



# **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 45-minute working time. The extended set facilitates deep/large volume pours up to six cubic yards in a single lift. 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**

- 45 minute working time
- One component
- Deep, large volume pours up to six cubic yards
- High six-hour strengths
- Coarse aggregate extension up to 80%
- 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)	
<b>Compressive Strength, ASTM C 109</b>	
6 Hours	3,000 psi (20.7 MPa)
1 Day	4,500 psi (31.0 MPa)
7 Days	6,000 psi (41.4 MPa)
<b>Bond Strength, ASTM C 882</b>	
1 Day	2,000 psi (13.8 MPa)
7 Days	2,500 psi (17.3 MPa)
<b>Length Change, extended with pea gravel, ASTM C 157</b>	
28 Days Wet	+0.03%
28 Days Dry	-0.05%
<b>Thermal Coefficient of Expansion, ASTM C 531</b>	
	5.0 x 10 <sup>-6</sup> in/in/°F (9.0 x 10 <sup>-6</sup> mm/mm/°C)
<b>Scaling Resistance, ASTM C 672</b>	
50 cycles	0
<b>Chloride Ion Permeability, ASTM C 1202</b>	
28 Days	Very Low (<1,000 Coulombs)
<b>Working Time at 70°F (21°C)</b>	
	45 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.*

## PLACEMENT GUIDELINES

- SURFACE PREPARATION:** All horizontal and vertical concrete surfaces in contact with Five Star Structural Concrete® ES 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. Mechanically roughen concrete surfaces in accordance with ICRI Technical Guideline 03732 to a minimum concrete surface profile roughness (CSP) 6 or greater. Remove all oxidation from exposed reinforcing steel. A perimeter edge and minimum depth of 1/4 inch (6 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, or use Five Star® Bonding Adhesive. Surfaces shall be conditioned to between 35°F and 90°F (2°C and 32°C) at time of placement.
- 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 Products' Engineering and Technical Service Center for further information.
- MIXING:** Wet down mortar mixer (stationary barrel with moving blades) before using and drain excess water. A drill and paddle mixer is acceptable for single bag mixes. With the mixer running add approximately 80% of the pre-measured potable water (total water content is 2½ to 3 quarts potable water per 50 lb. unit) to the mixer. While mixing, slowly add Five Star Structural Concrete® ES and mix to a uniform consistency for three to four minutes. 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 pours greater than 2 inches (50 mm) in depth; add coarse aggregate before final water adjustment. Do not mix more material than can be placed within 45 minutes. For larger quantities, a ready-mix concrete truck may be used.
- PLACEMENT PROCEDURES:** Whenever possible, place Five Star Structural Concrete® ES 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. Finish as necessary. For pumping procedures, contact the Five Star Products' Engineering and Technical Service Center.  
**SPECIAL CONDITIONS:** For use in cold temperatures, Five Star Structural Concrete® ES must be maintained at a temperature of at least 35°F (2°C). Protect from freezing until a compressive strength of at least 1,000 psi (6.9 MPa) is obtained. Faster strength gain will occur when the Five Star Structural Concrete® ES, mixing water and coarse aggregate have been conditioned to a higher temperature prior to placement. In high temperatures, Five Star Structural Concrete® ES should be kept as cool as possible, but not exceeding 90°F (32°C). Ice cold water should be used for mixing to help maintain sufficient working time.
- POST-PLACEMENT PROCEDURES:** Five Star Structural Concrete® ES shall be kept continuously wet for 4 to 24 hours, depending on the volume, depth and placement temperature. Wet curing shall begin as soon as material reaches final set.

**NOTE: PRIOR TO APPLICATION, READ ALL PRODUCT PACKAGING THOROUGHLY.** For more detailed placement procedures, refer to the Five Star® Design-A-Spec™ installation guidelines or call the Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

## CONSIDERATIONS

- Never exceed the maximum water content as stated on the package or add an amount that will cause segregation.
- Temperature of surfaces must be between 35°F and 90°F (2°C and 32°C) at time of placement. For cold and hot weather placement, refer to Design-A-Spec™.
- For pours exceeding six cubic yards, contact the Five Star Products' Engineering and Technical Service Center.
- When capping Five Star Structural Concrete® ES with either cement or epoxy grout, surface temperature shall have cooled down to 90°F (32°C) prior to grout placement.
- For ready-mix truck mixing guidelines, contact the Five Star Products' Engineering and Technical Service Center 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 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 the Five Star Products' Engineering and Technical Service Center at 1-800-243-2206.

SKU / PRODUCT CODE	DESCRIPTION	UNIT SIZE
29400	Structural Concrete® ES	50 lb. Bag
29300	Structural Concrete® ES	50 lb. 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."

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