



REMR MATERIAL DATA SHEET CM-PC-1.10

CONCRETE PATCHING MATERIAL: CEILCOTE 646 UNDERWATER GROUT

(Supersedes previously issued CM-PC-1.10)

1. NAME

Ceilmcote 646 Underwater Grout

2. MANUFACTURER

Master Builders, Inc.
23700 Chagrin Boulevard
Cleveland, OH 44122
Telephone: (216) 831-5500

3. DESCRIPTION

Ceilmcote 646 Underwater Grout is a three-component, modified epoxy-resin-based grout that provides tensile bond strength to prepared concrete.

4. USES

This material has been formulated specifically for underwater grouting applications. It can be used to fill voids in concrete and repair structures and foundations that are underwater. This grout has a high tolerance for moisture, allowing it to cure and bond to steel and concrete in a submerged condition. The fill ratio may be modified to make the grout more flowable or of a drypack consistency. Bond strength depends upon conditions and methods employed. Stresses resulting from curing, thermal excursions, and external sources may exceed bond strength. Specific installation procedures, performance, and selection should be established by actual field tests.

5. MANUFACTURER'S TECHNICAL DATA

Physical Properties:

	<u>7 Days @ 73° F Under Seawater</u>	<u>7 Days @ 73° F Under Freshwater</u>	<u>7 Days @ 73° F</u>
Compressive strength, psi ASTM C 579B Modified	12,000	11,000	11,000
Flexural strength, psi ASTM C 580	3,400	3,400	3,400
Tensile strength, psi ASTM C 307	1,400	1,400	1,400
Modulus of elasticity × 10 ⁶ , psi ASTM C 580	2.0	2.0	2.0
Coefficient of thermal expansion, millionths/°F ASTM C 531	13	13	24

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Physical Properties (Concluded):

	<u>31° to 74° F</u>	<u>75° to 110° F</u>	<u>75° to 211°F</u>
Compressive cure rate, psi			
Cure under fresh water			
ASTM C 579B modified			
	<u>40° F</u>	<u>55° F</u>	<u>75° F</u>
			<u>90° F</u>
8 hr	--	--	1,300
16 hr	--	1,800	6,100
24 hr	--	4,400	8,500
48 hr	2,000	9,900	10,500
72 hr	4,600	10,000	12,200
96 hr	5,100	11,500	12,600
120 hr	5,700	11,500	12,600
144 hr	7,300		
168 hr	8,300		
Tensile bond strength, psi	<u>24 hr @ 73° F</u>		
Steel-sandblasted and exposed to fresh water	1,600		
Concrete-sandblasted and exposed to fresh water	140		
Density	131 lb/cu ft		
ASTM C 905-79			
Water absorption	+ 0.08%		
ASTM C 413-83			
Flash point			
Pensky-Martens closed cup	230° F (646 Resin)		
	230° F (646 Hardener)		

Tolerance to water:

Pouring grout underwater can allow small amounts of water to become mixed into the grout. Ceilcote 646 Underwater Grout cures in the presence of and combined with water. The following test data were collected:

Underwater Grout	Flexural Strength	Modulus Elasticity
Cured 7 Days @73° F	(psi)	(psi)
ASTM C 580-74		
646 Control	3,400	2.0
+ 5% Seawater	2,000	1.5
+ 10% Seawater	1,800	1.3

Working time:

Temperature	Working Time
(°F)	(Minutes)
90	10-20
75	30-40
55	50-70

6. MANUFACTURER'S GUIDANCE FOR APPLICATION

Concrete or steel to be grouted should be water-jetted or sandblasted to

remove any loose or weakened material or algae growth.

The grout can be poured in open areas or exposed to free-flowing water. It should not be placed unconfined in areas where currents are expected or exist. The fill ratio can be modified for a more flowable grout (under steel or small clearance) or a drypack - trowelable type (large voids, wet or sloping floors).

If the grout is to be pumped, a pump capable of handling the larger aggregate stones should be obtained and evaluated in the field prior to job start-up.

Forms must be water-tight, as this grout is fluid and flowable.

7. SAFETY

Ceilcote 646 Underwater Grout contains epoxy resins catalyzed by a polyamine. The products' components have been formulated to optimize physical characteristics such as crack-filling

capability and chemical resistance while minimizing hazardous physical and health factors encountered during mixing and application. A concerned effort is made to acquire the latest chemical toxicological information and to apply this knowledge in a responsible manner to ensure product safety.

During application of 646 Underwater Grout materials, workers must always wear gloves, eye protection and appropriate work clothing to minimize contact. During mixing, ventilation, respiratory protection, or some engineering means of controlling dust with this operation is recommended.

Safe storage practices must be observed. Separate resins from hardeners, and store aggregate in a dry area. Observe the special Ceilcote warning on red and yellow labeled products. The Ceilcote red labels represent amine-type chemicals, and the Ceilcote yellow labels represent organic peroxide-type chemicals which should not be stored adjacent or mixed together because of the possible violent reaction between them.

8. CORPS OF ENGINEERS' EVALUATION

This material was evaluated by Singleton Laboratories, TVA, through a support agreement with the U.S. Army Engineer Waterways Experiment Station.*

<u>Property</u>	<u>Test Method</u>	<u>Results</u>
Compressive strength, psi	ASTM C 109	10,860
Slant-shear bond strength, psi	ASTM C 882	
Dry surfaces		3,530
Wet surfaces		2,670
Bond capacity in direct tension, psi	**	***
Bond capacity under flexural stress, psi	ASTM C 293	2,130

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- * Best, Floyd J., and McDonald, James E. 1990. "Spall Repair of Wet Concrete Surfaces," Technical Report REMR-CS-25, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- ** Causey, F. E. 1984. "Preliminary Evaluation of a Tension Test for Concrete Repairs," Report Gr-83-14, Department of the Interior, Bureau of Reclamation.
- *** Bond failure between concrete at patching material during coring process.

<u>Property</u>	<u>Test Method</u>	<u>Results</u>
Underwater abrasion loss, %	CRD-C 63	0
Resistance to cycles of freezing and thawing, % of original weight after 312 cycles	ASTM C 666 Procedure A	100
Impact resistance, in.-lb	--	1,020
Coefficient of thermal expansion, millionths/°F	--	20.3

9. ENVIRONMENTAL CONSIDERATIONS

Reasonable caution should guide the preparation, repair, and cleanup phases of activities involving potentially hazardous and toxic chemical substances. Manufacturer's recommendations to protect occupational health and environmental quality should be carefully followed. Material safety data sheets should be obtained from the manufacturers of such materials. In cases where the effects of a chemical substance on occupational health or environmental quality are unknown, chemical substances should be treated as potentially hazardous toxic materials.

10. AVAILABILITY AND COSTS

Ceilcote 646 Underwater Grout is packaged in a unit consisting of 21 lb 6 oz resin, 12 lb hardener, and 200 lb (four 50 lb - bags) aggregate. A unit yields 1.78 cu ft. 1987 cost was approximately \$204 plus shipping.