

GEO THERMAL GROUT™

ENHANCED THERMALLY CONDUCTIVE GROUT



Certified to NSF/ANSI/CAN 60

DESCRIPTION

GEO THERMAL GROUT is a specially blended high solids bentonite that can be mixed with CETCO TC BOOSTER, sand, or both in a two-part thermally conductive grouting material to improve the performance of ground source heat loop applications. GEO THERMAL GROUT is an easy pumping grout that has been carefully developed to efficiently suspend solids (CETCO TC BOOSTER or silica sand) for enhanced thermal conductivity. GEO THERMAL GROUT can be mixed to meet a range of thermal conductivity (TC) from 0.4 to 1.9 Btu/hr/ft/F (0.7 – 3.3 W/ mK). GEO THERMAL GROUT is certified to NSF/ANSI/CAN Standard 60, Drinking Water Treatment Chemicals - Health Effects.

ADVANTAGES

GEO THERMAL GROUT improves the efficiency and performance of ground source heat loop systems by matching the thermal conductivity of the surrounding soil and creating a permanent flexible seal to prevent aquifer contamination. Depending on site soil conditions, GEO THERMAL GROUT can be mixed and adjusted to meet individual thermal conductivity requirements, improving the transfer of heat between the fluids circulated in the loop and the surrounding soil for optimum system performance.

TYPICAL PROPERTIES

Batch Yield	16.4 - 31.3 gal/batch (62.2 - 119.6 liters/batch)
Grout Weight	10.2 - 14.1 lb/gal (1.22 - 1.69 kg/l)
Max Particle	<300 µm
Percent Solids	30.0 - 68.0%
Permeability	<7.13x10 ⁻⁹ cm/s
Specific Gravity	2.62 g/cm ³
Thermal Conductivity	0.40 - 1.90 Btu/hr/ft/F (0.7 - 3.3 W/mK) <i>(TC values will vary depending on testing method and the quality of sand used)</i>

MIXING AND APPLICATION

Place freshwater in a paddle-mixing tank of a commercial grout mixer. Start the grout mixer paddle, and add one 50 lb (22.7 kg) bag of GEO THERMAL GROUT to the water. Mix for about 1 minute. Add CETCO TC BOOSTER and/or silica sand at a steady rate (1 to 2 minutes), and continue mixing for about 2 minutes to obtain a consistent mixture. Pump with a positive displacement piston pump through a tremie pipe at a rate of 5 to 15 gallons (19 to 57 liters) per minute. **FOR CETCO TC BOOSTER AND SAND BLENDS CONTACT YOUR LOCAL REPRESENTATIVE.**

Thermal conductivity values are based on ASTM D-5334 procedures. Testing performed by the CETCO Laboratory uses the D-5334 method. (see page 3)



DOSAGE

SAND					
Btu/hr/ft/F (D-5334)	SAND lb/batch	Water gal/batch	Yield gal/batch	Weight lb/gal	Total Solids
0.40	0	14	16.4	10.2	30.0%
0.80	150	15	24.6	13.2	61.5%
0.90	200	16	28.0	13.7	65.2%
1.00	250	17	31.3	14.1	68.0%

W/mK (D-5334)	SAND kg/batch	Water l/batch	Yield l/batch	Weight kg/l	Total Solids
0.68	0	53	62	1.22	30.0%
1.36	67.5	57	93	1.58	61.5%
1.52	90	61	106	1.64	65.2%
1.69	113	64	130	1.69	68.0%

CETCO TC BOOSTER APPLICATION RATIOS

*CONTACT US FOR SAND AND GRAPHITE MIXTURES

TARGET THERMAL CONDUCTIVITY Btu/hr/ft/F	1.0	1.2	1.4	1.6	1.9
LBS GEO THERMAL GROUT	50	50	50	50	50
LBS TC BOOSTER	18	24	36	48	58
GALLONS FRESHWATER	15	15	15	16	17
GROUT WEIGHT (LBS/GAL)	10.57	10.72	10.92	11.03	11.24
GROUT VOLUME (GAL)	18.44	18.76	19.23	20.8	22.74
SPECIFIC GRAVITY (G/CC)	1.27	1.29	1.31	1.32	1.35

PACKAGING

~50 lb (~22.7 kg) bag, 48 per pallet. All pallets are plastic-wrapped.



GEOTHERMAL GROUT™ ENHANCED THERMALLY CONDUCTIVE GROUT

GEOTHERMAL GROUT TEST POLICIES

THERMAL CONDUCTIVITY (TC)

TC testing as required can be performed in the CETCO Laboratory free of charge for the distributor or contractor purchasing GEOTHERMAL GROUT.

- CETCO will perform the testing using ASTM D-5334 - *Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure*. Testing using ASTM C-518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus, can be performed at an outside test facility for an additional charge.
- The sample container(s) shall be a minimum of four inches in diameter by at least five inches deep.
- The container should be completely filled to the top and covered to prevent moisture loss.
- The container should be rigid to semi-rigid and packaged appropriately so no disturbance takes place when shipped for analysis.
- CETCO can provide the contractor with a list of laboratories qualified to conduct the TC testing according to acceptable ASTM standards.
- Test results will be reported as they become available to the supervising engineer, the installation contractor, and CETCO.
- CETCO will not be financially responsible for charges billed by independent laboratories and charges will be billed directly to the supervising engineering firm, CETCO distributor, or installation contractor.

SAND

Sand quality has a direct effect on the TC achieved by enhanced bentonite grouts. Sand quantity needed may vary depending on characteristics. CETCO suggests that sand being considered for enhancing the thermal conductivity of GEOTHERMAL GROUT be submitted to CETCO for laboratory analysis prior to commencement of the project. This service is free of charge for the distributor or contractor purchasing the GEOTHERMAL GROUT. TC testing as required can be performed in the CETCO laboratory free of charge for the distributor or contractor purchasing the GEOTHERMAL GROUT. The following procedures and policies should be adhered to in order to achieve desired results.

- Sand samples should be sent directly to the CETCO laboratory by the manufacturer.
- Sand should be accompanied by a description and sieve analysis from the manufacturer.

- Quality of the sand will be analyzed to confirm silica content, roundness, and size.
- CETCO will mix the sand into a lab batch with GEOTHERMAL GROUT using the same proportions of sand typically required to achieve the thermal conductivity (TC) desired.
- TC testing results will determine the quantity of sand required for the job specification.
- Results and recommended mix proportions will then be reported to the responsible party.

SAND SPECIFICATIONS

Silicon Dioxide: 99%	Grain Shape: Rounded		Moisture: <0.1%
Sieve Mesh Size	Retained %	Cumulative %	Passing %
#40	1.0% maximum	1.0% or less	99.0%
#50	23.0%	23.0%	77.0%
#70	57.0%	80.0%	20.0%
#100	15.0%	95.0%	5.0%
#140	3.0%	98.0%	2.0%
<#140	2.0%	100.0%	0.0%

CETCO TC BOOSTER

When working with CETCO TC BOOSTER or any other graphite product, an increase or decrease in water by 1 gallon per batch can either decrease or increase TC values by approximately 15%. A small change in water usage can affect final TC values. The use of a water meter or other measuring systems is recommended.

PERMEABILITY TESTING

Permeability testing as required can be performed in the CETCO Laboratory for a fee per sample for the distributor or contractor purchasing the GEOTHERMAL GROUT.

- CETCO will perform the testing using ASTM D-5084 - *Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter*.
- The sample(s) shall be a minimum of five inches in diameter and two inches deep and covered prior to shipment.
- Sample container should be rigid to semi-rigid in construction.
- If independent testing is required, CETCO can provide the contractor with a list of qualified laboratories.
- Test results will be reported as they become available to the supervising engineer, the installation contractor, and CETCO.
- CETCO will not be financially responsible for charges billed by independent labs and charges will be billed directly to the supervising engineering firm, CETCO distributor, or installation contractor.

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