

Proposed specification - For review by qualified architects and engineers.

SECTION 04117  
**EPOXY GEL INJECTION FOR HAIRLINE CRACKS IN LIMESTONE and HRM  
CAPPING MORTAR**

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Application of structural injection epoxy with Lime- based capping mortar, HRM- Historical Restoration Mortar and epoxy injection material . Injection of crack with manual equipment. Aesthetic 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.

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#### 1.05 DELIVERY, STORAGE, AND HANDLING

- 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 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.

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## 2.02 PERFORMANCE CRITERIA

A. **Bonstone® HRM**- Historic Restoration Mortar meets the requirements of this section.

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

1. Pot life: 15 minutes at 75 degrees F
2. Consistency at 75 degrees F. Knifegrade for vertical applications
3. Color: Buff limestone(color matching available)
4. Mix Ratio 4 parts "A" to 1 part "B" by volume
5. Initial setting time at 75 degrees F. 25-30 minutes
6. Full cure time at 75 degrees F. 24 hours

C. 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.
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.

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## 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, sound, and dust free.

D. Ports for injection: Use .245 diameter standard flexible straws and cut to 3" to 4" length. This diameter fits the standard Pro Tip nozzle for the Injection Gel Cartridge.

E. Crack chasing blade- If there is a need to open the crack for more volume of adhesive, the use of a 1/8 blade is recommended.

### 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 part A powder and shake part B latex thoroughly to ensure uniformity, before mixing the components together.

3. Determine the amount of capping compound which can be utilized within the pot-life at the existing temperature.

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4. Lightly mist water in crack and around crack area with a spray bottle.
5. Insert 2 inch straw lengths (precut) in the crack every 4 to 6 inches in length. Pinching them into the crack until mortar is applied is recommended
6. Measure and mix 4 part of "A" component and 1 part of "B" component (by volume in a clean mixing container) or mix to knife grade consistency for vertical applications. Mix thoroughly for at least thirty seconds. Use spatula when mixing by hand.
7. Ensure that no unmixed product exists on the sides or bottom of the mixing container and mix an additional twenty seconds minimum.
8. Cap the entire crack area and around straws with the HRM mortar. Cover crack area with approximately 1/8 to 1/4 inch on each side of crack opening thus sealing up crack. Leave approximately 1/32 to 1/64 inch overfill of the HRM.
8. After installing HRM, lightly mist the capping material with a spray bottle.

#### B. Installation of injection epoxy and sealing ports

1. The capping material must be thoroughly cured before epoxy is injected.
2. Place a 3 inch length of tape on the bottom of straw leaving 1 inch overhang. This will capture any release of material out of tip of straw port.
3. Next, I recommend using the Bonstone® Clear Gel epoxy to inject into ports thus structurally sealing up cracks. Inject cracks with slow but constant pressure. When epoxy is observed at the next adjacent port. Move site of injection to the next adjacent drill port.
4. Continue injection along crack until completed.
5. Pinch and remove straws before the epoxy sets up and tool back the epoxy into the hole if needed.
6. Fill the hole flush with additional mix of HRM mortar

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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

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