

ITEM 11555.8196 M - CRACK REPAIR BY INJECTION OF PORTLAND CEMENT GROUT

DESCRIPTION:

Install injection ports, seal the crack opening, fill the cracks with grout, and restore the sealed surface to a flush condition in areas visible to the public. Perform the work at locations indicated on the contract plans or where directed by the Engineer.

MATERIALS:

A. Epoxy Paste Crack Sealant. An epoxy paste that completely cures in 4 hours and retains the injected grout. Any other type of crack sealant is subject to a project demonstration and approval by the Engineer.

B. Portland Cement Grout. Use ingredients conforming to the following:

| | |
|--------------------------|------------|
| Portland Cement, Type II | 701-01 |
| Fly Ash (Type F) | 711-10 |
| Microsilica | 584-2.01 F |
| Grout Sand | 703-04 |
| Water | 712-01 |
| Admixtures | 711-08 |
| Expansive Agent | - |

Include an air entraining admixture to create 5 - 15% air entrainment, or if an expansive agent is used, use a maximum 1% by weight of cementitious material and eliminate any air entraining admixture.

For cracks less than 5 mm wide, design a grout (portland cement, water and admixtures) with a minimal water content that will fill and flow throughout the crack. Up to 25% by loose volume of the portland cement may be replaced, in combination or alone, as follows:

| | |
|-------------|----------|
| Fly Ash | 0 to 25% |
| Microsilica | 0 to 10% |

For cracks 5 mm wide and larger, use a loose volume ratio of 1 part cementitious material (portland cement, fly ash, microsilica) to 1 - 3 parts grout sand.

Perform mix trials to select a suitable grout for the application. When the repairs will be visible to the public, match the color of the repair to the adjacent material, to the satisfaction of the Engineer.

Demonstrate that the grout to be used flows satisfactorily through an installed injection port.

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CONSTRUCTION DETAILS:

A. Equipment. Use only equipment in good working order, approved by the Engineer. Provide a high speed colloidal mixing machine that operates in the range of 800 to 2000 revolutions per minute to create a homogeneous mixture. Use a positive displacement pump which maintains a consistent, uninterrupted pressure head (maximum pressure 690kPa) to uniformly force grout into the cracks. Provide easily viewed, accurate pressure gauges that enable the operator to fully control the flow of grout.

B. Surface Preparation. Remove all debris or contaminants accessible within the cracks by using hand tools, water blasting, or oil-free high pressure air blasting, vacuuming, or other methods suitable to the Engineer. Remove all materials, including moisture, from the surface adjacent to the crack which might interfere with bonding of the crack sealant.

C. Injection Port Installation. Attach injection ports to the prepared surface by placing them into or onto the cracks and affixing with crack sealant. Other injection port designs and attachment methods require approval by the Engineer.

Use the following general guidelines for spacing injection ports when cracks are uniform in width through the structure. For cracks that get tighter with depth, double this spacing.

1. For cracks that are accessible from only one side, space the ports not less than the thickness of the member.
2. For cracks that are accessible from both sides, on each side space the ports not less than twice the thickness of the member and stagger them relative to the ports on the opposite side.

Place the end-most ports at the ends of the crack so as to insure complete filling of the crack. When these guidelines cannot be followed, use port location approved by the Engineer.

D. Seal Crack Opening. Apply crack sealant only when the surface and ambient temperatures are above 10°C.

After the ports have been installed, seal the crack opening with crack sealant. Allow the crack sealant to cure completely before injecting grout.

Any other sealing method is subject to approval by the Engineer.

E. Water Flush. Prior to any grout injection, flush the crack with pressurized water using the grout injection procedure, or a similar procedure, to clean out any remaining debris, verify that water

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exits from all the installed ports, check for leaks, and dampen the walls of the crack. The Engineer decides whether this procedure is unsuitable for a particular crack.

F. Grout Injection. Perform grout injection only when the surface and ambient temperatures are above 7°C during the next 24 hours.

Start at either end of a horizontal crack, or at the lowest point of a sloping or vertical crack. Secure the feed line to the first port. Initiate and continue flow until grout exits from the adjacent port. Temporarily stop the injection process, remove the feed line, and seal the port. Attach the feed line to the adjacent port and repeat this procedure along the crack until the last port is sealed. Exercise care to assure a continuous grouting operation. When warranted, adjacent ports may be plugged and injection continued through the same port.

G. Clean Up. In all areas visible to the public, remove spillage, the ports and crack sealant until flush with the adjacent surface. Remove stains and repair any damage to the satisfaction of the Engineer at no additional cost.

METHOD OF MEASUREMENT:

Measure the work as the number of meters of crack repaired as required.

BASIS OF PAYMENT:

Include the cost of all labor, materials and equipment necessary to complete the work in the price bid per meter.

The Engineer will authorize payment only after the measured length of crack has been repaired, and surface cleaned, as required.