

SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
 - 1. Division 01 Section "Payment Procedures" For submitting Applications for Payment and the schedule of values.
 - 2. Division 01 Section "Project Management and Coordination" for submitting Coordination Drawings.
 - 3. Division 01 Section "Quality Control" for submitting test and inspection reports.
 - 4. Division 01 Section "Closeout Procedures" for submitting warranties, and Project Record Documents.

1.3 DEFINITIONS

- A. Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's approval. Submittals may be rejected for not complying with requirements.
- C. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

1.4 SUBMITTAL ADMINISTRATIVE REQUIREMENTS

- A. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

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1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
 - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.
1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
 2. If intermediate submittal is necessary, process it in same manner as initial submittal.
 3. Allow 15 days for processing each resubmittal.
- C. Paper Submittals: Place a permanent label or title block on each submittal for identification.
1. Indicate name of firm or entity that prepared each submittal on label or title block.
 2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
 3. Include the following information for processing and recording action taken:
 - a. Project name.
 - b. Date.
 - c. Name and address of Engineer.
 - d. Name and address of Contractor.
 - e. Name and address of subcontractor.
 - f. Name and address of supplier.
 - g. Name of manufacturer.
 - h. Unique identifier, including revision number.
 - i. Number and title of appropriate Specification Section.
 - j. Drawing number and detail references, as appropriate.
 - k. Location(s) where product is to be installed, as appropriate.
 - l. Other necessary identification.
- D. Options: Identify options requiring selection by Engineer.
- E. Substitutions: substitutions are not allowed.

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- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Use only final submittals that are marked with approval notation from Engineer's action stamp.

PART 2 - PRODUCTS

2.1 SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by individual Specification Sections by either of the following methods.
 - 1. Submit two copies of paper submittals. Engineer will not return copies.
 - 2. Submit electronic submittals as PDF electronic files. Engineer will not return annotated file.
 - a. Submit via email to al.bustamante@walkerrestoration.com. Only submittals marked as "Reviewed" by the Engineer will be distributed to the Owner.
- B. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 1. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - 2. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- C. Qualification Data: Prepare and submit written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with

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project names and addresses, names and addresses of Engineers and owners, and other information specified.

- D. **Welding Certificates:** Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- E. **Installer Certificates:** Submit written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.
- F. **Manufacturer Certificates:** Submit written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- G. **Product Certificates:** Submit written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- H. **Material Certificates:** Submit written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- I. **Material Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.
- J. **Product Test Reports:** Submit written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- K. **Research Reports:** Submit written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
 - 1. Name of evaluation organization.
 - 2. Date of evaluation.
 - 3. Time period when report is in effect.
 - 4. Product and manufacturers' names.
 - 5. Description of product.
 - 6. Test procedures and results.
 - 7. Limitations of use.
- L. **Preconstruction Test Reports:** Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.
- M. **Compatibility Test Reports:** Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests

performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

- N. Field Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during product installation or after product installation in its final location, for compliance with requirements in the Contract Documents.
- O. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- P. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
1. Preparation of substrates.
 2. Required substrate tolerances.
 3. Sequence of installation or erection.
 4. Required installation tolerances.
 5. Required adjustments.
 6. Recommendations for cleaning and protection.
- Q. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- R. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- S. Material Safety Data Sheets: When requested, submit information directly to Owner. If submitted to Engineer, Engineer will not review this information but will return it with no action taken.

2.2 DELEGATED-DESIGN SERVICES

- A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.
 - 1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Engineer.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit digitally signed PDF electronic file and three paper copies of certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.
 - 1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

2.3 REQUESTS FOR INFORMATION

- A. Engineer will review written Request for Information (RFI) on the Contractor company letterhead. However, the Engineer reserves the right to reject, unprocessed, any Request for Information (RFI) that the Engineer, at its sole discretion, deems frivolous.
- B. Engineer reserves the right to reject, unprocessed, any RFI that the Engineer, at its sole discretion, deems already answered in the Contract Documents.
- C. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

- A. Action and Informational Submittals: Review each submittal and check for coordination with other Work of the Contract and compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Engineer.
- B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

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3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Engineer or its subconsultant will review each submittal, make marks to indicate corrections or revisions required, and return it. Engineer will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:
 - 1. See Section 007300 "Supplementary Conditions" for description of terminology on Engineer's Stamp.
- C. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

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SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
 - 1. Divisions 02 through 09 for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

- A. Cutting: Removal of existing construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

1.4 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Owner's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections of these Specifications.
- B. Existing Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - 1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of existing materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
 - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to avoid interruption of services to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.

1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction by wet-sawing, wet-drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
 4. Where possible, use equipment with dust containment features with Hepa filters.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
 - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
 4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.
 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition.

END OF SECTION 017329

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SECTION 017423 - FINAL CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and other Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
 - 1. Special cleaning requirements for specific elements of Work are included in appropriate Sections of Divisions 02 through 09.
- B. General Project closeout requirements are included in Section "Closeout Procedures."
- C. General cleanup and waste removal requirements are included in Section "Temporary Facilities and Controls."
- D. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.
 - 1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
 - 2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by the manufacturer or fabricator of surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property, or that might damage finished surfaces.

PART 3 - EXECUTION

3.1 FINAL CLEANING

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- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete following cleaning operations before requesting inspection for Certification of Substantial Completion for entire Project or a portion of Project.
 - 1. Clean Project site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
 - 2. Remove tools, construction equipment, machinery and surplus material from the site.
 - 3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 - 4. Broom clean concrete floors in unoccupied spaces.
 - 5. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
 - 6. Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
 - 7. Leave Project clean and ready for occupancy.
- C. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction period. Perform necessary repairs to structure if damaged by temporary protection or removal of temporary protection.
- D. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.
 - 1. Where extra materials of value remain after completion of associated construction have become Owner's property, dispose of these materials as directed.

END OF SECTION 017423

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SECTION 025140 - SURFACE PREPARATION FOR PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to locate and remove all delaminated and unsound concrete and preparation of cavities created by removal to receive patching material and preparation of existing surface spalls and potholes to receive patching material.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 03 Section "Latex Modified Concrete and Mortar"
 - 2. Division 03 Section "Shotcrete"
 - 3. Division 03 Section "Trowel Applied Mortar"

1.3 REFERENCES

- A. "Specifications for Structural Concrete for Buildings" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
 - 1. "Guide for Repair of Concrete Bridge Superstructures" (ACI 546.1), American Concrete Institute.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. Floor Slabs:

1. Floor slab delaminations: locate by sounding surface with hammer, rod, or chain drag.
2. When delaminated area is struck, distinct hollow sound is heard.
3. Contractor: sound all designated floors for delaminations.
4. Certain structural systems that contain thin slab thicknesses with Welded Wire Reinforcement or other small diameter reinforcing, such as waffle slab or precast tees, may have significant deterioration without evidence of delaminations. These structural systems require qualified personnel to provide additional inspections, primarily visual in nature, to define the extent of deterioration.
5. Contractor: Visually inspect thin slab thicknesses with small diameter reinforcing for deterioration.

B. Vertical and Overhead Surfaces:

1. Vertical and overhead surface delaminations: locate by sounding appropriate member with hammer or rod.
2. Cracks, usually horizontal in orientation along beam faces, and vertical in orientation near column corners are indicators of delaminated concrete.
3. Contractor: sound only vertical and overhead surfaces that show evidence of cracking and/or salt and water staining.

C. Delaminated areas, once located by Contractor, shall be further sounded to define limits. Mark limits with chalk or paint.

D. Contractor: locate spalls by visual inspection and mark boundaries with chalk or paint after sounding surface.

E. Engineer/Architect will define and mark additional unsound concrete areas for removal, if required.

F. Areas to be removed shall be as straight and rectangular as practical to encompass repair and provide neat patch.

G. Contractor: Locate and determine depth of all embedded REINFORCEMENT, POST-TENSIONING TENDONS, and ELECTRICAL CONDUIT in repair area and mark these locations for reference during concrete removal. Do **NOT nick or cut any embeds unless approved by Engineer/Architect.**

3.2 PREPARATION

- A. **Temporary shoring may be required at concrete floor repair areas exceeding 5 sq ft and at any beam, joist, or column repair. Contractor: Review all marked removal and preparation areas and request clarification by Engineer/Architect of shoring requirements in questionable areas. Shores shall be in place prior to concrete removal and cavity preparation in any area requiring shores.**
- B. Delaminated, spalled and unsound concrete floor areas: mark boundaries. All concrete shall be removed from within marked boundary to minimum depth of 0.75 in. using 15 to 30 lb chipping hammers equipped with chisel point bits. When directed by Engineer/Architect, chipping hammers less than 15 lb shall be used to minimize damage to sound concrete. If delaminations exist beyond minimum removal depth, chipping shall continue until all unsound and delaminated concrete has been removed from cavity.
- C. Where embedded reinforcement or electrical conduit is exposed by concrete removal, exercise extra caution to avoid damaging it during removal of unsound concrete. If bond between exposed embedded reinforcement and adjacent concrete is impaired by Contractor's removal operations, Contractor shall perform additional removal around and beyond perimeter of reinforcement for minimum of 0.75 in. along entire length affected at no cost to Owner.
- D. If rust is present on embedded reinforcement where it enters sound concrete, additional removal of concrete along and beneath reinforcement required. Additional removal shall continue until non-rusted reinforcement is exposed, or may be terminated as Engineer/Architect directs.
- E. Sawcut to depth of 0.5 in. into floor slab, unless otherwise noted. For vertical and overhead surfaces marked boundary may be sawcut, ground or chipped to depth of 0.5 in. to 0.625 in. into existing concrete, measured from original surface. All edges shall be straight and patch areas square or rectangular-shaped. Diamond blade saw or grinder with abrasive disk suitable for cutting concrete is acceptable for performing work. Edge cut at delamination boundary shall be dressed perpendicular to member face. It shall also be of uniform depth, for entire length of cut. Exercise extra caution during sawcutting to avoid damaging existing reinforcement (ESPECIALLY POST-TENSIONING TENDONS) and electrical conduit and any other embedded items near surface of concrete. Any damage to existing reinforcement, post-tensioning tendons or sheathing during removals shall be repaired by Contractor with Engineer/Architect-approved methods at no additional cost to Owner.

3.3 INSPECTION OF REPAIR PREPARATION

- A. After removals are complete, but prior to final cleaning, cavity and exposed reinforcement shall be inspected by Contractor and verified by Engineer/Architect for compliance with requirements of this Section. Where Engineer/Architect finds

unsatisfactory cavity preparation, Engineer/Architect shall direct Contractor to perform additional removals. Engineer/Architect shall verify areas after additional removals.

- B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer/Architect of all defective and damaged reinforcement or conduits. Replacement of damaged or defective reinforcement or conduits shall be performed according to this Section and as directed by Engineer/Architect.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

- A. All embedded reinforcement exposed during surface preparation that has lost more than 15% (10% if 2 or more consecutive parallel bars and/or tendons are affected) of original cross-section due to corrosion shall be considered DEFECTIVE. All non-defective exposed reinforcement that has lost section to extent specified above as direct result of Contractor's removal operations shall be considered DAMAGED.
- B. **Embedded materials** including, but not limited to, electrical conduit, corrosion protection systems and snow/ice melting equipment **shall be protected by Contractor** during removal operations. **Damage due to removal operations shall be repaired by Contractor in accordance with national code requirements at no cost to Owner.** Embedded materials which are defective due to pre-existing conditions may be repaired or replaced by Contractor or abandoned at Owner's option and cost.
- C. Supplement defective or damaged embedded reinforcement by addition of reinforcement of equal diameter with Class "B" minimum splice per ACI 318 beyond damaged portion of reinforcement. Secure new reinforcement to existing reinforcement with wire ties and/or approved anchors. Supplemental reinforcement shall be ASTM A615 Grade 60 steel installed in accordance with Section "Cast-in-Place Concrete." Tendon supplement or repair materials, when applicable, shall be as required by Section "Work Items."
- D. Loose and supplemental reinforcement exposed during surface preparation shall be securely anchored prior to patch placement. Loose reinforcement shall be adequately secured by wire ties to bonded reinforcement or shall have drilled-in anchors installed to original concrete substrate. Drilled-in anchors shall be Powers "Tie-Wire Lok-Bolt" anchors, ITW Ramset/Red Head "TW-1400" anchor, or approved equivalent. Supplemental reinforcing needed to be held off substrate shall be adequately secured by drilled-in anchors installed to original concrete substrate with Powers "Tie-Wire Spike", ITW Ramset/Red Head Redi-Drive "TD4-112" anchors, or approved equivalent. Engineer/Architect will determine adequacy of wire ties and approve other anchoring devices prior to their use. Securing loose and supplemental reinforcement is incidental to surface preparation and no extras will be allowed for this Work.
- E. Concrete shall be removed to provide minimum of 3/4 in. clearance on all sides of defective or damaged exposed embedded reinforcement that is left in place. Minimum of 1.5-in. concrete cover shall be provided over all new and existing reinforcement. Concrete cover over reinforcement may be reduced to 1 in. with Engineer/Architect's approval if coated with an approved epoxy resin.

- F. Supplemental reinforcement and concrete removals required for repairs of defective or damaged reinforcement shall be paid for as follows:
 - 1. Concrete removals and supplemental reinforcement required for repairs of DEFECTIVE reinforcement shall be paid for by Owner at unit price bid.
 - 2. Concrete removals and supplemental reinforcement required for repairs of DAMAGED reinforcement shall be paid for by Contractor.

3.5 CLEANING OF REINFORCEMENT WITH DELAMINATION AND SPALL CAVITIES

- A. All exposed steel shall be cleaned of rust to bare metal by sandblasting. Cleaning shall be completed immediately before patch placement to insure that base metal is not exposed to elements and further rusting for extended periods of time. Engineer/Architect may require entire bar diameter be cleaned.
- B. After all sandblasting operations and cleanup are completed, paint all exposed steel with an approved material. Protect prepared surfaces from damage prior to and during patch placement.

3.6 PREPARATION OF CAVITY FOR REPAIR MATERIAL PLACEMENT

- A. Cavities will be examined prior to commencement of patching operations. Sounding surface shall be part of examination. Any delamination noted during sounding shall be removed as specified in this Section.
- B. Cavities shall be sandblasted. Airblasting is required as final step to remove sand. All debris shall be removed from site prior to commencement of patching.

END OF SECTION 025140

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SECTION 033750 - LATEX MODIFIED CONCRETE AND MORTAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, and equipment necessary for production and installation of latex modified concrete or mortar for patching floor spalls and overlays.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "Surface Preparation."
 - 2. Division 07 Section "Traffic Coatings."

1.3 QUALITY ASSURANCE

- A. Work shall conform to requirements of ACI 301 and ACI 318 except where more stringent requirements are shown on Drawings or specified in this Section.
- B. Testing Agency:
 - 1. Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.
 - 2. Accredited by AASHTO under ASTM C1077. Testing laboratory shall submit documented proof of ability to perform required tests.
- C. Sampling and testing of concrete and mortar shall be performed by ACI certified Concrete Field Technicians Grade I. Certification shall be no more than 3 years old.
- D. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency has authority to reject concrete or mortar not meeting Specifications.
- E. Proportioning, production, placement and finishing of latex modified concrete or mortar shall be overseen by, and have approval of, latex manufacturer. Latex admixture supplier shall make available qualified individual experienced in placement of latex modified concrete overlays, to aid Contractor during placement of all latex modified concrete overlay. Qualification of supplier's representative shall be acceptable to Engineer/Architect.

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- F. Testing Agency shall submit following information for field testing of concrete unless modified in writing by Engineer/Architect:
1. Project name and location.
 2. Contractor's name.
 3. Testing Agency's name, address and phone number.
 4. Concrete supplier.
 5. Date of report.
 6. Testing Agency technician's name (sampling and testing).
 7. Placement location within structure.
 8. Concrete mix data (quantity and type):
 - a. Cement.
 - b. Fine aggregates.
 - c. Coarse aggregates.
 - d. Water.
 - e. Water/cement ratio.
 - f. Latex emulsion.
 - g. Latex emulsion per cu yd of concrete.
 - h. Other admixtures.
 9. Weather data:
 - a. Air temperatures.
 - b. Weather.
 - c. Wind speed.
 10. Field test data:
 - a. Date, time and place of test.
 - b. Slump.
 - c. Air content.
 - d. Unit weight.
 - e. Concrete temperature.
 11. Compressive test data:
 - a. Cylinder number.
 - b. Age of concrete when tested.
 - c. Date and time of cylinder test.
 - d. Curing time (field and lab).
 - e. Compressive strength.
 - f. Type of break.

1.4 REFERENCES

- A. American Concrete Institute (ACI):
1. ACI 214, "Recommended Practice for Evaluation of Strength Test Results of Concrete."

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2. ACI 301, "Standard Specifications for Structural Concrete ."
3. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."
4. ACI 305R, "Hot Weather Concreting."
5. ACI 306R, "Cold Weather Concreting."
6. ACI 306.1, "Standard Specification for Cold Weather Concreting."
7. ACI 318, "Building Code Requirements for Reinforced Concrete."
8. ACI 347, "Recommended Practice for Concrete Formwork."

B. American Society for Testing and Materials (ASTM):

1. ASTM C31, "Method of Making and Curing Concrete Test Specimens in the Field."
2. ASTM C33, "Specification for Concrete Aggregates."
3. ASTM C39, "Test Method for Compressive Strength of Cylindrical Concrete Specimens."
4. ASTM C94, "Specification for Ready-Mixed Concrete."
5. ASTM C109, "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)."
6. ASTM C138, "Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete."
7. ASTM C143, "Test Method for Slump of Portland Cement Concrete."
8. ASTM C150, "Specification for Portland Cement."
9. ASTM C172, "Method of Sampling Freshly Mixed Concrete."
10. ASTM C173, "Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method."
11. ASTM C231, "Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method."
12. ASTM C260, "Specification for Air-Entraining Admixtures for Concrete."
13. ASTM C494, "Specification for Chemical Admixtures for Concrete."
14. ASTM C685, "Specification for Concrete Made by Volumetric Batching and Continuous Mixing."
15. ASTM C1040, "Standard Test Method for Density of Unhardened and Hardened Concrete by Nuclear Methods."
16. ASTM C1077, "Standard Practice for Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation."
17. ASTM C1218, "Sampling and Testing for Water Soluble Chloride Ion in Concrete and Concrete Raw Materials."

C. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI MSP, "Manual of Standard Practice."

D. Contractor shall have following ACI publications at Project construction site:

1. ACI SP-15, "Standard Specifications for Structural Concrete ACI 301 with selected ACI and ASTM References."
2. ACI 302.1R, "Guide for Concrete Floor and Slab Construction."
3. ACI 305R, "Hot Weather Concreting."
4. ACI 306R, "Cold Weather Concreting."
5. ACI 306.1, "Standard Specification for Cold Weather Concreting."

1.5 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 01 of this Specification, and as herein specified.
- B. Contractor shall submit concrete mix design reviewed and approved by latex manufacturer to Engineer/Architect 2 weeks prior to placing concrete. Use mix design submittal form included at end of this Section. Proportion mix designs as defined in ACI 301, 4.2.3. Include following information for each concrete mix design:
 - 1. Method used to determine proposed mix design (per ACI 301, 4.2.3).
 - 2. Gradation of fine and coarse aggregates: ASTM C33.
 - 3. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
 - 4. Water-cement ratio.
 - 5. Slump: ASTM C143.
 - 6. Certification of chloride content of admixtures.
 - 7. Air content of freshly mixed concrete by pressure method, ASTM C231.
 - 8. Unit weight of concrete: ASTM C138.
 - 9. Strength at 3 and 28 days.
 - 10. Water soluble chloride ion content of concrete per ASTM C1218.
- C. Contractor: At pre-concrete meeting, submit procedures to protect fresh concrete from rain and hot and cold weather conditions.
- D. Testing Agency: Promptly report all concrete test results to Engineer/Architect, Contractor and concrete supplier. Include following information:
 - 1. See Article "Quality Assurance," paragraph "Testing Agency shall submit...."
 - 2. Weight of concrete, ASTM C138.
 - 3. Slump, ASTM C143.
 - 4. Air content of freshly mixed concrete by pressure method, ASTM C231 or volumetric method, ASTM C173.
 - 5. Concrete temperature (at placement time).
 - 6. Air temperature (at placement time).
 - 7. Strength determined in accordance with ASTM C39.
- E. Concrete batched on-site shall be placed and finished within 30 minutes of adding water to mixture.
- F. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Aggregates (ACI 301, Article 4.2.1):

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1. Normal weight concrete aggregates:
 - a. Coarse aggregate: Crushed and graded limestone or approved equivalent conforming to ASTM C33, Class Designation 5S.
 - b. Fine aggregate: Natural sand conforming to ASTM C33 and having preferred grading shown for normal weight aggregate in ACI 302.1R, Table 4.2.1.
 2. Coarse aggregate: Nominal sizes indicated below, conforming to ASTM C33, Table 2:
 - a. 0.375 in. for patch cavities 0.75 to 1.5 in. deep.
 - b. 0.5 in. for patch cavities greater than 1.5 in. deep and overlay work. For overlays limit maximum size of aggregates to one-third nominal thickness of overlay.
 3. Chloride Ion Level: Chloride ion content of aggregates shall be tested by laboratory making trial mixes. Also, total water soluble chloride ion content of mix including all constituents shall not exceed 0.06% chloride ions by weight of cement for prestressed concrete, and 0.15% chloride ions by weight of cement for reinforced concrete. Test to determine chloride ion content shall conform to Test Method ASTM C1218.
- B. Cement (ACI 301, 4.2.1.1):
1. Portland cement, Type I, ASTM C150. Use 1 cement clinker source throughout project. No change in brand without prior written approval from Engineer/Architect.
- C. Water (ACI 301, 4.2.1.3):
1. ASTM C94.
- D. Latex Emulsion:
1. "Styrofan 1186," BASF Corporation, Chattanooga, TN.
- E. Admixtures (ACI 301, 4.2.1.4):
1. Only admixtures listed shall be acceptable. Do not submit alternates.
 2. Concrete supplier and manufacturer shall certify compatibility of all ingredients in each mix design.
 3. Use admixtures in strict accordance with manufacturer's recommendations.
 4. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.5% chloride ions, by weight of admixture, are not permitted. Additionally, each admixture shall not contribute more than 5 ppm, by weight, of chloride ions to total concrete constituents.
- F. Storage of Materials (ACI 301, 4.1.4).

2.2 CONCRETE MIX DESIGN

- A. Selection of concrete proportions shall be in accordance with ACI 301, 4.2.3.1. Before any concrete is placed for project, Contractor shall submit to Engineer/Architect data showing method used for determining proposed concrete mix design, including fine and coarse aggregate gradations, proportions of all ingredients, water-cement ratio, slump, air content, cylinder breaks and other required data specified in Article "Submittals," second paragraph, for each different concrete type specified. Mix design shall meet following minimum requirements:

Compressive Strength	5,000 psi @ 28 days (2500 psi @ 3 days)
Water-Cement Ratio	0.25 to 0.40
Latex Content Per Sack of Cement	3.5 gal.
Slump*	4 in. ± 2 in.
Cement Content	658-800 lb./c.y.
Air Content	Less than 6.5%

*For concrete placed by vibratory screeds, slump shall not exceed 4 in. at point of deposit.

- B. Chloride Ion Level: See Article "Materials," paragraph "Chloride Ion Level."
- C. Bonding Grout: Bonding grout shall consist of sand, cement, and latex emulsion in proportions similar to mortar in concrete with sufficient water to form stiff slurry to achieve consistency of "pancake batter."

PART 3 - EXECUTION

3.1 PRODUCTION OF MORTAR OR CONCRETE

- A. Production of latex modified mortar or concrete shall be in accordance with requirements of ACI 301, 4.3.1, except as otherwise specified herein.
- B. Concrete or mortar, mixed at site, shall be proportioned by continuous mixer used in conjunction with volumetric proportioning. Volumetric batching/continuous mixers shall conform to ASTM C685. In addition, self-contained, mobile, continuous type mixing equipment shall comply with following:
 - 1. Mixer shall be capable of producing batches of not less than 6 cu yds.
 - 2. Mixer shall be capable of positive measurement of cement being introduced into mix. Recording meter visible at all times and equipped with ticket printout shall indicate this quantity.
 - 3. Mixer shall provide positive control of flow of water into mixing chamber. Water flow shall be indicated by flowmeter and shall be readily adjustable to provide for minor variations in aggregate moisture.
 - 4. Mixer shall be capable of being calibrated to automatically proportion and blend all components of indicated composition on continuous or intermittent basis, as required by finishing operation, and shall discharge mixed material through conventional chute into transporting device or directly in front of finishing

machine. Sufficient mixing capacity of mixers shall be provided to permit intended pour to be placed without interruption.

5. Mixer shall be calibrated to accurately proportion specified mix. Yield is required to be within tolerance of 1.0 %.

- C. On-site mortar or concrete batching in mixer of at least 0.125 cu yd capacity shall be permitted only with approval of Engineer/Architect. On-site concrete batching and mixing shall comply with requirements of ACI 301, 4.3.1.

3.2 PREPARATION (ACI 301, 5.3.1)

- A. Cavity surfaces shall be clean and dry prior to commencement of patch or overlay installation. Preparation of surfaces to receive new concrete shall be in accordance with Section "Surface Preparation for Patching" and/or "Surface Preparation for Overlay."

- B. Bonding Grout: (For Overlays)

1. For overlays, bonding grout shall be applied to damp (but not saturated) concrete surface in uniform thickness of 0.0625 in. to 0.125 in. over all surfaces to receive patching or overlay. Grout shall not be allowed to dry or dust prior to placement of patch or overlay material. If concrete placement is delayed and the coating dries, cavity or surface shall not be patched or overlaid until it has been recleaned and prepared as specified in Section "Surface Preparation for Patching" or "Surface Preparation for Overlay." Grout shall not be applied to more area than can be patched or overlaid within 0.5 hr by available manpower.

- C. For patches, surface shall be surface saturated damp, (SSD), with potable water. Do not allow water to accumulate in the patch. Broom out all excess water.

- D. Receive Owner's and Engineer/Architect's written approval of concrete surface finish used on flatwork before beginning of construction.

3.3 INSTALLATION

- A. Placing (ACI 301, 5.3.2):

1. Do not place concrete when temperature of surrounding patch area or air is less than 50° F. unless following conditions are met:

- a. Place concrete only when temperature of surrounding air is expected to be above 45° F. for at least 36 hours.
- b. When above conditions are not met, concrete may be placed only if insulation or heating enclosures are provided in accordance with ACI 306, "Recommended Practice for Cold Weather Concreting." Submit proposed protective measures in writing for Engineer/Architect's review prior to concrete placement.
- c. Cost for precautionary measures required shall be borne by Contractor.

2. Concrete shall be manipulated and struck off slightly above final grade. Concrete shall then be consolidated and finished to final grade with internal and surface vibration devices. Proposed consolidation method shall be submitted for Engineer/Architect's review prior to concrete placement.
 - a. Do not place concrete if mix temperature exceeds 85° F.
 - b. Do not place concrete under hot weather conditions. Hot weather is defined as air temperature which exceeds 80° F. or any combination of high temperature, low humidity and high wind velocity which causes evaporation rates in excess of 0.10 psf per hr as determined by ACI 305R, Figure 2.1.5.
 3. Fresh concrete 3 in. or more in thickness shall be vibrated internally in addition to surface vibration.
 4. Concrete shall be deposited as close to its final position as possible. All concrete shall be placed in continuous operation and terminated only at bulkheads or designated control or construction joints.
 5. On ramps with greater than 5 % slope, all concreting shall begin at low point and end at high point. Contractor shall make any necessary adjustment to slump or equipment to provide wearing surface without any irregularities or roughness.
 6. For overlays concrete consolidation shall be by vibrating screeds meeting following requirements:
 - a. Placing and finishing equipment shall not exceed maximum weight of 6,000 lbs or 3,000 lbs per axle.
 - b. Screed shall be designed to consolidate concrete to 98% of unit weight determined in Section 2.04.A in accordance with ASTM C138. Sufficient number of identical vibrators shall be effectively installed such that at least 1 vibrator is provided for each 5 ft of screed length.
 - c. Bottom face of screeds shall not be less than 4 in. wide and shall be metal covered with turned-up or rounded leading edge to minimize tearing of surface of plastic concrete.
 - d. Screed shall be capable of forward and reverse movement under positive control. Screed shall be provided with positive control of vertical position and angle of tilt.
 - e. Screed shall be capable of vibrating at controlled rate, adjustable to between 3,000 and 6,000 vpm.
- B. Finishing (ACI 301, 5.3):
1. Flatwork (BROOM Finish, 5.3.4.2.d):
 - a. When tight and uniform concrete surface has been achieved by screeding and finishing operation, give slab surface coarse transverse scored texture by drawing broom across surface. Texture shall be accepted by Owner and Engineer/Architect from sample panels.
 - b. Finishing tolerance: ACI 301, 5.3.4.2; Class B tolerance.
 - c. Finish all concrete surfaces to proper elevations to insure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear cost of any corrections to provide for positive drainage.

- d. Before installation of overlay and after submittal, review, and approval of concrete mix design, Contractor shall fabricate 2 acceptable test areas simulating finishing techniques and final appearance to be expected and used on Project. Test overlay area shall be minimum of 200 sq ft and shall be cast to thickness of typical wearing surface in Project. Test overlay areas shall be cast from concrete supplied and batched in accordance with project specifications. Contractor shall finish test areas following requirements of items a and b above, and shall adjust finishing techniques to duplicate appearance of concrete surface of each test area. Finished overlay areas (1 or both) may be rejected by Owner or Engineer/Architect, in which case Contractor shall repeat procedure until Owner or Engineer/Architect acceptance is obtained. Accepted test overlay areas shall be cured in accordance with Specifications. Accepted test areas shall serve as basis for acceptance/rejection of final finished surfaces of all flatwork.

C. Joints in Concrete (ACI 301, 2.2.2.5):

1. Construction, control and isolation joints are located and detailed on Drawings:
 - a. Tool joints at time of finishing. Sawcut joints are prohibited.
 - b. Isolation joints - interrupt structural continuity resulting from bond, reinforcement or keyway.
 - c. Coordinate configuration of tooled joints with control joint sealants.

D. Curing:

1. Latex modified mortar and concrete shall be cured according to latex manufacturer's recommendations and according to following minimum requirements:
 - a. Surface shall be covered with single layer of clean, wet burlap as soon as surface will support it without deformation. Cover burlap with continuous single thickness of polyethylene film for 24 hours.
 - b. After 24 hours remove polyethylene film and allow burlap to dry slowly for an additional 24 to 48 hours.
 - c. Remove burlap and allow concrete to air dry for an additional 48 hours.
 - d. Curing time shall be extended, as Engineer/Architect directs, when curing temperature falls below 50° F.

E. Repair of Defects (ACI 301, 5.3.7):

1. Repair all surface defects exceeding 0.25 in. width or depth.
2. Match color of concrete to be repaired.
3. Submit samples of materials and relevant literature and test data on proprietary compounds and procedures used for adhesion or patching ingredients to Engineer/Architect for its review before patching concrete.
4. Receive written approval of Engineer/Architect of method and materials prior to making repairs to concrete.

3.4 FIELD QUALITY CONTROL BY TESTING AGENCY (ACI 301, 1.6)

A. Air Content:

1. Sample freshly-mixed concrete per ASTM C172 and conduct 1 air content test per ASTM C231 or ASTM C173 for each 10 cubic yards of concrete placed or each day's production, whichever is less.

B. Concrete Compressive Strength:

1. Mold test cylinders in accordance with ASTM C31 and test in accordance with ASTM C31 as follows:
 - a. Take minimum of 6 cylinders for each 25 cubic yards or fraction thereof, of each mix design of concrete placed in any 1 day. Use of 4 in. x 8 in. cylinders in lieu of standard cylinders is acceptable.
 - b. Additional 2 cylinders shall be taken and field cured under conditions of cold weather concreting, and when directed by Engineer/Architect.
2. Cover specimens properly, immediately after finishing. Protect outside surfaces of cardboard molds, if used, from contact with sources of water for first 24 hours after molding.
3. Fabricate and cure test cylinders per ASTM C31, except as follows:
 - a. To verify compressive strength, test cylinders required due to cold weather concreting conditions:
 - 1) Store test specimens on structure as near to point of sampling as possible and protect from elements in same manner as that given to portion of structure as specimen represents.
 - 2) Transport to test laboratory no more than 4 hours before testing. Remove molds from specimens immediately before testing.
 - b. To verify 28-day compressive strength:
 - 1) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80° F. and prevent loss of moisture from specimens.
 - 2) Remove test specimens from molds at end of 20 ± 4 hours and store at 73 ± 3° F., 50 ± 4% relative humidity in laboratory until moment of test.
4. Compression tests:
 - a. Test 2 cylinders at 3 days.
 - b. Test 2 cylinders at 28 days.
 - c. Hold 2 cylinders in reserve for use as Engineer/Architect directs.
5. Unless notified by Engineer/Architect, reserve cylinders may be discarded without being tested after 56 days.

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C. Slump Test:

1. Conduct 1 slump test in accordance with ASTM C143 for each 10 yards of concrete placed, or each day's production, whichever is less.

D. Yield and Proportioning Tests (ASTM C685):

1. When concrete placements involve more than 100 cu yds, accuracy of on-site batching equipment output indicators shall be verified at 50 cu yd intervals.
2. Accuracy of on-site batching equipment proportioning of concrete mixture shall be verified at 100 cu yd intervals.

E. Evaluation and Acceptance of Concrete (ACI 301, 1.6.7 and ACI 318, 4.7):

1. Concrete compression tests will be evaluated by Engineer/Architect in accordance with ACI 301, 1.6.7. If number of tests conducted is inadequate for evaluation of concrete or test results for any type of concrete fail to meet specified strength requirements, core tests may be required as directed by Engineer/Architect.
2. Core tests, when required, per ACI 301, 1.6.7.3.
3. Should tested hardened concrete meet these specifications, Owner will pay for coring and testing of hardened concrete. Should tested hardened concrete not meet these specifications, concrete contractor will pay for coring and testing of hardened concrete and for any corrective action required for unaccepted concrete.

F. Acceptance of Structure (ACI 301,1.7):

1. Acceptance of completed concrete Work will be according to provisions of ACI 301, 1.7.
2. Patched and overlaid areas shall be sounded by Contractor with chain drag after curing for 7 days. Contractor shall repair all hollowness detected by removing and replacing patch or affected area at no extra cost to Owner.
3. If shrinkage cracks appear in overlay when initial 24 hours curing period is completed, overlay shall be considered defective, and it shall be removed and replaced by Contractor at no extra cost.

END OF SECTION 033750

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**MIX DESIGN SUBMITTAL FORM
LATEX MODIFIED CONCRETE
(Submit separate form for each mix design)**

I. GENERAL INFORMATION	
Project:	City:
General Contractor:	
Mix Design Identification No.:	
Use (Describe) ⁽¹⁾ :	

⁽¹⁾ Overlay, Floor Patching, Beam Repairs, etc.

II. MIX DESIGN PREPARATION:		
Mix Design Based on (Check one):	Standard Deviation Analysis: or	Trial Mix Test Data:
Design Characteris- tics:	Density: _____ pcf;	Air: _____ %
	Strength: _____ psi (28 day);	Slump _____ in.

Latex Manufacturer Approval

Name: _____

Title: _____

Date: _____

W A L K E R A C C E P T A N C E S T A M P

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III. MATERIALS:		
Aggregates: (size; type; source; gradation report; specification)		
Coarse:		
Fine:		
Other Materials:	Type	Product-Manufacturer (Source)
Cement:		
Latex Admixture:		
Other(s):		

IV. MIX PROPORTIONS (per yd³)		
	WEIGHT (lbs.)	ABSOLUTE VOL. (cu. ft.)
Cement:		
Fine Aggregate: ⁽¹⁾		
Coarse Aggregate: ⁽¹⁾		
Latex: ⁽²⁾		
Water: ⁽³⁾		
Other(s):		
TOTALS:		
NOTES: ⁽¹⁾ Based on saturated surface dry weights of aggregates. ⁽²⁾ Include only weight of solids portion of latex admixture. Confirm with manufacturer actual percentages of solids and water in suspension and coordinate with Note 3. ⁽³⁾ Includes ALL WATER , including added water, free water contained on aggregates, and <u>water suspension portion of latex admixture.</u>		

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V. RATIOS	
Water ⁽⁴⁾ =	_____ lb.
Cement	_____ lb.
Fine Agg. =	_____ lb.
Total Agg	_____ lb.

VI. SPECIFIC GRAVITIES
Fine Aggregate
Coarse Aggregate

VII. ADMIXTURES		
Air Entraining Agent (A.E.A.):	_____ oz.	per 100# ce- ment
Water Reducer	_____ oz.	per 100# ce- ment
Latex Emulsion	_____ gal	per sack ce- ment
Other(s)		

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VIII. <u>STANDARD DEVIATION ANALYSIS:</u>	<u>Yes</u>	<u>N/A</u>
<u>(Complete this section only if mix design was developed using standard deviation analysis of previous project test results. If other method was used, check "N/A".)</u>		
<u>Number of Test Cylinders Evaluated:</u>	<u>Standard Deviation:</u>	
Mix Designs Proportioned to Achieve $f'_{cr} = f'_c + \underline{\hspace{2cm}}$ psi		
NOTE: Mix designs shall be proportioned to achieve f'_{cr} equal to or greater than the larger of $f'_{cr} = f'_c + 1.34s$ [s= calculated standard deviation] or $f'_{cr} = f'_c + 2.33s - 500$ (Refer to ACI 301 for increased deviation factor when less than 30 tests are available.)		

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IX. TRIAL MIXTURE TEST DATA:		Yes	N/A
(Complete this section only if mix design is based on data from trial test mixture(s) batched by testing agency or Contractor. If other method was used, check "N/A".)			
<u>Age</u> (days)	<u>Trial Mix #1</u> (comp. str.)	<u>Trial Mix #2</u> (comp. str.)	<u>Trial Mix #3</u> (comp. str.)
<u>7</u>			
<u>7</u>			
<u>28</u>			
<u>28</u>			
28 day average compressive strength: _____ psi			
DESIGN MIX CHARACTERISTICS			
Slump = _____ in.		Air Content = _____ %	
Unit Wet Wt. = _____ pcf		Unit Dry Wt. = _____ pcf	
Mix Design Proportioned to Achieve: f'c + 1200 psi (1200 psi increases to 1400 psi when f'c > 5000 psi)			
ACTUAL MIX CHARACTERISTICS			
Initial Slump = _____ in.		Final Slump _____ in.	
Unit Wet Wt.= _____ pcf.		Unit Dry Wt. = _____ pcf	
Air Content = _____ %			

X. <u>OTHER REQUIRED TESTS</u>
Soluble Chloride Ion Content of mix: _____ % by weight of cement (Water soluble by ASTM 1218 OR AASHTO T260)

XI. <u>Remarks:</u>

Submitted by:

Latex Modified Concrete Supplier
Name:
Address:
Phone Number:
Date:

My signature below certifies that I have read, understood, and will comply with the requirements of this Section.

Signature _____

Typed or Printed Name _____

REQUIRED ATTACHMENTS	
	Coarse aggregate grading report
	Fine aggregate grading report
	Concrete compressive strength data used for standard deviation calculations
	Chloride ion data and related calculations
	Admixture compatibility certification letter

INSTRUCTIONS:

1. Fill in all blank spaces. Use -0- (Zero) or N.A. (Not Applicable) where appropriate. See "Design and Control of Concrete Mixtures: 13th Edition by Portland Cement Association, for assistance in completing this form.
2. Provide the necessary documentation to support any laboratory test results or compliance to standard ASTM test methods or specifications referenced in the mix design submittal form.
3. If mix design utilizes multiple aggregate material sources, submit chloride ion content test data of each component from material suppliers. Test data shall be not more than 1 yr old.

Attach letter of certification that all admixtures, including latex admixture, are compatible for this mix design.

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SECTION 033760 - TROWEL APPLIED MORTAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, supervision and incidentals necessary to prepare deteriorated or damaged concrete surfaces and install patches to overhead and vertical surfaces to restore original surface condition and integrity.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "General Concrete Surface Preparation."
 - 2. Division 02 Section "Surface Preparation for Patching."
 - 3. Division 03 Section "Latex Modified Concrete and Mortar."

1.3 QUALITY ASSURANCE

- A. Work shall conform to requirements of ACI 301 as applicable except where more stringent requirements are shown on Drawings or specified in this Section.
- B. Testing Agency:
 - 1. Independent testing laboratory employed by Owner and acceptable to Engineer/Architect.
 - 2. Accredited by AASHTO under ASTM C1077. Testing laboratory shall submit documented proof of ability to perform required tests.
- C. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency has authority to reject mortar not meeting Specifications.
- D. Sampling and testing of mortar shall be performed by ACI certified Concrete Field Technicians Grade I. Certification shall be no more than three years old.
- E. Testing Agency shall submit following information for Field Testing of Concrete unless modified in writing by Engineer/Architect:
 - 1. Project name and location.
 - 2. Contractor's name.
 - 3. Testing Agency's name, address and phone number.

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4. Mortar manufacturer.
5. Date of report.
6. Testing Agency technician's name (sampling and testing).
7. Placement location within structure.
8. Weather data:
 - a. Air temperatures.
 - b. Weather.
 - c. Wind speed.
9. Date, time, and place of test.
10. Compressive test data:
 - a. Cube number.
 - b. Age of mortar when tested.
 - c. Date and time of cube test.
 - d. Compressive strength.

1.4 REFERENCES

- A. "Standard Specification for Structural Concrete" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
 1. "Building Code Requirements for Structural Concrete" (ACI 318), American Concrete Institute, herein referred to as ACI 318.
 2. "Hot Weather Concreting" reported by ACI Committee 305.
 3. "Cold Weather Concreting" reported by ACI Committee 306.
 4. "Standard Specification for Curing Concrete" (ACI 308)
- C. Contractor shall have following ACI publications at Project construction site at all times:
 1. "Standard Specifications for Structural Concrete (ACI 301) with Selected ACI and ASTM References," ACI Field Reference Manual, SP15.
 2. "Hot Weather Concreting" reported by ACI Committee 305.
 3. "Cold Weather Concreting" reported by ACI Committee 306.
 4. "Standard Specification for Curing Concrete" (ACI 308)
- D. American Society for Testing and Materials (ASTM):
 1. ASTM C109, "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)."
 2. ASTM C31, "Test Method for Compressive Strength of Cylindrical Concrete Specimens."

1.5 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 01 and as specified in this Section.
- B. Contractor: At pre-construction meeting, submit procedures for demolition, surface preparation, material batching, placement, finishing, and curing of application. Provide procedure to protect fresh patches from severe weather conditions.
- C. Testing Agency: Promptly report all mortar test results to Engineer/Architect and Contractor. Include following information:
 - 1. See Article "Quality Assurance," paragraph "Testing Agency shall submit...."
 - 2. Strength determined in accordance with ASTM C109.
- D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

PART 2 - PRODUCTS**2.1 MATERIALS**

- A. Trowel Applied Repair Mortar: Shall be prepackaged, polymer-modified cementitious repair mortar capable of vertical/overhead application by trowel achieving a minimum 3,000 psi compressive strength at 7 days and 5,000 psi compressive strength at 28 days per ASTM C 109 as certified by manufacturer. Manufacturer to submit volume and size of SSD aggregate used for mix extension.
- B. Acceptable materials for overhead and vertical work are:
 - a. "Planitop X or XS," Mapei Systems, Deerfield Beach, FL
 - b. "SikaRepair SHB with LatexR," Sika Corporation, Lyndhurst, NJ
 - c. "MasterEmaco N 400 RS," Master Builder Solutions, Shakopee, MN
 - d. "Verticoat Supreme," by Euclid Chemical Company, Cleveland, OH
- C. Acceptable materials for horizontal repair work are:
 - a. "Planitop 18," Mapei Systems, Deerfield Beach, FL
 - b. "SikaTop 122 Plus," Sika Corporation, Lyndhurst, NJ
 - c. "MasterEmaco T310 CI," Master Builder Solutions, Shakopee, MN
 - d. "Concrete Top Supreme," by Euclid Chemical Company, Cleveland, OH

2.2 MATERIAL ACCESSORIES

- A. Extended Open Time Epoxy Bonding Agent: Three component, water based, epoxy modified portland cement bonding agent providing the recommended Manufacturer's

open time in which to apply repair mortar. Product shall be capable of achieving bond strength of 2,700 psi per ASTM C 882.

1. Acceptable materials for this Work are:
 - a. "Duralprep A.C." by The Euclid Chemical Company, Cleveland, OH.
 - b. "Sika Armatec 110 EpoCem", by Sika Corporation, Lyndhurst, NJ.
 - c. "PLANIBOND 3C", by MAPEI Corporation, Deerfield Beach, FL.
 - d. Other types may be used only with Engineer/Architect's approval in writing prior to bidding.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Surface Preparation: Cavity surfaces shall be clean and dry prior to commencement of patch installation. Preparation of cavity to receive new mortar shall be in accordance with Section "Surface Preparation for Patching" and manufacturer's instructions.

3.2 INSTALLATION

- A. Repair Mortar Bonding Grout:
 1. Mix and apply bonding grout in strict accordance with manufacturer's recommendations.
 2. If bonding grout dries, cavity shall not be patched until it has been recleaned and prepared as specified in Section "Surface Preparation for Patching." Grout shall not be applied to more cavities than can be patched within 0.25 hr by available manpower.
- B. Mortar Placement: Patching materials shall be placed immediately following grout application in strict accordance with manufacturer's instructions. Properly proportioned and mixed patch material shall be placed using trowels to consolidate patch so that no voids exist within new material and continuous contact with base concrete is achieved. Supplemental wire mesh shall be required for delamination and spall repairs greater than two inches in depth. Fresh bonding grout is required between successive lifts of patching material.

3.3 CURING

- A. Protect freshly placed concrete repair mortar from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during placement. Keep patch material continually moist prior to final curing by evaporation retarder, misting, sprinkling, or using absorptive mat or fabric covering kept continually moist.

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1. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.1 lb/sq. ft. x h before and during finishing operations. Apply material according to manufacturer's written instructions one or more times after placement, but prior to float finishing. Repeated applications are prohibited after float finishing has begun.
 2. Acceptable evaporation retarder materials for this Work are:
 - a. "Cimfilm", by Axim Concrete Technologies.
 - b. "Confilm", by BASF Building Systems, Shakopee, MN.
 - c. "Aquafilm", by Conspec Marketing & Manufacturing Co., Inc.
 - d. "Sure-Film (J-74)", by Dayton Superior Corporation.
 - e. "Eucobar", or "Tamms Surface Retarder", by The Euclid Chemical Company, Cleveland, OH.
 - f. "E-Con", by L&M Construction Chemicals, Inc.
 - g. "EVRT", by Russ Tech Admixtures, Inc.
 - h. "SikaFilm", by Sika Corporation, Lyndhurst, NJ.
- B. Final Curing: Curing compounds complying with ASTM C309 may be used in accordance with recommendations of ACI 506.7, "Specification for Concrete." Provide additional curing immediately following initial curing and before patch material has dried. Use one of following materials or methods:
1. Continue method used in initial curing.
 2. Material conforming to ASTM C171.
 3. Curing compounds conforming to ASTM C309.
 4. Other moisture retaining covering as approved by Engineer/Architect.
 5. Duration of Curing: Continue curing for first 7 days after patch placement. During initial and final curing periods maintain patch material above 50° F.
 6. Prevent rapid drying at end of curing period.
 7. Provide additional curing as required or recommended by manufacturer.
- C. Curing Compound (VOC Compliant, less than 350 g/l): Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/m² when applied at 200 sq. ft/gal. Manufacturer's certification is required. Silicate based compounds prohibited.
1. Subject to project requirements provide one of the following products:
 - a. "Kurez DR VOX" or "Kurez RC," or "Kurez RC Off," Euclid Chemical Company.
 - b. "RxCure WB," or "RxCure VOC" or "W.B. Cure VOC," Conspec Marketing & Manufacturing.
 - c. "Kure N Seal W" or "Kure N Seal WB" BASF Construction Chemicals, LLC.
 - d. "MAPECURE DR", by MAPEI Corporation, Deerfield Beach, FL.
 2. Additional requirements:

- a. With product submittal provide plan and procedures for removal of residual curing compound prior to application of sealers, coatings, stains, pavement markings and other finishes.
- b. Provide a summary of testing to show adequate surface preparation for successful application of sealers, coatings, stains, pavement markings, and other finishes.

3.4 FIELD QUALITY CONTROL BY TESTING AGENCY

A. Concrete Compressive Strength:

1. Mold test cubes in the field in accordance ASTM C-31 and ASTM C-109 as follows and further below:
 - a. Take a minimum of twelve (12) cubes for each 10 cu ft, or fraction thereof, of each repair mortar placed in any one day.
 - b. Use 2 in. x 2 in. cubes.
 - c. Additional 2 cubes shall be taken and field cured under conditions of cold weather concreting, and when directed by Engineer/Architect.
 - d. Cover specimens properly, immediately after finishing. Protect molds from contact with sources of water for first 24 hours after molding.
2. Fabricate and cure test cubes per ASTM C-109, except as follows:
 - a. Do not remove specimens from molds before 24 hours.
 - b. To verify 7 and 28-day compressive strengths:
 - 1) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80° F. and prevent loss of moisture from specimens.
 - 2) Remove test specimens from molds at end of 24 hours and air dry in laboratory until moment of test.
 - c. To verify compressive strength of test cubes required due to cold weather concreting conditions:
 - 1) Store test specimens on structure as near to point of sampling as possible and protect from elements in same manner as that given to portion of structure as specimen represents.
 - 2) Transport to test laboratory no more than 4 hours before testing. Remove molds from specimens immediately before testing.
3. Compression Test:
 - a. Test 3 cubes at 1 day (Mandatory).
 - b. Test 3 cubes at 7 days (Mandatory).
 - c. Test 3 cubes at 28 days (Mandatory).
 - d. Hold 3 cubes in reserve for use as Engineer/Architect directs.

4. Unless notified by Engineer/Architect, reserve cubes may be discarded without being tested after 56 days.

3.5 EVALUATION AND ACCEPTANCE OF TROWEL APPLIED MORTAR REPAIRS

A. Acceptance of Repairs (ACI 301):

1. Acceptance of completed concrete Work will be according to provisions of ACI 301.
2. Patched areas shall be sounded by Engineer/Architect and Contractor with hammer or rod after curing for 72 hours. Contractor shall repair all hollowness detected by removing and replacing patch or affected area at no extra cost to Owner.
3. If shrinkage cracks appear in patch area when initial curing period is completed, patch shall be considered defective, and it shall be removed and replaced by Contractor at no extra cost.

END OF SECTION 033760

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SECTION 036400 –INJECTION GROUTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to prepare cracks in structural concrete members and inject them with a chemical grout resin system.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section "Submittal Procedures."
 - 2. Division 02 Section "Work Items."
 - 3. Division 02 Section "Selective Structure Demolition."
 - 4. Division 02 Section "Structure Demolition."
 - 5. Division 02 Section "General Concrete Surface Preparation."
 - 6. Division 02 Section "Surface Preparation for Patching."

1.3 QUALITY ASSURANCE

- A. Testing Agency will be independent testing laboratory employed by Owner and approved by Engineer.
- B. Testing Agency is responsible for conducting, monitoring and reporting to Owner results of all field tests of chemical grout resin injection and installation required under this Section with copy of all reports to Engineer and Contractor.
- C. Submit following information for Field Testing of Chemical Grout Injection Installation unless modified in writing by Engineer:
 - 1. Project name and location.
 - 2. Contractor's name.
 - 3. Testing Agency's name, address and phone number.
 - 4. Chemical grout manufacturer.
 - 5. Date of report.
 - 6. Testing Agency technician's name (sampling and testing).
 - 7. Placement location within structure.
 - 8. Chemical grout material data:

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- a. Resin type.
 - b. Port type.
 - c. Width of cracks injected (if applicable).
 - d. Crack conditions (dry or wet).
 - e. Injection port spacing.
 - f. Initial and (if different) constant injection pressures.
 - g. Use rate of chemical grout.
 - h. Crack and port sealing patching material and application methods.
9. Weather data:
- a. Air temperatures.
 - b. Weather.
 - c. Wind speed.
10. Field test data:
- a. Date, time and place of test.
 - b. Thickness of resin in crack or void.

1.4 REFERENCES

- A. "Standard Specifications for Structural Concrete," (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
 1. "Building Code Requirements for Reinforced Concrete," (ACI 318), American Concrete Institute, herein referred to as ACI 318.

1.5 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 01 and as specified in this Section.
- B. Contractor: Submit manufacturer's product data sheets, technical sheets, recommended application procedures and information on chemical grout injection equipment.
- C. Testing Agency: Promptly report all test results to Engineer and Contractor. Include following information:
 1. See Article "Quality Assurance," paragraph "Submit following information for Field Testing...."
 2. Visual examination of grout resin penetration.

- D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints

1.6 WARRANTY

- A. System manufacturer and Contractor shall furnish Owner written single source performance guarantee that chemical grout injection system will be free of defects related to design, workmanship or material deficiency for 3-year period from date of acceptance of Work required under this Section against leakage or bond failure of patching materials.
- B. Any repair under this guarantee shall be done at no cost to Owner. Guarantee shall be provided by Contractor and manufacturer of system.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Hydrophobic Chemical grout injection system shall be one of following:
 - 1. "Mountain Grout SLV or HL-100" as manufactured by Green Mountain International, LLC, 235 Pigeon Street, Waynesville, NC 28786.
 - 2. "Hydro Active Cut" as manufactured by De Neef Construction Chemicals (U.S.) Inc., 5610 Brystone Dr., Houston, TX 77041.
 - 3. "Urethane R" as manufactured by PYCOSA Chemicals, Inc., 1851 Gulf Freeway South, Suite 8, League City, TX 77573.
 - 4. "Dural Aqua-Dam LV" as manufactured by The Euclid Chemical Company, 19218 Redwood Rd., Cleveland, OH 44110.
 - 5. "Prime Flex EXP" as manufactured by Prime Resins, 2291 Plunkett Road, Conyers, GA 30012.
 - 6. "ST-540 Injection Resin" as manufactured by Strata-Tech, Inc., 3601 104th Street, Des Moines, IA 50322.
- B. Equipment:
 - 1. Equipment used to inject grout shall be capable of following:
 - a. High pressure range of 2000 to 2500 psi by positive displacement.
 - b. Injection of grout system at constant pressures as required by the manufacturer.

PART 3 - EXECUTION

3.1 PREPARATION

A. Crack Identification:

1. All cracks 1/32 in. wide or greater that are designated by Engineer, and not coincident with principal delamination, shall be injected. Cracks that occur coincident with principal delaminations shall not be injected, unless authorized by Engineer.
2. All cracks shall be located by Contractor at time of construction and marked with chalk. Cracks to be injected are to be verified and approved by the Engineer prior to crack preparation.

B. Crack Preparation for Injection:

1. Surface of concrete adjacent to crack must be free of all laitance, efflorescence, dirt or foreign particles.
2. Cracks are to be prepared according to Drawings and Work Item Details per manufacturer's recommendations.
3. Drill hole at 45 degree angle, beginning at a distance away from the crack so that the drilled hole intercepts the crack at approximately one half the thickness of the concrete. If repairing a vertical concrete face, drill the first hole at the bottom of the crack and work upwards.
4. Stagger holes either side of crack with a 12-inch maximum spacing.
5. Insert grout port into the drilled hole and tighten according to manufacturer's recommendations.

3.2 INSTALLATION

A. Chemical Grout Injection:

1. Flush crack with clean water immediately prior to the injection of the chemical grout, where this will indicate how the crack will behave during the grout injection and will prime the crack for the chemical reaction to occur.
2. Begin the injection on the lowest port on a vertical crack. Inject material until it appears at the next adjacent port. Disconnect and start injection on the next port. Continue to inject up the crack moving from port to port. After injection of a few ports, come back to the first port and reinject all the ports for a second time. Continue the procedure until the crack is completely filled and no water is leaking from crack. Re-inject each port with a small amount of water to ensure a full reaction of all of the resin in the drill holes.
3. After determining the crack is not leaking, clean the crack surface flush; remove the ports after the resin is set and patch injection holes according to repair Details.
4. Port holes shall be filled with non-shrink grout material. Grout shall be applied with hard trowel, and be thoroughly rodded and tamped in place. Finish, texture and color to match existing surface.
5. Contractor shall adhere to all limitations and cautions for chemical grout injection material per manufacturer's current printed literature.

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6. For injecting ceiling cracks, follow manufacture installation guidelines and recommendations.
7. Contractor shall adhere to all Federal, State and Local regulations for the use and disposal of all products.

B. Cleaning:

1. Contractor shall leave work area in clean condition when injection work is completed. Any chemical grout resin materials shall be cleaned off adjacent areas. Any painted surfaces are to be returned to original condition.

3.3 FIELD QUALITY CONTROL BY TESTING AGENCY

A. Evaluation and Acceptance of Chemical Grout Injection:

1. Results by visual examination will be reviewed by Engineer for lack of leaking water.
2. If the leakage continues in part of the crack, it shall be re-injected with no additional quantity as a pay item.

END OF SECTION 036400

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SECTION 079233 – CONCRETE JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in the following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
- B. This Section includes the following:
 - 1. Exterior joints in the following horizontal traffic bearing surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Control joints in slab-on-grade, pour strips, slabs and topping slabs.
 - c. Joints between precast concrete units.
 - d. Perimeter of all floor drains.
 - 2. Exterior joints in the following vertical and horizontal non-traffic surfaces:
 - a. Construction joints in cast-in-place concrete.
 - b. Joints between precast concrete units.
 - c. Cove joints at intersection of horizontal and vertical concrete.
 - d. Exterior horizontal joints between precast and cast-in-place concrete. Color to match precast concrete.
 - e. Vertical and horizontal joints between precast beams and columns at tiers exposed directly to weather. Color to match precast concrete.
- C. Related Sections: Following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section "Latex Modified Concrete and Mortar."
 - 2. Division 03 Section "Unbonded Post-Tensioned Concrete."
 - 3. Division 07 Section "Traffic Coatings."
 - 4. Division 09 Section "Pavement Marking."

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:

1. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
 2. Distribute reviewed submittals to all others whose Work is related.
- B. Make submittals in accordance with requirements of Division 01 Section, "Submittal Procedures:"
1. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.

1.4 QUALITY ASSURANCE

- A. Manufacturer's Qualifications: Owner retains right to reject any manufacturer.
1. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
 2. Evidence of financial stability acceptable to Engineer/Architect.
 3. Listing of 20 or more projects completed with submitted system, to include:
 - a. Name and location of project.
 - b. Type of system applied.
 - c. On-Site contact with phone number.
- B. Manufacturer's technical representative, acceptable to Engineer/Architect, shall be on site during surface preparation and initial stages of installation.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
1. Name of product.
 2. Name of manufacturer.
 3. Date of preparation.
 4. Lot or batch number.
- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.
- C. Do not store material on slabs to be post-tensioned before final post-tensioning of slabs is accomplished. At no time shall weight of stored material being placed on slab area, after post-tensioning is completed and concrete has reached specified 28 day strength, exceed total design load of slab area. Between time final post-tensioning is accomplished and time concrete has reached specified 28 day strength, weight of stored material placed on slab area shall not exceed half total design load of slab area.

1.6 FIELD CONDITIONS

- A. Weather and Substrate Conditions: Proceed with work only when existing and forecast weather and temperature of concrete substrate will permit work in accordance with manufacturer's recommendations.

1.7 WARRANTY

- A. System Manufacturer and Contractor shall furnish Owner written single source performance guarantee that the joint sealant system will be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:
 - 1. Any adhesive or cohesive failures.
 - 2. Weathering.
 - 3. Abrasion or tear failure resulting from normal traffic use.
- B. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.
- C. Warranty period shall be a one year period commencing with date of acceptance of work.
- D. Perform any repair under this warranty at no cost to Owner.
- E. Address the following in the terms of the Warranty: length of warranty, change in value of warranty – if any- based on length of remaining warranty period, transferability of warranty, responsibilities of each party, notification procedures, dispute resolution procedures, and limitations of liability for direct and consequential damages.
- F. Snowplows, vandalism, and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of 1 of following, only where specifically named in product category:
 - 1. Master Builders Solutions, Shakopee, MN.
 - 2. Lymtal International Inc. (Lymtal), Lake Orion, MI.
 - 3. Sika Corporation (Sika), North Canton, OH.
 - 4. Sonneborn, a Division of BASF Construction Chemicals (BASF).
 - 5. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, JOINT SEALANT SYSTEM

- A. Provide complete system of compatible materials designed by manufacturer to produce waterproof, traffic-bearing control joints as detailed on Drawings.
- B. Compounds used for sealants shall not stain masonry or concrete. Aluminum pigmented compounds not acceptable.
- C. Color of sealants shall match adjacent surfaces.
- D. Closed cell or reticulated backer rods: Acceptable products:
 - 1. "Sof Rod," Nomaco Inc., 501 NMC Drive, Zebulon, NC 27597. (800) 345-7279 ext. 341.
 - 2. "ITP Soft Type Backer Rod," Industrial Thermo Polymers Limited, 2316 Delaware Ave., Suite 216, Buffalo, NY 14216. (800) 387-3847.
 - 3. "Sonneborn Soft Type Backer Rod," Sonneborn, Minneapolis, MN.
- E. Bond breakers and fillers: as recommended by system manufacturer.
- F. Primers: as recommended by sealant manufacturer.
- G. Acceptable sealants are listed below. Sealants shall be compatible with all other materials in this Section and related work.
- H. Acceptable polyurethane control joint sealants (traffic bearing):
 - 1. MasterSeal SL-2, Master Builders Solutions.
 - 2. Iso-flex 880 GB, Lymtal.
 - 3. Sikaflex-2c SL, Sika.
 - 4. THC-900/901, Vulkem 45SSL, or Vulkem 245, Tremco.
- I. Acceptable polyurethane vertical and cove joints sealants (non-traffic bearing):
 - 1. Sikaflex-2c NS, Sika.
 - 2. MasterSeal NP-2, Master Builders Solutions.
 - 3. Dymeric 240/240FC or THC 901 (cove only), Tremco.
 - 4. Iso-flex 881, Lymtal.
- J. Proposed Substitutions: **None** for this project. Contact Engineer/Architect for consideration for future projects.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Work and report immediately in writing to Engineer/Architect any deficiencies in surface which render it unsuitable for proper execution of Work.
- B. Coordinate and verify that related Work meets following requirements before beginning installation
 - 1. Concrete surfaces are finished as acceptable for system to be installed.
 - 2. Curing compounds used on concrete surfaces are compatible with system to be installed.
 - 3. Concrete surfaces have completed proper curing period for system selected.

3.2 PREPARATION

- A. Seal all openings to occupied space to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.
- B. Correct unsatisfactory conditions before installing sealant system.
- C. Acid etching is prohibited.
- D. Grind joint edges smooth and straight with beveled grinding wheel before sealing. All surfaces to receive sealant shall be dry and thoroughly cleaned of all loose particles, laitance, dirt, dust, oil, grease or other foreign matter. Obtain written approval of method from system manufacturer before beginning cleaning.
- E. Final preparation of joints shall be a sandblast with medium that removes dust and ground material from surfaces to receive sealant.
- F. Check preparation of substrate for adhesion of sealant.
- G. Prime and seal joints and protect as required until sealant is fully cured. A primer coat is required for all systems.**

3.3 INSTALLATION/APPLICATION

- A. Do all Work in strict accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), thicknesses and texture, and as shown on Drawings.
- B. Completely fill joint without sagging or smearing onto adjacent surfaces.
- C. Fill horizontal joints slightly recessed to avoid direct contact with wheel traffic.
- D. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturers.

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- E. Cease material installation under adverse weather conditions, or when temperatures are outside manufacturer's recommended limitations for installation, or when temperature of work area or substrate are below 40°F.

3.4 FIELD QUALITY CONTROL

- A. Contractor and Engineer/Architect will jointly determine which one of following 2 methods of sealant testing to verify sealant profile:
 - 1. Contractor, at Engineer/Architect's direction, shall cut out lesser of 1% of total lineal footage placed or total of 100 lineal ft of joint sealant at isolated/random locations (varying from 3-in. to 1-ft of material) for Engineer/Architect and Manufacturer's Representative inspection of sealant profile.
 - 2. Contractor, at Engineer/Architect's direction, shall install 3 trial joint sections of 20 ft each. Contractor shall cut out joint sections, as selected by Engineer/Architect, for Engineer/Architect and Manufacturer's Representative inspection. Additional isolated/random removals may be required where sealant appears deficient. Total cut out sealant shall not exceed lesser of 1% of total lineal footage placed or total of 100 lineal ft of joint sealant at isolated/random locations (varying from 3-in. to 1-ft of material) for Engineer/Architect and Manufacturer's Representative inspection of sealant profile.
- B. Repair all random joint sealant "cut out" sections at no cost to Owner.

END OF SECTION 079233

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