SECTION 03610

CONCRETE CRACK SEALING WITH INJECTED POLYURETHANE GROUT

DESCRIPTION

PART 1 - GENERAL

1.01 Description

A. This section specifies furnishing and installing a concrete crack sealing system with an injected non-shrink polyurethane grout for sealing of joints, cracks, fractures and holes in concrete, and the repair of expansion joints as directed by the Engineer and as shown on the Drawings.

B. The contractor shall furnish, at no additional cost to the Owner, the services of a technical field representative to insure proper injection of the polyurethane grout.

1.11 Related Work Specified Elsewhere

A. Carefully examine all of the Contract Documents for requirements that affects the work of this section.

B. Other sections that may directly relate to the work of this section include, but are not limited to, the following:

1. Special provisions for limitations in work hours and other security requirements, if any.

1.03 Quality Control

A. Manufacturing Qualifications

1. The manufacture of the specified product shall have an established program of training and technically support Approved Contractors.

B. Contractor Qualifications

1. Contractor shall be an Approved Contractor of the manufacturer of the specified product, who has been instructed in the use of the specified repair material, and provide certification from the manufacturer attesting to their Approved Contractor status. Contractor shall be able to demonstrate past performance on jobs of similar scope and size. Contractor must have a minimum of five years experience injecting polyurethane grouts.

C. Manufacturer's Representative

1. Make all arrangements and pay all costs to have manufacturer's authorized representative on the job at the beginning of all major phases of the work, including joint preparation, and installation of polyurethane grout, to ensure proper procedures and quality control techniques are in compliance.

1.04 Submittals

A. Product Data

Submit manufacturer's product data, installation instructions, use limitations and recommendations for polyurethane grout material used and for all other associated materials as requested by Engineer. Grout materials shall be non-toxic when cured.

B. The Contractor shall submit a complete list of equipment and procedures for the proposed sealing of concrete cracks, holes, fractures and joints.

C. The Contractor shall submit to the Engineer for approval a detailed procedure for the installation of the water reactive polyurethane grout.

D. Provide a certificate of compliance stating that the repair material meets the specified requirements. Provide the manufacturer's current printed literature on the specified product.

1.04 Delivery, Storage, and Handling

A. Deliver the specified product in original, unopened containers with the manufacturer's name, labels, product identification, and batch numbers.

B. Store the specified product in a condition as recommended by the manufacturer.

1.05 Job Conditions

A. Environmental Conditions

Store dry at 60-90 degrees F. Material shall be 65-85 degrees F before using. Protect against freezing.

B. Protection

Precautions should be taken to ensure grout does not spill on, or come in contact with, other equipment or travel into areas beyond the scope of the work.

Part 2 - MATERIALS

2.01 Polyurethane Chemical Grout

A. The grouting material shall be a hydrophobic polyurethane liquid with catalyst developed to stop highly active leaks. The grout shall be non-toxic after curing. The polyurethane liquid shall react with water to foam and expand to form a flexible, tough, gasket that stops water. The catalyst is added to the grout to determine the reaction time with water.

B. Product Properties of Uncured Chemical Grout

	Property	Standards	Results
1.	Solids Content:	ASTM D1010	100%
2.	Viscosity:	ASTM D1638 at 70°F	600 cps +/-200
3.	Color:	Visual	clear
4.	Weight per gallon:	ASTM D1638	8.81 # per gallon
5.	Flash Point (Pensky Martens)		>200 degrees
6.	Corrosiveness:	Noncorrosive	
7.	Shipping requirements: Class 55-non hazardous		

C. Product Properties of the Cured Polyurethane Chemical Grout:

	Property	Standards	Results
1.	Density: lb./ cubic ft.	ASTM D3574	65
2.	Tensile Strength: PSI	ASTM D3574	2200
3.	Tear strength: PSI	ASTM D3574	400
4.	Elongation: Percent	ASTM D3574	400
5.	Shrinkage: Percent	ASTM 1042	0
5.	Toxicity:	Cured material is non-toxic	

D. Packers are required for injection. Packers for injection shall be supplied from the manufacturer.

E. Hoses: Moisture impermeable hoses are required for use where grout material is being pumped.

F. Expansion Joint Backer Rod: The expansion joint backer rod shall be cross linked open cell polyurethane foam with a rectangular or circular cross section as manufactured by Polytite of Cambridge MA. or Denver Foam of Denver CO., or approved equal. The cross section of the cross linked open cell polyurethane foam shall be a minimum 150% of the width of the joint as measured between the cleaned concrete surfaces.

G. Surface sealant: The surface sealant for the expansion joints shall be a silicone joint compound. The sealant shall be gray in color.

PART 3 - CONSTRUCTION METHODS

3.01 Surface Preparation

A. The cracks, holes, cold joints and fractures shall be clean, and sound. Remove dust, laitance, grease, curing compounds, waxes, impregnations, foreign particles, coatings, efflorescence, rust stains and disintegrated materials from the defects by wire brushing and scraping or mechanical means as approved by the manufacturer. All cracks, fractures, holes, joints, etc. shall be thoroughly flushed with clean water to remove dirt, dust and other contaminants. If joints or cracks that are being sealed are dry, water shall

be pumped into the cold joint or crack before injecting grout.

B. Expansion joints to be repaired shall have all temporary drain gutters removed prior to surface preparation. The expansion Joints shall be clean and sound. Remove all dust laitence, grease, curing compounds, waxes, impregnations, foreign particles, coatings, efflorescence, rust stains, fiber filler and any other unsuitable material which will inhibit bond to the dimensions shown on the drawings.

C. Repair cracks and cold joints by drilling offset test holes at a distance from the defect of 1/2 the depth of the concrete, at an angle sufficient to intersect the defect at approximately half the distance of the concrete. Injection hole spacing is normally 7 inches or up to 25 inches apart depending upon the width of the defect. Generally the wider the defect, the greater the distance of grout travel; therefore, the injection holes will be farther apart. The purpose of the test holes is to pump water into the crack or cold joint to determine spacing for injectors along the crack. Drill the holes to intersect the crack or cold joint midway through the substrate. Install the injection packers in holes and tighten. If the defect to be injected is 1/2" or greater at surface, use oil free oakum saturated with grout and mixed with water. Hold oakum for 2 to 3 minutes to allow foaming and insert oakum into defect, hole or cold joint. Water should be sprayed into area before inserting activated oakum.

D. For thin concrete walls of 6" or less, the injection holes should be drilled directly into the defect itself to prevent damage to the concrete.

E. The expansion joints shall be repaired by the insertion of the cross linked open cell polyurethane foam backer rod saturated with the polyurethane grout into the expansion joint as shown on the plans. The selection of the backer rod cross section is to be performed after the joint is cleaned and measured. The backer rod cross section is to be 150% larger than the cross section of the open cleaned expansion joint.

3.03 Application

A. Installation Procedure Crack Injection

1. Mix grout as recommended by manufacturer.

2. Injection Method: The injection equipment shall be used to meter the polyurethane chemical grout and dispense the product into the prepared crack, hole or joint. The unit shall be portable and be equipped with positive displacement type pumps with interlock to provide positive control of the polyurethane chemical grout at the nozzle. The pumps shall be air powered or electric capable of dispensing product up to 2500 psi.

3. Follow manufacturer's recommendations for the use of safety equipment required for the handling and storage of the polyurethane grout.

B. Injection of Grout

1. Basic steps for crack or joint repair are as follows:

   a. Clean area to be grouted.
   b. Drill holes for grout injection.
   c. Flush defect with water.
   d. Grout injection.
   e. Remove injectors.
   f. Patch injector holes.
   g. Remove excess surface grout.
   h. Apply a surface sealer to defect surfaces.

2. Flush the crack to be injected with clean potable water prior to the installation of the grout. Observe the return of the water from the surface of the crack prior to the moving to the next injection port for water flushing. The entire crack must be flushed prior to the injection of polyurethane grout.

3. Pump polyurethane chemical grout at a minimum 250 psi up to 2500 psi into or behind fissure or into voids which are allowing water to infiltrate into unwanted areas. If concrete being injected contains insufficient moisture to activate the grout, inject the defect with water prior to injecting the polyurethane chemical grout.

4. Pump polyurethane chemical grout for 45 seconds and then pause to allow the material to flow into all of the cracks and crevices. Watch for material flow and water movement to appear on the surface. When movement stops, begin injection into the next packer. When sealing vertical cracks,begin injecting at the bottom of the crack and work vertically. If faster reaction time is needed, or if grout is being pumped at cold temperature, additional Accelerator may be added to base material. Consult manufacturer before adding more than 2½% Accelerator. Reinject to assure that all voids are properly sealed off.

5. Caution: Adhere to all manufacturers' caution notes appearing in product literature including:

   a. The review of drawings of the areas to be repaired.
   b. Minimum substrate temperature shall be 40 degrees F; minimum material temperature, 65 degrees F.
   c. All equipment in contact with grout shall be dry.
   d. The cured material has a 400% elongation.

C. Repair of Expansion Joints

The repair of the expansion joints shall be performed in the following manner:

Remove all existing drain gutters.

Clean the concrete surface of all of the existing sealant, backer rod and fiberboard filler to the dimensions shown on the drawings. The cleaning shall be performed using brushes, chippers and other suitable equipment to provide a clean sound concrete surface for the polyurethane grout to bond.

The cross linked open cell polyurethane backer rod is to be soaked with water and wrung out to remove all excess water. Once wrung out the cross linked backer rod is to be soaked with the polyurethane grout in a bucket or other suitable container.

After the backer rod is saturated with the grout, it is to be inserted into the expansion joint as shown on the drawings.

After insertion into the expansion joint the saturated backer rod is to be sprayed with a water mist to enhance the catalization of the polyurethane grout.

24 hours after the backer rod is installed the concrete surfaces must be cleaned and dried to provide a bonding surface for the silicone sealant to be placed over the backer rod.

The surface of the expansion joint shall be sealed with a silicone sealant. The sealant shall be concrete gray in color.

Note all joints in the cross-linked open cell backer rod shall be mitered at connections between the roof and invert. Joints in vertical or horizontal runs will not be permitted.

3.04 Cleaning

A. Clean-up

Completely flush pump and hoses with approved polyurethane chemical grout pump flush. Use sharp-sided tool such as putty knife or trowel to remove excess material from walls, floors, etc. Wait for material to cure before removing. May be sanded off if necessary.

B. The uncured polyurethane chemical grout can be cleaned from tools with an approved solvent. The cured polyurethane chemical grout can only be removed mechanically.

C. Leave finished work and work area in a neat, clean condition without evidence of spillovers onto adjacent areas.

D. The grout shall not be allowed to spill over onto the the surface of the concrete walls or floors. The contractor shall provide suitable canvass or plastic tarps to protect the floors during injection. Mechanical means to remove any spilled grout from the concrete walls and floor must be approved by the Engineer.

3.05 Manufacturer's Field Representative

A. The Contractor shall arrange with the materials manufacturer or distributor to have the services of a competent field representative at the work site prior to start of grouting work to instruct the work crews in the proper application procedures. He shall remain at the job site after work commences and continue to instruct until he and the Contractor and Engineer are satisfied that the crew has mastered the technique of installing the system successfully. The representative shall make periodic visits to the project as the work progresses and shall confer on each visit with the Contractor or Engineer.

B. The manufacturer's field representative shall be fully qualified to perform the work and shall be subject to the approval of the Engineer.

PART 4 - COMPENSATION

4.01 Method of Measurement

A. The repair of leaking cracks shall be measured by the lineal foot in place and the quantity to be paid for shall be the lineal feet actually placed and successfully sealed for a period of 30 days after installation.

B. The repair of expansion joints shall be measured by the lineal foot in place and the quantity to be paid for shall be the lineal feet actually placed and successfully repaired and sealed for a period of 30 days after installation.

4.02 Basis of Payment

A. The repair of leaking cracks will be paid for at the contract unit bid price per lineal foot as stipulated in the schedule of Bid Prices, which payment shall be full compensation for furnishing and installing all materials, labor, tools, equipment, and other incidentals necessary to complete the specified work.

B. The repair of expansion joints will be paid for at the contract unit bid price per lineal foot as stipulated in the schedule of bid prices, which payment shall be full compensation for furnishing and installing all materials, labor, tools,

equipment, and other incidentals necessary to complete the specified work.

4.03 Payment Item

03610-1	CRACK SEALING WITH POLYURETHANE GROUT	LINEAR FOOT
03610-2	EXPANSION JOINT REPAIR	LINEAR FOOT