



FIVE STAR STRUCTURAL CONCRETE® HTR SHOTCRETE

Fast Repair For High Temperature Exposure

PRODUCT DESCRIPTION

Five Star Structural Concrete HTR Shotcrete is a unique high temperature resistant concrete repair material which is applied by dry process shotcrete. Five Star Structural Concrete HTR Shotcrete gains strength rapidly and can be exposed to 1000°F (538°C) in three hours and up to 2400°F (1316°C) after a 7-day curing procedure.

ADVANTAGES

- Thermal shock resistant
- High temperature resistance
- High early strengths
- Resistant to sulfates
- Dry process shotcrete application

USES

- Areas of high temperature exposure
- Thermal cycling up to 2400°F (1316°C)
- Rapid repairs during shutdowns
- Coker, kiln and foundry repairs

TECHNICAL SUPPORT

Five Star Products maintains the industry's foremost Engineering and Technical Support Group:

- Over 30 years of experience in concrete repair
- Technical Center staffed with experienced engineers available for consultation
- Design-A-Spec™ for engineering specification assistance
- Experienced representatives for field service
- Corporate research laboratory available to customize products for unique applications

PACKAGING AND YIELD

Five Star Structural Concrete HTR Shotcrete is packaged in heavy-duty polyethylene lined bags containing 50 lb (22.7 kg) yielding approximately 0.39 cubic feet (11.0 liters) at maximum water.

SHELF LIFE

One year in original unopened packaging when stored in dry conditions. Higher humidity will reduce shelf life.

TYPICAL PROPERTIES AT 73°F (23°C)

Compressive Strength, ASTM C 109

3 Hours	2500 psi (17.3 MPa)
1 Day	4500 psi (31.1 MPa)
28 Days	7000 psi (48.3 MPa)

Compressive Strength, ASTM C 42
in accordance with ACI 506R-90

3 Days	5000 psi (34.5 MPa)
7 Days	5700 psi (39.3 MPa)
28 Days	7000 psi (48.3 MPa)

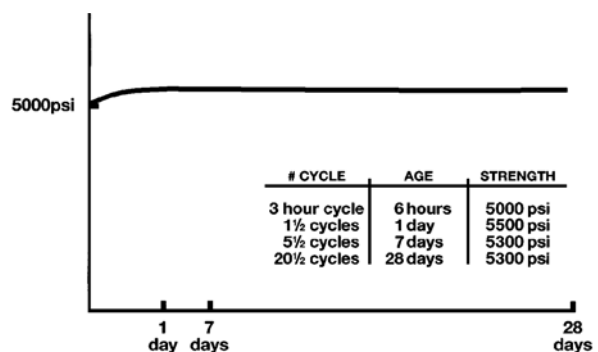
Bond Strength, ASTM C 882

1 Day	1500 psi (10.4 MPa)
7 Days	2500 psi (17.3 MPa)

Thermal Coefficient of Expansion, ASTM C 531
5.0 x 10⁻⁶ in/in/°F (9.0 x 10⁻⁶ mm/mm/°C)

Set Time, ASTM C 266 20 minutes

Thermal Shock Resistance



Samples cured at 70°F (21°C) for 3 hours, then exposed to 1000°F (538°C) in 24 hour cycles



PLACEMENT GUIDELINES

1. **SURFACE PREPARATION:** All surfaces in contact with Five Star Structural Concrete HTR Shotcrete shall be free of oil, grease, laitance, and other contaminants. Concrete must be clean, sound and rough to ensure a good bond. Remove all oxidation from exposed reinforcing steel and for additional protection coat reinforcing steel with Five Star® AC Coat. Featheredging is not desirable for structural repairs. A perimeter edge and minimum depth of two inches (50 mm) should be provided for a durable repair. Soak concrete surfaces prior to application with liberal quantities of potable water, leaving the concrete saturated and free of standing water. Surfaces shall be conditioned to between 40°F and 90°F (4°C and 32°C) at the time of placement.
2. **MIXING:** The mixing equipment should be capable of maintaining continuous placement.
DRY-MIX PROCESS: Predampen Five Star Structural Concrete HTR Shotcrete either in a mortar mixer prior to placement into gun or with a prehydration water ring (equip gun with a screen to avoid plug-ups). Avoid over dampening material. Do not predampen more material than can be placed in 20 minutes. Adjust consistency at nozzle.
3. **PLACEMENT:** Apply Five Star Structural Concrete HTR Shotcrete to full design thickness whenever possible. Overhead placement is applied in layers just thick enough to prevent sagging. Direct nozzle perpendicular to surface and rotate in a series of circular patterns, filling all inside corners first. Five Star Structural Concrete HTR Shotcrete should emerge from the nozzle in a uniform, uninterrupted flow. Finish to desired texture with screed, float, trowel, or brush. For more detailed application procedures, refer to ACI 506R-90, Guide to Shotcrete.
4. **POST-PLACEMENT PROCEDURES:** Five Star Structural Concrete HTR Shotcrete shall be kept wet for at least 30 minutes immediately after hardening. Approximately three hours after placement, material can be brought up to an operating temperature of 1000°F (538°C). For operating temperature up to 2400°F (1316°C), wet cure for 3 days followed by dry cure for 4 days. Then slowly apply heat up to 2400°F (1316°C). **NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY.** For more detailed placement procedures, refer to Design-A-Spec™ or call the Five Star Products Engineering and Technical Center at 800-243-2206.

LIMITATIONS

- Never exceed the maximum water content stated on the package.
- Temperature of surfaces must be between 40°F and 90°F (4°C and 32°C) at time of placement. For cold and hot weather placement, refer to Design-A-Spec™.
- For placements thinner than two inches (50 mm) or greater than four inches (102 mm), and a volume exceeding two cubic feet (56.6 liters), contact Five Star Products Engineering and Technical Center.
- Placement shall be continuous to avoid cold joints.

CAUTION

Contains cementitious material and crystalline silica. International Agency for Research on Cancer has evaluated that there is sufficient evidence for the carcinogenicity of inhaled crystalline silica to humans. Take appropriate measures to avoid breathing dust. Avoid contact with eyes and contact with skin. In case of contact with eyes, immediately flush with plenty of water for at least 15 minutes. Immediately call a physician. Wash skin thoroughly after handling. Keep product out of reach of children. **PRIOR TO USE, REFER TO MATERIAL SAFETY DATA SHEET.**

WARRANTY: "FIVE STAR PRODUCTS, INC. (FSP) PRODUCTS ARE MANUFACTURED TO BE FREE OF MANUFACTURING DEFECTS AND TO MEET FSP'S CURRENT PUBLISHED PHYSICAL PROPERTIES WHEN APPLIED IN ACCORDANCE WITH FSP'S DIRECTIONS AND TESTED IN ACCORDANCE WITH ASTM AND FSP STANDARDS. HOWEVER, SHOULD THERE BE DEFECTS OF MANUFACTURING OF ANY KIND, THE SOLE RIGHT OF THE USER WILL BE TO RETURN ALL MATERIALS ALLEGED TO BE DEFECTIVE, FREIGHT PREPAID TO FSP FOR REPLACEMENT. THERE ARE NO OTHER WARRANTIES BY FSP OF ANY NATURE WHATSOEVER, EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE IN CONNECTION WITH THIS PRODUCT. FSP SHALL NOT BE LIABLE FOR DAMAGES OF ANY SORT, INCLUDING PUNITIVE, ACTUAL, REMOTE OR CONSEQUENTIAL DAMAGES, RESULTING FROM ANY CLAIMS OF BREACH OF CONTRACT, BREACH OF ANY WARRANTY, WHETHER EXPRESSED OR IMPLIED, INCLUDING ANY WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR FROM ANY OTHER CAUSE WHATSOEVER. FSP SHALL ALSO NOT BE RESPONSIBLE FOR USE OF THIS PRODUCT IN A MANNER TO INFRINGE ON ANY PATENT HELD BY OTHERS."

For worldwide availability, additional product information and technical support, contact your local Five Star distributor, local sales representative, or you may call Five Star's Engineering and Technical Center at 800-243-2206.

Corporate Offices

Five Star Products, Inc.

750 Commerce Drive

Fairfield, CT 06825

Tel: 203-336-7900

Fax: 203-336-7930

www.fivestarprouducts.com



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