ITEM 555.82NN0001 - JOINT AND CRACK SEALING BY URETHANE RESIN INJECTION

DESCRIPTION
This work shall consist of drilling injection holes and furnishing and injecting hydrophilic urethane resin and the appropriate ratio of additives to seal cracks and joints in concrete and masonry structures by saturating the backfill, foaming, gelling and setting, and/or filling the cracks or joints to stop active (or dormant) leaks. The mixture shall be injected at locations shown on the plans or as directed by the Engineer.

MATERIALS
Resin. The resin shall be hydrophilic and it must react with water to cure and form either a flexible gel or an elastomeric foam depending on the amount of reaction water introduced. The mixture must be capable of expanding as it cures to form a strong impermeable water barrier. Unrestrained, the mixture shall be capable of expanding up to ten times its initial volume during the curing process. The resin shall be non-flammable, non-carcinogenic and non-corrosive as defined by 40 CFR and as defined in the NIOSH Pocket Guide for Hazardous Materials. The supplier shall certify that the end product shall be a chemically inert substance, tolerating freeze-thaw and wet dry cycles, and extrusion and compression to a substantial degree while maintaining its integrity in place, for a minimum of 15 years.

Water. Water shall conform to Subsection 712-01 as a minimum. Water must be approved by the “Resin Injection Project Technical Advisor.”

Grout. Grout for sealing injector holes shall meet the requirements of section 701-05.

CONSTRUCTION DETAILS
A “Resin Injection Project Technical Advisor” shall be provided by the Contractor. This person shall design a plan for each joint or crack that represents the optimum mixture of components, the volume of material to be applied, the ideal equipment to accomplish the work at that particular joint or crack, and a safety and access plan. The Injection Plan for each joint shall be submitted to the Regional Structures Engineer for approval at least 15 workdays prior to the commencement of the injection process at that joint. The Regional Structures Engineer will have 5 workdays to review the Injection plan. The “Resin Injection Technical Advisor” shall be on-site during all resin injection related operations or as directed by the Engineer.

Submittals. The Contractor shall submit to the Regional Structures Engineer, for approval, the following information prior to injection operations:

1. Injection Plan for each joint or crack (15 workdays prior submission and 5 workday review)
2. A plan for the daily disposal of wasted and unused resin, cleaning solvents etc..
3. Resin manufacturer handling and storage requirements, including temperature limits.
4. The resume of a representative of the manufacturer or person having considerable experience with chemical injection, equipment, procedures and safety, including examples of work and contacts. This resume shall be submitted at least 60 workdays prior to commencement of the injection operation to the Regional Structures Engineer for approval.
Engineer will have 5 workdays to review the resume. If approved, this person will become the “Resin Injection Project Technical Advisor”.

5. See “Safety” (Confined Space Certifications)

General. All injection shall be performed in a continuous operation. The use of accelerators or parallel injection of water may be required in certain voids to control active leaks. The crack or joint may be sealed during injection. The injection plan shall recommend the materials and process. The Injection Plan may be varied in the field by the Engineer to accommodate actual conditions encountered based on the recommendation of the “Resin Injection Project Technical Advisor”.

Holes. Holes shall be drilled in accordance with subsection 586-3.02A unless otherwise approved in the Injection Plan. Holes shall be the diameter and in the configuration approved in the Injection Plan.

Material Supply. All injection materials shall be delivered to the site undamaged in unopened containers bearing the manufacturer’s original labels and handled and stored according to the manufacturer’s instructions.

Injection Sequence. Injection shall proceed in areas as indicated on the plans from the lower elevations upward, or as indicated in the approved Injection Plan or as directed by the Engineer.

Injection Method.

1. Mixing and handling of the injection materials shall be in accordance with the recommendations of the manufacturer and all applicable safety codes to minimize hazards to personnel and the environment. These criteria shall be reflected in the Injection Plan.

2. Injection procedures shall follow the manufacturer’s instructions or recommendations to achieve best results. Each hole shall first be flushed with water to clean it of debris and establish fluid communication with other drilled holes and the crack or joint. Resin shall be continuously injected in any hole until it appears at adjacent holes or in the surrounding joint or crack. In dry areas, water shall first be injected into the holes prior to grouting and then allowed to drain out leaving the back fill and back of wall wet which will aid the bonding process. A simultaneous injection system shall be used if necessary to supply setting water or other additives to the injected resin. Active leaks may need to be temporarily packed with hemp or quick setting masonry grout to facilitate injection. Open joints or cracks may be temporarily sealed during the injection process with commercially available expanding foam insulation, epoxy or urethane based products when recommended and approved by the Injection Project Technical Advisor. Injectors, packers or ports shall be left in place for 24 hours after injection is complete. All these criteria shall be reflected in the Injection Plan.
3. Should leakage continue at the end of the planned injection sequence, reapplication of the resin will be required. The method of reapplication shall be as recommended by the “Resin Injection Project Technical Advisor”.

4. When injection has been completed 24 hours or more, excess resin on the surface shall be removed so that the visible surface is clean or cured resin shall be removed to the depth necessary to accommodate superficial concrete repairs as the repairs progress. The injectors, (packers or ports), shall be removed and the holes shall be cleaned and patched with mortar meeting the requirements of section 701-05.

**Equipment.** Hand operated, air driven or electrical positive displacement pumps may be used provided the injection rate and ratios can be controlled to prevent over-injection, improper mixture and material wastage. These criteria shall be reflected in the Injection Plan.

**Safety.**

1. Where the work to be performed is considered to be in a “confined space”, the following requirements apply:

   a. The personnel working in the confining space shall be trained and certified to work in a confined space. The Contractor shall submit proof of certification for all personnel who will enter a confined space.

2. Adequate personnel safety equipment including gloves, goggles, face shields, foul weather gear and boots shall be supplied by the Contractor and worn by all personnel involved with grouting including the Engineer or his designee. Adequate ventilation including the use of blowers or fans shall be provided. As a minimum, a pressurized source of water such as a garden sprayer shall be provided at the work site to be used exclusively for emergency first aid in the event the chemicals should come into contact with an employees skin. In addition, a portable eye wash shall be provided at the work site for immediate use in an emergency. The appropriate equipment for each situation shall be reflected in the Injection Plan.

3. All safety precautions recommended by the manufacturer, or required by OSHA, shall be followed in the undertaking of this project. These criteria shall be reflected in the Injection Plan.

**METHOD OF MEASUREMENT**
The unit of measurement will be each linear foot of crack or joint designated in the approved Injection Plan, or directed by the Engineer, that is sealed.
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**BASIS OF PAYMENT**
The unit price bid per foot shall include the cost of all labor, equipment, materials and preparation work necessary to satisfactorily complete this item of work. In order to be eligible for payment, each meter must be represented in the pre-approved Injection Plan or approved by the Engineer.

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<th>ITEM NO.</th>
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<td>Joint and Crack Sealing by Urethane Resin Injection</td>
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Note: nn denotes serialized pay item.