FIREROK™ cement concrete has been engineered to produce a concrete that exhibits superior durability in environments subject to high thermal cycles and temperatures. FIREROK™ cement concrete can withstand intermittent temperatures as high as 1000°C (1850°F) and sustained temperatures up to 300°C (570°F) without significant loss of strength.

Traditional portland cement concrete is principally comprised of a calcium silicate hydrate gel that begins to break down when exposed to temperatures above 120°C (250°F). Portland cement’s low thermal conductivity and heat capacity cause internal stresses resulting in strength loss and related failures.

Alternatively, CeraTech’s FIREROK™ cement concrete is comprised of a dense interlocking network of crystalline calcium aluminosilicate hydrates that allow for twice the heat capacity and five times the thermal conductivity of typical cement concrete.

Specify CeraTech’s FIREROK™ high performance cement concrete for your next project and realize reduced operational downtime, lower maintenance costs and extended infrastructure service life!

Applications include:
- Metal Foundries
- Molten Mineral Facilities
- Annealing Oven Bases
- Vertical Take-Off & Landing (VTOL) Pads
- Military Aviation Parking Areas
- Jet Engine Testing Facilities
- Thermal Food Processing Areas
- Glass Manufacturing
- Steam Coil Lines
- Pickling Lines
- Natural Gas Infrastructure

FIREROK™ cement concrete is being successfully utilized in industrial and military applications for both rapid repair and new construction.

CeraTech’s cement concrete is batched, delivered, placed and finished using standard industry practices and protocols.
**Durability Technology**

CeraTech’s FIREROK™ cement produces an extremely dense concrete with high thermal diffusivity rates that enable it to withstand high intermittent thermal loading. Spherical cement particle shapes reduce yield stress and viscosity during mixing and allow for low water to cement (w/c) ratio mix designs (0.18 – 0.22). These attributes, combined with a unique cement chemistry that lacks calcium hydrates & hydroxides, produces a durable concrete with the characteristics to endure high temperature environments.

**Thermal Limitations of Traditional Concrete**

Free calcium hydroxide in portland cement concrete loses its bound water at approximately 400 – 500 °C (750 – 930 °F) leaving calcium oxide (Fig. A). When this calcium oxide is re-exposed to moisture, it re-hydrates and expands, compromising the structural integrity and durability of concrete. (Fig. B)

**Reduced Foreign Object Damage (FOD) Potential**

When portland cement concrete is exposed to a rapid rise in temperature, free water within the concrete will convert to steam and cause surface spalling. FIREROK™ cement concrete requires less than half as much mix water as portland concrete, additionally, this mix water is consumed in the hydration process leaving no available free water to facilitate the steam spalling process.

**Improved Heat Capacity**

FIREROK™ cement concrete absorbs heat more slowly as it has twice the heat capacity than that of portland cement concrete. FIREROK™ then dissipates this heat rapidly, reducing thermal stresses that contribute to loss in strengths and ultimately the structural integrity of concrete.

**Exceptional Thermal Conductivity**

CeraTech’s FIREROK™ cement concrete conducts heat 5 times faster than ordinary portland cement concrete, making it far less susceptible to cracking and spalling due to thermal stresses.
Portland Cement exhibits lower thermal conductivity and heat capacity values than CERA TECH’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 testing conducted by Dynalene Inc. Whitehall, PA.

Finite Element Analysis

The following data was developed to illustrate the differences between CeraTech’s Firerok™ and portland cement concrete. The model consisted of a 6 ft. x 6 ft. x 12 inch slab. The slab had an initial temperature of 72˚F and was subjected to a 60 second cycle of convective heat at 1000˚F with a constant film coefficient of 15 W/m²K.

This analysis shows that CeraTech’s Firerok™ cement concrete absorbed less heat and experienced lower tensile stresses than an equivalent volume of portland cement concrete under equal thermal loading.

Sustainability

CeraTech’s unique, carbon neutral cement technology sets the standard for sustainable construction materials. A typical 10 yd³ placement of carbon neutral Firerok™ provides the following environmental benefits:

- Eliminates 3.5 tons of CO₂
- Preserves 5.25 tons of virgin mineral resources
- Saves 190 Gallons of water
- Diverts 3.5 tons of fly ash from landfills
- Liquid activators are produced with rapidly renewable resources