



STRUCTURAL CONCRETE® ES

Fast, High Early Strength, Extended Working Time Permanent Repair

PRODUCT DESCRIPTION

Five Star Structural Concrete® ES is a high early strength, single component, permanent concrete repair material which provides a 60-minute working time. The extended set facilitates deep/large volume pours in a single lift. Install neat at thicknesses up to 2 inches or extend with aggregate for placements up to 12 inches in a single pour (12 mm to 300 mm). Five Star Structural Concrete® ES produces a repair which is dimensionally stable, develops an integral bond to existing concrete, and restores structural integrity within hours of placement. Five Star Structural Concrete® ES provides increased corrosion protection of steel reinforced structures with migrating corrosion inhibitor technology and very low chloride ion permeability.

ADVANTAGES

- 60 minute working time
- One component
- Deep, large volume pours
- High six-hour strengths
- Coarse aggregate extension up to 80% with Five Star® 3/8 Coarse Aggregate
- Can apply cement/epoxy grouts and epoxy coatings as early as 6 hours after placement dependent on environmental conditions
- Excellent freeze/thaw resistance
- Provides permanent concrete and equipment/machinery foundation repair
- Facilitates equipment rebuilds in under 24 hours
- Pumpable
- High bond strength
- Outstanding corrosion resistance for protection and rehabilitation

USES

- Deep, large volume repair of concrete structures and machinery foundations
- Concrete floor toppings and overlays
- Hot weather concrete repair
- Heavy industrial repairs and retrofits

PACKAGING AND YIELD

Five Star Structural Concrete® ES is packaged in heavy-duty polyethylene lined bags or plastic pails and is available in 50 lb. (22.7 kg) units yielding approximately 0.42 cubic feet (11.9 liters) at maximum water, or 0.60 cubic feet (17.0 liters) with a 60% extension using 3/8" pea gravel. Five Star Structural Concrete® ES is also available in 3,000 lb. (1,360 kg) bulk bags.

SHELF LIFE

One year (packaged in bags) or two years (packaged in pails) 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	3,000 psi (20.7 MPa)
1 Day	4,500 psi (31.0 MPa)
7 Days	6,000 psi (41.4 MPa)
28 Days	7,700 psi (53.1 MPa)
Bond Strength, ASTM C 882	
1 Day	2,000 psi (13.8 MPa)
7 Days	2,500 psi (17.3 MPa)
Length Change, extended with pea gravel, ASTM C 157	
28 Days Wet	+0.03%
28 Days Dry	-0.05%
Thermal Coefficient of Expansion, CRD-C39	6.2×10^{-6} in/in/°F (11.2×10^{-6} mm/mm/°C)
Scaling Resistance, ASTM C 672	
50 cycles	0
Chloride Ion Permeability, ASTM C 1202	
28 Days	Very Low (<1,000 Coulombs)
Working Time at 70°F (21°C)	60 minutes

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

APPLICATION INFORMATION

Mixing Ratio	2½ to 3 qts (2.4 to 2.8 L) potable water per 50 lb. bag	Maximum In-Service Temperature	400°F (204°C)
		Placement Depth	½" - 2" (12 mm - 50 mm) neat > 2 in (50 mm), refer to TB302

PLACEMENT GUIDELINES

The material can be installed at an ambient temperature range from 35°F – 95°F (2°C – 35°C), however for optimum performance, the material, environment, mixing equipment, and all surfaces in contact with the material should be at temperatures between 50°F - 90°F (10°C and 32°C). After installation, maintain material and substrate temperatures above 35°F (2°C) until material reaches a minimum of 1,000 psi (6.9 MPa) compressive strength. **Flowability, strength gain, and working time are affected** by lower and higher temperatures. Refer to Five Star® Technical Bulletin (TB) 300 and 301 *Concrete Repair Cold and Hot Weather* for installation temperatures outside recommended ranges.

- SURFACE PREPARATION:** All horizontal and vertical concrete surfaces in contact with Five Star Structural Concrete® ES shall be clean and free of oil, grease, laitance, and other bond-inhibiting contaminants. To maximize bond, concrete surfaces shall be prepared by acceptable means to remove the top surface to coarse aggregate exposure. A minimum 1/4 to 1/2 inch (6 mm - 12 mm) peak to valley surface profile is recommended. Remove all oxidation from exposed reinforcing steel. A perimeter edge and minimum depth of 1/2 inch (12 mm) should be provided. Featheredging is not recommended. Presoak concrete surfaces with potable water for a minimum of 4 - 8 hours (optimum presoak 24 hours), continuously and consistently, via wet rags, wet burlap, ponding, or similar method to obtain a Saturated Surface Dry (SSD) condition. Presoak times are temperature dependent. In some applications an epoxy bonding adhesive may be utilized, contact Five Star Products. Any existing cracks shall be brought to the project engineer's attention prior to material installation. Refer to TB306 *Concrete Repair Surface Preparation*.
- FORMWORK:** Formwork should be constructed sufficiently in advance to allow it to be properly sealed, prepped, and tested prior to use. Formwork shall be constructed of rigid non-absorbent materials, securely anchored, liquid-tight, and strong enough to resist forces developed during placement. Liquid tight forms should also allow for pre-soaking of the substrate and avoid material leakage. Formwork and areas where bond is not desired shall be treated with form release oil, paste wax, or similar material. Isolation/construction joints may be necessary depending on pour dimensions. Any existing joints within the repair area should be maintained. Air relief ports, installation ports, and quick acting isolation valves may also be necessary. Refer to ACI Committee 347 *Guide to Formwork for Concrete* [ACI 347-14(21)] for additional information.
- MIXING:** Use of a mortar mixer (stationary barrel with moving blades) is required to completely mix the material. For single bag mixes, refer to TB416 *Single Unit Mixing Instructions*. Start with approximately 2 ½ quarts (2.4 L) potable water per 50 lb. bag (22.7 kg). Add Structural Concrete and mix for approximately 3 minutes to a uniform consistency. To achieve desired consistency, add additional potable water and mix for an additional 2 minutes. Do not exceed the maximum recommended amount of potable mixing water as directed. Do not allow the material to segregate. Addition of coarse aggregate, meeting ASTM C33, should be used for pours greater than 2 inches (50 mm) in depth. NOTE: The addition of coarse aggregate may result in lower compressive strength values. A concrete mixer may be used if the material is extended with coarse aggregate; refer to TB302 *Aggregate Extension Guidelines* for details. For further mixing details refer to TB305 *Cementitious Mortars Mixing Guidelines*.
- PLACEMENT PROCEDURES:** Five Star Structural Concrete® ES shall be form and poured, poured, pumped, or horizontally troweled into place. If possible, firmly work the material into substrate and place at full depth from one side of the repair to the other. Placement should be continuous to prevent cold joints between pours. Finish as necessary. For pumping procedures, contact Five Star Products.
- POST-PLACEMENT PROCEDURES:** Five Star Structural Concrete® ES shall be continuously wet cured for a minimum of 4 hours*. Wet curing of exposed surfaces shall begin as soon as the hydration process is visibly underway (surface changes from dark to light). Continuously wet cure all exposed material surfaces by flooding, using wet rags, burlap, or burlene saturated with potable water/ice. If needed, place plastic sheeting over the material used for wet cure to protect against evaporation. Monitor the condition of material used for wet cure to ensure drying does not occur during the minimum cure time duration. Protect the new concrete from traffic, vibration, damage, wind/sun/rain exposure, and temperature extremes (< 40°F [5°C] and >90°F [32°C]) while the material is developing the desired strength. *Refer to TB307 *Structural Concrete Curing* for lower cure time scenarios and additional information.
- CLEAN-UP:** All tools and equipment may be cleaned with soap and water before the material hardens. Sand or a similar abrasive may be used with the soap and water to aid in the clean-up.

For additional Five Star® Technical Bulletins, visit FiveStarProducts.com. For further questions, or if additional information is required, contact your local Five Star® Technical Sales Representative at 1-800-243-2206.

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 SAFETY DATA SHEET.**

SKU/PRODUCT CODE	DESCRIPTION	#UNITS/PALLET	UNIT SIZE
29400	Five Star Structural Concrete® ES	56	50 lb. (22.7 kg) Bag
29300	Five Star Structural Concrete® ES	36	50 lb. (22.7 kg) Pail

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."

Specifications Subject to Change.

For most current version of datasheet, go to FiveStarProducts.com

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