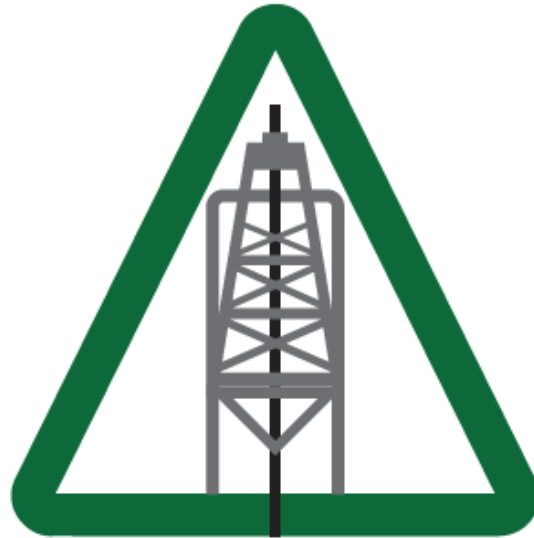


# **ENER-CRETE THERMAL BLEND CEMENT**



**ENER-CRETE  
SYSTEMS INC.**

**4810-47th STREET EAST, REDWATER AB  
T0A 2W0 Phone: (780)-638-9501**

**ENER-CRETE SYSTEMS INC.**  
*in conjunction with*



**INTEGRA**  
Laboratory Services Ltd

**INTEGRA LABORATORY  
SERVICES LTD.**



# ENER-CRETE THERMAL BLEND CEMENT

FOR WELLBORE TREATMENTS  
TECHNICAL DATA SHEET

## DESCRIPTION

In an environment where wellbore temperatures exceed 115°C, due to well depth, processes such as steam flooding, etc., there is a need for a special cement. Under these types of conditions, regular cement undergoes severe chemical structural changes causing a rapid breakdown of the cement integrity. Ener-Crete's Thermal Cement overcomes this degradation by blending higher content of silica (SiO<sub>2</sub>), which extends the Thermal Cement's stability to extreme temperatures up to +/-360°C.

## PROPERTIES- PHYSICAL

- Appearance is a fine textured greyish-white powder
- Composition is a combination of Oil "G" cement and silica flour
- Bulk Density is 0.741 m<sup>3</sup>/Tonne

## PROPERTIES- CHEMICAL

- Solubility is that the product is insoluble in water
- pH ranges between 10-12 (in fresh water)
- Water requirement to mix product is 0.41 m<sup>3</sup>/Tonne
- Product is a Thermally Stable Oilwell Cement

(Hrs:min at BHT)

## APPROX. WORKING TIME

Bag Size (kg)	Water Req. (litres)	Slurry Yield (litres)	Density (kg/m <sup>3</sup> )	20°C	30°C
20	8.3	15.0	1885	2:30	2:00
40	16.6	30.0	1885	2:30	2:00
1mt	415.0	750.0	1885	2:30	2:00
Compressive Strength Mpa (8, 16, 24 hours)				0.1,2.5, 5.0	0.2,3.8, 6.1

## NOTE

Strengths are for reference only. Actual strength values may vary under changing conditions in the wellbore, water quality, density variations. Strength samples should be taken during the application process and compared to the estimated wellbore temperature for additional strength development.

If the wellbore temperatures are typically *below 30°C*, Thermal Cement can be augmented with a small amount of calcium chloride which accelerates set time. Typical dosages of calcium chloride is **0.5-1.0%** w/w, depending on wellbore depth & temperature. Viscosity and working time will reduce with the addition. Caution working with calcium chloride should be taken as it is an extremely corrosive material. Using it incorrectly may lead to a flash set of the Thermal cement caused by excessive heat of hydration.



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## APPLICATION

### Oilfield Cementing

Typical use of **Thermal Cement** is for dump-bail treatments. Thermal Cement is typically batched in small volumes according to the following blend table, and using conventional rig equipment, is “dumped” down the wellbore. After a period of time the cement sets, providing a small, hard plug in the problem area.

## MIXING & HANDLING

**Storage Precautions** - Thermal Cement is not hazardous. Keep dry and avoid excessive humid conditions. Best stored in cool, dry place.

**Handling Precautions** - When mixing with water, some heat will occur due to heat of hydration process. Mix continuously once started. Mixed it is caustic in nature pH 10-12, can cause burns to eyes and skin. Wearing appropriate PPE is a must. See SDS sheet for further information.



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## DATA

### TESTS REQUESTED:

- a) Slurry Thickening Time
- b) Slurry Compressive Strength

### CEMENT SYSTEMS:      a) Thermal 40

Slurry Density:	1880	Kg/m <sup>3</sup>
Slurry Yield:	0.75	M <sup>3</sup> /Tonne
Water Requirement:	0.42	M <sup>3</sup> /Tonne

### Test Parameters

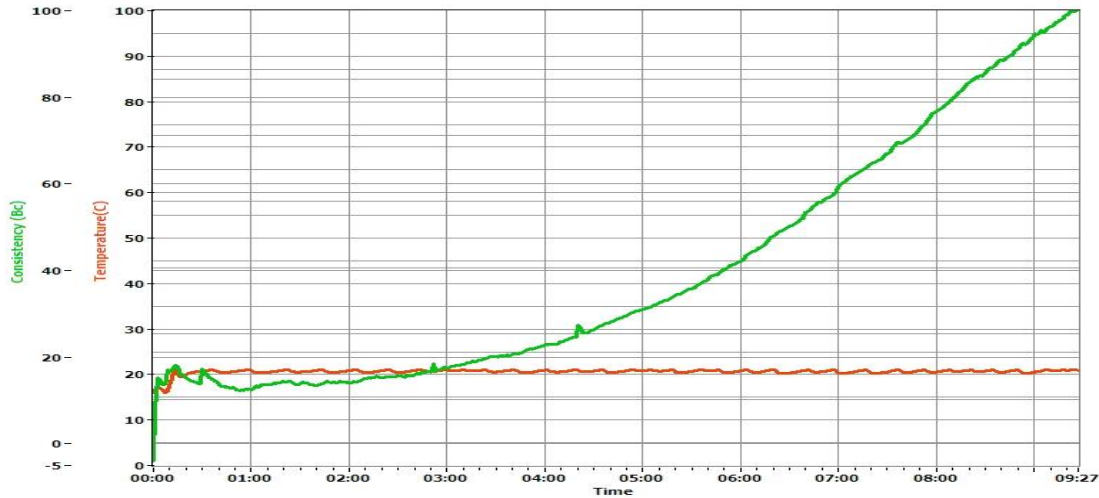
All tests contain Lafarge Oilwell G cement + 40% Silica Flour only.



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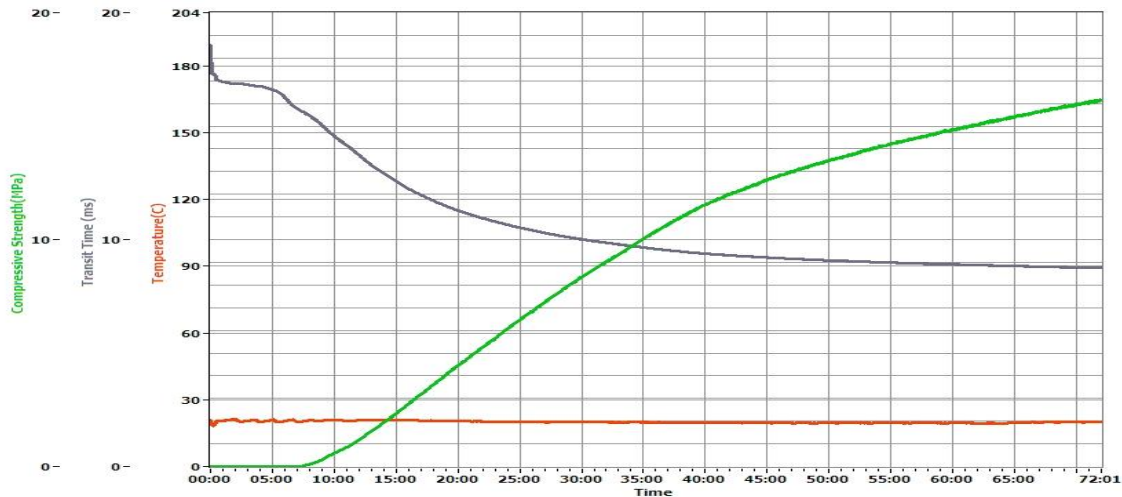
## LABORATORY RESULTS

a) Thickening Time @ 20°C.



Time to (HR:mins):      40 Bc: 5:50      70 Bc: 7:44      100 Bc: 9:28

b) Compressive Strength



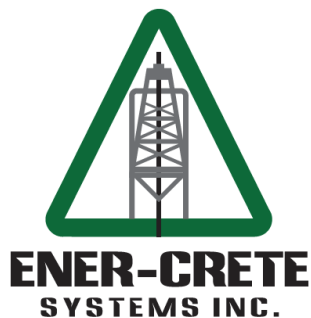
Time to (HR:mins):    3.5 MPa 17:47      6.05 MPa: 24 HR      13.17 MPa: 48 HR



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## **Comments**

- 1) All tests were run without additives, with exception of 0.15% liquid defoamer.
- 2) Test results are representative of basic, neat cement/silica flour slurry.



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## TERMINOLOGY

**American Petroleum Institute (API):** Organisation which provides standards of practice, regulations and materials standards for use in the oilfield.

**Bearden Units of Consistency ( $B_c$ ):** Dimensionless scale from 1-100 that indicates the pumpability or consistency of a cement slurry. Thus it is a measurement of thickening time.  $B_c$  is measured by a consistometer, which measures the resistance to the paddles turning as the cement sets. Generally difficult pumping begins at 50  $B_c$  and cement completely sets at 100  $B_c$ . A value of 100  $B_c$  is equivalent to 2080 g-cm of torque.

**Bottom Hole Circulating Temperature (BHCT):** The temperature that occurs at the bottom of the well while fluid is being circulated. This temperature is used in most tests of cement slurry in liquid state such as thickening time and fluid loss. Measured in degrees Celsius ( $^{\circ}\text{C}$ ).

**Bottom Hole Static Temperature (BHST):** The temperature that occurs at the bottom of the well if fluid is left undisturbed for about 24-36 hours. This temperature is used for most tests of cement slurry in which the cement slurry is required to set or is set such as compressive strength. Measured in degrees Celsius ( $^{\circ}\text{C}$ ).

**BWOB:** By weight of blend

**BWOC:** By weight of cement

**BWOW:** By weight of water

**Compressive strength:** The strength achieved by a set cement sample typically measured by the force required to crush it. Equivalent testing is accomplished via an ultrasonic compressive analyzer.

**Filtrate:** The amount of fluid which is forced out of a cement slurry during a fluid loss test.

**Free Fluid:** Water which has separated from a cement slurry during a Free Water Test.

**Free Water Test:** A method of measuring the amount of free fluid (or water separation) derived from a cement slurry over a set period of time. This test is observed at the proposed or actual wellbore angle.

**Slurry Density:** The weight per unit volume of cement slurry (units:  $\text{kg}/\text{m}^3$ ).

**Slurry Yield:** The volume of slurry obtained when 1 tonne of dry cement is mixed with the required amount of water (units:  $\text{m}^3/\text{tonne}$ ).

**Wait on Cement (WOC):** The time required to wait for the cement to develop necessary strength for the next operation.

**Thickening Time:** The time required for a cement slurry to become unpumpable. Generally speaking, this value is recognized as 100  $B_c$ , but can be expressed at other values, such as 70  $B_c$ .



# ENER-CRETE THERMAL BLEND CEMENT

FOR WELLBORE TREATMENTS

## Safety Data Sheet

### SECTION 1. IDENTIFICATION

**Product Identifier** Ener-Crete Thermal Blend Cement For Wellbore Application

**Other Means of Identification**

**Product Family** ENER-CRETE Cements

**Recommended Use** Special blend of cementitious materials with thermal properties.

**Manufacturer** 4810-47th STREET EAST, REDWATER AB T0A 2W0;  
www.enercrete.com

**Emergency Phone No.** Ener-Crete Systems Inc., Phone: (780)-638-9501

**SDS No.** 0001

**Date of Preparation** May 15, 2017

### SECTION 2. HAZARD IDENTIFICATION

#### Classification

Skin irritation - Category 2; Serious eye damage - Category 1; Skin sensitization - Category 1; Carcinogenicity - Category 1A; Specific target organ toxicity (single exposure) - Category 3; Specific target organ toxicity (repeated exposure) - Category 1

#### Label Elements



#### Signal Word:

Danger

#### Hazard Statement(s):

Causes skin irritation.

Causes serious eye damage.

May cause an allergic skin reaction.

May cause cancer.

May cause respiratory irritation.

Causes damage to organs (lungs) through prolonged or repeated exposure.

#### Precautionary Statement(s):

Do not handle until all safety precautions have been read and understood.

Wash hands thoroughly after handling.

Contaminated work clothing must not be allowed out of the workplace.

Wear protective gloves/protective clothing/eye protection/face protection.

Use only outdoors or in a well-ventilated area.

Do not breathe dust/fume/gas/mist/vapors/spray.

Do not eat, drink or smoke when using this product.

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Product Identifier: Ener-Crete Thermal Blend Cement For Wellbore Application

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**IF exposed or concerned:** Get medical advice/attention. **IF ON SKIN:** Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical advice/attention.

**IF IN EYES:** Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTRE or doctor.

**IF INHALED:** Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTRE or doctor if you feel unwell. Store in a well-ventilated place. Keep container tightly closed. Dispose of contents and container in accordance with local, regional, national and international regulations. 10% of the mixture consists of ingredient(s) of unknown acute toxicity.

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Name	CAS No.	%	Other Identifiers
Portland cement	65997-15-1	30-70%	Not applicable
Silica, crystalline	14808-60-7	20-40%	Not applicable
Aluminum oxide	1344-28-1	0-5%	Not applicable
Iron oxide	1309-37-1	0-5%	Not applicable
Titanium dioxide	13463-67-7	0-5%	Not applicable

#### Notes

The exact percentage (concentration) of composition has been withheld as a trade secret in accordance with paragraph (i) of §1910.1200.

### SECTION 4. FIRST-AID MEASURES

#### First-aid Measures

##### Inhalation

Move to fresh air. Keep at rest in a position comfortable for breathing. Call a Poison Centre or doctor if you feel unwell.

##### Skin Contact

Rinse with lukewarm, gently flowing water for 5 minutes. Take off immediately contaminated clothing, shoes and leather goods (e.g. watchbands, belts). Thoroughly clean clothing, shoes and leather goods before reuse or dispose of safely. If skin irritation or a rash occurs, get medical advice or attention.

##### Eye Contact

Immediately rinse the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. Remove contact lenses, if present and easy to do. Immediately call a Poison Centre or doctor.

##### Ingestion

Never give anything by mouth if person is rapidly losing consciousness, or is unconscious or convulsing. Do not induce vomiting. Get medical advice or attention if you feel unwell or are concerned.

#### Most Important Symptoms and Effects, Acute and Delayed

*If inhaled:* can irritate the nose and throat, can cause lung injury. *If on skin:* skin sensitizer, may cause an allergic skin reaction in some people. May cause moderate to severe irritation. *If in eyes:* causes moderate to severe irritation. Symptoms include sore, red eyes, and tearing. *If swallowed:* can irritate the mouth, throat and stomach. Symptoms may include nausea, vomiting, stomach cramps and diarrhea.

#### Immediate Medical Attention and Special Treatment

##### Special Instructions

Not applicable.

## SECTION 5. FIRE-FIGHTING MEASURES

### Extinguishing Media

#### Suitable Extinguishing Media

Not combustible. Use extinguishing agent suitable for surrounding fire.

#### Unsuitable Extinguishing Media

None known.

### Specific Hazards Arising from the Product

This product presents no unusual hazards in a fire situation.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

### Personal Precautions, Protective Equipment, and Emergency Procedures

Use the personal protective equipment recommended in Section 8 of this safety data sheet.

### Environmental Precautions

It is good practice to prevent releases into the environment. Do not allow into any sewer, on the ground or into any waterway.

### Methods and Materials for Containment and Cleaning Up

Collect using shovel/scoop and place in a suitable container for disposal. Avoid generating dust.

## SECTION 7. HANDLING AND STORAGE

### Precautions for Safe Handling

Avoid repeated or prolonged skin contact. Do not swallow. Do not breathe in this product. Avoid generating dusts. Keep containers tightly closed when not in use or empty. Do NOT eat, drink or store food in work areas.

### Conditions for Safe Storage

Store in an area that is: dry, well-ventilated. Protect product from contact with water, including humidity. Prevent rainwater and ground water from reaching storage area.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### Appropriate Engineering Controls

Use local exhaust ventilation, if general ventilation is not adequate to control amount in the air.

### Individual Protection Measures

#### Eye/Face Protection

Wear chemical safety goggles and face shield when contact is possible.

#### Skin Protection

Wear chemical protective clothing e.g. gloves, aprons, boots.

#### Respiratory Protection

Wear a NIOSH approved particulate respirator equipped with a N95, R95, or P95 filter.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### Basic Physical and Chemical Properties

Appearance	Grey powder.
Odor	Odorless
Odor Threshold	Not available
pH	10-12
Melting Point/Freezing Point	Not available (melting); Not available (freezing)
Initial Boiling Point/Range	Not available
Flash Point	Not available
Evaporation Rate	Not available
Flammability (solid, gas)	Not applicable
Upper/Lower Flammability or Explosive Limit	Not available (upper); Not available (lower)
Vapor Pressure	Not available
Vapor Density (air = 1)	Not available
Relative Density (water = 1)	2.7-2.8
Solubility	Not available in water; not available (in other liquids)
Partition Coefficient, n-Octanol/Water (Log Kow)	Not available
Auto-ignition Temperature	Not available
Decomposition Temperature	Not available
Viscosity	Not available (kinematic); Not available (dynamic)
Other Information	
Physical State	Solid

## SECTION 10. STABILITY AND REACTIVITY

### Reactivity

Not reactive under normal conditions of use.

### Chemical Stability

Normally stable.

### Possibility of Hazardous Reactions

None expected under normal conditions of storage and use.

### Conditions to Avoid

Water, moisture or humidity.

### Incompatible Materials

None known.

### Hazardous Decomposition Products

Under normal conditions of storage and use, hazardous decomposition products should not be produced.

## SECTION 11. TOXICOLOGICAL INFORMATION

### Likely Routes of Exposure

Inhalation; skin contact; eye contact; ingestion.

**Skin Corrosion/Irritation**

May cause moderate or severe irritation based on information for closely related materials.

**Serious Eye Damage/Irritation**

May cause serious eye damage based on information for closely related materials.

**STOT (Specific Target Organ Toxicity) - Single Exposure****Inhalation**

May cause severe nose and throat irritation, severe lung injury.

**Skin Absorption**

No information was located.

**Ingestion**

May be harmful based on information for closely related materials.

**Aspiration Hazard**

Can cause lung damage if aspirated based on human experience.

**STOT (Specific Target Organ Toxicity) - Repeated Exposure**

Causes irritation of the respiratory system. Respiratory tract injury has been observed. Prolonged exposure to respirable crystalline silica has been known to cause silicosis, a lung disease, which may be disabling. The risk of contracting silicosis and the severity of the disease is clearly related to the amount of dust exposure and the length of time (usually years) of exposure.

**Respiratory and/or Skin Sensitization**

May cause an allergic reaction (skin sensitization) based on information for closely related chemicals.

**Carcinogenicity**

May cause cancer.

**Reproductive Toxicity**

No information was found.

**Germ Cell Mutagenicity**

No information was found.

**Interactive Effects**

No information was found.

**SECTION 12. ECOLOGICAL INFORMATION**

**General Comments** There are no known significant effects or critical hazards.

**SECTION 13. DISPOSAL CONSIDERATIONS****Disposal Methods**

Contact local environmental authorities for approved disposal or recycling methods in your jurisdiction.

**SECTION 14. TRANSPORT INFORMATION**

**Environmental Hazards** Not applicable

**Special Precautions** Protect from moisture.

**SECTION 15. REGULATORY INFORMATION****Safety, Health and Environmental Regulations****Canada****WHMIS 1988 Classification**

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Product Identifier: Ener-Crete Thermal Thermal Blend Cement For Wellbore Application  
SDS No.: 0001  
Date of Preparation: May 15, 2017



Class D2A



Class E

D2A - Very Toxic (Chronic toxicity; Carcinogenicity); E - Corrosive

## SECTION 16. OTHER INFORMATION

**SDS Prepared By** Ener-Crete Systems Inc.

**Phone No.** (780)-638-9501

**Date of Preparation** May 15, 2017

**Disclaimer** To the best of our knowledge, the information contained herein is accurate. However, Ener-Crete Systems Inc. assumes no liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.