In the event that questions regarding subsurface environments arise, it is always best to consult your local Baroid IDP representative to determine if the Baroid product of choice is appropriate for the given conditions.

**Packaging**

BAROTHERM GOLD thermally conductive grout is packaged in 50-lb (22.7 kg) multiwall paper bags, containing 0.7 ft<sup>3</sup> (0.02 m<sup>3</sup>). 3000-lb supersacks are available by special order.

**Availability**

BAROTHERM GOLD thermally conductive grout can be purchased through any Baroid Industrial Drilling Products Retailer. To locate the Baroid IDP retailer nearest you contact the Customer Service Department in Houston or your area IDP Sales Representative.

**Baroid Industrial Drilling Products  
Product Service Line, Halliburton**  
3000 N. Sam Houston Pkwy E.  
Houston, TX 77032

**Customer Service** (800) 735-6075 Toll Free (281) 871-4612  
**Technical Service** (877) 379-7412 Toll Free (281) 871-4613

## MATERIAL SAFETY DATA SHEET

**Product Trade Name:**            **BAROTHERM® GOLD**

**Revision Date:**                    02-Jun-2009

<b>1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION</b>
---

**Product Trade Name:**            BAROTHERM® GOLD  
**Synonyms:**                        None  
**Chemical Family:**                Mineral  
**Application:**                      Grouting Material

**Manufacturer/Supplier**            Baroid Fluid Services  
a Product Service Line of Halliburton Energy Services, Inc.  
P.O. Box 1675  
Houston, TX 77251  
Telephone: (281) 871-4000  
Emergency Telephone: (281) 575-5000

**Prepared By**                        Chemical Compliance  
Telephone: 1-580-251-4335  
e-mail: fdunexchem@halliburton.com

<b>2. COMPOSITION/INFORMATION ON INGREDIENTS</b>
--

SUBSTANCE	CAS Number	PERCENT	ACGIH TLV-TWA	OSHA PEL-TWA
Sodium carbonate	497-19-8	1 - 5%	Not applicable	Not applicable
Bentonite	1302-78-9	60 - 100%	Not applicable	Not applicable
Crystalline silica, quartz	14808-60-7	1 - 5%	0.025 mg/m <sup>3</sup>	10 mg/m <sup>3</sup> %SiO <sub>2</sub> + 2
Crystalline silica, cristobalite	14464-46-1	0 - 1%	0.025 mg/m <sup>3</sup>	1/2 x 10 mg/m <sup>3</sup> %SiO <sub>2</sub> + 2
Crystalline silica, tridymite	15468-32-3	0 - 1%	0.05 mg/m <sup>3</sup>	1/2 x 10 mg/m <sup>3</sup> %SiO <sub>2</sub> + 2

**More restrictive exposure limits may be enforced by some states, agencies, or other authorities.**

### 3. HAZARDS IDENTIFICATION

#### Hazard Overview

**CAUTION! - ACUTE HEALTH HAZARD**

May cause eye and respiratory irritation.

**DANGER! - CHRONIC HEALTH HAZARD**

Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposures below recommended exposure limits. Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product. Review the Material Safety Data Sheet (MSDS) for this product, which has been provided to your employer.

### 4. FIRST AID MEASURES

#### Inhalation

If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

#### Skin

Wash with soap and water. Get medical attention if irritation persists.

#### Eyes

In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

#### Ingestion

Under normal conditions, first aid procedures are not required.

#### Notes to Physician

Treat symptomatically.

### 5. FIRE FIGHTING MEASURES

Flash Point/Range (F): Not Determined

Flash Point/Range (C): Not Determined

Flash Point Method: Not Determined

Autoignition Temperature (F): Not Determined

Autoignition Temperature (C): Not Determined

Flammability Limits in Air - Lower (%): Not Determined

Flammability Limits in Air - Upper (%): Not Determined

Fire Extinguishing Media All standard firefighting media.

Special Exposure Hazards Not applicable.

Special Protective Equipment for Fire-Fighters Not applicable.

NFPA Ratings: Health 0, Flammability 0, Reactivity 0

HMIS Ratings: Health 0\*, Flammability 0, Physical Hazard 0, PPE: E

### 6. ACCIDENTAL RELEASE MEASURES

Personal Precautionary Measures Use appropriate protective equipment. Avoid creating and breathing dust.

Environmental Precautionary Measures None known.

**Procedure for Cleaning / Absorption**

Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

**7. HANDLING AND STORAGE**

**Handling Precautions**

This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

**Storage Information**

Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container. Product has a shelf life of 12 months.

**8. EXPOSURE CONTROLS/PERSONAL PROTECTION**

**Engineering Controls**

Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits listed in Section 2.

**Respiratory Protection**

Wear a NIOSH certified, European Standard EN 149, or equivalent respirator when using this product.

**Hand Protection**

Normal work gloves.

**Skin Protection**

Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

**Eye Protection**

Wear safety glasses or goggles to protect against exposure.

**Other Precautions**

None known.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

<b>Physical State:</b>	Powder
<b>Color:</b>	Tan
<b>Odor:</b>	Mild earthy
<b>pH:</b>	8-10
<b>Specific Gravity @ 20 C (Water=1):</b>	2.6
<b>Density @ 20 C (lbs./gallon):</b>	Not Determined
<b>Bulk Density @ 20 C (lbs/ft3):</b>	50- 73
<b>Boiling Point/Range (F):</b>	Not Determined
<b>Boiling Point/Range (C):</b>	Not Determined
<b>Freezing Point/Range (F):</b>	Not Determined
<b>Freezing Point/Range (C):</b>	Not Determined
<b>Vapor Pressure @ 20 C (mmHg):</b>	Not Determined
<b>Vapor Density (Air=1):</b>	Not Determined
<b>Percent Volatiles:</b>	Not Determined
<b>Evaporation Rate (Butyl Acetate=1):</b>	Not Determined
<b>Solubility in Water (g/100ml):</b>	Insoluble
<b>Solubility in Solvents (g/100ml):</b>	Not Determined
<b>VOCs (lbs./gallon):</b>	Not Determined
<b>Viscosity, Dynamic @ 20 C (centipoise):</b>	Not Determined
<b>Viscosity, Kinematic @ 20 C (centistrokes):</b>	Not Determined
<b>Partition Coefficient/n-Octanol/Water:</b>	Not Determined

## 9. PHYSICAL AND CHEMICAL PROPERTIES

Molecular Weight (g/mole): Not Determined

## 10. STABILITY AND REACTIVITY

<b>Stability Data:</b>	Stable
<b>Hazardous Polymerization:</b>	Will Not Occur
<b>Conditions to Avoid</b>	None anticipated
<b>Incompatibility (Materials to Avoid)</b>	Hydrofluoric acid.
<b>Hazardous Decomposition Products</b>	Amorphous silica may transform at elevated temperatures to tridymite (870 C) or cristobalite (1470 C).
<b>Additional Guidelines</b>	Not Applicable

## 11. TOXICOLOGICAL INFORMATION

<b>Principle Route of Exposure</b>	Eye or skin contact, inhalation.
<b>Inhalation</b>	<p>Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).</p> <p>Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See "Chronic Effects/Carcinogenicity" subsection below).</p>
<b>Skin Contact</b>	May cause mechanical skin irritation.
<b>Eye Contact</b>	May cause eye irritation.
<b>Ingestion</b>	None known
<b>Aggravated Medical Conditions</b>	Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to quartz dust.

**Chronic Effects/Carcinogenicity** Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as "Known to be a human carcinogen". Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.

**Other Information** For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768 (1997).

#### **Toxicity Tests**

<b>Oral Toxicity:</b>	Not determined
<b>Dermal Toxicity:</b>	Not determined
<b>Inhalation Toxicity:</b>	Not determined
<b>Primary Irritation Effect:</b>	Not determined
<b>Carcinogenicity</b>	Refer to <u>IARC Monograph 68, Silica, Some Silicates and Organic Fibres</u> (June 1997).
<b>Genotoxicity:</b>	Not determined
<b>Reproductive / Developmental Toxicity:</b>	Not determined

## **12. ECOLOGICAL INFORMATION**

<b>Mobility (Water/Soil/Air)</b>	Not determined
<b>Persistence/Degradability</b>	Not determined
<b>Bio-accumulation</b>	Not Determined

#### **Ecotoxicological Information**

<b>Acute Fish Toxicity:</b>	Not determined
<b>Acute Crustaceans Toxicity:</b>	Not determined



<b>Acute Algae Toxicity:</b>	Not determined
<b>Chemical Fate Information</b>	Not determined
<b>Other Information</b>	Not applicable

**13. DISPOSAL CONSIDERATIONS**

<b>Disposal Method</b>	Bury in a licensed landfill according to federal, state, and local regulations.
<b>Contaminated Packaging</b>	Follow all applicable national or local regulations.

**14. TRANSPORT INFORMATION**

**Land Transportation**

**DOT**  
Not restricted

**Canadian TDG**  
Not restricted

**ADR**  
Not restricted

**Air Transportation**

**ICAO/IATA**  
Not restricted

**Sea Transportation**

**IMDG**  
Not restricted

**Other Shipping Information**

**Labels:** None

**15. REGULATORY INFORMATION**

**US Regulations**

<b>US TSCA Inventory</b>	All components listed on inventory or are exempt.
<b>EPA SARA Title III Extremely Hazardous Substances</b>	Not applicable
<b>EPA SARA (311,312) Hazard Class</b>	Acute Health Hazard Chronic Health Hazard
<b>EPA SARA (313) Chemicals</b>	This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).
<b>EPA CERCLA/Superfund Reportable Spill Quantity</b>	Not applicable.

<b>EPA RCRA Hazardous Waste Classification</b>	If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.
<b>California Proposition 65</b>	The California Proposition 65 regulations apply to this product.
<b>MA Right-to-Know Law</b>	One or more components listed.
<b>NJ Right-to-Know Law</b>	One or more components listed.
<b>PA Right-to-Know Law</b>	One or more components listed.
<b>Canadian Regulations</b>	
<b>Canadian DSL Inventory</b>	All components listed on inventory.
<b>WHMIS Hazard Class</b>	D2A Very Toxic Materials Crystalline silica

## 16. OTHER INFORMATION

The following sections have been revised since the last issue of this MSDS

Not applicable

**Additional Information** For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Material Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

**Disclaimer Statement** This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

**\*\*\*END OF MSDS\*\*\***