



CITY OF HOUSTON

Administration and Regulatory Affairs Department
Strategic Purchasing Division

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December 15, 2011

Subject: Letter of Clarification No. 2 to Invitation to Bid No. S50-C23560, Concrete Repair Services for Various Departments

To: All Prospective Bidders:

This letter of Clarification is being issued for the following reasons:

- **To revise the Scope Work/Specifications and the Electronic Bid Form:**

1.) Section B, Scope of Work/Specifications has been revised:

- Remove page 7 of 141 and replace with attached page 7 of 156 marked, REVISED 12/15/2011.
- Add pages 80, 81, 82, 83, 84, 85, 96, 87, 88, 89, 90, 91, 92, 93 & 94 of 156 marked, "Revised 12/15/2011" Accordingly, the bid document has been re-numbered to reflect the new attached pages. (See *attachments*)

2.) The Electronic Bid Form has been revised; Group No. 1 has been revised in all five years. (See the revised electronic bid form for specifics.)

Note: No further questions will be accepted after the publication of this Letter of Clarification.

When issued, Letter(s) of Clarification shall automatically become a part of the bid documents and shall supersede any previous specification(s) and/or provision(s) in conflict with the Letter(s) of Clarification. It is the responsibility of the bidders to ensure that it has obtained all such letter(s). By submitting a bid on this project, bidders shall be deemed to have received all Letter(s) of Clarification and to have incorporated them into this solicitation.

Furthermore, it is the responsibility of each Contractor to obtain any previous Letter of Clarification associated with this solicitation.

Arturo Lopez

Arturo Lopez
Senior Procurement Specialist
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Attachments: Revised bid document which includes the revised pages 7, 80, 81, 82, 83, 84, 85, 96, 87, 88, 89, 90, 91, 92, 93 & 94 of 156

Partnering to better serve Houston

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ETHICS LANGUAGE:

The respondent warrants that no person or selling agency has been employed or retained to solicit or secure this contract upon agreement or understanding for a commission, percentage, brokerage, or contingent fee, excepting bona fide employees. For breach or violation of this warranty, the City shall have the right to annul this agreement without liability or, at its discretion, to deduct from the contract prices or consideration, or otherwise recover the full amount of such commission, percentage, brokerage or contingent fee.

HIRE HOUSTON FIRST:

Designation as a City Business or Local Business

To be designated as a City or Local Business for the purposes of the Hire Houston First Program, as set out in Article XI of Chapter 15 of the Houston City Code, a bidder or proposer must submit the **Hire Houston First Application and Affidavit (“HHF Affidavit”)** to the Director of the Mayor’s Office of Business Opportunities and receive notice that the submission has been approved prior to award of a contract. Bidders are encouraged to secure a designation prior to submission of a bid or proposal if at all possible.

Download the HHF Affidavit from the Office of Business Opportunities Webpage at the City of Houston e-Government Website at the following location:

www.houstontx.gov/obo/moreforms/hirehoustonfirstaffidavit.pdf

Submit the completed application forms to: Mayor’s Office of Business Opportunity, One Stop Business Center, 900 Bagby St., Public Level, Houston, TX 77002 or Applications may be submitted via e-mail to HHF-MOBO@houstontx.gov or faxed to 832.393.0952.

Award of Procurement of \$100,000 or More for Purchase of Non-Professional Services , Including Construction Services:

THE CITY WILL AWARD THIS PROCUREMENT TO A ” CITY BUSINESS,” AS THAT TERM IS DEFINED IN SECTION 15-176 OF THE CITY OF HOUSTON CODE OF ORDINANCES (“THE CODE”):

- IF THE BID OF THE LOCAL BUSINESS IS THE LOWEST RESPONSIBLE BID OR IS WITHIN 3% OF THE LOWEST BID RECEIVED, AND
- UNLESS THE USER DEPARTMENT DETERMINES THAT SUCH AN AWARD WOULD UNDULY INTERFERE WITH CONTRACT NEEDS, AS PROVIDED IN SECTION 15-181 OF THE CODE.

IF THERE IS NO BID OF A LOCAL BUSINESS THAT MEETS THESE CRITERIA, THE CITY WILL AWARD THE PROCUREMENT TO THE LOWEST RESPONSIBLE BIDDER.

Award of Procurement under \$100,000 Purchase of Non-Professional Services Including Construction Services:

THE CITY WILL AWARD THIS PROCUREMENT TO A “LOCAL BUSINESS,” AS THAT TERM IS DEFINED IN SECTION 15-176 OF THE CITY OF HOUSTON CODE OF ORDINANCES (“THE CODE”):

- IF THE BID OF THE CITY BUSINESS IS THE LOWEST RESPONSIBLE BID OR IS WITHIN 5% OF THE LOWEST BID RECEIVED, AND

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**Section 03931
CONCRETE REPAIR AND REHABILITATION**

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Repair of cracks, holes and surface defects, and repair of deteriorated concrete surfaces.
- B. Installation of embedded items into existing concrete.

1.02 UNIT PRICES

- A. Measurement for repair materials is on a lump-sum basis for each structure as bid. Payment includes work performed on these structures in accordance with related sections included in the Contract Documents.
- B. Measurement for extra removal of deteriorated concrete and placement of repair mortar is on a cubic-foot basis. Measurement for other repair materials is as defined in the appropriate related sections. Payment includes associated work performed in accordance with related sections included in the Contract Documents.
- C. Refer to Section 01270 - Measurement and Payment for unit price procedures.

1.03 REFERENCES

- A. ASTM C 109 - Compressive Strength of Hydraulic Cement Mortars.
- B. ASTM C 881 - Epoxy-Resin-Base Bonding Systems for Concrete.
- C. ASTM C 882 - Bond Strength of Epoxy-Resin Systems Used with Concrete.

1.04 SUBMITTALS

- A. Under provisions of Section 01330 -Submittal Procedures, submit manufacturer's product information, installation instructions and recommendations, and certification of compliance with required properties for all repair materials.

1.05 REPAIR SCOPE

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- A. Patch and fill openings in existing concrete indicated to be patched or filled.
- B. Patch, fill holes in and otherwise repair damage to concrete and concrete surfaces resulting from removal of penetrating pipes and other embedded items, from installation of pipes or other items embedded in or passed through concrete, and from other construction activities.
- C. Crack Repair: Repair the full length of cracks in concrete members in new structures, and in existing structures as follows:
- D. Deteriorated Concrete:
 - 1. Repair interior concrete surfaces showing signs of deterioration in the following existing structures:
 - 2. The level of deterioration of the concrete varies within each of the listed structures. For bidding purposes, average depth of deteriorated concrete walls and undersides of top slabs is assumed to be one inch. Repair for the portion exceeding one inch in depth, as measured from the existing wall surface, will be paid as extra work as defined above.
- E. Make other repairs to existing structures as follows:

1.06 QUALITY ASSURANCE

- A. Field Tests of Cement-based Grouts:
 - 1. Compression test specimens will be prepared during construction by the City Engineer, or his authorized representative, from the first placement of each type of mortar or grout, and at intervals thereafter as determined by the City Engineer, to ensure continued compliance with these specifications.
 - 2. Specimen preparation and compression testing for repair mortar and non-shrink grout will be performed as specified in ASTM C 109. A set of three specimens will be made for testing at 7 days, 28 days, and additional testing as appropriate.
 - 3. Material failing to meet Contract requirements is subject to removal, and replacement with new material meeting requirements, at no additional cost to the City.
 - 4. Cost of laboratory tests on mortar and grout will be borne by the City, except Contractor shall pay for tests failed, and additional testing and investigation work performed because of work not meeting Contract requirements.

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- 5. Contractor shall supply all materials necessary for fabricating test specimens and assist the Project Manager in obtaining specimens for testing.
- B. Repair concrete shall be tested as required in **Section 03311 – Structural Concrete**.
- C. Epoxy grout shall be tested as required in **Section 02956 – Structural Grout**.
- D. Chemical Grout:
 - 1. Installer: A waterproofing contractor with a minimum of 3 years experience in the installation of chemical grout systems as specified herein, and shall be certified or approved by the manufacturer.
 - 2. Waterproofing contractor shall submit a list of 5 previous jobs successfully completed by that firm that successfully utilized the specified chemical grout system.
- E. Construction Tolerances: As specified in Section 03100 – Concrete Formwork, and Section 03350 – Concrete Finishing, except as otherwise indicated.

PART 2 P R O D U C T S

2.01 REPAIR MORTAR

- A. Repair Mortar: Prepackaged polymer-modified cement-based product specifically formulated for repair of surface defects in concrete, having the following properties:

<u>Physical Property</u>	<u>Value</u>	<u>ASTM Standard</u>
Compressive Strength (minimum)		C 109
1 day	2000 psi	
28 days	6000 psi	
Bond Strength (minimum)		C 882 (modified)
1 day	1200 psi	
7 days	2000 psi	

- B. Manufacturer and Product: Emaco by Master Builders, SR93 by Euclid Chemical Company, Sikacem by Sika Corporation, Five Star Structural Concrete by Five Star Products, Inc., or equal. Where the manufacturer

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offers products in formulations intended for specific application conditions such as overhead and shotcrete application, use the formulation recommended by the manufacturer for the condition required.

- C. Minimum Repair Thickness: 0.50 inch.

2.02 NON-SHRINK GROUT

- A Non-shrink Grout: Comply with requirements of Section 03600 - Structural Grout.

2.03 CONCRETE MATERIALS

- A. Cement: Type II Portland cement, unless indicated otherwise. Where repairs are made on wall surfaces exposed to view and above normal water surface elevation, blend white Portland cement with Type II cement as needed to match the color of adjacent existing concrete surface.
- B. Repair Concrete: Class A (4000 psi) concrete with one-inch maximum coarse aggregate, complying with Section 03310 - Structural Concrete; minimum repair thickness, 2 inches.
- C. Cement Grout: Comply with Section 03600 - Structural Grout; minimum repair thickness, one inch.
- D. Curing Materials, Bonding Agents, and Other Miscellaneous Materials: Comply with Section 03310 - Structural Concrete and Section 03390 - Concrete Curing.

2.04 AGGREGATE

- A. Aggregate for Extending Repair Mortar and Non-shrink Grout Products: 3/8 inch clean, washed gravel or crushed stone complying with Section 03390 - Concrete Curing.

2.05 CHEMICAL GROUT

- A. Chemical Grout: Hydrophobic urethane or polyurethane material of low viscosity suitable for pumped injection into cracks, which reacts with water to form a closed-cell foam material that completely fills and seals all cracks against leakage. Cured material shall remain elastic and maintain an expansive pressure through repeated wet-dry cycles.
- B. Manufacturer and Product: Scotch Seal 5600 by the Adhesives, Coatings, and Sealers Division of 3M Products; Flex LV by De Neef America, Inc.; SikaFix by Sika Corporation; or equal. Use different formulations in the same family of

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materials, accelerators, and other materials necessary for installation where recommended by the manufacturer for specific application conditions.

- C. Reacted and cured chemical grout shall be resistant to organic solvents, mild acids, alkali and micro-organisms. Cured material shall be approved for use with potable water by the appropriate federal, state, or local government agency.

2.06 EPOXY PRODUCTS

- A. Epoxy Grout: Comply with Section 03600 - Structural Grout, modified as specified herein.
- B. Epoxy for Crack Injection: ASTM C 881, Type IV; low viscosity, moisture-insensitive material specifically formulated for that use; 2500 psi minimum bond strength when tested in accordance with ASTM C 882 at 14 days, moist cured.

2.07 SEALANT

- A. Sealant: 2-part polyurethane.

2.08 FORMWORK

- A. Formwork, Where Needed: Comply with Section 03100 - Concrete Formwork.

2.09 REINFORCEMENT

- A. Reinforcement, Where Required: Comply with **Section 03210 - Reinforcing Steel**.

2.10 RESILIENT WATERSTOP

- A. Resilient Waterstop.

PART 3 EXECUTION

3.01 PREPARATION AND CURING

- A. Where repairs are made on wall surfaces exposed to view and above normal water surface elevation, installed repair material shall match adjacent concrete surface in color.
- B. Surface Preparation:
 - 1. Clean entire area to be repaired of laitance, foreign material and loose or deteriorated concrete by chipping, hydroblasting or sandblasting;

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further roughen surfaces as specified herein. Where non-shrink grout or repair mortar is used, perform any additional surface preparation steps recommended by the manufacturer.

2. Where cementitious repair materials are used, maintain surfaces to be repaired in a saturated surface dry condition and prevent concrete from drying until repair operations are completed. Re-wet surfaces to be repaired by water spray on at least a daily basis. Remove standing water in areas to be repaired prior to placement of repair material. Provide means to remove excess water from the structure.
 3. Where repair material manufacturer recommends use of an epoxy bonding agent, follow recommendations of both the repair material and epoxy bonding agent manufacturers.
- C. Fully consolidate repair material, completely filling all portions of areas to be filled.
- D. Bring repair surfaces into alignment with adjacent existing surfaces to provide uniform, even surfaces. Unless indicated otherwise, repair surfaces shall match adjacent existing surfaces in texture and receive coatings or surface treatments provided for adjacent existing surfaces.
- E. Curing:
1. Cure repair mortar and non-shrink grout according to manufacturer's recommendations, except that minimum cure period shall be 3 days.
 2. Cure other materials in accordance with Section 03390 - Concrete Curing.
 3. If manufacturer recommends use of a curing compound, use no material that would interfere with the bond of any coating or adhesive required to be applied to the surface.

3.02 TREATMENT OF SURFACE DEFECTS

- A. Definition - Surface Defects: Depressions in concrete surfaces not extending all the way through a member, caused by physical damage, unrepaired rock pockets created during original placement, spalling due to corroded reinforcing steel or other embeds, or removal of embedded items or intersecting concrete members.
- B. Preparation:
1. Remove loose, damaged concrete by chipping to sound material.
 2. Where existing reinforcing bars are exposed, remove concrete at least one inch deep all around the exposed bars. If the existing bars are cut

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through, cracked, or cross-sectional area is reduced by more than 25 percent, notify City Engineer immediately.

C. Repair Material:

1. Use only repair mortar to repair surface defects in members normally in contact with water or soil, and defects in interior surfaces of structures which are intended to contain water.
2. Repair of other surface defects may be by application of repair mortar, repair concrete or cement grout, as appropriate.

3.03 PATCHING OF HOLES IN CONCRETE

A. General:

1. Definition - Holes: For the purposes of this section, holes are defined as penetrations completely through a concrete member, with interior surfaces approximately perpendicular to the surface of the existing member. Chip interior surface areas which are inclined and do not meet this criterion as necessary to meet this requirement.
2. Perimeter of holes at the surface shall form a regular shape composed of curved or straight line segments. Provide at least the minimum placement depth specified for the material used at all locations. Score existing concrete by sawcutting and chip as needed to meet this requirement.
3. Roughen the interior surface of holes less than 12 inches in diameter to at least 0.125 inch amplitude. Roughen larger holes to at least 0.25 inch amplitude.
4. At holes not filled with repair mortar or non-shrink grout, and where otherwise recommended by the repair material manufacturer, coat existing surfaces to be repaired with epoxy bonding agent.
5. Where a surface of a member is exposed to view and the repair material cannot be adjusted to match the color of the existing concrete, hold back the repair material 2 inches from the surface. Fill the remaining 2 inches with color-adjusted cement grout. Roughen the surface of the repair material when placed to improve bond with the cement grout.

B. Patching Small Holes:

1. Fill holes less than 12 inches in least dimension and extending completely through concrete members with repair mortar or non-shrink grout.

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2. Fill holes in members normally in contact with water or soil with Class I non-shrink grout in accordance with Section 03600 - Structural Grout.

C. Patching Large Holes:

1. Fill holes larger than 12 inches in least dimension with repair concrete, repair mortar or non-shrink grout.
2. Provide large holes normally in contact with water or soil and not filled with Class I non-shrink grout with resilient waterstop placed in a groove approximately 0.25 inch deep ground into the interior edge of the hole at the center of the wall providing a smooth surface in which to place the resilient waterstop. Alternatively, bond bentonite waterstop to the surface using an epoxy grout which completely fills all voids and irregularities beneath the waterstop material.
4. Provide reinforcing steel in layers matching existing reinforcement locations, except provide concrete cover required by the Contract Documents for the applicable service condition.
5. For holes smaller than 48 inches, reinforcement shall be at least #5 bars on 12 inch centers in each layer required. At all holes larger than 30 inches, drill and grout the reinforcement into the existing concrete.
6. For holes larger than 48 inches, see the drawings for reinforcement details.

3.04 PATCHING OF LINED HOLES

- A. These provisions apply to openings which have embedded material over all or a portion of the inside edge. Requirements for repairing holes in concrete specified above shall apply as modified herein. The City Engineer will determine when the embedded material is allowed to remain.
- B. Where embedded material is allowed to remain, trim it back a minimum of 2 inches from the concrete surface. Roughen or abrade the embedded material to promote good bonding to the repair material. Completely remove any substance that interferes with good bonding.
- C. Completely remove embedded items not securely and permanently anchored in the concrete.
- D. Completely remove embedded items larger than 12 inches in least dimension unless composed of a metal to which reinforcing steel can be welded. Where reinforcement is required, weld it to the embedded metal.
- E. The following additional requirements apply to concrete in contact with water or soil.

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1. Fill lined openings less than 4 inches in least dimension with epoxy grout.
2. Coat lined openings greater than 4 inches but less than 12 inches in least dimension with an epoxy bonding agent prior to filling with Class I non-shrink grout.
3. Coat lined openings greater than 12 inches in least dimension with an epoxy bonding agent and bond bentonite waterstop to the interior of the opening prior to filling with approved repair material.

3.05 INSTALLATION OF PIPES AND FRAMES

- A. The following applies to installation of permanent pipes and frames in openings cut into existing concrete members.
- B. Cut opening to a size which is a minimum of one inch and a maximum of 3 inches larger than the outside edge of the embedded item. At openings with sharp corners, take care not to sawcut beyond the opening so as to damage existing reinforcing bars. At openings which are greater than 24 inches in least dimension, chip a keyway into the center of the wall. Keyway shall be at least 1.5 inches in depth and from 3 inches to 1/3 the member thickness in width. All surfaces except at the keyway shall be perpendicular to the member surface as specified herein for patching holes.
- C. Provide embedded items with a flange or other positive means of anchorage to repaired members. At members in contact with soil or water, provide continuous waterstop flanges around embeds. Where concrete pipe will be embedded, provide resilient waterstop around pipe at wall centerline.
- D. Roughen the interior surface of openings to at least 1/4-inch amplitude. Sandblast the embed surface to be in contact with concrete clean to promote good bonding to the repair material.
- E. Fill the space between the frame and the existing concrete with Class I non-shrink grout.
- F. Where surface of a member is exposed to view and the repair material cannot be adjusted to match the color of the existing material, hold back the repair material 2 inches from the surface. Fill the remaining 2 inches with color-adjusted cement grout.

3.06 NON-FIXED INSTALLATION OF PIPES

- A. The following applies to installation through existing concrete of piping to be sealed with adjustable linked seals, resilient connectors, or packing and sealant. When more appropriate, City Engineer may require installation of a sleeve instead of the core-drilled hole specified herein.

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- B. Size core-drilled opening to permit installation of the required seal; locate to minimize cutting of existing reinforcing steel.
- C. Where linked or resilient seals are to be installed, coat the interior surface of the opening with epoxy at least 1/8 inch thick for a smooth and even surface promoting a good seal.
- D. Where packing and sealant are required, seal exposed reinforcing bars with at least an 1/8-inch thick layer of epoxy extending 1/2 inch beyond the bars on all sides. Prepare the surface of the cut concrete and the pipe as recommended by the sealant manufacturer.

3.07 GENERAL CRACK REPAIR

- A. Repair cracks identified by the Project Manager as caused by shrinkage or thermal movement by injection with chemical grout as specified herein.
- B. Repair cracks not caused by shrinkage or thermal movement by epoxy injection or as otherwise directed by the Project Manager.

3.08 CHEMICAL GROUT CRACK REPAIR

- A. Inject chemical grout into all cracks as directed by the Project Manager in those structures included in the scope of work listed herein in accordance with the chemical grout manufacturer's installation instructions and recommendations.
- B. Location of Injection Ports: Locate injection ports as recommended by the chemical grout manufacturer and as needed to insure complete penetration of the joint or crack with the grout. Spacing of injection ports shall not exceed 2 feet.
- C. Drilling Ports: Drill holes for injection ports to the depth needed for proper distribution of the chemical grout. Take care to not damage any reinforcing steel.
- D. Port preparation: Clean holes for injection ports of all debris and fit with an injection fitting as provided by the manufacturer of the chemical grout, or equal. Install injection fittings in accordance with manufacturer's instructions; allow fittings to remain in place until chemical grout injection work is complete in that area. Install caps or valves at injection ports to prevent back flow of uncured chemical grout after it has been injected.
- E. Chemical Grout Injection:
 - 1. Follow instructions and recommendations of the chemical grout manufacturer and its representatives for chemical grout mixing and injection procedures.

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2. Seal cracks at the surface where needed to assure complete penetration of injected chemical grout and prevent loss of material.
3. Prior to chemical grout injection, inject water into ports to provide water for the reaction process, flush out foreign matter and verify continuity between adjacent ports. Inject water into each port until it begins to flow from an adjacent or nearby port.
4. If the water injection procedure indicates the potential presence of voids within members or behind members resting against soil, notify the Project Manager immediately.
5. Beginning at the lowest injection port, inject chemical grout until the grout begins to flow from an adjacent or nearby port. Repeat the process until the crack is completely filled. In general, port-to-port travel of the injection process will be from low to high in a continuous operation.
6. If port-to-port continuity does not occur at locations where continuity was verified through water injection, mark location and notify the Project Manager.
7. Avoid sudden application of high pressure during the injection process.
8. After completion of the grouting operation, remove all ports and surface sealing materials leaving an undamaged surface.

3.09 EPOXY CRACK REPAIR

- A. Inject epoxy into all cracks in damaged concrete as indicated by the City Engineer in structures included in the scope of work listed herein. Follow installation instructions and recommendations of the epoxy manufacturer.
- B. Inject cracks with sufficient pressure to ensure full penetration of epoxy but without causing further damage.
- C. Location, drilling and preparation of ports for injection: As specified for chemical grout herein.
- D. Epoxy Injection:
 1. Follow instructions of the epoxy manufacturer and its representatives for all mixing and injection procedures.
 2. Seal all cracks at the surface where needed to provide for complete penetration of the injected epoxy and to prevent loss of material.
 3. Beginning at the lowest injection port, inject the epoxy until it begins to flow from an adjacent or nearby port. Repeat the process until the crack is completely filled.

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4. If port-to-port continuity does not occur, mark the location and notify Project Manager.
5. Avoid sudden application of high pressure during the injection process.
6. After completion of injection operations, remove all ports and surface sealing materials to leave an undamaged surface.

3.10 REPAIR OF DETERIORATED CONCRETE

- A. These provisions pertain to concrete damaged by abrasion, chemical attack or corrosion of reinforcing steel. The only material acceptable for surface repair is repair mortar as specified herein. Where the repaired surface is to be subsequently covered with a PVC liner or other protective material, coordinate finishing details with the liner material manufacturer.
- B. Surface Preparation:
 1. Remove loose, broken, softened and acid-contaminated concrete to sound, uncontaminated concrete.
 2. Notify the City Engineer when removal of deteriorated concrete is complete. Schedule two weeks for the City Engineer to inspect the surface, perform testing for acid contamination, determine if additional concrete must be removed, and to develop any special repair details that may be needed. Should it be determined that additional concrete must be removed to reach sound, uncontaminated material, schedule another two week period for further evaluation after completion of the additional removal.
 3. Follow repair mortar manufacturer's instructions for additional surface preparation.
- C. Repair Mortar Placement:
 1. Follow manufacturer's recommendations for mixing and placement of repair mortar. After the initial mixing of the repair mortar, do not add additional water to change the consistency should the mix begin to stiffen.
 2. Place repair mortar to the minimum thickness recommended by manufacturer but not less than 1/2 inch. Should there be areas where less than the minimum repair mortar depth of concrete is removed, Contractor may remove additional concrete to attain the minimum repair mortar thickness or may place repair mortar so as to increase the original thickness of the member. In any case, add repair mortar so that minimum cover over existing reinforcing steel is 2 inches. Do not place repair mortar so as to create locally raised areas. Where there is a transition with wall surfaces which are not in need of repair,

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do not feather the repair mortar at the transition. Sawcut a score line to not less than the minimum repair mortar depth and chip concrete out to it to form the transition. Take care not to cut or otherwise damage reinforcing steel.

3. Finish repair mortar in an even, uniform plane to restore the member to its original surface. Out-of-plane tolerance: No localized depressions or projections; 0.25 inch maximum gap between repair mortar surface and a 10-foot straight edge in any orientation at any location.
- D. Finishing:
1. Apply a smooth magnesium float finish to repair mortar.
 2. When completed: No sharp edges. Exterior corners, such as at penetrations: One-inch radius. Interior corners: Square, except 2-inch repair mortar fillet at corners to receive PVC lining.

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THE FOLLOWING ITEMS SHOULD BE CHECKED FOR COORDINATION DURING DESIGN:

- A. Coordinate this specification with other related specifications including the following related Sections.

RELATED SECTIONS

Section 03100 - Concrete Formwork

Section 03211 - Reinforcing Steel

Section 03310 - Structural Concrete

Section 03350 - Concrete Finishing

Section 03390 - Concrete Curing

Section 03600 - Structural Grout

- B. Include this section whenever there are existing structures in the project which require repair. Modify the scope of work section to include all such structures and the types of repairs needed. Several types of repair are included; where a project does not require a particular form of repair, the appropriate paragraphs should be removed and the remaining specification adjusted accordingly.
- C. Paragraph 1.05C. Carefully and thoroughly document existing structures having cracks to be repaired, listing structures to be repaired and describing the crack repairs under the Paragraph below, or delete the Paragraph below and refer to the Drawings, if crack repair requirements in existing structures are sufficiently indicated there. Re-letter the remaining Paragraph(s) as required. Coordinate with Paragraph 3.9A.
- D. Paragraph 1.05D. The following is for concrete attacked chemically, usually by hydrogen sulfides which have turned into sulfuric acid. Repair is usually done to prepare for placement of a PVC liner or some other form of protective coating. Revise subparagraph 1 below to define repair scope, carefully describing areas to be repaired and the extent of repairs; refer to drawings if necessary. If possible, engage a testing lab during design to take core samples, test for sulfate levels at depth increments, and determine how much concrete must be removed to reach sound uncontaminated material. If that is done, revise subparagraph 2 below to define the amount of concrete to be removed; if testing ahead of time is not possible, revise subparagraph 2 as necessary to state the estimated amount of concrete to be removed.
- E. Paragraph 1.05E. Carefully and thoroughly document the extent of other repairs required to existing structures, listing the existing structures to be repaired and describing the nature of those repairs under the Paragraph below, or delete the Paragraph below and refer to the Drawings, if repair areas in existing structures are sufficiently indicated there.

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- F. Paragraph 2.01A. Repair mortars with faster strength gain and greater 28-day strengths are available if needed for a specific application. Some products listed below greatly exceed specified values. Contact manufacturers listed and adjust the required properties to suit what is available and appropriate.
- G. Paragraph 3.02. Add Paragraph 3.02B.3 below if reinforcing bars are known to be corroded or otherwise damaged to the point where replacement is necessary. Define such areas on the drawings, and add provisions in this section (or in Section 03310 - Structural Concrete) specifying repair by welding in replacement bars. The other subparagraphs in 3.02B are intended to cover situations where loss of rebar is not anticipated
1. Score cut perimeter of damaged area at least one-half inch deep, to a maximum depth so as not to cut existing reinforcing steel. Chip existing concrete up to the score line so that minimum thickness of repair mortar is one-half inch.
- H. Paragraph 3.10C.3. Use tolerances and finish specified below for sheet PVC liner applied to concrete surface. Other liners or coatings may require a different level of finish or tolerance. Edit the following paragraphs to reflect the level of finish needed for the protection system selected for the project.