



B R O W N S V I L L E
PUBLIC UTILITIES BOARD

Date: August 10, 2022
To: All Vendors
Subject: Addendum #1

REFERENCE: **B058-22 WPT1 Train A and Train C Concrete Structure Repair Project**

This Addendum forms part of the contract and clarifies, corrects or modifies original bid document.

See attached Notice to All Bidders

DO NOT INCLUDE PRICING WHEN ACKNOWLEDGING THIS ADDENDUM

The signature of the company agent, for the acknowledgement of this addendum, shall be required. **Complete information below and return via e-mail to: dsolitaire@brownsville-pub.com.**

I hereby acknowledge receipt of this addendum.

Company: _____

Agent Name: _____

Agent Signature: _____

Address: _____

City: _____ **State:** _____ **Zip:** _____

Phone Number: _____ **E-mail address:** _____

If you have any further questions about the Bid, call 956-983-6366.

BY: ***Diane Solitaire***
Purchasing

Date:	08.10.2022	Distribution:
Project:	BPUB Train A/Train C Concrete Repairs	Marie Leal, PE (BPUB) Diane Solitaire (BPUB) Hugo Lopez (BPUB)
Project No.:	B058-22	
Addendum No.:	One (1)	

Notice to All Bidders

This Addendum forms a part of the Contract Documents and modifies the original Specifications and Drawings, issued 11 March 2022, to the extent noted hereinafter.

All parties of interest shall take careful note of this Addendum so that proper allowance is made in all computations, estimates and contracts and so that all trades affected are fully advised in the performance of work that will be required by them.

This Addendum supersedes all previous Drawings, Specifications, and instructions pertaining to these items.



 8.10.2022

Clarifications from Pre-Bid meeting held on 8/9/2022 and submitted questions:

1. New BID DEADLINE: August 23, 2022 at 2:00 PM (same time) and New Bid Opening Deadline, August 23, 2022 at 2:15 PM
2. SITE VISIT to be on: Friday, August 12, 2022, at 1:00 PM at Water Plant #1 (Address: 5 Power Plant Drive, Brownsville, TX). All contractors attending the site visit must call: Dan Tamez, BPUB Lead W/WW Operator at 956-430-6161 to gain access into the plant and project site
3. Deadline for Questions will be on August 16, 2022, at 5:00 PM
4. Reply to all Questions will be by August 19, 2022, at 5:00 PM
5. Q: If cracks are leaking water or moisture, use of sealants probably will fail. Is there or will there be a pay item for stopping the leaks with chemical injection?

A: Water leaks were previously repaired; however, new leaks may have sprung up, so a bid item has been created for water leaks/moisture crack repairs. See attached epoxy and chemical injection specifications and updated bid schedule sheet.

6. Q: Final cleaning - is this to remove construction debris or sterilization of the basins?

A: Final cleaning is to remove construction debris.

7. Q: On plans, page 6 Picture #4, are there any repairs to be made down into the shaft?

A: No visible repairs were required during the design phase so it is not anticipated since the shaft is below the surface water level. The damage is all related to the exposed overflow structure top slab.

8. Q: On page 6, small drawing top right indicates multiple additional rebar, hair pins and anchors, it is assumed that detail is for depth of 4" or greater, correct?

A: That is correct.

9. Q: Bid item #7 grout pockets, where are they on the plans?

A: The grout pockets are on the ends of the weir trough. There is some short-circuiting of water around the weirs due to the spalling.

10. Q: Bid Item #8 stair treads, where are they on the plans?

A: The stair treads are not shown as the work is very minimal. The 2 step stairs are leading up the basin and and less than 4-ft in width.

11. Q: Is there a requirement to install hand holds down into the shaft on Train C?

A: The top slab is supported via the wall and the horizontal slab reinforcement and concrete. For forming Support purposes prior to placement, hold downs may be needed.

12. Q: Bid Item A1, notes coat the top 3.5' of structure. Is there requirement to coat the underside of the beams with Sika 107.

A: The Sika 107 coating includes the beams in their entirety and columns top 3.5', and the underside of the perimeter cantilever wall.

13. Q: Is the hatch a manufactured hatch?

A: The hatch is a manufactured hatch with safety grate system.

Specifications:

1. Replace Bid Schedule in its entirety with attached Bid Schedule.
2. Add attached Section 03 01 38 – Epoxy Injection Grouting and Section 03 01 39 Chemical Grout Injection Grouting in their entirety to Division 03- Concrete technical specifications.

I hereby certify receipt of this addendum and have incorporated its information or changes in preparation of my bid submittal.

Authorized Signature

Date

Printed Name

Company Name

Complete information above and return via e-mail to: dsolitaire@brownsville-pub.com, and submit a Copy of the Addendum with your bid submittal !!

BID

B058-22

BPUB Purchasing Department

1155 FM 511

Olmito, Texas 78575

Due: August 23, 2022 at 2:00 PM

Bid of _____ hereinafter called BIDDER, a corporation organized and existing under the laws of the State of _____, or, a partnership, or an individual doing business as _____.

To the Brownsville Public Utilities Board of the City of Brownsville, Texas, hereinafter called OWNER.

Gentlemen:

The undersigned BIDDER, in compliance with your Invitation to Bid for the **WTP1 TRAIN A AND TRAIN C CONCRETE STRUCTURE REPAIR PROJECT**, having read and examined the Plans and Specifications with related Contract Documents and visited the site of the proposed Work, and being familiar with all of the federal, state and local conditions surrounding the construction of the proposed Project, including the availability of materials and labor, hereby proposes to furnish all labor, materials, equipment and supplies, and to construct the Project in accordance with the Contract Documents, within the time set forth herein, and at the Total Base Bid Amount prior to OWNER options on additive/deductive alternates of: (in words and numeric figures)

_____. These price(s) are to cover all expenses incurred in performing the Work required under the Contract Documents, of which this bid is a part. These price(s) are firm and shall not be subject to adjustment, provided this Bid is accepted by OWNER within ninety (90) calendar days after the time set for BPUB receipt of bids.

BIDDER hereby agrees to commence Work under this Contract on or before a date to be specified in a written "Notice to Proceed" to be issued by the OWNER, and to then fully complete the Project within the times established in Article 3 of the Construction Agreement. BIDDER further agrees to pay as liquidated damages, not as a penalty, for failure to do so, the sum(s) established in Article 3 of the Construction Agreement.

BIDDER agrees to perform all Work for which he contracts as described in the Technical Specifications and as shown on the Plans, for the prices indicated on the following Bid Form.

BID SCHEDULE
BID – B058-22
BROWNSVILLE PUBLIC UTILITIES BOARD

The Bidder, in compliance with the Invitation for Bids for the **WTP1 TRAIN A AND TRAIN C CONCRETE STRUCTURE REPAIR PROJECT**, having examined the scope of work and written Specifications, hereby proposes to furnish construction services for the following Unit prices and lump sums.

Base Bid Items					
Bid Item	Description	Unit	Est Quantity	Unit Bid Price in Words	Amount Bid
1	Insurance, bonds and move-in/move-out Related expenses not to exceed 5% of total bid.	LS	1	_____ Dollars and _____ cents per unit	\$
2	Partial-depth removal and replacement of deteriorated concrete floor repair (assume 1-inch avg depth and include pressure washing/prep, clean & coat corroded steel and installation of supplemental steel) per repair details	SF	30	_____ Dollars and _____ cents per unit	\$
3	Partial-depth removal and replacement of deteriorated concrete column/beam/wall repair (assume 1-inch avg depth and include pressure washing/prep, clean & coat corroded steel and installation of supplemental steel, scaffolding and shoring) per repair details	SF	200	_____ Dollars and _____ cents per unit	\$
4	Partial-depth removal and replacement of deteriorated concrete column/beam/wall repair (assume 1 < 4-inch avg depth and include pressure washing/prep, clean & coat corroded steel and installation of supplemental steel, scaffolding and shoring) per repair details	SF	350	_____ Dollars and _____ cents per unit	\$

Bid Item	Description	Unit	Estimated Quantity	Unit Bid Price in Words	Amount Bid
5	Partial-depth removal and replacement of deteriorated concrete column/beam/wall repair (assume > 4-inch avg depth and include pressure washing/prep, clean & coat corroded steel and installation of supplemental steel, scaffolding and shoring) per repair details	EA	125	_____ Dollars and _____ cents per unit	\$ _____
6	Full-depth removal and replacement of deteriorated concrete column or beam (assume 12"x12" and include pressure washing/prep, clean & coat corroded steel and installation of supplemental steel, scaffolding and shoring) per repair details	LF	40	_____ Dollars and _____ cents per unit	\$ _____
7	Grout pocket repair – troughs, ramps	EA	10	_____ Dollars and _____ cents per unit	\$ _____
8	Grout wash repair – stair tread/riser interface	LF	20	_____ Dollars and _____ cents per unit	\$ _____

9	Crack Repair - Sealants	LF	50	_____ Dollars and _____ cents per unit	\$ _____
10	Crack Repair - Chemical or Epoxy Injection	LF	25	_____ Dollars and _____ cents per unit	\$ _____
11	Demo and removal of top slab at Overflow Drain Structure, replacement of reinforced concrete top slab (4000 psi) to match existing horizontal and vertical reinforcement, and installation of embedded 30"x30" Aluminum 60# Safe Hatch with safety grate system, removal and reinstallation of handrails with new stainless steel hardware to match existing size anchors.	EA	1	_____ Dollars and _____ cents per unit	\$ _____
A1	Installation of two 40-mil coats of SikaTop Seal 107 waterproofing system, applied to interior walls, beams, columns, cantilever walls and troughs (top 3.5-ft only)	SF	3800	_____ Dollars and _____ cents per unit	\$ _____

TOTAL AMOUNT OF BASE BID (ITEMS 1- 11): \$ _____

(written in words)

TOTAL AMOUNT OF ADDITIVE ALTERNATE (ITEM A1): \$ _____

(written in words)

TOTAL AMOUNT BID: BASE BID + ALTERNATE A1: \$ _____

(written in words)

NOTE: Quantities are estimated. The Brownsville PUB reserves the right to increase or decrease quantities as allowed by Texas law (plus or minus fifteen (15%) percent and as deemed necessary by OWNER, without impacting the quoted unit prices. Prospective bidders are encouraged to visit and assess the existing Project site and structures prior to submitting a bid.

BIDDER Acknowledges receipt of the following Addenda:

SUBCONTRACTORS. The undersigned BIDDER proposes that he will be responsible to perform major portions of the Work at the Project site with his own forces and that specific portions of the Work not performed by the undersigned will be subcontracted and performed by the following subcontractors.

Work Subcontracted	Name of Subcontractor
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Bid amounts are to be legibly shown in both words and figures. In case of discrepancy, the unit price amount written in words will govern.

The above lump sum and unit prices shall include all labor, materials, excavation, bailing, shallow groundwater dewatering, shoring, removal, backfill, overhead, profit, insurance, etc., to cover the finished Work of the several kinds called for.

BIDDER understands that the OWNER reserves the right to reject any or all bids and to waive any informalities in the bidding and to elect to opt for any additive or deductive alternates in arriving at a final Contract price.

BIDDER agrees that this bid shall be good and may not be withdrawn for a period of ninety (90) calendar days after the scheduled bid opening.

The undersigned hereby declares that only the persons or firms interested in the bid as principal or principals are named herein, and that no other persons or firms than are herein mentioned have any interest in this Bid or in the Contract to be entered into; that this Bid is made without connection with any other person, company, or entities likewise submitting a bid or bid; and that it is in all respects for and in good faith, without collusion or fraud.

Upon receipt of written notice of the acceptance of this bid, BIDDER will execute the formal Contract attached within ten (10) calendar days and deliver the Bonds and Insurance Certificates as required under the GENERAL CONDITIONS. The Bid security attached in the sum of _____ (\$ _____) is to become the property of the OWNER in the event the Contract, Bonds, and insurance certificates are not executed or delivered within the time above set forth, as mutually agreed to liquidated damages and not as a penalty for the delay and additional administrative expense to the OWNER caused thereby; otherwise the Bid security will be returned upon the signing of the Contract and delivering the approved Bonds and Insurance Certificates.

Seal affixed here if BID is by a Corporation:
Respectfully submitted,

By: _____
Signature **(Failure to sign disqualifies bid)**

Title

Address

Attest: _____

SECTION 03 01 38

EPOXY INJECTION GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation, supply, and injection of epoxy into cracks and joints.

1.2 UNIT PRICES

- A. Perform injection Work on unit price basis. Payment based on linear feet of cracks and joints injected.

1.3 REFERENCES

- A. Reference Standards: Latest edition as of Specification date.
 - 1. American Concrete Institute:
 - a. *ACI 503.7 Specification for Crack Repair by Epoxy Injection.*

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate Work to ensure that adjacent areas are not adversely affected and that fumes due to injection Work are not objectionable. Coordinate:
 - 1. With Owner's Representative.
 - 2. With other trades:
 - a. To ensure that work done by other trades is complete and ready for injection Work.
 - b. To avoid or minimize Work on, or in immediate vicinity of, injection Work in progress.
- B. Pre-installation Meeting:
 - 1. Conduct meeting at Site.
 - 2. Review requirements for injection Work, including:
 - a. Construction schedule
 - b. Availability of materials, Injection Subcontractor's personnel, equipment, and facilities needed to make progress and avoid delays
 - c. Site use, access, staging, and set-up location limitations
 - d. Forecast weather conditions
 - e. Cracks and joints to be injected, and condition of other construction that will affect injection Work
 - f. Surface preparation and substrate condition and pretreatment
 - g. Injection procedures
 - h. Testing and inspection requirements
 - i. Site protection measures
 - j. Governing regulations
 - 3. Contractor's Site superintendent, injection-material manufacturer's technical representative, Injection Subcontractor's foreman, Owner's Representative, and Engineer shall attend.

- C. Sequencing: For cracks and joints in areas of unsound concrete:
 - 1. Remove unsound concrete per Section 03 01 05.
 - 2. Prepare and clean areas for partial and full depth concrete repair per Section 03 01 05
 - 3. Clean crack to be injected by pressure washing followed by vacuuming to remove debris and water.
 - 4. Prepare and inject cracks and joints. Do not allow epoxy to flow from cracks into voids that will receive cementitious repair materials.
 - 5. Remove or grind smooth surface sealing paste and injection ports from sidewalk surface, slab soffit, and other exposed surfaces.
 - 6. Complete partial or full depth repairs per Section 03 01 05.

1.5 SUBMITTALS

- A. Product Data: Injection-material manufacturer's literature including written instructions for evaluating, preparing, and treating substrate; technical data including tested physical and performance properties; and mixing and injection instructions.
 - 1. Include temperature ranges for storage and application of materials, and special cold-weather application requirements or limitations
 - 2. Include recommended Site protection measures
 - 3. Include Safety Data Sheets
- B. Certificates:
 - 1. Signed by injection-material manufacturer, certifying that Subcontractor is approved to install its products
- C. Injection Subcontractor Qualifications: Evidence that Subcontractor's existing company has minimum 5 years of continuous experience in injection of specified materials; list of at least 5 representative, successfully completed projects of similar scope and size, including:
 - 1. Project name
 - 2. Owner's name
 - 3. Owner's Representative name, address, and telephone number
 - 4. Description of work
 - 5. Injection materials used
 - 6. Equipment used
 - 7. Project supervisor
 - 8. Total cost of injection work and total cost of project
 - 9. Completion date

1.6 QUALITY ASSURANCE

- A. Injection Subcontractor Qualifications: Experienced firm that is approved, authorized, or licensed by injection-material manufacturer to inject specified material and that is eligible to receive injection-material manufacturer's warranty. Must have successful installations of specified materials in local area in use for minimum of 5 years.
 - 1. Employ foreman trained and certified by injection-material manufacturer and with minimum 5 years of experience as foreman on similar projects, to be on Site at all times during Work. Do not change foremen during course of Project except for reasons beyond control of Subcontractor; inform Engineer in advance of any changes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials according to manufacturer's recommendations and in such manner as to prevent damage to materials and structure.
- B. Deliver materials to Site in original containers with seals unbroken, labeled with manufacturer's name; product brand name and type; date of manufacture; lot number; SPI hazardous rating and appropriate warnings for handling; and directions for storing and mixing.
- C. Keep materials dry and do not allow materials to be exposed to moisture during transportation, storage, handling, and installation. Reject and remove from Site new materials which exhibit evidence of moisture during application, or have been exposed to moisture.
- D. Store materials in original, undamaged containers in clean, dry, protected location on raised platforms with weather-protective coverings, within temperature range required by injection-material manufacturer.
- E. Limit stored materials on structures to safe loading capacity of structure at time materials are stored, and to avoid permanent deck deflection.
- F. Conspicuously mark damaged or opened containers or containers with contaminated materials, and remove from Site as soon as possible.
- G. Remove and replace materials that cannot be applied within stated shelf life.

1.8 PROJECT CONDITIONS

- A. Verify existing dimensions and details prior to start of injection Work. Notify Engineer of conditions found to be different than those indicated in Contract Documents. Engineer will review situation and inform Contractor and Injection Subcontractor of changes.
- B. Comply with Owner's limitations and restrictions for Site use and accessibility.
- C. Exercise care to avoid injecting or otherwise damaging embedded items. Remove and replace or otherwise remedy damage to embedded items, at no cost to Owner.
- D. Environmental Limitations: Install injection material when existing and forecast weather conditions permit material to be installed and cured according to injection-material manufacturer's written instructions and warranty requirements.
 - 1. Do not install when air and substrate temperatures are outside limits permitted by injection-material manufacturer. Do not install when substrate temperatures are below 60 degrees F within 4 hours prior to injection Work, or are forecast to go below 60 degrees F within 48 hours following injection Work, unless approved in writing by injection-material manufacturer.
 - 2. Verify moisture level in crack is compatible with injection material.
 - 3. Do not inject into substrates with high pHs, such as cracks filled with efflorescence, unless approved by injection-material manufacturer.
- E. Handle and install materials in strict accordance with safety requirements required by injection-material manufacturer; Safety Data Sheets; and local, state, and federal rules and regulations. Maintain Safety Data Sheets with materials in storage area and available for ready reference on Site.

F. Maintain adequate ventilation during preparation and injection Work.

1.9 CHANGES IN WORK

- A. During rehabilitation work, existing conditions may be encountered which were not known or are at a variance with Contract Documents. Such conditions may interfere with Work and may consist of damage or deterioration of substrate or surrounding materials that could jeopardize integrity or performance of Work.
1. Notify Engineer of conditions that may interfere with proper execution of Work or jeopardize performance of Work prior to proceeding with Work.

1.10 WARRANTY

- A. Joint and Several Warranty by Manufacturer, Contractor, and Injection Subcontractor:
1. Written warranty, signed by injection-material manufacturer, Contractor, and Injection Subcontractor, including:
 - a. Additional injection of injected cracks and joints that do not comply with requirements; that do not remain watertight; that fail in adhesion, cohesion, or general durability; or that deteriorate in manner not clearly specified by submitted injection-material manufacturer's data as inherent quality of material for application indicated. Warranty does not include deterioration or failure of injection material due to failure of substrate prepared according to requirements.
 - b. Provide access to warranty work, including removal and replacement of overlying materials. Warranty includes replacement of overlying materials as necessary.
 - c. Labor and materials to perform warranty work.
 2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain injection materials through one source from single manufacturer, or from sources approved by manufacturer of injection material.
- B. Epoxy Resin:
1. MasterInject 1380 manufactured by BASF/Master Builders
 2. Sikadur-35 Hi-Mod LV manufactured by Sika Corporation
 3. Approved equivalent
- C. Auxiliary Materials:
1. Epoxy gel:
 - a. MasterEmaco ADH 327RS manufactured by BASF/Master Builders
 - b. Sikadur-31 Hi-Mod Gel manufactured by Sika Corporation.
 2. Hydraulic cement: Use 1 of following or approved equal:
 - a. EmacoSeal 590 manufactured by BASF/Master Builders
 - b. SikaPlug Fast-Setting Water Stop manufactured by Sika Corporation.
 3. Injection ports and packers.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Injection Subcontractor and representative of injection-material manufacturer for compliance with requirements and for other conditions affecting installation or performance of injection Work.
 - 1. Ensure that work done by other trades is complete and ready for injection Work.
 - 2. Verify that areas and conditions under which injection Work is to be performed permit proper and timely completion of Work.
 - 3. Notify Engineer in writing of conditions which may adversely affect installation or performance of injection Work and recommend corrections.
 - 4. Do not proceed with injection Work until adverse conditions have been corrected and reviewed by Engineer.
 - 5. Commencing injection Work constitutes acceptance of Work surfaces and conditions.

3.2 PROTECTION

- A. Where opposite of member to be injected is accessible, observe during injection Work for leakage of injection material; control leakage to avoid damage to persons or property.
- B. Take precautions to ensure safety of people, including building users, passers-by, and workmen, and animals, and protection of property, including adjacent building elements, landscaping, and motor vehicles.
- C. Prevent construction materials from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
- D. Protect paving and sidewalk, and adjacent building areas from mechanical damage due to scaffolding and other equipment.
- E. Limit access to Work areas.
- F. Erect temporary protective canopies, as necessary, over walkways and at points of pedestrian and vehicular access that must remain in service during Work.
- G. Assume responsibility for injury to persons or damage to property due to Work, and remedy at no cost to Owner.

3.3 PRESSURE INJECTION EQUIPMENT

- A. Injection equipment shall be capable of continuously metering, mixing, and pumping injection material under pressure through crack injection ports; equipment shall be approved by injection-material manufacturer.
 - 1. Volumetric metering shall continuously dispense components in proportions specified by injection-material manufacturer, within tolerance of plus or minus 5 percent.
 - 2. Delivery shall be at constant, preset pressure recommended by injection-material manufacturer. Pressure loss in either line in 3 minutes, when stalled at 80 percent or higher of maximum possible discharge pressure, shall be less than 5 pound per square inch.
 - 3. Pump shall be equipped with automatic shut-off device to prevent injection of unmixed components.

3.4 PREPARATION

- A. Inspect concrete surfaces and mark with crayon, cracks and joints to be injected. Engineer may review injection Work prior to start of surface preparation work.
 - 1. Inject cracks as shown on Drawings.
- B. Protect areas on both sides of cracked member from damage during injection Work.
- C. Prepare cracks and joints as recommended by injection-material manufacturer.
- D. Clean concrete surface along crack or joint to be injected. Surface shall be dry and free of dirt, dust, oil, laitance, unsound concrete and other foreign material which might impede bond of epoxy gel or hydraulic-cement seal.
- E. Remove mud, laitance, and other loose or porous materials in and along surface of cracks and joints, that could impair bond of injection material.
- F. Install injection ports to achieve complete filling of crack or joint.
 - 1. Number and spacing of injection ports shall be approved by representative of injection-material manufacturer.
 - a. Spacing shall not exceed lesser of 2 feet; thickness of member for full-depth cracks and joints; or depth of crack for partial-depth cracks.
 - 2. As required drill holes along crack or joint.
 - 3. Install injection ports on crack surface or in drilled holes in such manner that crack or joint is not plugged and injection Work is not adversely affected.
- G. Seal crack and joint surfaces and perimeters of injection ports or packers with ribbon of hydraulic cement or epoxy gel at least 1/8 inch thick and 1 inch wider than crack, joint, port, or packer. Seal back side of member at full-thickness cracks and joints if possible.
- H. Fill cracks and joints designated by Engineer with aggregate, if recommended by manufacturer, before injecting grout.

3.5 GROUTING

- A. Perform initial injection Work in presence of representative of injection-material manufacturer. At conclusion of Site visit, representative shall prepare and furnish letter to Engineer, stating whether installation was completed in accordance with requirements. These services shall be provided at no additional cost to Owner.
- B. Commence injection only after hydraulic cement or epoxy gel has developed sufficient strength to withstand injection pressure without debonding or rupture.
- C. Maintain concrete substrate and injection material at suitable temperature for suitable time period so that injection material will completely fill crack or joint and will achieve full cure.
- D. Continuously inject material into crack or joint, as recommended by injection-material manufacturer.
 - 1. Use injection pressure of 200 to 3,000 pounds per square inch, depending on crack or joint width, thickness of member, and condition of substrate.
 - 2. Start injection at lowest injection port and continue until injection material emerges from adjacent port.

3. Remove injection nozzle and cap injection port immediately after injection material emerges from adjacent port.
 - a. Alternately, cap adjacent port and continue injection until injection material emerges from next higher port; alternate procedure may be used if injection pressure does not substantially increase, port caps remain in place, and no leaks occur.
4. Continue injection process upward from port to port, waiting for emergence of injection material from adjacent port and capping injection port, until crack or joint is filled.
5. After injecting 3 or 4 ports, re-inject last 3 or 4 ports.
6. If port-to-port travel does not occur, stop Work and modify injection setup to achieve port-to-port travel. Modifications may include resetting injection ports, installing injection ports at closer spacing, or drilling holes which intersect crack or joint at different angle. Modifications shall be approved in advance by representative of injection-material manufacturer and Engineer.

3.6 FIELD QUALITY CONTROL

- A. Provide:
 1. Access to Work.
 2. Materials for sampling.
 3. Site facilities for sampling, testing, and storage of materials.
 4. Incidental labor.
- B. Sample Injection Material: Obtain 1 sample of the injection material prior to beginning injection Work each day, representing first 50 feet of injection, and 1 sample for every 30 feet of injection thereafter.
 1. Place injection material in plastic cup or other container.
 2. Allow samples to cure.
 3. Do not begin injection Work each day until initial sample has satisfactorily cured.
 4. Label samples with injection date and location of injected crack or joint represented by sample.
 5. Give samples to Engineer.
- C. Injection Equipment Pressure/Ratio Tests:
 1. Test equipment: Device with 2 independent sections, identical in design and function, complete with proper fittings, pressure gauges with 3,000 pounds per square inch maximum rating, in-line filters, and needle valves with appropriate discharge nozzles. Device shall be capable of controlling flow rate and pressure of injection-material components independently by opening or closing needle valves.
 2. Pressure test:
 - a. Test method:
 - 1) Disconnect mixing chamber on injection equipment.
 - 2) Attach test equipment to component discharge lines.
 - 3) Bring pressure in component discharge lines to at least 80 percent of maximum discharge pressure of injection equipment.
 - 4) Close valves and observe pressure for 3 minutes.
 - b. Test results: Pressure shall not fall by more than 5 pounds per square inch in either line during 3-minute test period.
 - c. Test frequency: Perform test at beginning and middle of work shift, and when equipment is repaired or adjustments are made.
 3. Ratio test:
 - a. Test method:

- 1) Attach test equipment as in pressure test.
 - 2) While injection equipment is in operation, simultaneously collect separate samples of injection-material components in pre-weighed or volumetric-calibrated containers. Collect at least 3 fluid ounces of lesser volume component.
 - 3) Conduct sampling at atmospheric pressure; at 80 percent of maximum pump discharge pressure; and at prevailing Site temperature.
- b. Test results: Deviation from specified mix ratio of average of at least 3 individual tests shall not exceed 5 percent.
 - c. Test frequency: Perform test at beginning and middle of work shift, when equipment is repaired or adjustments are made, and as directed by Engineer.
- D. Core Sampling and Testing:
1. When requested by Engineer, procure concrete core samples from injected cracks and joints at locations indicated by Engineer.
 - a. Cores shall be of sufficient diameter that intact cores are procured and so that specified testing can be performed.
 - b. Unless otherwise specified, core samples shall be through the full thickness of the member.
 2. Visual inspection:
 - a. Observe penetration of injection material into crack or joint on side of core sample.
 - b. Injection Work is acceptable if 70 percent of crack or joint is filled with injection material.
 - c. If less than 70 percent of crack or joint is filled with injection material, re-inject crack or joint lengths represented by core sample, procure new core sample, and observe injection-material penetration. Repeat process until crack or joint is satisfactorily filled.
 3. Contractor shall patch core holes.

3.7 CLEANING

- A. Clean surfaces of excess grout, hydraulic cement, epoxy gel, and injection ports.
1. Allow injection material sufficient time to cure before performing cleanup.
 2. Clean surfaces by grinding or other means, so that face of repair crack is flush with adjacent surface, with no indentations or protrusions.
 3. Patch holes at injection ports.

END OF SECTION

SECTION 03 01 39

CHEMICAL GROUT INJECTION GROUTING

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Surface preparation, supply, and injection of chemical grout into cracks and joints.

1.2 UNIT PRICES

- A. Perform injection Work on unit price basis. Payment based on linear feet of cracks and joints injected.

1.3 REFERENCES

- A. Reference Standards: Latest edition as of Specification date.
 - 1. ASTM International:
 - a. C42/C42M: *Standard Test Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete*

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordinate Work to ensure that adjacent areas are not adversely affected and that fumes due to injection Work are not objectionable. Coordinate:
 - 1. With Owner's Representative
 - 2. With other trades:
 - a. To ensure that work done by other trades is complete and ready for injection Work
 - b. To avoid or minimize Work on, or in immediate vicinity of, injection Work in progress
- B. Pre-installation Meeting:
 - 1. Conduct meeting at Site
 - 2. Review requirements for injection Work, including:
 - a. Construction schedule
 - b. Availability of materials, Injection Subcontractor's personnel, equipment, and facilities needed to make progress and avoid delays
 - c. Site use, access, staging, and set-up location limitations
 - d. Forecast weather conditions
 - e. Cracks and joints to be injected, and condition of other construction that will affect injection Work
 - f. Surface preparation and substrate condition and pretreatment
 - g. Injection procedures
 - h. Testing and inspection requirements
 - i. Site protection measures
 - j. Governing regulations

3. Contractor's Site superintendent, injection-material manufacturer's technical representative, Injection Subcontractor's foreman, Owner's Representative, and Engineer shall attend
- C. Sequencing: For cracks and joints in areas of unsound concrete:
1. Remove unsound concrete per Section 03 01 05
 2. Prepare and inject cracks and joints
 3. Prepare and clean concrete removal areas per Section 03 01 05; install patch material per Section 03 01 05

1.5 SUBMITTALS

- A. Product Data: Injection-material manufacturer's literature including written instructions for evaluating, preparing, and treating substrate; technical data including tested physical and performance properties; and mixing and injection instructions.
1. Include temperature ranges for storage and application of materials, and special cold-weather application requirements or limitations
 2. Include recommended Site protection measures
 3. Include Safety Data Sheets
- B. Certificates:
1. Signed by injection-material manufacturer, certifying that Subcontractor is approved to install its products
- C. Injection Subcontractor Qualifications: Evidence that Subcontractor's existing company has minimum 5 years of continuous experience in injection of specified materials; list of at least 5 representative, successfully-completed projects of similar scope and size, including:
1. Project name
 2. Owner's name
 3. Owner's Representative name, address, and telephone number
 4. Description of work
 5. Injection materials used
 6. Equipment used
 7. Project supervisor
 8. Total cost of injection work and total cost of project
 9. Completion date

1.6 QUALITY ASSURANCE

- A. Injection Subcontractor Qualifications: Experienced firm that is approved, authorized, or licensed by injection-material manufacturer to inject specified material and that is eligible to receive injection-material manufacturer's warranty. Must have successful installations of specified materials in local area in use for minimum of 5 years.
1. Employ foreman trained and certified by injection-material manufacturer and with minimum 5 years of experience as foreman on similar projects, who is fluent in English, to be on Site at all times during Work. Do not change foremen during course of Project except for reasons beyond control of Subcontractor; inform Engineer in advance of any changes.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle materials according to manufacturer's recommendations and in such manner as to prevent damage to materials and structure.
- B. Deliver materials to Site in original containers with seals unbroken, labeled with manufacturer's name; product brand name and type; date of manufacture; lot number; SPI hazardous rating and appropriate warnings for handling; and directions for storing and mixing.
- C. Keep materials dry and do not allow materials to be exposed to moisture during transportation, storage, handling, and installation. Reject and remove from Site new materials which exhibit evidence of moisture during application, or have been exposed to moisture.
- D. Store materials in original, undamaged containers in clean, dry, protected location on raised platforms with weather-protective coverings, within temperature range required by injection-material manufacturer.
- E. Limit stored materials on structures to safe loading capacity of structure at time materials are stored, and to avoid permanent deck deflection.
- F. Conspicuously mark damaged or opened containers or containers with contaminated materials, and remove from Site as soon as possible.
- G. Remove and replace materials that cannot be applied within stated shelf life.

1.8 PROJECT CONDITIONS

- A. Verify existing dimensions and details prior to start of injection Work. Notify Engineer of conditions found to be different than those indicated in Contract Documents. Engineer will review situation and inform Contractor and Injection Subcontractor of changes.
- B. Comply with Owner's limitations and restrictions for Site use and accessibility.
- C. Exercise care to avoid injecting or otherwise damaging embedded items. Remove and replace or otherwise remedy damage to embedded items, at no cost to Owner.
- D. Environmental Limitations: Install injection material when existing and forecast weather conditions permit material to be installed and cured according to injection-material manufacturer's written instructions and warranty requirements.
 - 1. Do not install when air and substrate temperatures are outside limits permitted by injection-material manufacturer.
 - 2. Verify moisture level in crack is compatible with injection material.
 - 3. Do not inject into substrates with high pH, such as cracks filled with efflorescence, unless approved by injection-material manufacturer.
- E. Handle and install materials in strict accordance with safety requirements required by injection-material manufacturer; Safety Data Sheets; and local, state, and federal rules and regulations. Maintain Safety Data Sheets with materials in storage area and available for ready reference on Site.
- F. Maintain adequate ventilation during preparation and injection Work.

1.9 CHANGES IN WORK

- A. During rehabilitation work, existing conditions may be encountered which were not known or are at a variance with Contract Documents. Such conditions may interfere with Work and may consist of damage or deterioration of substrate or surrounding materials that could jeopardize integrity or performance of Work.
 - 1. Notify Engineer of conditions that may interfere with proper execution of Work or jeopardize performance of Work prior to proceeding with Work.

1.10 WARRANTY

- A. Joint and Several Warranty by Manufacturer, Contractor, and Injection Subcontractor:
 - 1. Written warranty, signed by injection-material manufacturer, Contractor, and Injection Subcontractor, including:
 - a. Additional injection of injected cracks and joints that do not comply with requirements; that do not remain watertight; that fail in adhesion, cohesion, or general durability; or that deteriorate in manner not clearly specified by submitted injection-material manufacturer's data as inherent quality of material for application indicated. Warranty does not include deterioration or failure of injection material due to failure of substrate prepared according to requirements.
 - b. Provide access to warranty work, including removal and replacement of overlying materials. Warranty includes replacement of overlying materials as necessary.
 - c. Labor and materials to perform warranty work.
 - 2. Warranty Period: 2 years from date of Substantial Completion.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Source Limitations: Obtain injection materials through 1 source from single manufacturer, or from sources approved by manufacturer of injection material.
- B. Urethane Grout: Use the following or approved equal:
 - 1. DE NEEF Flex LV SLV PRe manufactured by GCP Applied Technologies
 - 2. SikaFix HH Hydrophilic, HH LV, or HH+ (as required for the application) manufactured by Sika Corporation
- C. Auxiliary Materials:
 - 1. Epoxy gel: Use 1 of following or approved equal:
 - a. MasterEmaco ADH 327RS manufactured by BASF/Master Builders
 - b. DE NEEF Denepox Rapid Gel manufactured by GCP Applied Technologies
 - c. Sikadur-31 Hi-Mod Gel manufactured by Sika Corporation
 - 2. Hydraulic cement: Use 1 of following or approved equal:
 - a. EmacoSeal 590 manufactured by BASF/Master Builders
 - b. SikaPlug Fast-Setting Water Stop manufactured by Sika Corporation.
 - 3. Injection ports and packers.
 - 4. For cracks that will be prepacked with sand, wider than 1/4 inch:
 - a. Fine aggregate for prepacking cracks: Clean, dry, prepackaged, silica sand.
 - 1) Gradation, by volume: Equal parts 12 mesh and 80 mesh; equal parts 16 mesh and 90 mesh; or 30 mesh.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions with Injection Subcontractor and representative of injection-material manufacturer for compliance with requirements and for other conditions affecting installation or performance of injection Work.
 - 1. Ensure that work done by other trades is complete and ready for injection Work
 - 2. Verify that areas and conditions under which injection Work is to be performed permit proper and timely completion of Work
 - 3. Notify Engineer in writing of conditions which may adversely affect installation or performance of injection Work and recommend corrections
 - 4. Do not proceed with injection Work until adverse conditions have been corrected and reviewed by Engineer
 - 5. Commencing injection Work constitutes acceptance of Work surfaces and conditions

3.2 PROTECTION

- A. Where opposite of member to be injected is accessible, observe during injection Work for leakage of injection material; control leakage to avoid damage to persons or property.
- B. Take precautions to ensure safety of people, including building users, passers-by, and workmen, and animals, and protection of property, including adjacent building elements, landscaping, and motor vehicles.
- C. Prevent construction materials from coming into contact with pedestrians, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.
- D. Protect paving and sidewalk, and adjacent building areas from mechanical damage due to scaffolding and other equipment.
- E. Limit access to Work areas.
- F. Erect temporary protective canopies, as necessary, over walkways and at points of pedestrian and vehicular access that must remain in service during Work.
- G. Assume responsibility for injury to persons or damage to property due to Work, and remedy at no cost to Owner.

3.3 PRESSURE INJECTION EQUIPMENT

- A. Injection equipment shall be capable of continuously metering, mixing, and pumping injection material under pressure through crack injection ports; equipment shall be approved by injection-material manufacturer.
 - 1. Volumetric metering shall continuously dispense components in proportions specified by injection-material manufacturer, within tolerance of plus or minus 5 percent.
 - 2. Delivery shall be at constant, preset pressure recommended by injection-material manufacturer. Pressure loss in either line in 3 minutes, when stalled at 80 percent or higher of maximum possible discharge pressure, shall be less than 5 pound per square inch.
 - 3. Pump shall be equipped with automatic shut-off device to prevent injection of unmixed components.

3.4 PREPARATION

- A. Inspect concrete surfaces and mark with crayon, cracks and joints to be injected. Engineer may review injection Work prior to start of surface preparation work.
- B. Protect areas on both sides of cracked member from damage during injection Work.
- C. Prepare cracks and joints as recommended by injection-material manufacturer.
- D. Clean concrete surface along crack or joint to be injected. Surface shall be dry and free of dirt, dust, oil, laitance, unsound concrete and other foreign material which might impede bond of epoxy gel or hydraulic-cement seal.
- E. Remove mud, laitance, and other loose or porous materials in and along surface of cracks and joints, that could impair bond of injection material.
- F. Install injection ports or packers to achieve complete filling of crack or joint.
 - 1. Number, spacing, and location of injection ports or packers shall be approved by representative of injection-material manufacturer; spacing shall not exceed 2 feet.
 - 2. Drill holes for injection ports or packers at 45-degree angle to intersect crack or joint at approximately mid-depth of concrete member. For concrete members thicker than 12 inches, reduce drill angle to accommodate maximum 36-inch-long drill bit.
 - 3. Alternate port or packer placement from side to side along length of crack or joint.
 - 4. Insert injection ports or packers into holes in such manner that crack or joint is not plugged and injection Work is not adversely affected. Remove grease fittings to allow water to flow through open port or packer.
- G. Seal crack and joint surfaces and perimeters of injection ports or packers with ribbon of hydraulic cement or epoxy gel at least 1/8 inch thick and 1 inch wider than crack, joint, port, or packer. Seal back side of member at full-thickness cracks and joints if possible.
- H. Flush crack or joint with potable water to remove dirt or foreign objects from crack or joint.
 - 1. If necessary, flush cracks and joints with maximum 5 percent solution of muriatic acid to remove excessive lime deposits from efflorescence. Flush crack or joint with potable water to neutralize acid flush.
 - 2. In cold weather, use warm water as recommended by chemical grout manufacturer. Do not pump grout into cracks where ice is present.
- I. Fill cracks and joints designated by Engineer with fine aggregate, if recommended by manufacturer, before injecting grout.

3.5 GROUTING

- A. Perform initial injection Work in presence of representative of injection-material manufacturer. At conclusion of Site visit, representative shall prepare and furnish letter to Engineer, stating whether installation was completed in accordance with requirements. These services shall be provided at no additional cost to Owner.
- B. Commence injection only after hydraulic cement or epoxy gel has developed sufficient strength to withstand injection pressure without debonding or rupture.

- C. Maintain concrete substrate and injection material at suitable temperature for suitable time period so that injection material will completely fill crack or joint and will achieve full cure.
- D. Continuously inject material into crack or joint, as recommended by injection-material manufacturer.
 - 1. Use injection pressure of 200 to 3,000 pounds per square inch, depending on crack or joint width, thickness of member, and condition of substrate.
 - 2. Start injection at lowest injection packer and continue until injection material emerges from adjacent packer.
 - 3. Remove injection nozzle and cap injection packer immediately after injection material emerges from adjacent packer.
 - a. Alternately, cap adjacent packer and continue injection until injection material emerges from next higher packer; alternate procedure may be used if injection pressure does not substantially increase, packer caps remain in place, and no leaks occur.
 - 4. Continue injection process upward from port to port, waiting for emergence of injection material from adjacent packer and capping injection packer, until crack or joint is filled.
 - 5. After injecting 3 or 4 packers, re-inject last 3 or 4 packers.
 - 6. If port-to-port travel does not occur, stop Work and modify injection setup to achieve port-to-port travel. Modifications may include resetting injection packers or installing injection packers at closer spacing, or drilling holes which intersect crack or joint at different angle.

3.6 FIELD QUALITY CONTROL

- A. Provide:
 - 1. Access to Work.
 - 2. Materials for sampling.
 - 3. Site facilities for sampling, testing, and storage of materials.
 - 4. Incidental labor.
- B. Sample Injection Material: Obtain 1 sample of the injection material prior to beginning injection Work each day, representing first 50 feet of injection, and 1 sample for every 30 feet of injection thereafter.
 - 1. Place injection material in plastic cup or other container. Add small amount of water if necessary.
 - 2. Allow samples to cure.
 - 3. Do not begin injection Work each day until initial sample has satisfactorily cured.
 - 4. Label samples with injection date and location of injected crack or joint represented by sample.
 - 5. Give samples to Engineer.
- C. Injection Equipment Pressure/Ratio Tests:
 - 1. Test equipment: Device with 2 independent sections, identical in design and function, complete with proper fittings, pressure gauges with 3,000 pounds per square inch maximum rating, in-line filters, and needle valves with appropriate discharge nozzles. Device shall be capable of controlling flow rate and pressure of injection-material components independently by opening or closing needle valves.
 - 2. Pressure test:
 - a. Test method:
 - 1) Disconnect mixing chamber on injection equipment.

- 2) Attach test equipment to component discharge lines.
- 3) Bring pressure in component discharge lines to at least 80 percent of maximum discharge pressure of injection equipment.
- 4) Close valves and observe pressure for 3 minutes.
- b. Test results: Pressure shall not fall by more than 5 pounds per square inch in either line during 3-minute test period.
- c. Test frequency: Perform test at beginning and middle of work shift, and when equipment is repaired or adjustments are made.
- 3. Ratio test:
 - a. Test method:
 - 1) Attach test equipment as in pressure test.
 - 2) While injection equipment is in operation, simultaneously collect separate samples of injection-material components in pre-weighed or volumetric-calibrated containers. Collect at least 3 fluid ounces of lesser volume component.
 - 3) Conduct sampling at atmospheric pressure; at 80 percent of maximum pump discharge pressure; and at prevailing Site temperature.
 - b. Test results: Deviation from specified mix ratio of average of at least 3 individual tests shall not exceed 5 percent.
 - c. Test frequency: Perform test at beginning and middle of work shift, when equipment is repaired or adjustments are made, and as directed by Engineer.
- D. Core Sampling and Testing:
 - 1. Procure concrete core samples from injected cracks and joints at locations indicated by Engineer.
 - a. Cores shall be of sufficient diameter that intact cores are procured and so that specified testing can be performed.
 - b. Core samples shall extend to half of member thickness.
 - 2. Visual inspection:
 - a. Observe penetration of injection material into crack or joint on side of core sample.
 - b. Injection Work is acceptable if 70 percent of crack or joint is filled with injection material and no pathways for water to flow through the member are available.
 - c. If less than 70 percent of crack or joint is filled with injection material, re-inject crack or joint lengths represented by core sample, procure new core sample, and observe injection-material penetration. Repeat process until crack or joint is satisfactorily filled.
 - 3. Contractor shall patch core holes.

3.7 CLEANING

- A. Clean surfaces of excess grout, hydraulic cement, epoxy gel, ports, and packers.
 - 1. Allow injection material sufficient time to cure before performing cleanup.
 - 2. Clean surfaces by grinding or other means, so that face of repair crack is flush with adjacent surface, with no indentations or protrusions.
 - 3. Patch holes at injection ports.

END OF SECTION