

Proposed specification - For review by qualified architects and engineers.

SECTION 04117
EPOXY GEL INJECTION FOR HAIRLINE CRACKS IN LIMESTONE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Application of structural injection epoxy with urethane capping mortar, cyanoacrylate adhesive and epoxy injection material . Injection of crack with manual equipment. Aesthetic removal of capping mortar. Capping and sealing crack back side of panel if accessible. Furnish all materials, labor, and equipment.

1.02 RELATED SECTIONS

- A. Section 04460 - Limestone
- B. Section 04500 - Masonry Cleaning

1.03 REFERENCE STANDARDS

- A. ASTM D 638 Test method for Tensile Properties of Plastics
- B. ASTM D 648 Test method for Deflection Temperature of Plastics under Flexural Load.
- C. ASTM D 695 Test Method for Compressive Properties of Rigid Plastics
- D. ASTM D 790 Test Method for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
- E. ASTM D 2240 Test Method for Rubber Property - Durometer Hardness

1.04 QUALITY ASSURANCE

- A. Manufacturer qualifications: Company regularly engaged in the manufacturing of the products specified in this section.
- B. Contractor qualifications: Qualified to perform the work specified by reason of manufacturer's contractor certification or experience in the installation and repair of dimensional building stone.

1.05 DELIVERY, STORAGE, AND HANDLING

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- A. Deliver products in original factory packaging bearing identification of product, manufacturer, and batch number. Provide Material Safety Data Sheets for each product
- B. Store products above 60 degrees F in an area protected from precipitation, construction activity, and direct sunlight.
- C. Condition products to a temperature between 60 and 85 degrees F before application.
- D. Handle all products in accordance with Material Safety Data Sheets.

1.06 PROJECT CONDITIONS

- A. Apply product under ambient conditions between 60 and 85 degrees F. Protect site from precipitation, or apply product only after stone has thoroughly dried. Apply when stone temperature is between 50 and 85 degrees F.
- B. Mask or otherwise protect all adjacent work from Urethane capping mortar, its components, and the injection epoxy.

PART 2

2.01 MANUFACTURERS

- A. Bonstone Materials Corporation; 707 Swan Drive; Mukwonago, WI 53226; 262-363-9877; conforms to the requirements of this specification
- B. Substitutions: Alternates to the acceptable manufacturer will be considered only upon the basis of written request and shall include substantiation of product performance as listed in section 2.02 below.

2.02 PERFORMANCE CRITERIA

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A. Bonstone® Last Patch™-Gel meets the requirements of this section.

B. Properties of the mixed Urethane utilized for preparing the capping mortar, shall meet the following:

1. Pot life: 2 to 5 minutes at 75 degrees F
2. Consistency at 75 degrees F. Knifegrade
3. Color: Clear Cloudy(color matching available)
4. Mix Ratio 7 parts "A" to 1 part "B" by volume
5. Initial setting time at 75 degrees F. 15-20 minutes
(accelerator available for faster cure or during colder temperatures))
6. Full cure time at 75 degrees F. 24 hours

B. Cured properties of the Urethane utilized for producing the mortar, shall meet or exceed the following:

1. Tensile Strength - 14 days ASTM D-638/ 354 psi minimum
2. Tensile Elongation - 14 days ASTM D-638/ 2.4 % minimum
3. Tensile Modulus - 14 days ASTM D-638/ 16436 psi minimum
4. Compressive Strength - 28 days ASTM D-695/ 1437 psi minimum
5. Compressive Modulus -28 days ASTM D-695/ 12810psi minimum

C. Thickening powder used to modify viscosity of the epoxy mortar shall come from the epoxy compound manufacturer. (used mainly in high temperatures)

D. Properties of the injection epoxy(*Bonstone Clear Gel epoxy*) shall conform to the following criteria:

1. Tensile Strength - 7 day ASTM D638 2,044 psi min.

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2. Tensile Modulus- 7 days	ASTM D-638	458,763 psi
3. Tensile Elongation -7 day	ASTM D638	1.16%
4. Compressive Strength - 7 day	ASTM D695	8,182 psi min.
5. Compressive Modulus - 7 days	ASTM D695	106,191 psi min.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Inspect all areas to be repaired for possible exposure to precipitation, soundness of stone to be repaired, need for masking of adjacent objects, and the existence of any coating or contamination on the Limestone surface or in the Limestone's crack.

3.02 PREPARATION

A. Protect all adjacent surroundings from exposure to mixed Urethane repair compounds or their components.

B. Ensure that all coatings or contaminants are removed before application of Urethane repair compound to a Limestone surface or before injection into a crack.

C. Ensure that all Limestone (both on the surface and in cracks) is clean, dry, sound, and dust free.

3.03 APPLICATION

A. Preparation of capping mortar on face of stone

1. Precondition materials to a temperature between 60 and 85 degrees F.

2. Premix each component of the Urethane capping compound separately, to ensure uniformity, before mixing the components together.

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3. Determine the amount of capping compound which can be utilized within the potlife at the existing temperature.
4. Measure and mix 1 part of "A" component and 1 part of "B" component (by volume in a clean mixing container. Mix thoroughly for at least thirty seconds. Use either a stainless steel spatula when mixing by hand. Avoid the use of waxed paper cups as mixing containers.
5. Ensure that no unmixed product exists on the sides or bottom of the mixing container and mix an additional twenty seconds minimum.
6. Cap the entire crack area with the Last Patch Gel adhesive. Cover crack area with approximately 1/8 to 1/4 inch on each side of crack opening thus sealing up crack. Leave approximately 1/16 overfill of the Last Patch Gel. (Buff tint available for color matching Last Patch Gel).

B. Installation of injection epoxy and sealing crack

1. When the capping material is cured, drill several holes with 1/8 drill bit thru capping material directly over crack. Drill approximately 1/2 to 3/8 inch in depth of stone.
2. Next, I recommend using the Bonstone® Clear Gel epoxy to inject into drilled holes thus structurally sealing up cracks. Inject cracks with slow but constant pressure. When epoxy is observed at the next adjacent drill hole. Move site of injection to the next adjacent drill hole.
3. Continue injection along crack until completed.
4. Dry grind the Last Patch Gel flush with the limestone

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3.04 FIELD QUALITY CONTROL

A. Keep samples of cured epoxy for quality control. Log time and dates of use.

3.05 CLEANING

A Remove uncured epoxy repair compound from tools and equipment with lint free dry towel or with xylene or MEK.

B. Remove cured Urethane repair compound mechanically.

C. Remove all debris related to the epoxy repair application from the work site in accordance with all applicable regulations for hazardous waste disposal.

END OF SECTION

Project Name/95-01/07-11-95 04117-7 Epoxy Injection for Hairline Cracks in Limestone

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