



Dutchman Repair For Limestone

*Proposed Specification
For Review by Qualified Architects and Engineers*

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SECTION 04108

DUTCHMAN REPAIR FOR LIMESTONE

Bonstone® Clear Gel Epoxy- Medium set for cartridge mixing

Bonstone® Duropxi – Medium set for container mixing

Bonstone® - Fast setting, cold temperature or smaller repairs for cartridge or container mixing.

Patching Dutchman joint- HRM- Historical Restoration Mortar

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dutchman stone replacement utilizing epoxy repair compound
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.

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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. Store material in original containers. When opened, reseal opened containers tightly, and as soon as possible, to avoid moisture absorption from the atmosphere.

C. Condition products to a temperature between 60 to 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.

B. Mask or otherwise protect all adjacent work from epoxy repair compound or it's components.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Bonstone Materials Corporation; 707 Swan Drive; Mukwonago, WI 53149; 414-363-9877; conforms to the requirements of this specification.

B. Substitutions:

1. 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® Clear Gel Epoxy meets the requirements of this section for larger “Dutchman’s” where **medium** set time is required using a **cartridge system**. For smaller “Dutchman’s require less adjustment time, the Fast Set Extreme is recommended

B. Properties of the mixed epoxy repair compound for limestone shall meet the following:

Bonstone® Clear Gel Epoxy

1. Pot life: 15 minutes at 75 degrees F
2. Consistency at 75 degrees F.: Knife Grade
3. Color: Clear
4. Mix Ratio: 2 parts "A" to 1 part "B" by volume
5. Initial setting time at 75 degrees F.: 2 hours
6. Full cure time at 75 degrees F.: 24 hours

C. Cured properties of the epoxy repair compound shall meet or exceed the following:

1. Tensile Strength - 7 days: ASTM D 638 2,044 psi minimum
2. Tensile Elongation - 7 days: ASTM D 638 1.16 % minimum
3. Tensile Modulus - 7 days: ASTM D 638 458,763 psi minimum
4. Compressive Strength - 7 days: ASTM D 695 8,182 psi minimum
5. Compressive Modulus -7 days: ASTM D 695 106,191 psi minimum
6. Flexural Strength -7 days: ASTM D 790 9,896 psi minimum
7. Flexural Modulus -7 days: ASTM D 790 536,751 psi minimum

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Bonstone® Duropoxi meets the requirements of this section for larger “Dutchman’s” where **medium** set time is required using a **container mixing method**. For smaller “Dutchman’s” require less adjustment time, the Fast Set Extreme is recommended

Bonstone® Duropoxi

1. Pot life: 20 minutes at 75 degrees F
2. Consistency at 75 degrees F.: Knife Grade
3. Color: Tan/ Buff
4. Mix Ratio: 1 parts "A" to 1 part "B" by volume
5. Initial setting time at 75 degrees F.: 1 to 2 hours
6. Full cure time at 75 degrees F.: 24 hours

C. Cured properties of the epoxy repair compound shall meet or exceed the following:

1. Tensile Strength - 7 days: ASTM D 638 2,622 psi minimum
2. Tensile Elongation - 7 days: ASTM D 638 0.6 % minimum
3. Tensile Modulus - 7 days: ASTM D 638 527,467 psi minimum
4. Compressive Strength - 7 days: ASTM D 695 5,791 psi minimum
5. Compressive Modulus -7 days: ASTM D 695 177,493 psi minimum
6. Flexural Strength -7 days: ASTM D 790 5,626 psi minimum
7. Flexural Modulus -7 days: ASTM D 790 281,936 psi minimum

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Bonstone® Extreme Epoxy - **Fast setting**, cold temperature or smaller repairs for cartridge or container mixing.

Bonstone® Fast Set Extreme Epoxy

1. Pot life: 10 minutes at 75 degrees F
2. Consistency at 75 degrees F.: Knife Grade
3. Color: Buff/ Tan
4. Mix Ratio: 1 parts "A" to 1 part "B" by weight
5. Initial setting time at 75 degrees F.: 15 minutes
90% of full cure at 75F: 60 minutes
6. Full cure time at 75 degrees F.: 24 hours

C. Cured properties of the epoxy repair compound shall meet or exceed the following:

1. Tensile Strength - 7 days: ASTM D 638 2,414 psi minimum
2. Tensile Elongation - 7 days: ASTM D 638 0.2 % minimum
3. Tensile Modulus - 7 days: ASTM D 638 852,634 psi minimum
4. Compressive Strength - 7 days: ASTM D 695 6,947 psi minimum
5. Compressive Modulus -7 days: ASTM D 695 161,416 psi minimum
6. Flexural Strength -7 days: ASTM D 790 5,626 psi minimum
7. Shore D Hardness: ASTM D 2240 92

D. Thickening powder used to modify viscosity of the approved epoxy compound shall come from the epoxy compound manufacturer.

PART 3 - EXECUTION

3.01 ACCEPTABLE INSTALLERS

A. Contractor qualifications: Company regularly engaged in the repair and installation of dimension stone.

3.02 EXAMINATION

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

3.03 PREPARATION

A. Protect all adjacent surroundings from exposure to mixed epoxy repair compound or it's components.

B. Ensure that all coatings or contaminates are removed before application of epoxy repair compound to a stone surface.

C. Ensure that all stone surfaces are clean, dry, sound, and dust free.

3.04 APPLICATION

A. Mixing Procedure:

1. Precondition materials to a temperature between 60 and 85 degrees F for the Bonstone® Clear Gel Epoxy. For Temperature below 40F use the Fast Set Extreme epoxy.

2. Premix each component of the epoxy repair compound separately before mixing. When using cartridges, dispense approximately 3 to 4 inches from mix nozzle before applying to hole or bonding surface.

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

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4. Measure by weight or volume 2 parts of A Clear Gel Epoxy and 1 part Clear Gel hardener B into a clean mixing container. Mix thoroughly for at least 40-50 seconds. Use either a stainless steel spatula when mixing by hand, or a slow speed mixer (400 RPM) with a clean stainless steel mixing paddle. 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 one minute minimum.

6. Should additional thickening powder be necessary for high temperatures slowly add thickening powder while mixing to achieve the desired lump free consistency.

Note: When using Bonstone® cartridge systems refer to instruction sheets for dispensing epoxy.

B. Dutchman Repair of spalled stone.

Preparation:

1. Remove a right rectangular section of stone from the panel as follows:

To a depth of Z inches, remove stone (*X plus or minus Y*) inches past the furthest interior point of the spall. Remove stone(*X plus or minus Y*) inches above and below the highest and lowest point of the spall.

Manufacture of Dutchman assembly:

2. Prepare a replacement stone (Dutchman) of dimensions such that it will fit into the remaining space left by stone removal with a gap of 1/16th of an inch, plus or minus 1/32nd of an inch on all sides.

Installation of Dutchman:

3. Mask face of stone panel and Dutchman adjoining each other.

4. Apply epoxy prepared as in 3.04-A-(1 through 5) to adjoining sides of Dutchman and stainless steel anchor if required. When applying epoxy(especially a clear epoxy) to the sides of the limestone remember to leave epoxy roughly 1/2 to 3/4 inch from face/ surface of stone. This will eliminate any squeeze-out of epoxy on the face of the limestone. Tape may be used to mask off joint as well.

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5. Install Dutchman into existing stone assuring true and level fit
6. Allow joint to cure and remove forms, masking and holding devices.
7. Apply flush with surface the Bonstone® HRM Mortar to the Dutchman surface joint for aesthetic repair.

Bonstone® HRM PRODUCT DESCRIPTION:

A two-component, lime-based, latex modified mortar for the restoration of historic masonry structures.

INSTALLATION Surface Preparation & Use:

Use gloves, wear eye protection, and avoid skin contact. When grinding cured materials, wear a dust mask. Mix only the amount of material which can be used in 15 minutes. Clean uncured HRM Historic Restoration Mortar from tools with hot, soapy water. Remove cured material mechanically.

Recommend testing an area of the structure before applying to large sections

MIXING INSTRUCTIONS:

All materials should be at or above 55°F. Priming: For best adhesion, do not apply product to dry surfaces- light misting is appropriate. MIX PART B WELL BEFORE USING. Combine the two ingredients of powder and liquid until a slurry or knife grade desired consistency is obtained. Determine the powder to liquid proportion that works and handles the best for your particular application. Use a straight edge trowel to spread the material. Lightly mist the repair mortar with clean water immediately after application. Allow to cure before carving, grinding, or shaping.

3.05 FIELD QUALITY CONTROL

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

3.06 CLEANING

- A. Remove uncured epoxy repair compound from tools and equipment with dry towel or with xylene or MEK.
- B. Remove cured epoxy 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