



STRUCTURAL CONCRETE HTR

High Early Strength Repair For High Temperature Exposure

PRODUCT DESCRIPTION

Five Star Structural Concrete HTR is a unique high temperature resistant concrete repair material which can be pumped or poured into place. Five Star Structural Concrete HTR gains strength rapidly and can be exposed to 1000°F (538°C) in six hours and up to 2400°F (1316°C) after a 7-day curing procedure.

ADVANTAGES

- Thermal shock resistant
- High temperature resistance
- Coarse aggregate extension up to 100%
- Resistant to sulfates
- High early strengths
- Excellent freeze/thaw resistance

USES

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

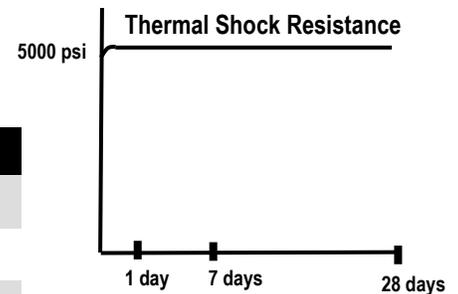
PACKAGING AND YIELD

Five Star Structural Concrete HTR is packaged in heavy-duty polyethylene lined bags and is available in 50 lb (22.7 kg) units yielding approximately 0.40 cubic feet (11.3 liters) at maximum water.

SHELF LIFE

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

TYPICAL PROPERTIES AT 70°F (21°C)	
Compressive Strength, ASTM C 109	
6 Hours	2500 psi (17.3 Mpa)
1 Day	4500 psi (31.1 MPa)
7 Days	5500 psi (38.0 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)	
Working Time at 70°F (21°C)	30 minutes



# CYCLE	AGE	STRENGTH
3 hour cycle	9 hours	5000 psi
1 1/2 cycles	1 day	5300 psi
5 1/2 cycles	7 days	5300 psi
20 1/2 cycles	28 days	5300 psi

Samples cured at 70°F (21°C) for 6 hours, then exposed to 1000°F (538°C) in 24 hour cycles

The data shown above reflects typical results based on laboratory testing under controlled conditions. Reasonable variations from the data shown may result. Test methods are modified where applicable.

PLACEMENT GUIDELINES

1. **SURFACE PREPARATION:** All horizontal and vertical surfaces in contact with Five Star Structural Concrete HTR shall be free of oil, grease, laitance, and other contaminants. All horizontal and vertical concrete surfaces 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. A perimeter edge and minimum depth of two inches (50 mm) should be provided for a durable repair. Featheredging is not desirable. 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 time of placement.
2. **FORMWORK:** Formwork shall be constructed of rigid non-absorbent materials, securely anchored, liquid-tight and strong enough to resist forces developed during placement. Areas where bond is not desired must be treated with form oil, paste wax or similar material. Joints may be necessary depending on pour dimensions. Any existing joints within the repair area should be maintained. Contact the Five Star Engineering and Technical Service Center for further information.
3. **MIXING:** Mix Five Star Structural Concrete HTR thoroughly for four to five minutes to a uniform consistency with a mortar mixer (stationary barrel with moving blades). A drill and paddle mixer is acceptable for single bag mixes. For optimum performance, condition between 60°F and 80°F (16°C and 27°C). Mix Five Star Structural Concrete HTR with 1 3/4 to 2 1/4 quarts potable water per 50 lb. unit. Adjust consistency if necessary, but do not exceed maximum water content stated on the package or an amount that will cause segregation. Addition of coarse aggregate, meeting ASTM C 33, should be used for large volume pours. Working time is approximately 30 minutes at 70°F (21°C). Follow printed instructions on the package. Always add mixing water first to mixer followed by repair material.
4. **PLACEMENT PROCEDURES:** Whenever possible, place Five Star Structural Concrete HTR full depth from one side of the repair to the other. To ensure optimal bond development, firmly work material into substrate. Placement should be continuous to prevent cold joints between pours. For pours over 3 inches (50 mm) in depth and detailed information regarding pumping, contact the Five Star Engineering and Technical Service Center at (800) 243-2206. Finish as necessary.
5. **POST-PLACEMENT PROCEDURES:** Five Star Structural Concrete HTR shall be kept wet for a minimum of one to four hours immediately after hardening depending on the volume and depth of the placement. Wet curing shall begin as soon as the material is thumb -print hard. Approximately six hours after placement, material can be brought up to an operating temperature of 1000°F (538°C). For operating temperatures 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™ installation guidelines or call the Five Star Engineering and Technical Service Center at (800) 243-2206.

CONSIDERATIONS

- Never exceed the maximum water content as stated on the package or add an amount that will cause segregation.
- If temperatures of equipment and surfaces are not between 40°F and 90°F (4°C and 32°C) at time of placement, refer to Design-A-Spec™, or call the Five Star Engineering and Technical Service Center at (800) 243-2206.
- 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), call the Five Star Engineering and Technical Service Center at (800) 243-2206.

CAUTION

Contains cementitious material and crystalline silica. International Agency for Research on Cancer has determined 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.**

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 Service Center at (800) 243-2206.

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, EXPRESS 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."

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