

SHOTCRETE

PRODUCT NO. **1228-21, 1229-80, 1229-86, 1229-83, 1229-87**

PRODUCT DESCRIPTION

QUIKRETE® Shotcrete Mixes are specially designed for machine applications to repair above- or below-grade concrete and mortar.

PRODUCT NAMES

QUIKRETE® Shotcrete #1228-21
QUIKRETE® Shotcrete MS #1229-80
QUIKRETE® Shotcrete MS Coarse #1229-82
QUIKRETE® Shotcrete MS with Polypropylene Fibers #1229-86
QUIKRETE® Shotcrete MS – AR Fiberglass Reinforced #1229-83
QUIKRETE® Shotcrete MS – Steel Fiber Reinforced #1229-87

PRODUCT USE

QUIKRETE® Shotcrete Mixes are structural repair materials for bridges, tunnels, parking garages, ramps, beams, piers, sewer pipes and dams. They can be used for structural concrete in vertical, horizontal and overhead surfaces. QUIKRETE® Shotcrete is a well proportioned blend of Portland cement and concrete sand suitable for general-use construction. Shotcrete MS is a 1-component, dry process shotcreting material containing microsilica. Advantages include high strength, improved sulphate resistance, high adhesion, low permeability, low rebound and low sag. Shotcrete MS can be placed at a greater single pass thickness than conventional shotcrete. Other performance levels are also available to meet specific jobsite requirements, including coarse aggregate versions.

SIZES

•QUIKRETE® Shotcrete products are packaged in both 3000 lb (1362 kg) bulk bags and in 50 lb (22.7 kg) bags

YIELD

• Applied at ½" (13 mm) thickness, each 50 lb (22.7 kg) bag will cover approximately 9 ft² (0.84 m²).

TECHNICAL DATA

APPLICABLE STANDARDS

ASTM International

- ASTM C42 *Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (AASHTO T24)*
- ASTM C78 *Standard Test Method for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading)*
- ASTM C109 *Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50 mm] Cube Specimens)*
- ASTM C666 *Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing*
- ASTM C882 *Standard Test Method for Bond Strength of Epoxy Resin Systems Used with Concrete By Slant Shear*
- ASTM C1012 *Standard Test Method for Length Change of Hydraulic-Cement Mortars Exposed to a Sulfate Solution*
- ASTM C1202 *Standard Test Method for Electrical Indication of Concrete's Ability to Resist Chloride Ion Penetration*
- ASTM C1399 *Standard Test Method for Obtaining Average Residual-Strength of Fiber Reinforced Concrete*

DIVISION 3

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- ASTM C1480 *Standard Specification for Packaged, Pre-Blended, Dry, Combined Materials for Use in Wet or Dry Shotcrete Applications*
- ASTM C1583 *Standard Test Method For Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)*

PHYSICAL /CHEMICAL PROPERTIES

The performance of dry process shotcrete cannot be duplicated in the laboratory. In spite of that fact, laboratory data are important for quality control purposes and for making comparisons between formulations. QUIKRETE Shotcrete products have been extensively tested both in the laboratory and in the field. The greatly enhanced performance in the field shows the benefits of low water/cement ratio and high compaction. The field test data are offered only as an example of what can be achieved with qualified operators using proper techniques. The quality of dry process shotcreting is very dependent on the skills of the operator. Table 1 shows typical laboratory data for shotcretes with and without fibers. Expected field results for Shotcrete MS with fibers compared to QUIKRETE Shotcrete are shown in Tables 2 & 3. All of the Quikrete Shotcrete products in Tables 1 through 3 comply with the requirements of ASTM C1480 Type FA (Fine Aggregate), Grade GU (General Utility). Additionally, Shotcrete MS complies with Grades SR (Sulfate-Resistant) and LP (Low Permeability). QUIKRETE Shotcrete MS with Steel Fibers complies with Grade FR (Fiber- Reinforced), Class II. QUIKRETE also offers custom designs to meet other types and grades of ASTM C1480, as well as job specific specifications. Consult a local QUIKRETE representative for details.

INSTALLATION

EQUIPMENT

QUIKRETE Shotcrete MS is normally applied using dry process shotcrete machinery. Dry process shotcrete is a very efficient method for making repairs to horizontal, vertical and overhead surfaces. The process allows for the placement of the repair material at a very low water/cement ratio with a high degree of compaction. The result is a repair that is superior to other methods of placement of repair material. QUIKRETE Shotcrete MS can also be applied using wet process shotcrete machinery. The performance will be enhanced by the appropriate choice of admixtures. Consult a local QUIKRETE representative for details.

SURFACE PREPARATION

PREPARATORY WORK

QUIKRETE recommends that job mock-ups be prepared by the contractor and tested prior to beginning a project.

METHODS

QUIKRETE recommends that American Concrete Institute (ACI) Committee 506 procedures be followed for surface preparation, equipment, nozzle man certification and shotcrete placement and curing procedures. Refer to the following publications:

- ACI 506R-90 Guide to Shotcrete
- ACI 506.2-95 Specifications for Shotcrete
- ACI 506.1R-98 Committee Report on Fiber Reinforced Shotcrete
- ACI CP-60 Craftsman Workbook for ACI Certification of Shotcrete Nozzleman

APPLICATION

APPLICATION OVER CONCRETE SURFACES

Remove all spalled, severely cracked, deteriorated, loose and unsound concrete from existing concrete surface by chipping, water blasting or other mechanical methods. Adequate pre-wetting of the concrete substrates should be done prior to shotcreting. Surfaces should be damp with no glistening water.

APPLICATION OVER MASONRY SURFACES

Prepare as required for concrete surfaces. However, prevention of water absorption from the shotcrete into the masonry surface is critical. Surface should be pre-dampened with no glistening water.

WARRANTY

The QUIKRETE® Companies warrant this product to be of merchantable quality when used or applied in accordance with the instructions herein. The product is not warranted as suitable for any purpose or use other than the general purpose for which it is intended. Liability under this warranty is limited to the replacement of its product (as purchased) found to be defective, or at the shipping companies' option, to refund the purchase price. In the event of a claim under this warranty, notice must be given to The QUIKRETE® Companies in writing. This limited warranty is issued and accepted in lieu of all other express warranties and expressly excludes liability for consequential damages.

The QUIKRETE® Companies

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TABLE 2 – TYPICAL FIELD TEST RESULTS

General Properties	Result
Water content / bag	~2/3 gal (2.5 L) / 50 lb (22.7 kg)
Unit Weight/Bulk Density	149 pcf (2387 kg/m ³)
Absorption	7.3%
Rebound	2-3%
Freeze Thaw Resistance, C666	
% Loss	3.2%, 300 cycles
Durability Factor	100

TABLE 3 TYPICAL FIELD APPLIED PHYSICAL PROPERTIES

	Shotcrete	Shotcrete MS
Rapid Chloride Permeability Test, C1202		
Coulombs	12,000	< 500
Rating	high	very low
Compressive Strength, C 42		
1 day	3000 psi (20.7 MPa)	3200 psi (22.0 MPa)
7 days	6000 psi (41.3 MPa)	6900 psi (47.5 MPa)
28 days	8000 psi (55.1 MPa)	9000 psi (62.0 MPa)
Flexural Strength, C 78		
7 days	700 psi (4.8 MPa)	900 psi (6.2 MPa)
28 days	1000 psi (6.9 MPa)	1100 psi (7.6 MPa)

¹ 4" (100 mm) cubes sawed from a 4" x 2' x 2' (100x600x600 mm) panel

² 4"x4"x15" (100x100x380 mm) beams sawed from a 4" x 2' x 2' (100x600x600 mm) panel

TABLE 1 TYPICAL LABORATORY TEST RESULTS¹

	Shotcrete	Shotcrete MS	Shotcrete MS Coarse	Shotcrete MS with Polypropylene Fibers	Shotcrete with Steel Fibers
Compressive strength, ASTM C109					
1 day	1500 psi (10.3 MPa)	1750 psi (12.1 MPa)	1750 psi (12.1 MPa)	1750 psi (12.1 MPa)	2500 psi (17.2 MPa)
7 days	3050 psi (21.0 MPa)	3500 psi (24.1 MPa)	3500 psi (24.1 MPa)	3500 psi (24.1 MPa)	4000 psi (27.6 MPa)
28 days	5075 psi (35.0 MPa)	5500 psi (37.9 MPa)	5500 psi (37.9 MPa)	5500 psi (37.9 MPa)	7000 psi (48.3 MPa)
Flexural strength, ASTM C78					
1 day	250 psi (1.7 MPa)	350 psi (2.4 MPa)	350 psi (2.4 MPa)	350 psi (2.4 MPa)	450 psi (3.1 MPa)
7 days	500 psi (3.4 MPa)	600 psi (4.1 MPa)	600 psi (4.1 MPa)	600 psi (4.1 MPa)	700 psi (4.8 MPa)
28 days	600 psi (4.1 MPa)	700 psi (4.8 MPa)	700 psi (4.8 MPa)	700 psi (4.8 MPa)	1000 psi (6.9 MPa)
Residual strength, ASTM C1399					
28 days	-	-	-	45 psi (0.3 MPa)	290 psi (2 MPa)
Sulfate expansion, ASTM C1012					
	-	< 0.05% at 180 days	-	-	-
	-	< 0.1% at 1 yr	-	-	-
Bond strength, ASTM C882					
7 days	-	1100 psi (7.6 MPa)	-	-	-
28 days	-	2200 psi (15.2 MPa)	-	-	-

¹Laboratory testing is conducted in accordance with ASTM C1480.