

PRODUCT DATA

3 03 37 13 Shotcrete

EMACO[®] S88 CI

Sprayable, fiber-reinforced structural repair mortar with integral corrosion inhibitor

Description

Emaco[®] S88 CI repair mortar is a one-component rheoplastic, shrinkage-compensated, fiber-reinforced product that contains an integral corrosion inhibitor. It contains silica fume to offer high strength and superior performance for structural concrete repairs. Emaco[®] S88 CI can be applied vertically or overhead by low-pressure spraying or hand troweling.

Yield

Approximately 0.45 ft³ (0.013 m³) per 55 lb (25 kg) bag. A 55 lb (25 kg) bag of Emaco[®] S88 CI mortar will cover approximately 5.4 ft² (0.52 m²) at a 1" (25 mm) thickness.

For estimating purposes, adjust for anticipated cut off and any other waste that will reduce in-place coverage.

Packaging

55 lb (25 kg) multi-wall bags
 Shelf life 1 year when properly stored
 3,300 lb (1,500 kg) bulk bags available by special order
 Shelf life 6 months when properly stored

Storage

Store in unopened containers in a clean, dry area between 45 and 90° F (7 and 32° C).

Features

- Quality controlled
- One component for mixing
- No additional bonding agent required
- Sprayable, virtually no rebound
- Sulfate-resistant and freeze/thaw durable
- Silica-fume formulation
- Integral corrosion inhibitor
- High early and ultimate compressive, flexural, and bond strengths
- Shrinkage compensated

Benefits

- Produces uniform, predictable results
- Requires only the addition of potable water
- Bonds tenaciously to concrete
- Low waste
- For use in adverse weather environments
- Denser matrix and extremely low permeability
- Ideal for wet, corrosive environments
- Long-lasting, durable repairs
- Reduces stress at the bondline

Where to Use

APPLICATION

- Vertical and overhead repair of concrete and masonry
- Repairs in federally inspected meat and poultry plants (FDA approved)
- Manhole, wet-well, sewer, and lift-station repairs
- Bridges, parking garages, tunnels
- Piers, navigation locks, dams, sea walls, and other marine structures

How to Apply

Surface Preparation

CONCRETE

1. Perform surface preparation in compliance with ICRI Technical Guideline No. 310.1R "Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion" or if appropriate; as per ICRI Technical Guidelines no. 310.2 "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays."

2. Remove concrete that has been saturated with oil or grease. Simple light sandblasting will not provide a sufficient profile for most repairs. Remove all unsound or delaminated concrete, providing a minimum of 1/4" (6 mm) substrate profile and 3/4" (19 mm) clearance behind corroded reinforcing steel. Expose the aggregate. Limit the size of chipping hammers to 16 lb (6.8 kg) to reduce microfractures. Do not use a method of surface preparation that will fracture the concrete. Verify the absence of microcracking or bruising in accordance with ICRI Guideline No. 210.3: Guide for using in-situ tensile pull-off tests to evaluate bond of concrete surface materials (formerly No. 03739).

3. Sawcut the perimeter of the area being patched to a minimum depth of 1/4" (6 mm) to prevent featheredges. Do not cut existing steel reinforcement.

4. After concrete removal and before placement, mechanically abrade the concrete surface to remove all bond-inhibiting materials and to provide additional mechanical bond. Presoak the prepared concrete surface to provide a saturated surface-dry (SSD) condition.



Technical Data

Composition

Emaco® S88 CI is a one-component rheoplastic, silica-fume modified, fiber-reinforced repair mortar with an integral corrosion inhibitor.

Typical Properties

PROPERTY	VALUE
Unit weight, lb/ft ³ (kg/m ³)	139 (2,275)
Working time, min	45
Set times, hrs (ASTM C 266)*	
Initial set	< 4 hours
Final set	< 7 hours

Test Data

PROPERTY	RESULTS	TEST METHODS		
Modulus of elasticity, psi (GPa), at 28 days	5.0 x 10 ⁶ (34.5)	ASTM C 469		
Rapid chloride permeability, coulombs, at 28 days	Very low chloride penetrability 100-1000 coulombs	ASTM C 1202 / AASHTO T 277		
Freeze/thaw resistance, % RDM, at 300 cycles	96.0	ASTM C 666, Procedure A		
Salt scaling resistance, 50 cycles	None	ASTM C 672		
Sulfate resistance, %, 6 months	< 0.10	ASTM C 1012		
	1 Day Psi (MPa)	7 Day Psi (MPa)		
	28 Day Psi (MPa)			
Direct tensile bond strength	100 (0.7)	175 (1.2)	300 (2.1)	ACI 503R, Appendix A
Direct shear bond strength	350 (2.4)	450 (3.1)	700 (4.8)	Michigan DOT
Slant shear bond strength	1,500 (10.3)	2,500 (17.2)	3,000 (20.7)	ASTM C 882, modified ¹
Splitting tensile strength	350 (2.4)	500 (3.5)	900 (6.2)	ASTM C 496
Flexural strength	650 (4.5)	1,000 (6.9)	1,300 (9.0)	ASTM C 348
Compressive strength	3,500 (24.1)	6,600 (45.5)	9,000 (62.1)	ASTM C 109
Drying shrinkage, %, at 28 days	0.09			ASTM C 157, modified ²

¹No epoxy-bonding agent used.

²ICRI Guideline No. 320.2R "Guide for Selecting and Specifying Materials for Repair of Concrete Surfaces" (formally No. 03733), 1 by 1 by 10" (25 by 25 by 250 mm) prism, air cured.

Results were obtained when material was mixed with 1 gallon (3.8 L) of water per bag and cured at 70° F (21° C). Expect reasonable variations depending upon mixing equipment, temperature, application methods, test methods, and curing conditions.

CORRODED REINFORCING STEEL

1. Remove all oxidation and scale from the exposed reinforcing steel in accordance with ICRI Technical Guideline No. 310.1R "Guide to Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion."
2. For additional protection from future corrosion, coat the prepared reinforcing steel with Emaco® P24 rebar coating or install Emaco® CP intact galvanic anodes.

Mixing

1. Add 0.7 – 1.0 gallons (2.7 – 3.8 L) of potable water (10.5 – 15% by weight) per 55 lb (25 kg) bag of Emaco® S88 CI repair mortar.
2. Mechanically mix using a mortar mixer of appropriate size. Pour approximately 90% of the mix water into the mixing container, then charge the mixer with the bagged material. Add the remaining mix water as required.
3. Mix for 3 – 5 minutes to achieve a homogeneous consistency. For overhead applications, use a stiffer mix.

NOTE: Manual mixing is not recommended; it tends to result in an excessive water-to-cement ratio.

Application

REINFORCING MESH

1. In the following conditions, use a 4 by 4" (102 by 102 mm) low-gauge (10 – 12) mesh firmly tied into the properly prepared substrate. If repairing chloride contaminated concrete consider using galvanized or stainless mesh. Use of Emaco® CP intact galvanic anodes or Zincrich primer should also be considered to protect adjacent concrete:
 - When applying Emaco® S88 CI mortar in repairs greater than 10 lineal feet (3 m) in the longest direction
 - In overlays at depths of 1 – 1-1/2" (25 – 38 mm) or greater
 - For overhead applications of the same size
2. Locate the mesh no closer than 3/8" (10 mm) and no more than 1" (25 mm) from the finished surface using spacers and concrete anchors.
3. Mesh is not necessary in applications with side restraints, such as square-cut patches or areas where existing concrete reinforcement will provide adequate restraint. For depths over 2" (51 mm), consult your BASF representative.

HAND-TROWEL APPLICATION

1. Use a bond coat to obtain maximum bond on hand-trowel applications. Thoroughly scrub a thin layer of mixed Emaco® S88 CI mortar into the clean, saturated surface with a stiff-bristled brush. Do not dilute the bond coat with water. Apply the coat immediately before the application of the bulk of the mortar. Do not apply more of the bond coat than can be covered with mortar before the bond coat dries. Do not retemper this material. Spray application does not require a bond coat.
2. Use a mortar mixer to ensure a workable mix. After the bond coat has been applied, firmly place the mixed material onto the repair area with a trowel. This hawk-and-trowel plastering method will improve adhesion and finishability.

SPRAY APPLICATION

1. Emaco® S88 CI mortar may be applied using low-pressure spray equipment, such as a Powercreter®, Moyno, or screwtype machine commonly used for plastering. Spray application is recommended for larger repairs refer to ACI RAP 3 “Spalling Repair by Low-Pressure Spraying”.
2. Applicators must have thorough knowledge of pump and spray equipment before spray-applying Emaco® S88 CI. Use normal techniques of pumping water first and then a cement slurry to prime and lubricate the base (neither being applied to the repair area). Be careful not to get too far ahead of the finishing crew; Emaco® S88 CI mortar stiffens rapidly after placement. Also, periodic cleaning of the pump may be helpful when applying large quantities.

NOTE: Existing concrete colors vary considerably. If color matching is a concern, a field evaluation may be necessary. Allow for sample to dry to a uniform color. Contact your local BASF representative.

APPLICATION THICKNESS

Emaco® S88 CI mortar may be applied on vertical or overhead surfaces in thicknesses from 3/8 – 2" (10 mm – 51 mm). For depths over 2" (51 mm), consult your BASF representative. Achieve a thicker build by making multiple passes with the spray nozzle.

- Vertical applications: Emaco® S88 CI mortar can be applied on vertical applications in a thickness up to 2" (51 mm) in a single lift.
- Overhead applications: Unless forming is used, the thickness for overhead application should be no more than 1 – 1-1/2" (25 – 38 mm) per pass. For depths greater than 1-1/2" (38 mm), succeeding lifts of no more than 1" (25 mm) should be used.
- MULTIPLE LIFTS: Timing between lifts is critical and will vary with several factors, including mix consistency, mix and ambient temperature, wind conditions, humidity, and application technique. Succeeding lifts may be placed after repair mortar has developed initial set. Roughen or profile the preliminary lifts to ensure the adhesion of subsequent lifts. When succeeding lifts will not be applied the same day, keep the surface continually moist.

FINISHING

1. After placing Emaco® S88 CI mortar, level the surface immediately using a wooden float. A darby or screed may be necessary in larger applications.
2. In hot, dry, or windy conditions, use Confilm® evaporation reducer.
3. Start final finishing when the mortar has begun to set; that is, when finger pressure does not penetrate the surface, but marks it lightly. Final finishing may be done using a wooden or sponge float. If the material is difficult to finish at this point, a very light misting of Confilm® evaporation reducer may help.

HOT WEATHER APPLICATION (ABOVE 80° F [27° C])

1. Do not apply Emaco® S88 CI mortar when ambient and surface temperatures are 100° F (38° C) and above. Shade the material and prepared surface to keep them cool.
2. To extend working time, mix the material with cool water or ice-cooled water. Be certain the substrate is saturated surface-dry (SSD) before application begins.
3. When finishing is required, work the material quickly once it has stiffened—when a finger pressed against the material will mark it lightly but not sink beneath the surface.
4. Proper curing is always required and is particularly important in hot weather. Refer to the section on Curing below.

COLD WEATHER APPLICATION (BELOW 45° F [7° C])

1. Do not apply if the ambient temperature is expected to fall below 40° F (4° C) within 72 hours of placement. Both the substrate and ambient temperature must be at least 45° F (7° C) at the time of placement.
2. Low substrate and ambient temperatures slow down rate of set and strength development. Protect the finished patch with insulating blankets to aid in the development of early strength gain.
3. At temperatures below 50° F (10° C), warm the material, water, and substrate. Properly ventilate the area when heating it.

Curing

1. The finished patch requires curing for optimum performance and durability. Either keep the finished patch continuously moist with water for a minimum of 7 days or use a two-coat application of a quality curing compound compliant with ASTM C 1315. BASF recommended curing compounds include Kure-N-Seal and Kure 1315.
2. Apply the first coat of curing compound immediately after finishing operations are completed. Apply the second coat as soon as the first coat dries.

Clean Up

Remove repair mortar as soon as possible from tools and mixing equipment with water. Cured material can only be removed mechanically.

For Best Performance

- Precondition these materials to approximately 70° F (21° C) for 24 hours before using.
- Protect repairs from direct sunlight, wind, and other conditions that could cause rapid drying of material.
- Minimum application thickness is 3/8" (10 mm). Maximum application thickness is 2" (51 mm) in a single lift.
- Do not mix partial bags.
- Minimum ambient and surface temperatures should be 45° F (7° C) and rising at the time of application.
- Make certain the most current versions of product data sheet and MSDS are being used; call Customer Service (1-800-433-9517) to verify the most current version.
- Proper application is the responsibility of the user. Field visits by BASF personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

Health and Safety

EMACO® S88 CI

WARNING!

Risks

Product is alkaline on contact with water and may cause injury to skin or eyes. Ingestion or inhalation of dust may cause irritation. Contains small amount of free respirable quartz which has been listed as a suspected human carcinogen by NTP and IARC. Repeated or prolonged overexposure to free respirable quartz may cause silicosis or other serious and delayed lung injury.

Precautions

Avoid contact with skin, eyes and clothing. Prevent inhalation of dust. Wash thoroughly after handling. Keep container closed when not in use. DO NOT take internally. Use only with adequate ventilation. Use impervious gloves, eye protection and if the TLV is exceeded or used in a poorly ventilated area, use NIOSH/MSHA approved respiratory protection in accordance with applicable Federal, state and local regulations.

First Aid

In case of eye contact, flush thoroughly with water for at least 15 minutes. In case of skin contact, wash affected areas with soap and water. If irritation persists, SEEK MEDICAL ATTENTION. Remove and wash contaminated clothing. If inhalation causes physical discomfort, remove to fresh air. If discomfort persists or any breathing difficulty occurs or if swallowed, SEEK IMMEDIATE MEDICAL ATTENTION.

Waste Disposal Method

This product when discarded or disposed of is not listed as a hazardous waste in federal regulations. Dispose of in a landfill in accordance with local regulations.

For additional information on personal protective equipment, first aid, and emergency procedures, refer to the product Material Safety Data Sheet (MSDS) on the job site or contact the company at the address or phone numbers given below.

Proposition 65

This product contains material listed by the State of California as known to cause cancer, birth defects or other reproductive harm.

VOC Content

0 g/L or 0 lbs/gal less water and exempt solvents.

**For medical emergencies only,
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Form No. 1019947 2/11
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