

SHOTPATCH 21F

Silica fume enhanced, fiber reinforced structural shotcrete for wet or dry process applications

DESCRIPTION:

SHOTPATCH® 21F is a pre-packaged silica fume enhanced, fiber reinforced mortar which contains an integral corrosion inhibitor. The unique technology of SHOTPATCH 21F allows for application by either the wet or dry shotcrete process. The result is a high quality structural repair material which exhibits high bond strengths, low permeability and excellent resistance to freeze-thaw cycling and salt scaling.

Application Thickness:

- Minimum application thickness is 3/8" in. (10 mm)
- Recommended maximum application thickness per lift is 6 in. (152 mm). Deeper applications are possible depending on the size and configuration of the repair.

RECOMMENDED FOR:

Structural repair and retrofit of:

- Bridges, tunnels, and parking garages
- Piers, docks and dams
- Reservoirs and tanks
- Treatment facilities
- Canals and aqueducts

FEATURES/BENEFITS:

- Fiber reinforced - for plastic shrinkage control and reduced rebound
- Versatile - designed for use with the dry or wet shotcrete process
- Low permeability - resists water and chloride ion penetration
- Corrosion resistant - contains an integral corrosion inhibitor
- Workable - easy to cut and finish
- Pre-packaged quality - bag-to-bag uniformity

STANDARDS COMPLIANCE:

Sand gradation meets ASTM C 33 and ACI 506 standards. Cement meets ASTM C 150, Type II requirements.

PACKAGING/ESTIMATING:

SHOTPATCH 21F is supplied in 55 lb (25 kg) moisture-resistant bags which yield approximately 0.48 ft³ (0.013 m³). This will cover approximately 5.8 ft² (0.54 m²) at a 1 in. (25 mm) depth before rebound and waste. The product is also available in 3,300 lb (1,497 kg) bulk bags.

PERFORMANCE DATA:

Results were obtained when material was mixed with 0.8 gal (3.0 L) of water per bag and cured at 73 °F (22 °C). Reasonable variations can be expected depending upon application methods, test methods, and curing conditions.

PLASTIC PROPERTIES:

Unit Weight 129 lb/ft³ (2,067 kg/m³)

Set Times, (hr:min) (ASTM C 266)	Initial Set 2:45	Final Set 6:00
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HARDENED PROPERTIES:	1 Day psi (MPa)	7 Day psi (MPa)	28 Day psi (MPa)
Direct Tensile Bond Strength (ACI 503R, Appendix A)	50 (0.3)	130 (0.9)	180 (1.2)
Slant Shear Bond Strength (ASTM C 882 Modified ¹)	1200 (8.3)	2500 (17.2)	3000 (20.7)

Drying Shrinkage at 28 Days
(ASTM C 157 Modified²) 0.08%

Modulus of Elasticity at 28 Days
(ASTM C 469) 4.6 x 10⁶ psi (31.7 GPa)

Rapid Chloride Permeability at 28 Days
(ASTM C 1202/AASHTO T 277) 685 coulombs

Freeze-Thaw Resistance at 300 Cycles
(ASTM C 666 Procedure A) 95% RDM

Abrasion Resistance (ASTM C 779)	Duration	Depth of Wear
	30 Minutes	0.021 in. (0.53 mm)
	60 Minutes	0.036 in. (0.91 mm)

	1 Day psi (MPa)	7 Day psi (MPa)	28 Day psi (MPa)
Splitting Tensile Strength (ASTM C 496)	200 (1.4)	300 (2.1)	400 (2.8)
Flexural Strength (ASTM C 348)	600 (4.1)	1200 (8.3)	1800 (12.4)
Compressive Strength (ASTM C 109)	2500 (17.2)	6000 (41.4)	7000 (48.3)

	3 Day psi (MPa)	28 day psi (MPa)
Compressive Strength (ASTM C 42)	6,000	10,000
Dry Process	(41.4)	(69.0)
Wet Process	6,000 (41.4)	10,000 (69.0)

¹ No epoxy bonding agent used

² ICRI Guideline #03733, 1" x 1" x 10" prism

SURFACE PREPARATION:

Concrete: Perform surface preparation in compliance with ICRI Technical Guideline No. 03730 "Guideline for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion" and ACI 506.2

"Specification for Materials, Proportioning, and Application of Shotcrete". Remove all unsound or delaminated concrete providing a minimum 1/4 in. (6 mm) substrate profile amplitude and 3/4 in. (19 mm) clearance behind corroded reinforcing steel. The perimeter of the area to be patched should be tapered toward the center at approximately 45° to prevent square and feather edges, or saw cut to a minimum depth 1/4 in. (6 mm). After concrete removal and prior to placement, mechanically abrade the concrete surface to remove all bond-inhibiting materials from the concrete substrate and to provide additional mechanical bond. Presoak the prepared concrete surface to provide a saturated, surface dry (SSD) condition.

Corroded reinforcing steel: Remove all oxidation and scale from the exposed reinforcing steel in accordance with ICRI Technical Guideline No. 03730 "Guideline for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion". For additional protection from future corrosion, coat the prepared reinforcing steel with EMACO® P-22 or P-24 rebar coatings.

MIXING:

Wet process: Add 0.7 to 0.9 gal (2.7 to 3.4 L) of potable water per 55 lb (25 kg) bag of SHOTPATCH 21F. Mechanically mix using an appropriate size mortar mixer. Pour approximately 90% of the water into the mixing container then charge the mixer with the bagged material. Add the remaining mix water as required. Mix for 3 to 5 minutes until a homogenous consistency is achieved.

APPLICATION:

The installation of Shotpatch 21F is dependent primarily upon the skill of the nozzleman. Apply SHOTPATCH 21F in accordance with ACI 506R "Guide to Shotcrete". Remove excess water from the saturated substrate and apply while taking proper consideration for rebound and compaction around reinforcing steel. When applying with multiple lifts, scratch the preliminary lift before initial set. Apply the succeeding lift after the preliminary lift has reached final set. If the succeeding lift is not to be immediately placed, keep the surface continually moist. Cut-off or level as required matching the original concrete elevation. Where rapid drying conditions exist (such as hot, dry, and windy conditions) use CONFILM® evaporation reducer. Finish the final surface as required.

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CURING:

Proper curing is extremely important and should be conducted in accordance with ACI 308 "Standard Practice for Curing Concrete". Apply a curing compound which complies with the moisture retention requirements of ASTM C 309 such as MASTERCURE® 100W or 200W or moist cure for a minimum of 7 days.

SAFETY:

For industrial and professional use only. Refer to MSDS before use. Wear appropriate protective clothing and eye protection.

LIMITATIONS:

Minimum application thickness is 3/8 in. (10 mm). Do not mix partial bags. Minimum ambient and surface temperatures should be 45 °F (7 °C) and rising at the time of application.

STORAGE AND SHELF LIFE:

Unopened bags have a shelf life of 12 months when stored under cover in dry conditions between 45 °F (7 °C) and 90 °F (32 °C).

RELATED BULLETINS:

Material Safety Data Sheet - SHOTPATCH 21F
Specification Bulletin