



REMR MATERIAL DATA SHEET CM-PC-1.26  
 CONCRETE PATCHING MATERIAL: EMBECO 411-A  
 MORTAR

## 1. NAME

EMBECO 411-A Mortar

drying shrinkage, and resists freezing and thawing and deicing salts.

## 2. MANUFACTURER

Master Builders  
 23700 Chagrin Boulevard  
 Cleveland, Ohio 44122  
 Telephone: 216-831-5500  
 Telex: 980-305

Limitations: Do not use EMBECO 411-A under the following conditions: the mortar will be in contact with aluminum or magnesium, highly stressed anchors, strands, cables, anchors, bolts, or reinforcement with the potential to conduct stray currents; the mortar will be exposed to acids or other chemicals known to attack concrete; the application requires feather edging; or the appearance of the repair is critical and must match the surrounding concrete.

## 3. DESCRIPTION

EMBECO 411-A Mortar is a specially prepared, ready-to-use product that utilizes metallic aggregate to provide greater flexural strength and resistance to drying shrinkage. It also contains a special air-entraining admixture to help withstand cycles of freezing and thawing and frequent exposure to deicing salts.

## 4. USES &amp; LIMITATIONS

Uses: EMBECO 411-A can be used to repair highways and bridge decks, floors and parking areas subject to heavy traffic, sidewalks, curbs, and gutters, and to patch holes and spalled or worn areas 1 to 8 in. (25 mm to 200 mm) deep in concrete slabs, columns and beams.

It is a mortar that screeds easily into areas to be filled without danger of either rapid set or long delay and that hardens without bleeding. It has good bond to concrete, develops high early strength, is not affected by

## 5. MANUFACTURER'S TECHNICAL DATA

Compressive strength, psi  
 (MPa), (2-in. cubes)

|         |              |
|---------|--------------|
| 6 hr    | 400 (2.8)    |
| 9 hr    | 1,000 (6.9)  |
| 12 hr   | 2,250 (15.5) |
| 24 hr   | 4,150 (28.6) |
| 3 days  | 6,200 (42.7) |
| 7 days  | 6,500 (44.8) |
| 28 days | 8,100 (55.8) |

Flexural strength, psi (MPa),  
 (3- x 4- x 16-in. beams)

|         |           |
|---------|-----------|
| 3 days  | 700 (4.8) |
| 7 days  | 775 (5.3) |
| 28 days | 825 (5.7) |

Split tensile strength, psi (MPa),  
 (6- x 12-in. cylinders)

|         |           |
|---------|-----------|
| 7 days  | 425 (2.9) |
| 28 days | 490 (3.4) |

Bond shear strength, psi (MPa)  
 (3- x 3- x 10-in. beams)

7 days 2,000 (15.2)  
 28 days 2,300 (16.2)

Modulus of elasticity, psi (MPa),  
 (2,000 psi load)

7 days  $4.5 \times 10^6$  ( $3.10 \times 10^4$ )  
 28 days  $4.7 \times 10^6$  ( $3.25 \times 10^4$ )

Freezing and thawing durability,  
 300 cycles, ASTM C 666, Procedure A

| <u>Immersed in</u> | <u>Durability Factor</u> | <u>Weight Loss</u> |
|--------------------|--------------------------|--------------------|
| Water              | 99.7%                    | 0.6%               |
| 5 percent CaCl     | 98.3%                    | 2.6%               |
| 5 percent NaCl     | 87.0%                    | 6.5%               |

Typical data: The data shown are based on carefully controlled laboratory tests. Reasonable variations from the results shown are to be expected. Both field and laboratory tests should be controlled on the basis of the indicated slump rather than on the water content.

Mixing water: 5.6 lb (2.5 kg) per 55 lb (25 kg) mortar.

Slump: 3-1/2 in. (90 mm).

Yield: 0.42 cu ft (12 litre) per 55 lb (25 kg) mortar.

Air content: 5.1%.

## 6. MANUFACTURER'S GUIDANCE FOR APPLICATION

Surface preparation: Chip unsound concrete from the area to be repaired. Square cut or undercut the perimeter of the patch to sound concrete or to a depth of 1 in. (25 mm). Do not cut the reinforcement. Remove areas that have been saturated with oil or grease. Thoroughly clean the roughened surface and exposed reinforcement of dirt, loose chips, and dust. Form

as required on vertical surfaces. Saturate the area with water (several hours, if possible) prior to placing the mortar. Immediately before mixing, blow off or remove all excess water from the repair area. The surface should be wet, but with no pockets of water.

Mixing: Mix EMBECO 411-A in a 4- to 6-cu ft (110 to 170 l) paddle-type mortar mixer. Set the mixer on blocks so it can discharge EMBECO 411-A directly into wheelbarrows. Depending on temperature and humidity, EMBECO 411-A will require slightly over 0.67 U.S. gal (2.54 l) of drinkable water per 55-lb bag (25 kg) of EMBECO 411-A. Once the water requirement is determined, the water should be precisely measured to maintain uniform consistency for finishing.

Mix only the amount of mortar that can be used in 20 min. Do not retemper mortar that has stiffened with additional water. Approximately 10.9 psf of EMBECO 411-A mortar (53.4 kg-m) produces a 1-in. (25 mm) thick mortar. A 55-lb (25 kg) bag yields 0.42 cu ft (0.012 m).

Application: By hand or machine, mix EMBECO 411-A mortar with enough water to make a creamy slurry for bonding. Thoroughly scrub a thin layer of this mixture into the saturated surface with a stiff-bristle broom or brush. Make sure coarse aggregate does not collect in the corners. Do not apply more of this bond coat than can be covered with mortar before the bond coat dries. Do not retemper bond coat.

For floor slab and pavement repairs, mix, place, screed, float and finish the mortar to the desired surface texture.

Note: For repairing flat slabs, a 3- to 4-in. (76 mm to 102 mm) slump is easily placed, screeded, leveled and finished. For higher early strengths,

prepare and thoroughly tamp a stiff mixture into place; then screed, level and finish.

For vertical surfaces on which forms will retain the mortar, use a 3- to 5-in. (76 mm to 127 mm) slump. Place the mortar behind the forms and gently but thoroughly consolidate it. Prepare forms in advance for rapid assembly in 12- to 18-in. (300 mm to 450 mm) sections so that the mortar will not be dropped more than that distance behind the forms.

Ambient temperature should be as close to 70° F (21° C) as possible. Special information on high- or low-temperature applications is available from the local Master Builders field representative.

Finishing: Under certain temperature and humidity conditions, minor surface oxidation can be expected. Where this condition is objectionable, apply a dust-on application of Mastercron concrete surface hardener.

If possible, wet cure the mortar by using wet, clean cloth or burlap for several hours; follow by applying a

membrane-type curing compound such as Master Builders Masterseal or MB-429 curing compound.

Supplemental information: Add only drinkable water to this product. Do not add cement, sand, pea gravel, crushed stone, calcium chloride or admixtures. Use suggested water amount merely as a guide. Work to slump. The job temperature and mixing and placing methods are factors that determine the actual amount of water needed. However, do not use more water than necessary since extra water reduces strength at all ages. For information on applications that require special considerations, contact a local Master Builders representative.

Do not use this product in contact with prestressed or posttensioned anchorages or steel tendons.

Safety: Cementitious material may cause irritation. Avoid contact with eyes and prolonged contact with skin. In case of contact with eyes, immediately flush with plenty of water for at least 15 min. Call a physician. Wash skin thoroughly after handling. Keep product out of reach of children.

## 7. CORPS OF ENGINEERS' EVALUATION

### Technical data:

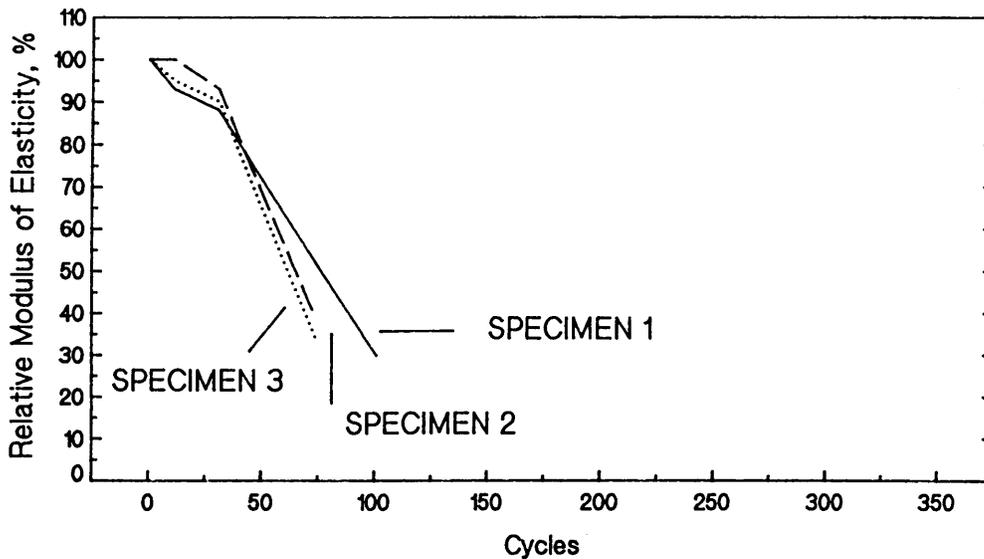
| Properties                 | Test Method                         | Results            |                            |
|----------------------------|-------------------------------------|--------------------|----------------------------|
|                            |                                     | 24 hr              | 28 days                    |
| Compressive strength, psi  | ASTM C 39                           | 5,060              | 7,360                      |
| Modulus of elasticity, psi | ASTM C 469                          | $4.84 \times 10^6$ | $5.14 \times 10^6$         |
| Flexural strength, psi     | ASTM C 78                           | 590                | 725                        |
| Bond to concrete, psi      | ASTM C 882                          | 1,460              | 3,489<br>(concrete failed) |
| Shrinkage, percent         | GR-83-10*                           |                    |                            |
|                            | (Unconfined Condition) <sup>1</sup> | 0.146              |                            |
|                            | (Concrete Patch) <sup>1,2</sup>     | 0.032              |                            |

\* Bureau of Reclamation Technical Report Standard

1 No exotherm was recorded on the shrinkage specimen using a mixture design of 5.6 lb of water per 55-lb bag.

2 The slab cracked in the middle where the thermocouple was embedded to measure the temperature rise, thus reducing the shrinkage.

Rapid Freezing and Thawing  
ASTM C 666, Relative Dynamic Modulus  
of Elasticity, %



8. 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.

Cost: The material sells for \$29.50 per 55-lb bag.

9. AVAILABILITY AND COST

Availability: This material is marketed throughout the United States through a network of local distributors. Distributors are also located throughout the rest of the world.