



FIREROK™ Bulk Cement System for Thermal Resistant Structural Concrete

CERATECH's FIREROK™ Cement System is comprised of a non-portland hydraulic cement and proprietary liquid and or powder admixtures. CERATECH's FIREROK™ cement can be mixed in all standard industry mixing apparatus including barrel mixers, pan type turbo mixers and continuous mix systems.

Depending upon product and/or project specifications, the FIREROK™ Cement System may require standard industry portland cement concrete admixtures such as AEA's & SRA's. Other admixtures used with portland cement are no longer needed.

Working times, slump, strength development and finishing times can be easily adjusted by varying CERATECH's liquid admixture ratios.

FIREROK™ is a hydraulic cement and meets or exceeds ASTM-C-1157 requirements

Characteristics

CERATECH's FIREROK™ cement technology produces a dense, interlocking crystalline material structure that results in thermal conductivity rates three times greater than portland cement. When subjected to heat (in convection) a concrete element produced from **FIREROK™** cement will increase its temperature more uniformly, thereby reducing the thermal strain generated by the thermal differentials. Due to a low water/cement ratio, concrete produced from **FIREROK™** cement is also less susceptible to steam or thermal shock spalling.

Applications

FIREROK™ is the cement solution for a wide variety of challenging industrial & military concrete environments that are routinely exposed to intermittent temperatures up to 1000°C / 1850°F.

Typical Concrete Strengths

Data based on a nominal concrete mix design utilizing 750 pounds of cement powder per cubic yard of concrete produced. Concrete performance also dependent upon aggregate types & quality. Data represents typical results from production materials. Actual results may vary from third party testing results; however, CERATECH's materials meet and/or exceed established internal quality control standards, (available upon request) . All samples were air cured 4" diameter x 8" cast cylinders.

Concrete Strengths, psi (MPa)	24 hours	7 day	28 day	ASTM Test Method
Compressive	3187 (21.8)	6720 (43.1)	8326 (58.0)	ASTM - C - 39
Flexural	400 (2.8)	691 (4.8)	767 (5.4)	ASTM - C - 78
Splitting Tensile	218 (1.5)	605 (4.2)	666 (4.6)	ASTM - C - 496
Modulus of Elasticity, msi (GPa)	4.1 (28.7)	4.8 (33.2)	5.1 (35.0)	ASTM - C - 469
Coefficient of Thermal Expansion in/in/°F	Not Applicable	Not Applicable	4.6	AASHTO - TP-60
Rapid Freeze Thaw Resistance, (Durability Factor - Retained percentage of Dynamic Modulus) 300 Cycles	100%			ASTM - C - 666A
Scaling Resistance, lbs/ft² (kg/m²) 50 Cycles	0			ASTM - C - 672





Properties & Typical Concrete Strengths (continued)

Color: Cement powder is light tan

Specific Gravity: 2.6 - 2.8

Concrete Setting Time (@ 72°F / 22°C) ASTM-C-403

Initial Set: 60 minutes to 4 hours

Final Set: 90 minutes to 6 hours

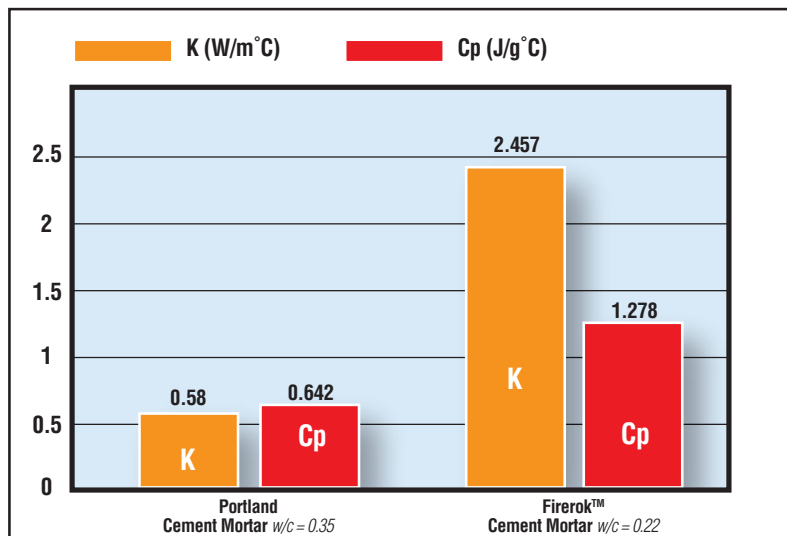
Note: Set times can be adjusted by varying the dosage rates of CERATECH's liquid admixtures

Curing: Follow standard ACI curing practices.

Coating Time: Concrete may be coated with a non-breathable material 72- 96 hours from time of placement.



Typical Thermal Properties Vs. Portland Cement (*Mortars*)



Portland cement exhibits lower thermal conductivity and heat capacity values than CERATECH'S **Firerok™** cement making it far more susceptible to cracking and spalling caused by thermal stresses. Conversely, **Firerok™** readily diffuses heat minimizing thermal stresses; a feature that is highly desirable in intermittent thermal loading environments.

Thermal conductivity (K) followed ASTM D5334 - 08 Standard Test Method for Determination of Thermal Conductivity of Soil and Soft Rock by Thermal Needle Probe Procedure.

Thermal testing conducted by Dynalene Inc. Whitehall, PA.

Availability

The **FIREROK™** Cement System is available throughout the U.S. Contact CERATECH Sales for more information 800-581-8397

Powder available in 2000 lb. Super Saks or bulk transport truck. Liquid activators available in 275 gallon totes or bulk transport truck.





Storage

Cement powder should be stored in cool dry conditions
Liquid admixtures should be kept above 50°F / 10°C

Conditions of Use

- To achieve optimum results from FIREROK™ cement in concrete, it is essential that it is correctly specified and used.
- Consult with CERATECH Field Engineering for concrete mix designs, water to cement ratios and appropriateness of FIREROK™ cement for your specific project requirements.
- Normal hot & cold weather practice should also be followed.
- FIREROK™ cement is produced from natural materials and slight shade variations may occur.
- CERATECH Inc. cannot be held responsible where workmanship has not been carried out in accordance with industry standard practices.

Sustainability & Environmental Impact

Materials Usage	One Ton of Cement		One Cubic Yard of Concrete (Based on 1/3 ton of cement)	
	Portland Cement	FIREROK™	Portland Cement	FIREROK™
Virgin Resources	3500 lbs.	16 lbs.	667 lbs.	5.3 lbs.
Renewable Resources	0 lbs.	80 lbs.	0 lbs.	26.7 lbs.
Pre-Consumer Waste (Coal Ash)	None	1900 lbs.	200 lbs.	602 lbs.
Landfill Relief (Coal Ash)	None	1900 lbs.	200 lbs.	602 lbs.
Recycled Fine Aggregate (Pulverized consumer waste glass)	NA	NA	Cannot Use	50%
Post Consumer Waste (Crushed glass as an aggregate)	NA	NA	Cannot Use	Yes
Crude Oil	55 gallons	0 gallons	18.3 gallons	0 gallons
Total Energy Req'd.	6 M BTUs	0 BTUs	1.7 M BTUs	0 BTUs
Total CO ₂ Production	2000 lbs.	12 lbs.	667 lbs.	4 lbs.
Water H ₂ O Required	Varies	0 Gals.	*36 Gals.	**18 Gals.

Portland cement production data from www.epa.gov/

*Based on a w/c ratio of 0.44

**Based on a w/c ratio of 0.22

Technical Support

Further information and advice on this product and the full range of CERATECH Cement products can be obtained through the contacts listed below. Click on the following link for immediate access to our website. www.ceratechinc.com
email: fieldengineering@ceratechinc.com

Health & Safety

- See **Material Safety Data Sheet (MSDS)** www.ceratechinc.com/products/msds
- This document does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this document to establish appropriate safety and health practices and to determine the applicability of regulatory limitations prior to use.
- Dispose of water and materials in accordance with Federal, State and Local regulations.
- The use of a dust mask, safety goggles and gloves is recommended.

CERATECH Inc.
1500 North Beauregard St.
Suite 320
Alexandria, VA 22311
Phone: (800) 581-8397 Fax: (703) 894-1068
Technical Support: (888) 341-2600

The information in this data sheet is accurate at time of printing, however, CERATECH reserves the right to amend details as part of their product development program.

FIREROK™
Heat Resistant Cement