

COLUMBUS METROPOLITAN LIBRARY

Invitation to Bid

MAIN GARAGE RESTORATION

Issue Date: June 08, 2022

ITB Number: CML #22-026

Issued by

Procurement Department
96 S. Grant Ave.
Columbus, OH 43215

Deadline for Submittal

June 30, 2022
No later than 12:00 NOON EST



INVITATION TO BID COVER SHEET

The Columbus Metropolitan Library (“CML” or “Library”) is issuing this Invitation to Bid (“ITB”) for a *Main Garage Restoration* (“Project”). The ITB Identification Number is: **CML #22-026**.

Bids must be received no later than **12:00 Noon on Jun 30, 2022**. Any Bid (“Bid”) arriving after 12:00 Noon will be considered late and will receive no consideration for selection to provide the specified services.

All questions or requests for clarifications should be submitted in writing no later than 5:00 p.m. seven (7) days prior to the Bid due date to procurement@columbuslibrary.org.

The Bidder (“Bidder”) declares to have read, understood and affirms, by its signature below, to be bound by all the instructions, terms, conditions and specifications of this ITB and agrees to fulfill the requirements of any contract (“Contract”) for which it is selected to provide the specified goods or services at the prices proposed.

The Bidder certifies, by signature affixed to this “Invitation to Bid Cover Sheet,” that the information provided in response to this ITB, including certified statements, is accurate and complete.

Federal Taxpayer Identification Number (TIN)		
Name of person signing Bid (Please print or type)		Title
Bidder Name		
Mailing address		
City	State	ZIP
Telephone		Toll Free Telephone
Contact Person		Fax Number
E-Mail address		
Authorized Signature (Original signature only) Please use Blue Ink.		

THIS FORM MUST BE SIGNED AND SUBMITTED WITH THE BID

PROJECT OVERVIEW

The Columbus Metropolitan Library is seeking sealed Bids (“Bids”) for parking garage restoration at Main Library.

Project specifications and further detailed information for the project can be found on pages 9-82.

GENERAL INSTRUCTIONS

This project (“Project”) is to repair and restore the parking garage at Main Library.

The Bidder must be able to provide all products/services and meet all of the requirements contained in this solicitation, and the successful Bidder (the Contractor) shall remain responsible for Contract performance for the duration of the agreement.

PRE-BID CONFERENCE

A pre-bid conference and Walkthrough will be held on **Thursday, June 16, 2022, 10:00 am** to allow potential Bidders to inspect the site and to permit potential Bidders the opportunity to ask questions about this Project. Although the pre-Bid conference is not mandatory, attendance by any prospective Bidder is encouraged. Interested Bidders will be asked to RSVP to procurement@columbuslibrary.org. An edited and annotated summary of the Pre-Bid conference will be published in the form of an addendum to the solicitation and will be available on the “Doing Business with Us” page of the Columbus Metropolitan Library website, www.columbuslibrary.org.

DIVERSITY

Columbus Metropolitan Library serves a diverse customer base and prefers service providers whose staff are representative of the diverse populations in the Central Ohio region. Certified Minority Business Enterprises (MBE), Woman Business Enterprises (WBE) and/or Disadvantaged Business Enterprises (DBE) are encouraged to respond to this solicitation. All potential vendors are encouraged to propose project teams comprised of diverse professional staff.

A completed Bidder’s Diversity & Inclusion Participation Form or documentation of good faith efforts must accompany the completed Bid. Please complete Appendix C Bidder’s Diversity & Inclusion Participation Form or denote the omission of participation.

COMPLIANCE WITH APPLICABLE LAWS

By submitting a Bid for Work on the Project, the Bidder acknowledges that it is in compliance with applicable federal, state, and local laws and regulations, including, but not limited to, the following:

Equal Employment Opportunity/Nondiscrimination. The Bidder agrees that if it is awarded a contract that in the hiring of employees for performance of work under the Contract or any subcontract, neither it nor any subcontractor, or any person acting on its behalf or its subcontractor’s behalf, by reason of race, creed, sex, disability as defined in Section 4112.01 of the Ohio Revised Code, or color, shall discriminate against any citizen of the state in the employment of labor or workers who are qualified and available to perform work to which the employment relates. The Bidder further agrees that neither it nor any subcontractor or any person on its behalf or on behalf of any subcontractor, in any manner, shall discriminate against or intimidate any employees hired for the performance of the work under the Contract

on account of race, creed, sex, disability as defined in Section 4112.01 of the Ohio Revised Code, or color.

Ethics Laws. The Bidder represents that it is familiar with all applicable ethics law requirements, including without limitation Sections 102.04 and 3517.13 of the Ohio Revised Code, and certifies that it is in compliance with such requirements.

BID SUBMISSION REQUIREMENTS

1. Bidders are cautioned to carefully review all parts of the ITB. No allowance may be made for any error or negligence of the Bidder.
2. Bids are to be prepared in such a way as to provide a straightforward, concise description of the Bidder's capabilities to satisfy the requirements of this ITB and provide sufficient information to fully establish the Bidder's ability to perform all of the actions, activities, and functions described in this ITB.
3. Emphasis should be on conformance to the ITB instructions, responsiveness to the ITB requirements, completeness and clarity of content. The Bidder should minimize extraneous marketing materials.
4. Costs for developing the Bid are entirely the responsibility of the Bidder and shall not be chargeable to the Library.
5. The Bidder must address all of the requirements listed in the ITB. All Bids must be emailed to procurement@columbuslibrary.org, with the Identification Number **CML #22-026**, title, and Bidder name in the subject line of the email and the file names.

BID SUBMITTAL

Each Bidder must submit a completed Bid Price Form (See Appendix A) as part of its Bid package.

Bid must be clearly labeled "**CML #22-026 Main Garage Restoration.**"

PROJECTED TIMELINE

The projected timeline for this ITB process is provided below. The Library may, at its sole discretion, modify the schedule as necessary to allow for thorough and complete analysis of responses.

Activity	Target Completion Date
Issuance of ITB	06/08/2022
Pre-Bid Meeting	06/16/2022
Inquiry Period Ends	Seven (7) days prior to the Bid due date
Final Response to Vendor Questions	Five (5) days prior to the Bid due date
Due Date	06/30/2022
Selection of Successful Bidder	TBA

CML reserves the right to modify this schedule at CML's discretion. Notification of changes in the response due date would be posted on the CML website or as otherwise stated herein. All times are Eastern Standard Time.

BID FORMAT AND INSTRUCTIONS:

Bids will be accepted until the time indicated in the ITB. Times referenced herein are Eastern Standard Time. The Library is not responsible for any late mail or late special service deliveries.

The award shall be made to the responsive and responsible Bidder with the lowest Bid price.

BID REQUIREMENTS:

To facilitate comparison of Bids, responses shall be organized into the following marked or tabbed sections:

1. Bids must include a table of contents listing all sections:
 - a. A cover letter, on the Bidders letterhead, shall be submitted and shall include, but need not be limited to, the following information:
 - i. The signature of a person authorized to bind the Bidder legally to the extent of work and financial obligation outlined in its Bid.
 - ii. A statement that the Bid will be valid for 90 days.
 - iii. Identification of all the material enclosures submitted in response to this ITB.
 - iv. A summary of the submitted Bid and a brief statement of the Bidder s qualifications to meet all requirements as described in this ITB.
 - a. Executive level summary of the proposed solution, which shall include but shall not be limited to:
 - i. The Bidders Work Plan. The Work Plan must address exactly how the Bidder will provide all required services specified in this ITB.
 - b. Statement of the Bidder's particular abilities and qualifications to include, but not limited to:
 - i. Brief history of the company.
 - ii. Describe the core competencies, including the rationale as to why the Bidder should be selected for this project.
 - iii. The number of years the Bidder has been in business.
 - iv. Primary corporate location's address.
 - v. The geographical area of operations and professional affiliations.
 - vi. Overview of the ownership structure of the company.
 - vii. All alliances and/or strategic partnerships with other companies.
 - viii. Size and composition of the organization.
 - ix. Number of current customers.
 - c. A description of the Bidder's staffing plan for the CML project, which shall include but shall not be limited to:
 - i. The name of each team member that will be assigned to this project and the role assigned for each location.
 - d. A disclosure of all adverse information that may be publicly available, which shall include but shall not be limited to:
 - i. Lawsuits, judgments, liens, bankruptcies or claims made against the Bidder within five (5) years of the Bid due date.
 - ii. Debarment from entering into Contracts with the State of Ohio, any county in the State of Ohio, or any other government entity within five (5) years of the Bid due date.

- e. If applicable, include a list of proposed Subcontractors for this project. For each Subcontractor listed, identify whether or not the Subcontractor is a certified woman- or minority-owned business. CML reserves the right to reject any Subcontractor not identified within the Bidder's response.
- f. References - The Bidder shall provide at least three (3) references for engagements within three (3) years of the Bid submission date that are substantially similar to the scope of work outlined herein.
- g. Include any other information documentation believed to be pertinent, but not specifically mentioned in this ITB, that may be useful and applicable to this project.
- h. The Bidder must include a completed W-9 Form.
- i. The Bidder must provide a Certificate of Insurance ("COI") with coverage per the terms provided herein and list CML as an Additional Insured. Waiver of Subrogation shall also apply and indicated on the COI.
- j. A list of all assumptions and exceptions to the specifications outlined in the ITB.

BID PRICE REQUIREMENTS:

The Bid shall contain all price information in the format specified in the scope of services. Prices offered shall be all-inclusive and shall remain fixed for the duration of the agreement. CML is a tax-exempt entity.

Since this Work will need to be done on off hours, Bid price should be based on labor rates for after hours and Holidays.

OTHER BID REQUIREMENTS:

1. Completed Bidder's Diversity & Inclusion Participation Form – Appendix C
2. Bidders are required to acknowledge the receipt of all ITB addenda by using the supplied Acknowledgement of Addenda Form – Appendix D. Addenda to this ITB will be posted on the Columbus Metropolitan Library website: www.columbuslibrary.org/about/doing-business at least five (5) business days prior to the ITB opening. Bidders are responsible for any information provided in any and all issued addenda.

ITB & BID QUESTIONS

All questions regarding this ITB must be sent to procurement@columbuslibrary.org and must reference the ITB Identification Number and title of the ITB no later than **5:00 p.m. seven (7) days prior to the Bid due date. CML will post written responses to all properly received questions no later than five (5) days prior to the Bid due date.**

Answers to all questions will be documented and posted on the "Doing Business with Us" page of the Library's website at www.columbuslibrary.org/about/doing-business.

CONTRACT AWARD

The Library is not, by virtue of issuing this ITB, obligated to enter into a Contract and reserves the right to not issue a Contract as a result of this solicitation.

CML will enter into negotiations with the responsive and responsible Bidder that submits the lowest Bid Price. The selected Bidder will be invited to negotiate a contract with CML. The contents of the selected Bid, together with the ITB and any formal questions and answers generated during the Bid process, will be incorporated with and made part of the final contract as developed by CML. Should negotiations fail to result in a signed contract within thirty (30) days, CML reserves the right to terminate negotiations and select the Bidder whose Bid is determined to be the next most advantageous to CML.

All Bidder's that respond will receive notification if they have been selected or not.

SECTION 02 00 10 - WORK ITEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Divisions 1, 2, 3 and 7 Specification Sections apply to this Section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

WI 1.0 GENERAL REQUIREMENTS

- A. Scope of Work
 - 1. Work consists of performing all tasks, specifically required and incidental, which are not identified under separate Work Item designation, but necessary to perform the work identified in this project. This work includes, but is not limited to the following items:
 - WI 1.1 - Mobilization
 - WI 1.5 - Temporary Signage

WI 1.1 PROJECT MOBILIZATION

- A. Scope of Work
 - 1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work defined in this Contract. Payment of lump sum amount for mobilization shall be according to following schedule and shall be based on percentage of original contract amount earned.
- B. Materials
 - 1. None
- C. Execution
 - 1. At execution of agreement by all parties, mobilization payment shall not be more than 25% of mobilization lump sum amount.

2. When billing amount earned is greater than 10% but less than 25% of original contract amount, total payment for mobilization shall not be more than 50% of mobilization lump sum amount.
3. When billing amount earned is equal to or greater than 25% but less than 50% of original contract amount, total payment for mobilization shall not be more than 75% of mobilization lump sum amount.
4. When billing amount earned is equal to or greater than 50% of original contract amount, total payment for mobilization shall be 100% of mobilization lump sum amount.

WI 1.5 TEMPORARY SIGNAGE

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment and supervision necessary to provide and install and remove following completion of project, temporary signage as required for traffic control and user information during construction and as required by Owner/Engineer/Architect.

B. Materials

1. Temporary signage shall meet following minimum requirements:
 - a. Minimum size: 48" x 48"
 - b. Backing material: 0.5 in. medium density overlay plywood.
 - c. Colors:
 - 1) Background: medium orange or white.
 - 2) Symbols/Lettering: black
 - d. Lettering: silk screened or die-cut.
 - 1) Font Style: Helvetica or similar.
 - 2) Size: 2 in. high minimum for pedestrian information; 4 in. high minimum for traffic information.

C. Execution

1. Mounting height: 5 ft. to bottom of sign. Provide mounting brackets as required.
2. Contractor shall submit shop drawings detailing sign size, layout, colors, and mounting schemes for approval prior to fabricating signs and mounting brackets.
3. Typical regulatory signs (that is, STOP, YIELD, etc.) and "Handicap" signs shall conform to all Federal, state, and local requirements for sizes, materials, and colors.

WI 3.0 CONCRETE FLOOR REPAIR

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound floor concrete, prepare cavities and install new concrete and reinforcing (as required) materials to restore concrete floor to original condition and appearance. Refer to Detail Series 3.0 for specific requirements.

B. Materials

1. Concrete repair materials shall be as specified in Division 03 Section "Cast-in-Place Concrete Restoration", and/or Division 03 Section "Prepackaged Repair Mortar"
2. Conventional steel reinforcement shall be as specified in Division 03 Section "Cast-in-Place Concrete Restoration" and/or Work Item 1.4, "Concrete Reinforcement."

C. Execution

1. Locating, marking, removal, preparation, and inspection of deteriorated concrete and reinforcing steel preparation, repair and installation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay."
2. Final surface preparation, concrete placement, finishing and curing shall be performed as specified in concrete repair material specification. Manufacturer specifications/requirements for these issues shall also be followed in the event proprietary bag mix repair materials are used.

WI 3.1 FLOOR REPAIR - PARTIAL DEPTH

- A. Refer to Work Item 3.0, "Concrete Floor Repair" for scope of Work, materials and Execution procedure associated with this Work Item. Refer to Detail 3.1 for specific requirements.

WI 3.2 FLOOR REPAIR AT HANDRAIL BASE

- A. Refer to Work Item 3.0, "Concrete Floor Repair" for scope of Work, materials and Execution procedure associated with this Work Item. Refer to Detail 3.2 for specific requirements.

WI 4.0 CONCRETE CEILING REPAIR

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound overhead concrete, prepare cavities and install new concrete and reinforcing (as required) materials to restore overhead concrete to original condition and appearance. Refer to Detail Series 4.0 for specific requirements.

B. Materials

1. Trowel applied patching material shall be as specified in Division 03 Section "Prepackaged Repair Mortar." This material may be used for shallow removal and repair Work Items only.

C. Execution

1. Locating, marking, removal, preparation, and inspection of deteriorated concrete and reinforcing steel preparation, repair and installation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay."
2. Final surface preparation, concrete placement, finishing and curing shall be performed as specified in concrete repair material specification. Manufacturer specifications/requirements on these issues shall also be followed in the event proprietary bag mix repair materials are used.

WI 4.1 CEILING REPAIR - PARTIAL DEPTH

- A. Refer to Work Item 4.0, "Concrete Ceiling Repair" for Scope of Work, materials and procedure associated with this Work Item. Refer to Detail 4.1 for specific requirements.

WI 11.5 EPOXY INJECTION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate cracks, prepare and pressure inject cracks with an epoxy resin so as to create waterproof barrier and/or structural repair as indicated in the Drawings. Refer to Detail 11.5 for specific requirements.

B. Materials

1. Epoxy injection materials shall be as specified in Division 03 Section "Epoxy Injection Systems."

C. Execution

1. Epoxy injection work and materials shall be performed in accordance with Division 03 Section "Epoxy Injection Systems."
2. Contractor is responsible for location of all locations requiring epoxy injection prior to start of Work.
3. Contractor shall allow for Engineer/Architect inspection of all epoxy injection sites for condition as specified.
4. No payment will be allowed for Work executed without Engineer/Architect inspection and verification.
5. Remove and patch all ports, holes, temporary seal materials to match existing conditions. This is considered incidental to the Work.

6. Clean and paint the repair area limited to the disturbed surfaces to match existing surfaces.

WI 16.0 TRAFFIC TOPPING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals, including installation of joint sealant materials, necessary to prepare existing floor surfaces and install traffic topping. Coating of all vertical surfaces within Work limits shall be incidental to installation of traffic topping. Refer to Detail series 16.0 for specific requirements.

B. Materials

1. Traffic topping materials shall be as specified in Division 07 Section "Traffic Coatings."

C. Execution

1. Floor surface preparation shall be performed by coating system licensed applicator or under its direct supervision.
2. Shotblast surface preparation is required for floors.
3. Coating system shall be installed by licensed applicators in strict accordance with manufacturer's recommendations and referenced specification section.
4. Crack preparation, including installation of sealant material where required, is incidental to traffic topping work.
5. Coating system shall be thoroughly cured prior to Work areas being returned to service.

WI 16.4 TRAFFIC TOPPING – RECOAT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals, including preparation and installation of crack, joint and cove sealant materials, necessary to prepare and recoat the existing traffic topping as shown on Drawings. Refer to Detail 16.4 for specific requirements.

B. Materials

1. Traffic topping materials shall be as specified in Division 07 Section "Traffic Coatings" and shall be compatible with existing system. Obtain written approval from new traffic topping manufacturer that existing coating surface is acceptable for installing new coating before beginning Work.

C. Execution

1. Removal of loose/failed existing coating, preparation of exposed concrete surfaces and existing traffic topping membrane shall be in strict accordance with manufacturer's recommendations and referenced specification section. Floor surface preparation shall be performed by coating system licensed applicator or under its direct supervision.
2. Shotblast surface preparation is required for floors.
3. Coating system shall be installed by licensed applicators in strict accordance with manufacturer's recommendations and referenced specification section.
4. Crack preparation, including installation of sealant material where required, is incidental to traffic topping work.
5. Preparation and installation of crack, joint, and cove sealant material, where required, is incidental to this Work Item.
6. Prior to recoating the area, any patches and/or bare concrete areas shall be coated with a base coat and an appropriate number of intermediate coats to bring the new membrane up to the level of the existing membrane. After this has been completed, the entire area will be recoated.
7. Existing prepared traffic topping membrane shall be recoated with a minimum of one intermediate coat with aggregate and one top coat.
8. Coating system shall be thoroughly cured and traffic marking completed prior to returning work areas to service.

WI 30.1 ELECTRICAL ALLOWANCE

A. Scope of Work

1. Electrical allowance shall be all related utility work (drain lines, sprinkler lines, electrical conduit, junction boxes, etc.) associated with interruptions of these utilities to repair existing structural areas.
2. All utilities removed during Work shall be reinstalled in accordance with latest edition of electrical and mechanical codes in effect. Work ineligible for allowance includes Work covered by or incidental to Work Items within this Specification or for Work required through Contractor's negligence.

B. Method of Payment

1. Electrical work as approved in writing by Engineer/Architect prior to implementation, shall be paid for by Contractor. Contractor shall provide written documentation of costs for work performed, including invoices from subcontractors with any General Contractor's markup, to Engineer/Architect with each pay request. Contractor shall attach documentation and invoices to written authorization. At completion of project, any variation between allowance and actual cost documentation will be reflected in an adjustment of allowance amount.

END OF SECTION 02 00 10

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SECTION 02 51 40 - SURFACE PREPARATION FOR PATCHING AND OVERLAY

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, all existing failed patches, all existing surface spalls and potholes, and preparation of cavities created by removal to receive concrete patching material.
- B. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to prepare existing sound concrete slab surfaces to receive bonded concrete overlay.
- C. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 03 Section "Cast-in-Place Concrete – Restoration"
 - 2. Division 03 Section "Prepackaged Repair 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. "Concrete Repair Guide" (ACI 546R-04)

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.

H. For overlay installation, boundaries of overlay areas will be as defined in project drawings and verified 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. Near vertical chipped edge shall be provided along perimeter of repair area where shown on drawings. Areas to be removed shall encompass repair and provide uniform cavity surface. 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 patch and overlay boundaries to depth of 0.75 in. into floor slab, unless otherwise noted. No sawcutting required at overlay boundaries abutting existing vertical surface (wall, beam, curb, etc.). 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 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 SHEATHING) 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.
- F. All sound surfaces (surfaces not requiring spall or delamination repair as previously discussed in this section) to receive overlay shall be heavy abrasive blasted or heavy shotblasted prior to overlay placement, to produce a final concrete surface profile matching ICRI CSP.

3.3 INSPECTION OF REPAIR PREPARATION

- A. After removals are complete, but prior to final cleaning, exposed concrete surfaces 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 surface or 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.
- C. After inspections of exposed surfaces and reinforcement are complete, Engineer/Architect and Contractor shall measure and document removal and replacement quantities for payment, as required.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

- A. All embedded reinforcement exposed during surface preparation that has lost more than **20%** (20% 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 Division 03 specification Sections. 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 concrete 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 concrete placement to ensure that base metal is not exposed to elements and further rusting for extended periods of time. Entire bar diameter is to be cleaned.
- B. After all sandblasting operations and cleanup are completed, paint all exposed steel with an approved epoxy. Protect prepared surfaces from damage prior to and during concrete placement.

3.6 PREPARATION OF CAVITY FOR PATCH PLACEMENT

- A. Floor slab and cavity surfaces will be examined prior to commencement of concrete placement operations. Sounding surface shall be part of examination. Any delamination noted during sounding shall be removed as specified in this Section.
- B. Cavities prepared by chipping or other impact methods shall be sandblasted to remove material that may impair concrete bonding. Sound concrete surfaces shall be prepared by shotblasting as previously specified in this section. Airblasting is required as final step to remove all debris including sand and dust. All debris shall be removed from site prior to commencement of concrete placement, bonding agent preparation, etc. as specified in Division 03 Sections.

END OF SECTION 02 51 40

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SECTION 03 30 21 - CAST-IN-PLACE CONCRETE RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Work in other Sections related to Cast-in-Place Concrete:
 - 1. Division 02 Section "Work Items."
 - 2. Division 02 Section "Surface Preparation for Patching."
 - 3. Division 03 Section "Unbonded Post-Tensioned Concrete."
 - 4. Division 07 Section "Traffic Coatings."

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.
- B. Self-Consolidating Concrete (SCC): Highly flowable, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.

1.4 SUBMITTALS

- A. General: In addition to the following, comply with submittal requirements in ACI 301.
- B. Product Data: For each type of manufactured material and product indicated.
- C. Design Mixes: For each concrete mix. Use form at end of this Section.
- D. Testing Agency: Promptly report all field concrete test results to Engineer, Contractor and Concrete Supplier.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.
- C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.
- D. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
 - 1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
 - 2. Formwork and form accessories.
 - 3. Steel reinforcement and supports.
 - 4. Concrete mixtures.
 - 5. Handling, placing, and constructing concrete.
- E. Testing Agency Qualifications:
 - 1. Independent agency, acceptable to authorities having jurisdiction, and acceptable to engineer, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.
- F. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency shall immediately report test results showing properties that do not conform to Project Specification requirements to Contractor's authorized on-site representative and to Owner's authorized on-site representative.
- G. Testing Agency: Submit following Field Test information for Project Concrete 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. Concrete supplier.
 - 5. Date of report.
 - 6. Testing Agency technician's name (sampling and testing).
 - 7. Placement location within structure.
 - 8. Time of batching.
 - 9. Time of testing.
 - 10. Elapsed time from batching at plant to discharge from truck at site.
 - 11. Concrete mixture identification number.
 - 12. Weather data:
 - a. Air temperatures.

- b. Weather.
13. Field test data:
- a. Date, time and place of test.
 - b. Slump.
 - c. Concrete Temperature.
 - d. Slump flow (for SCC).
 - e. Air content.
14. 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. Cross-sectional area of cylinder.
 - f. Compressive strength.
 - g. Type of failure (at break).
- H. Mockups: Before casting concrete, build mockups to verify typical joints, surface finish, texture, tolerances, and standard of workmanship. See Paragraphs “Finishing Formed Surfaces” and “Finishing Floors and Slabs” within this Section for criteria. Build mockups to comply with the following requirements, using materials indicated for the completed Work:
- 1. Obtain Engineer's acceptance of mockups before casting concrete with specified finishes.
 - 2. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 REFERENCES

- A. American Concrete Institute (ACI):
- 1. ACI 117, “Standard Specifications for Tolerances for Concrete Construction and Materials.”
 - 2. ACI 214R, “Evaluation of Strength Test Results of Concrete.”
 - 3. ACI 301, “Specifications for Structural Concrete.”
 - 4. ACI 302.1R, “Guide for Concrete Floor and Slab Construction.”
 - 5. ACI 305R, “Hot Weather Concreting.”
 - 6. ACI 306.1, “Cold Weather Concreting.”
 - 7. ACI 308R, “Guide to Curing Concrete.”
 - 8. ACI 308.1, “Standard Specifications for Curing Concrete.”
 - 9. ACI 318, “Building Code Requirements for Structural Concrete & Commentary.”
 - 10. ACI 347, “Guide to Formwork for Concrete.”
 - 11. ACI 347.2 “Guide to Shoring/Reshoring of Concrete Multistory Buildings.”
- B. American Society for Testing and Materials (ASTM):

1. ASTM A 36, “Standard Specification for Carbon Structural Steel.”
2. ASTM A 615, “Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement.”
3. ASTM A 706, “Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.”
4. ASTM A 775, “Standard Specification for Epoxy-Coated Steel Reinforcing Bars.”
5. ASTM A 884, “Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement.”
6. ASTM A1064, “Standard Specification for Carbon-Steel Wire and Welded Wire Steel Reinforcement, Plain and Deformed, for concrete.”
7. ASTM C 31, “Standard Practice for Making and Curing Concrete Test Specimens in the Field.”
8. ASTM C 33, “Standard Specification for Concrete Aggregates.”
9. ASTM C 39, “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens.”
10. ASTM C 94, “Standard Specification for Ready-Mixed Concrete.”
11. ASTM C 138, “Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete.”
12. ASTM C 143, “Standard Test Method for Slump of Hydraulic Cement Concrete.”
13. ASTM C 150, “Standard Specification for Portland Cement.”
14. ASTM C 171, “Standard Specification for Sheet Materials for Curing Concrete.”
15. ASTM C 172, “Standard Practice for Sampling Freshly Mixed Concrete.”
16. ASTM C 173, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.”
17. ASTM C 231, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.”
18. ASTM C 260, “Standard Specification for Air-Entraining Admixtures for Concrete.”
19. ASTM C 309, “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.”
20. ASTM C 494, “Standard Specifications for Chemical Admixtures for Concrete.”
21. ASTM C 567, “Standard Test Method for Determining the Density of Structural Lightweight Concrete.”
22. ASTM C 618, “Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.”
23. ASTM C 989, “Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars.”
24. ASTM C 1218, “Standard Test Method for Water Soluble Chloride Ion in Mortar and Concrete.”
25. ASTM C 1315, “Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete.”
26. ASTM C 1611/C 1611M, “Standard Test Method for Slump Flow of Self-Consolidating Concrete.”

PART 2 - PRODUCTS

2.1 FORMWORK

- A. Furnish formwork and form accessories according to ACI 301, ACI 347, and ACI 347.2.

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M or ASTM A 706, Grade 60 (Grade 420), deformed.
- B. Epoxy-coated Reinforcing Bars: ASTM A775
- C. Plain-Steel Welded Wire Fabric: ASTM A 1064, fabricated from as-drawn steel wire into flat sheets, mats only. Roll stock prohibited.
- D. Epoxy-Coated Welded Wire Fabric: ASTM A884, fabricated from as-drawn steel wire into flat sheets, mats only. Roll stock prohibited.
- E. Post-tensioned Reinforcement: See Division 03, Section “Unbonded Post-tensioned Concrete”.
- F. Provide bar supports according to CRSI’s “Manual of Standard Practice.” Use all-plastic bar supports when in contact with exposed concrete surface.

2.3 CONCRETE MATERIALS

- A. Ready Mixed Concrete: Obtain concrete from plant with current certification from:
 - 1. Concrete Materials Engineering Council.
 - 2. Kentucky Department of Transportation.
 - 3. National Ready Mixed Concrete Association.
 - 4. Prestressed Concrete Institute.
- B. Portland Cement: ASTM C 150, Types I or II or Type I/II.
- C. Fly Ash: ASTM C618, Class C or Class F.
- D. Ground-Granulated Blast Furnace Slag: ASTM C989, Gr. 100 or higher.
- E. Silica Fume: ASTM C1240.
- F. Normal-Weight Coarse Aggregate: ASTM C 33, Crushed and graded limestone or approved equivalent, Class 5S uniformly graded, not exceeding 1-inch nominal size. No cherts, opaline or crushed hydraulic-cement concrete is permitted.
- G. Normal-Weight Fine Aggregate: Natural sand conforming to ASTM C 33 and having preferred grading shown for normal weight aggregate in ACI 302.1R, Table 5.1.
- H. Lightweight Aggregates: ASTM C 330.
- I. Water: Potable and complying with ASTM C 1602.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.
- B. General: Admixtures certified by manufacturer that all admixtures used are mutually compatible.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing or high-range water reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, fiber reinforced concrete, and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.45.
 - 4. Use non-corrosive accelerator for all concrete, less than 8 inches thick, placed at air temperatures below 50 degrees Fahrenheit.
 - 5. Use high range water reducing admixture and viscosity modifying admixture, where required, in Self-Consolidating Concrete (SCC).
 - 6. Use corrosion-inhibiting admixture in parking structure slabs and other areas noted on drawings.
 - 7. Use alkali-silica reactivity inhibitor unless ready mix company confirms that the aggregates to be used on the job are non-reactive.
- D. Normal Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon Series," Euclid Chemical Co.
 - b. "WRDA Series," W.R. Grace & Co.
 - c. "Master Pozzolith Series," or "Master PolyHeed Series," BASF Corporation.
 - d. "Plastocrete Series", Sika Corporation.
- E. Mid-Range Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Subject to compliance with requirements, provide one of following:
 - a. "Eucon MR" or "Eucon X-15 and X-20," Euclid Chemical Co.
 - b. "Daracem Series" or "MIRA Series," W.R. Grace & Co.
 - c. "Master Polyheed Series," BASF Corporation.
 - d. "Sikaplast Series" or "Plastocrete Series", Sika Corporation.
 - e. "Polychem 1000" or "KB Series," General Resource Technology.
 - f. "Finishease-NC," Russ Tech Admixtures, Inc.
 - g. "OptiFlo Series" or "EcoFlo Series," Premiere Concrete Admixtures.
- F. High-Range, Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.
 - 1. Products: Subject to compliance with requirements, provide one of following:

- a. “Eucon 37” or “Eucon SP-Series” or “Plastol Series,” Euclid Chemical Co.
 - b. “Daracem Series” or “ADVA Series,” W.R. Grace & Co.
 - c. “Master Rheobuild 1000”, “PS 1466” or “Master Glenium Series,” BASF Corporation.
 - d. “Sikament Series” or “Sika ViscoCrete Series,” Sika Corporation.
 - e. “Melchem Series,” General Resource Technology.
 - f. “Superflo 443” or “Superflo 2000 Series,” Russ Tech Admixtures, Inc.
 - g. “EcoFlo Series” or “UltraFlo Series,” Premiere Concrete Admixtures.
- G. Viscosity Modifying Admixture for Self-consolidating Concrete:
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. “Visctrol” or “Eucon ABS,” Euclid Chemical Co.
 - b. “Master Matrix VMA Series,” BASF Corporation.
 - c. “Sika Stabilizer Series,” Sika Corporation.
- H. Water-Reducing and Retarding Admixture: ASTM C 494, Type B or D.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. “Eucon Retarder-75”, “Eucon DS” or “Eucon Stasis.” Euclid Chemical Co.
 - b. “Daratard-17” or “Recover,” W.R. Grace & Co.
 - c. “MasterSet R Series” or “MasterSet Delvo Series,” BASF Corporation.
 - d. “Sikatard Series,” or “Plastiment Series” or “Plastocrete Series,” Sika Corporation.
- I. Air Entraining Admixture: ASTM C260.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. “Air-Mix,” “Eucon Air-Series” or “AEA-92,” Euclid Chemical Co.
 - b. “Daravair Series” or “Darex Series,” W.R. Grace & Co.
 - c. “Master Air AE90”, or Master Air AE 200”, or “Master Air VR10,” BASF Corporation.
 - d. “Sika AEA Series,” or “Sika AIR Series,” Sika Corporation.
- J. Non-Chloride, Non-Corrosive Water-Reducing, Accelerating Admixture: ASTM C 494, Type C or E.
1. Products: Subject to compliance with requirements, provide one of following:
 - a. “Eucon AcN-Series,” “Accelguard 80,” “Accelguard NCA,” or “Accelguard 90,” by Euclid Chemical Company.
 - b. “DCI,” “PolaraSet,” “Lubricon NCA,” “Daraset” or “Gilco,” by W.R. Grace & Co.
 - c. “MasterSet FP 20” or “MasterSet AC 534,” by BASF Corporation.
 - d. “Sika Set NC,” “Plastocrete 161FL”, or “Sika Rapid-1,” by Sika Corporation.
 - e. “Catexol 2000 RHE,” by Axim Concrete Technologies.
- K. “Corrosion Inhibiting Admixture shall be capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. “Eucon CIA” or “Eucon BCN,” Euclid Chemical Company.
 - b. “DCI” or “DCI-S,” W.R. Grace.
 - c. “MasterLife CI 30,” BASF Corporation.
 - d. “Sika CNI,” Sika Corporation.
 - e. “Catexol 1000 CN-CI,” Axim Concrete Technologies.
 - f. “Polychem CI,” General Resource Technology.
 - g. “Russ Tech RCI,” Russ Tech Admixtures, Inc.
2. Add at rate of 3 gal/cu yd. of concrete, which shall inhibit corrosion to 9.9 lb of chloride ions per cu. yd. of concrete. Calcium Nitrite based corrosion inhibitor shall have a concentration of 30 percent, plus or minus 2 percent of solids content.

L. Shrinkage Compensating Admixture:

1. Design requires using materials with combined drying shrinkage characteristic of 0.04 percent maximum at 28 days. Proposed concrete mixture(s), using actual aggregates, admixtures and cement of the proposed mix for Project as detailed herein and in Drawings, shall meet criteria. Submit ASTM C 157 (may be modified by curing period duration) results for at least 3 specimens. Test takes 28 days minimum. Begin tests as soon as possible so final test results available for submittal to Engineer.
2. Provide powdered admixture used for the compensation and reduction of shrinkage in Portland Cement concrete. Its functional mechanism shall be based on the formation of an expansive Type G component, which produces a calcium hydroxide platelet crystal system based on calcium aluminate/calcium hydroxide, as specified in ACI 223.
3. Acceptable Product:
 - a. Conex by The Euclid Chemical Company.
 - b. “Eclipse Plus,” W.R. Grace & Co.
 - c. “MasterLife SRA 20,” BASF Corporation.
 - d. “Sika Control 40,” Sika Corporation.
 - e. “SRA-157,” Russ Tech Admixtures, Inc.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Evaporation Retarder:
 - a. AquaFilm J74 by Dayton Superior Corporation, Miamisburg, OH
 - b. Eucobar; Euclid Chemical Co.
 - c. E-Con; L&M Construction Chemicals, Inc.
 - d. MasterKure ER 50; BASF Corporation.
 - e. SikaFilm; Sika Corporation.
 - f. Sure-Film (J-74); Dayton Superior Corporation.

- g. “EVRT”, Russ Tech Admixtures, Inc.
 - h. “Barrier,” Premiere Concrete Solutions.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry. Materials must be free of harmful substances, such as sugar or fertilizer, or substances that may discolor the concrete. To remove soluble substances, burlap should be thoroughly rinsed in water before placing it on the concrete.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 CONCRETE MIXTURES

- A. Proportion mixtures determined by either laboratory trial mix or field test data bases, as follows:
- 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
 - 3. Provide different mixtures as the season warrants, as well as each type and strength of concrete or for different placing methods.
- B. Use a qualified independent testing agency for preparing and reporting proposed Mixture Proportions for the laboratory trial mix basis.
- C. Requirements for normal-weight concrete mix are shown on Drawings:
- 1. Compressive strength
 - 2. Slump
 - 3. Water-cementitious materials ratio
 - 4. Air content
- D. Supplementary cementitious materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials according to ACI 318 requirements.
- E. Air Entrainment:
- 1. See General Notes on Drawings for total average air content (percent by volume).
 - 2. Average air content shall exceed value stated in General Notes on Drawings.
 - 3. Permissible variation for any one test result from specified average total air content: plus or minus 1.5 percent unless noted otherwise on General Notes on Drawings.

4. Hardened concrete shall have an air void spacing factor of 0.0080 in. maximum. Specific surface (surface area of air voids) shall be 600 in² per cu in. of air-void volume, or greater. Concrete mixes not meeting these values as determined by ASTM C 457 may require adjustments unless accepted in writing by Engineer.”

F. Chloride Ion Content of Mixture:

1. Water soluble chloride ion content of concrete shall not exceed 0.06 percent by weight of cement for pre-stressed concrete and 0.15 percent for reinforced concrete. (ACI 318 Chapter 4 Table 4.4.1“Maximum Chloride Ion Content for Corrosion Protection of Reinforcement”) Testing procedure to determine chloride ion content shall conform to ASTM C 1218.
2. Concrete chloride ion content shall be determined by Testing Agency prior to placement. Cast samples from current production of concrete mix proposed for superstructure.
3. Concrete not meeting the requirements of paragraph “Water soluble chloride ion content of concrete...” above, shall contain appropriate amount of calcium nitrite. Concrete supplier shall provide laboratory test results showing the amount of excess chloride ion content in the concrete mixture contributed by the aggregates. For each pound of chloride ion in excess of the amount allowed, mix shall contain calcium nitrite (30 percent, plus or minus 2 percent, solids content) on one-to-one basis (one gallon of calcium nitrite for one lb. of excess chloride ion). Calcium nitrite used to offset chloride ions is in addition to calcium nitrite used as a corrosion inhibitor. Maximum of 1.5 lb. of chloride ion per cubic yard may be offset in this manner.

G. Alkali-Aggregate Reactivity Resistance: Provide one of the following:

1. Total equivalent alkali content of mixture less than 5 lb. /cu. yd.
2. ASTM C1293: Expansion less than 0.04 % after 1 year for each of the aggregates (both coarse and fine) in the proposed concrete mixture. This data shall be less than 1 year old.
3. ASTM C1260 or AASHTO T303: Expansion less than 0.1 % after 14 days for each of the aggregates (both coarse and fine) in the proposed concrete mixture.
4. ASTM C1567: Expansion less than 0.1 % after 14 days with each of the aggregates (both coarse and fine) and the supplementary cementing materials (both source and quantity) of the proposed concrete mixture design. Alternatively, if satisfactory ASTM C1260 or AASHTO T303 test results can be provided for one of the aggregates that are being used, ASTM C1567 testing does not need to be provided for that aggregate.
5. CE CRD-C662: Expansion less than 0.1 % after 28 days with the each of the aggregates (both coarse and fine), the supplementary cementing materials (both source and quantity) of the proposed concrete mixture design and the lithium admixture source and dosage level of the proposed mixture design. Alternatively, if satisfactory ASTM C1260 or AASHTO T303 test results can be provided for one of the aggregates that are being used, CRD-C662 testing does not need to be provided for that aggregate.

H. Admixtures: Use admixtures according to manufacturer’s written instructions.

1. Consider using water-reducing admixture or high-range water-reducing admixture (Superplasticizers), OR admixtures that achieve self-consolidating concrete, as required, for placement, workability, finishing and when required, increased flowability.
 2. Consider using water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 3. Use high range water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio of 0.45 or less. Use normal or mid-range water reducing admixture for concrete with water-cementitious materials ratio greater than 0.45.
 4. Use corrosion-inhibiting admixture in concrete mixes where indicated.
- I. Slump (ACI 301, Part 4 header “Slump”):
1. Maximum slump for concrete is indicated on Drawings. Where field conditions require slump to exceed that shown, increased slump shall be obtained by use of high range water reducers (superplasticizers) only, and Contractor shall obtain written acceptance from Engineer who may require an adjustment to mix.
 2. All concrete containing high-range water-reducing admixture (superplasticizer) shall have a verified initial slump of 2– 3 in. Final slump after the addition of the superplasticizer shall be 6–9 in. as required by the contractor to properly place the concrete. Before permission for plant addition of superplasticizer to be granted by Engineer, fulfill following requirements:
 - a. Submit letter from testing laboratory which developed original mixture proportions, for each super plasticized mixture, certifying volume of mix water which will produce specified slump and water/cement ratio, taking into account aggregate moisture content.
 - b. Submit plant computer printout of mixture ingredients for each truckload of super plasticized concrete with delivery of that truckload. Mix water volume greater than that certified shall be cause for concrete rejection.
 - c. Over-retarding or crusting of flatwork surface: cause for concrete rejection.
 - d. Segregation or rapid slump loss (superplasticizer life) due to incompatibility or under-dosing: cause for concrete rejection.
- J. Shrinkage (Length Change):
1. Determine length change of hardened concrete test specimens in accordance with ASTM C 157, except as noted in paragraph below. Existing test data from previous project with same materials may be acceptable.
 2. Test specimens shall be moist cured, including period in molds for 7 days. Then store specimens in air for period of 28 days.
 3. Utilize concrete materials and mix proportions submitted, for use in floor slab beam, in accordance with Part 1 Article “Submittals”.
 4. Report length change of specimens after periods of air drying after curing of 4, 7, 14, 21, and 28 days.
 5. Average length change after 28 days shall be limited to 0.04%, unless otherwise accepted by Engineer. Values exceeding 0.04% shall be rejected.

- K. Self-Consolidating Concrete:
1. Minimum flow of 24 in. to 28 in. or as required by the successful test placement. All self-consolidating concrete shall contain the specified high-range water-reducing admixture and viscosity-modifying admixture as required.
 2. Measure slump flow using slump cone upright or inverted in accordance with ASTM C1611. Measured flow shall be greater than 24 inches and consistent with submitted mixture test parameters plus or minus 2 in.
 3. Measure passing ability in accordance with ASTM C 1621/C 1621M. Use the slump cone in the same way as in the slump flow test. Difference in average slump flow between slump flow and passing ability tests shall not exceed 2 in.
 4. Determine the static segregation (stability) in accordance with ASTM C 1610/C 1610M. Segregation factor of the mixture shall not be more than 15 percent.
- L. Engineer's acceptance of mixture proportions shall not relieve Contractor from responsibility for any variation from requirements of Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.
- M. Adjustment to Concrete Mixtures: Adjustments to mixture proportions may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mixture and strength results shall be submitted to and accepted by Engineer before using in work.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch plant-printed ticket information at delivery to site.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Provide plant-printed batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mixture identification number, date, time of batching, mixing time, quantity and details of materials, amount of water introduced and water permitted by plant to be added, if any.
- C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).

3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.8 MATERIAL ACCESSORIES

- A. Extended Open Time Epoxy Bonding Agent: Three component, water based, epoxy modified portland cement bonding agent and corrosion inhibitor coating 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. Other types may be used only with Engineer/Architect's approval in writing prior to bidding.
- B. Epoxy Adhesive: 2 or 3 component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Product shall be capable of achieving bond strength of 1,800 psi per ASTM C 882.
 1. Acceptable materials for this Work are:
 - a. "MasterEmaco P 124" or "MasterEmaco ADH 326," by BASF Corporation.
 - b. "Kemko 001 or 008", by ChemCo Systems, Inc., Redwood City, CA.
 - c. "Dural #452 and Dural Series", by The Euclid Chemical Company, Cleveland, OH.
 - d. Sikadur 32 Hi-Mod LPL", by Sika Corporation, Lyndhurst, NJ.
 - e. Other types may be used only with Engineer/Architect's approval in writing prior to bidding.
- C. Epoxy Coating for Existing Exposed Non-prestressed Steel Reinforcement or Welded Wire Reinforcement:
 1. Provide one of following epoxy coatings:
 - a. "Sikadur 32 Hi-Mod," Sika Chemical Corp.
 - b. "MasterEmaco ADH 326," BASF Corporation.
 - c. "Scotchkote 413 PC," 3M Company.
 - d. "Dural 452 MV," The Euclid Chemical Company.
 - e. "Resi-Bond (J-58)," Dayton Superior Corporation.
- D. For mechanical tension splices of reinforcement:
 1. All splices to develop 125 percent of specified yield strength of bars, or of smaller bar in transition splices. Acceptable products:
 - a. Bar-Lock Rebar Coupler, by Dayton Superior.
 - b. Bar-Grip or Grip-Twist, by Barsplice Products, Inc.

- c. Extender HRC 500 Series Coupler, by Headed Reinforcement Corp.
 - d. Splice Sleeve, by NMB.
 - e. LENTON Splices, by Erico.
- E. Compression splices: Mechanically coupled splices in accordance with ACI 318, Chapter 12.
- F. Joint Fillers
- 1. Joint filler in slabs and curbs per ASTM D1751 Asphalt impregnated fiber board; as shown on Drawings. Acceptable products as follows:
 - a. “Flexcell,” Knight-Celotex Corp.
 - b. “Fibre Expansion Joint,” W.R. Meadows, Inc.
 - 2. Joint filler used vertically to isolate walls from columns or other walls: White molded polystyrene bead board type.

2.9 TOOLS

A. Slab Jointing

- 1. Concrete groovers: For tooled joints in concrete:
 - a. For concrete not exceeding 4 in. thickness, use groover with 1 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
 - b. For concrete exceeding 4 in. thickness, use groover with 1.5 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
 - 2. Saw Cut Joints:
 - a. Acceptable tool: “Soff-Cut Saw Model 310” or “Model G2000,” Soff-Cut International, Corona, CA.
 - 1) Cut joint as soon as concrete will support weight of operator and saw without deforming.
 - 2) Joint shall be 1 in. deep for concrete thickness of 4 in. or less. Joint shall be 1.5 in. deep for concrete exceeding 4 in. thickness. Do not cut reinforcement.
 - 3) Extend joint to adjacent vertical surface within 30 minutes of cutting.
 - 4) Retool or grind saw cut joint before installing sealant to provide equivalent dimensions, shape and volume as joint obtained by tooled joint. Surface width shall be 0.5 in. with 3/16 to 1/4 in. edge radius.
- B. All joints subject to acceptance by sealant installer. Concrete contractor to rework rejected joints until acceptable to sealant installer.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

- A. Conduct a preconstruction meeting addressing the concrete preparation, installation, protection, quality control, and acceptance of Work.

3.2 FORMWORK

- A. Design, construct, erect, shore, brace, and maintain formwork according to ACI 301 and ACI 347.

3.3 STEEL REINFORCEMENT

- A. Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.

3.4 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Locate and install so as not to impair strength or appearance of concrete, at locations indicated or as approved by Engineer.
- C. Isolation Joints: Install joint-filler strips at junctions with slabs-on-grade and vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
 - 1. Extend joint filler full width and depth of joint, terminating flush with finished concrete surface, unless otherwise indicated.

3.5 CONCRETE PLACEMENT

- A. Comply with recommendations in ACI 304R for measuring, mixing, transporting, and placing concrete.
- B. Do not add water to concrete during delivery, at Project site, or during placement.
- C. Consolidate concrete with mechanical vibrating equipment.
- D. Cold Weather Placement: Comply with ACI 306.1.
- E. Hot Weather Placement: Comply with ACI 305 R.

3.6 FINISHING FORMED SURFACE.

- A. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defective areas repaired and patched, and fins and other projections exceeding 1/4 inch (6 mm) in height rubbed down or chipped off.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise indicated.

3.7 FINISHING FLOORS AND SLABS

- A. Flatwork in Horizontal Areas (BROOM Finish, ACI 301, Section 5 header “Broom or Belt Finish”):
 - 1. Bullfloat immediately after screeding. Complete before any excess moisture or bleed water is present on surface (ACI 302.1R, Article 8.3.3). The use of power trowels is discouraged; however, if they are used the following applies:
 - a. Use minimal passes so as to not overwork the concrete.
 - b. At the contractor’s expense a petrographic analysis will be required in each area where a power trowel is used to verify the air content at the slab surface is within specified limits.
 - 2. After excess moisture or bleed water has disappeared and concrete has stiffened sufficiently to allow operation, give slab surfaces coarse transverse scored texture by drawing broom across surface. Texture shall be as accepted by Engineer from sample panels.
 - 3. Finish tolerance: ACI 301, Paragraph 5.3.4.2 and ACI 117, paragraph 4.5.7: The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed 0.5 in. In addition, floor surface shall not vary more than plus or minus 0.75 in. from elevation noted on Drawings anywhere on floor surface.
 - 4. Before installation of flatwork and after submittal, review, and approval of concrete mixture proportions, Contractor shall fabricate two acceptable test panels simulating finishing techniques and final appearance to be expected and used on Project. Test panels shall be minimum of 4 ft. by 4 ft. in area and shall be reinforced and cast to thickness of typical parking and drive area wearing surface in Project. (Maximum thickness of test panels need not exceed 6 in.) Contractor shall finish panels following requirements of paragraphs above. Finished panels (one or both) may be rejected by Engineer, in which case Contractor shall repeat procedure on rejected panel(s) until Engineer acceptance is obtained. Accepted test panels shall be cured in accordance with Specifications and may be incorporated into Project. Accepted test panels shall serve as basis for acceptance/rejection of final finished surfaces of all flatwork.
 - 5. Finish all concrete slabs to proper elevations to ensure 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.

- B. Flatwork subject to pedestrian traffic:
1. Concrete surfaces at all walking areas subject to pedestrian traffic shall provide a smooth, slip resistant walking surface for pedestrians with these minimum requirements:
 - a. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces and “2010 ADA Standards for Accessible Design”.
 - b. Adjoining walkway surfaces shall be flush and meet the following minimum requirements:
 - 1) Changes in level of less than ¼ inch in height may be without edge treatment as shown in ADA Figure 303.2 and on the Drawings.
 - 2) Changes in Level between ¼ inch and ½ inch height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3 and on the Drawings.
 - 3) Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp with minimum requirements shown on the Drawings.
 - 4) Openings in floor or ground surfaces shall not allow passage of a sphere more than ½ inch diameter except as allowed for elevators and platform lifts as shown in ADA Figure 302.3 and on the Drawings.
 - c. Walkway surfaces shall provide a slip resistant surface.
 - 1) Concrete surfaces shall be troweled and finished to provide a slip resistant finish.
 - 2) Contractor shall provide sample area with slip resistant surface finish.

3.8 TOLERANCES

- A. Comply with ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

3.9 CONCRETE PROTECTION AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during placement. Keep concrete continually moist prior to final curing by evaporation retarder, misting, sprinkling, or using absorptive mat or fabric covering kept continually moist.
- B. 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, screeding and bull floating concrete, but

prior to float finishing. Repeated applications are prohibited after float finishing has begun.

1. Acceptable evaporation retarder materials for this Work are:
 - a. "Cimfilm", by Axim Concrete Technologies.
 - b. "MasterKure ER 50," by BASF Corporation.
 - 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.

- C. Immediate upon conclusion of finishing operation cure concrete in accordance with ACI 308 for duration of at least seven days by moisture curing or moisture retaining covering. Dissipating 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 concrete has dried.
 1. Continue method used in initial curing.
 2. Material conforming to ASTM C171.
 3. Other moisture retaining covering as approved by Engineer/Architect.
 4. During initial and final curing periods maintain concrete above 50°.
 5. Prevent rapid drying at end of curing period.

- D. Concrete surfaces to receive slab coatings or penetrating sealers shall be cured with moisture curing or moisture-retaining cover. Concrete surfaces may be cured by sealer/coating manufacturer recommended dissipating resin curing compound, complying with ASTM C309 and in accordance with ACI 506.7.

- E. Dissipating 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 are prohibited.
 1. Subject to project requirements provide one of the following products:
 - a. "Kurez DR VOX" or "Kurez RC," or "Kurez RC Off," The Euclid Chemical Company.
 - b. "RxCure WB," or "RxCure VOC" or "W.B. Cure VOC," Conspec Marketing & Manufacturing.
 - c. "MasterKure CC 200 WB" or "MasterKure CC 160 WB," BASF Corporation.

 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.
- F. Curing Methods: Cure formed and non-formed concrete moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: **Contractor** shall engage a qualified independent testing and inspecting agency acceptable to the Engineer to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article. Perform tests according to ACI 301.
- B. Sample concrete in accordance with ASTM C 172.
- C. Epoxy Coated Material:
1. Perform field inspection of installed epoxy coated material under provisions of Division 01 Section "Quality Control."
 2. Repair all epoxy coating damage due to fabrication and handling, using a mirror to find any damage on undersides.
 3. Repair all damaged areas using manufacturer's recommended patching material and method.
 4. No damaged area shall be left uncorrected.
 5. Epoxy coated welded wire reinforcement with consistent visible holes in epoxy coating (particularly at mesh intersections): unacceptable. Remove from project.
- D. Temperature:

1. Test temperature of concrete in accordance with ASTM C 1064/C 1064M and ACI 301 each time cylinders are taken or as directed by the Engineer.

E. Slump Test:

1. Conduct one slump test in accordance with ASTM C 143/C 143M per truck load of ready-mixed concrete delivered to Project at truck for superstructure concrete.
2. Conduct slump test in accordance with ASTM C143/C 143M and ACI 301 for foundation concrete.
3. When high-range water-reducing admixture (superplasticizer) is used, initial slump must be verified by Testing Agency.

F. Slump Flow Test (SCC):

1. Conduct one slump flow test in accordance with ASTM C 1611/C 1611M per truck load of ready mixed concrete delivered to Project at truck for superstructure concrete.
2. Conduct slump flow test in accordance with ASTM C1611/C 1611M and ACI 301 for foundation concrete.

G. Water Content:

1. Water content or water-cementitious materials ratio shall be verified by use of the Microwave Test in accordance with AASHTO T 318.
2. Conduct test each time test cylinders are taken and as directed by Engineer.

H. Air Content:

1. General Contractor: Coordinate all parties involved to produce conforming concrete.
2. Sample freshly-mixed concrete at point of final placement in accordance with ASTM C 172 and conduct one air content test in accordance with ASTM C 231 or ASTM C 173 for each truck of ready-mix, air entrained concrete delivered to Project.

I. Concrete Compressive Strength:

1. Make test cylinders in accordance with ASTM C 31 and test in accordance with ASTM C 39 as follows:
 - a. Take minimum of three sets of cylinders for each 100 cu yds. or fraction thereof, of each Mixture of concrete placed in any one day.
 - b. A set of cylinders shall be comprised of two 6 inch by 12 inch cylinders or three 4 inch by 8 inch cylinders.
 - c. At Contractor's option and cost, cylinders may be taken to verify concrete strength prior to form removal.
 - d. Testing Agency: Provide and maintain site cure box for cylinders.
2. Sample plastic concrete for testing at point of final placement, in accordance with ASTM C 172. Engineer will select sampling locations which may include points where plastic concrete has already been screeded and floated. Sample concrete

- for test cylinders to be used to verify concrete compressive strength for post-tensioning as near as possible to actual tendon anchorages.
3. 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.
 4. Cure test cylinders per ASTM C 31 as follows:
 - a. To verify compressive strength prior to **[post-tensioning or]** form removal or for additional 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 degrees F. and prevent loss of moisture from specimens.
 - 2) Remove test specimens from molds at end of 20 +/- 4 hours and store in moist condition at 73.4 +/- 3 degrees F. until moment of test. Laboratory moist rooms shall meet requirements of ASTM C 511.
 5. Compression test for non-prestressed concrete:
 - a. Test one set of cylinders at 7 days.
 - b. Test one set of cylinders at 28 days.
 - c. Test one set of cylinders at 56 days for concrete strength requirement of 7000 psi or greater.
 6. Compression tests for post-tensioned concrete:
 - a. Test one set of cylinders immediately before tensioning slabs and beams. Cylinders must be field cured in accordance with paragraph "Cure test cylinders per ASTM C 31...."
 - b. Test one set of cylinders at 28 days.
 7. Hold one set of cylinders in reserve for use as Engineer directs.
 8. Unless notified by Engineer, reserve cylinders may be discarded without being tested after 56 days.
- J. Report all nonconforming test results to Engineer and others on distribution lists via fax or email. Follow up with colored paper copies to flag the non-conformances.
- K. Monthly, submit a graph showing distribution of compressive strength test results and air content test results. Include microwave test results for concretes with a water cementitious ratio less than or equal to 0.40 concrete.

3.11 EVALUATION AND ACCEPTANCE OF WORK

A. Acceptance of Repairs (ACI 301):

1. Acceptance of completed concrete Work will be according to provisions of ACI 301.
2. Repair areas shall be sounded by Engineer 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 repair area when initial curing period is completed, repair shall be considered defective, and it shall be removed and replaced by Contractor at no extra cost.

3.12 CONCRETE MIX DESIGN FORM

- A. See appendix to this Section for concrete mix design form.

END OF SECTION 03 30 21

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APPENDIX: Concrete Mix Design Submittal Form

I. <u>GENERAL INFORMATION</u>	
Project:	City:
General Contractor:	
Concrete Supplier:	
Mixture Identification No.:	Concrete Grade:
Use (Describe) ¹ :	

¹ example: floor slabs, topping, columns, etc.

II. <u>MIXTURE PROPORTIONING DATA</u>		
Proportioning Based on (Check only one):		
Standard Deviation Analysis: _____ or Trial Mix Test Data: _____		
Mixture Characteristics: (see Mixtures in Drawings General Notes)	Density: _____ pcf;	Air: _____ % specified
	Slump _____ in. before superplasticizer	Slump _____ in. after superplasticizer Or for SCC: Spread _____ in.
	Strength: _____ psi (28 day);	

WALKER SUBMITTAL STAMP
CONTRACTOR SUBMITTAL STAMP

III. MATERIALS		
Aggregates: (size; type; source; gradation report; specification)		
Coarse:		
Fine:		
Other Materials:	<u>Type</u>	<u>Product-Manufacturer (Source)</u>
Cement:		
Flyash, slag, or other pozzolan:		
Silica Fume		
Processed Ultra Fine Fly Ash		
HRM		
Air Entraining Agent:		
Water Reducer		
High Range Water Reducer (HRWR / superplasticizer)		
Non-Corrosive Accelerator		
Retarder		
Fibers		
Other(s):		

IV. MIX PROPORTIONS ⁽²⁾		
	WEIGHT (lbs.) (per yd³)	ABSOLUTE VOL. (cu. ft.) (per yd³)
Cement:		
Fine Aggregate: ⁽³⁾		
Coarse Aggregate: ⁽³⁾		
Flyash, slag, or other pozzolan:		
Silica Fume		
Processes Ultra-Fine Fly Ash		
HRM		
Water: ⁽⁴⁾ (gals. & lbs.)		
Entrained Air: (oz.)		
Fibers:		
(Other) _____:		

TOTALS:		
NOTES:		
⁽²⁾ Mix proportions indicated shall be based on data used in section VII or IX.		
⁽³⁾ Based on saturated surface dry weights of aggregates.		
⁽⁴⁾ Includes ALL WATER, including added water and free water contained on aggregates.		

V. RATIOS		VI. SPECIFIC GRAVITIES	
Water ⁽¹⁾	lb.	Fine Aggregate:	
_____ = _____ =			
Cementitious Material ⁽²⁾	lb.	Coarse Aggregate:	
_____ = _____ =			
Fine Agg.	lb.		
_____ = _____ =			
Total Agg.	lb.		
<p>NOTES:</p> <p>(1) Includes ALL water, including added water and free water contained on aggregates.</p> <p>(2) Cementitious materials include cement, fly ash, slag, silica fume, HRM, Processed Ultra-Fine Fly Ash or other pozzolan.</p>			

VII. ADMIXTURES				
Air Entraining Agent (A.E.A.):	___ oz.	per yd ³	___ oz.	per 100# cement
Superplasticizer	___ oz.	per yd ³	___ oz.	per 100# cement
Water Reducer	___ oz.	per yd ³	___ oz.	per 100# cement
Non-corrosive Accelerator	___ oz.	per yd ³	___ oz.	per 100# cement
Retarder	___ oz.	per yd ³	___ oz.	per 100# cement
Other	___ oz.	per yd ³	___ oz.	per 100# cement
Lithium Nitrate	___ gal.	per yd ³		

VIII. <u>STANDARD DEVIATION ANALYSIS:</u>		<u>Yes</u>	<u>N/A</u>
(Complete this section only if Mixture was developed using standard deviation analysis of previous project test results. If other method was used, check "N/A".)			
<u>Number of Tests Evaluated:</u> (One test is average of two cylinder breaks)		<u>Standard Deviation:</u> (Single Group)	
<u>Attach copy of test data considered:</u>		<u>Standard Deviation:</u> (Two Groups)	
Required average compressive strength: $f'_{cr} = f'_c + \underline{\hspace{2cm}}$ psi			
<p>NOTE: Mixture shall be proportioned in accordance with ACI 301 section 4.2.3 to achieve average compressive strength f'_{cr} equal to or greater than the larger of one of the following equations:</p> <p>(4.-3) $f'_{cr} = f'_c + 1.34ks$ [s= calculated standard deviation] or (4-4) $f'_{cr} = f'_c + 2.33ks - 500$ or (4-5) $f'_{cr} = 0.9f'_c + 2.33ks$ (for $f'_c > 5,000$ psi)</p> <p>(Refer to ACI 301 for required average when data are not available to establish standard deviation. For post-tensioning projects, see also special requirements for strength required to apply initial post-tensioning.)</p>			
MIXTURE CHARACTERISTICS (As shown on drawings)			
Slump = <u> </u> in.		Air Content = <u> </u> %	
Unit Wet Wt. = <u> </u> pcf		Unit Dry Wt. = <u> </u> pcf	
MIXTURE CHARACTERISTICS (Based on proportioning data)			
Initial Slump = <u> </u> in.		Final Slump <u> </u> in.	
Unit Wet Wt.= <u> </u> pcf.		Unit Dry Wt. = <u> </u> pcf.	
Air Content = <u> </u> %			

IX. <u>TRIAL MIXTURE TEST DATA:</u>		<u>Yes</u>	<u>N/A</u>
(Complete this section only if Mixture Proportion 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>Mix #1</u> (comp. str.)	<u>Mix #2</u> (comp. str.)	<u>Mix #3</u> (comp. str.)
<u>7</u>			
<u>7</u>			
<u>28</u>			
<u>28</u>			
<u>28</u>			
<u>28 day average com-</u> <u>pressive strength, psi</u>			
<p>NOTE: Mixture shall be proportioned in accordance with ACI 301 section 4.2.3 to achieve average compressive strength f'_{cr} equal to or greater than the larger of one of the following equations:</p> <p>(Less than 3000) $f'_{cr} = f'_c + 1000$ or (3000 to 5000) $f'_{cr} = f'_c + 1200$ or (Over 5000) $f'_{cr} = 1.1f'_c + 700$</p> <p>For post-tensioning projects, see also special requirements for strength required to apply initial post-tensioning.</p>			
MIXTURE CHARACTERISTICS (as shown on drawings)			
Slump = _____ in.		Air Content = _____ %	
Unit Wet Wt. = _____ pcf		Unit Dry Wt. = _____ pcf	
MIXTURE CHARACTERISTICS (Based on proportioning data)			
Initial Slump = _____ in.		Final Slump _____ in.	
Unit Wet Wt.= _____ pcf.		Unit Dry Wt. = _____ pcf.	
Air Content = _____ %			

<u>X. OTHER TEST DATA</u>		
Water Soluble Chloride Ion Content of mix:	_____ % (by weight of cement)	ASTM C 1218
Hardened Air Content (per ASTM C457):		
Air content: _____%	Air void spacing Factor _____ in.	Specific surface: _____ in ² /in ³
Chloride Ion Content of Concrete Mixture: ASTM C 1218		
Shrinkage (Length Change, Average) per ASTM C157:		
_____ % @ 4 days	_____ % @ 7 days	_____ % @ 14 days
_____ % @ 21 days	_____ % @ 28 days	

<u>XI. Remarks:</u>

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Ready Mix Concrete Supplier Information
Name:
Address:
Phone Number:
Date:
Main Plant Location:
Miles from Project Site:
Secondary or Backup Plant Location:
Miles from Project Site:

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 calculation of required average strength and for calculation of standard deviation
	Chloride ion data and related calculations
	Admixture compatibility certification letter
	Shrinkage information per ASTM C157
	ASTM C 457
	Alkali Content Data and Calculations OR ASTM C1293, ASTM C1260, ASTM C 1567 or CE CRD-C662 Test report for each aggregate

SECTION 03 37 60 – PREPACKAGED REPAIR 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 prepackaged concrete repair mortar to formed horizontal, vertical and overhead surfaces to restore original surface condition and integrity.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "Work Items."
 - 2. Division 02 Section "General Concrete Surface Preparation."
 - 3. Division 02 Section "Surface Preparation for Patching and Overlay."
 - 4. Division 03 Section "Cast-In-Place Concrete - Restoration."
 - 5. Division 07 Section "Traffic Coatings."

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.

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. "Specification for Hot Weather Concreting," ACI 305.1.
 - 3. "Standard Specification for Cold Weather Concreting," ACI 306.1.
 - 4. "Standard Specification for Curing Concrete" (ACI 308.1)
- 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. "Specification for Hot Weather Concreting," ACI 305.1.
3. "Standard Specification for Cold Weather Concreting," ACI 306.1.

D. ASTM International (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."
3. ASTM C1583, "Standard Test Method for the Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method)"

1.5 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 01 and as specified in this Section.
- B. Contractor: At preconstruction 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.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following, only where specifically named in product category:
 1. BASF Building Systems (BASF), Shakopee, MN
 2. Euclid Chemical Corporation (Euclid), Cleveland, OH
 3. King Construction Products (King), Burlington, ON
 4. Mapei Corporation (MAPEI), Deerfield Beach, FL
 5. Sika Corporation (Sika), Lyndhurst, NJ.
 6. J.E. Tomes (Tomes), Blue Island, IL

2.2 MATERIALS

- A. Horizontal Repair and Form and Pour Mortar: Shall be prepackaged cementitious repair mortar capable of horizontal and form and pour partial depth applications, achieving a minimum 3,000 psi compressive strength at 7 days and 5,000 psi compressive strength at 28 days per ASTM C39 as certified by manufacturer with maximum lineal shrinkage of 0.10% at 28 days. Extend per manufacturer's instructions as required for deeper placements.

1. Acceptable cementitious repair materials for this Work are as follows:
 - a. "MasterEmaco S440," by BASF Corporation.
 - b. "Eucocrete," by Euclid.
 - c. "FA-S10 Concrete," by King.
 - d. "Planitop 11," by MAPEI.
 - e. "Sikacrete 211," by Sika.
 - f. Other types may be used only with Engineer's approval in writing prior to bidding.

- B. Rapid Strength Repair Mortar: Shall be prepackaged, cementitious repair mortar. Repair mortar shall be capable of application achieving a minimum 3,500 psi compressive strength at 1 day and 5,000 psi compressive strength at 28 days per ASTM C39 as certified by manufacturer. Extend per manufacturer's instructions as required for deeper placements.

1. Acceptable materials for this Work are as follows:
 - a. "MasterEmaco T430," by BASF Corporation.
 - b. "Speedcrete 2028," by Euclid.
 - c. "HP-S10 Concrete," by King.
 - d. "Planitop 18 ES" by MAPEI.
 - e. "Sikaquick 1000," by Sika.
 - f. "Aprisa P-80," by Tomes.
 - g. Other types may be used only with Engineer's approval in writing prior to bidding.

- C. Trowel Applied Repair Mortar: Shall be prepackaged, cementitious repair mortar capable of vertical/overhead application by trowel achieving a minimum 3,000 psi compressive strength at 7 days and 4,500 psi compressive strength at 28 days per ASTM C 109 as certified by manufacturer.

1. Acceptable materials for this Work are as follows:
 - a. "MasterEmaco N425," by BASF Corporation.
 - b. "Verticoat Supreme," by Euclid.
 - c. "Super-Top," by King.
 - d. "Planitop XS," by MAPEI
 - e. "Sikaquick VOH," by Sika.
 - f. "CT-40 Do All Mortar," by Tomes.
 - g. Other types may be used only with Engineer's approval in writing prior to bidding.

2.3 MATERIAL ACCESSORIES

- A. Extended Open Time Epoxy Bonding Agent: Three component, water based, epoxy modified portland cement bonding agent and corrosion inhibitor coating providing the recommended Manufacturer's open time in which to apply repair mortar.
1. Acceptable materials for this Work are:

- a. "MasterEmaco P124," by BASF.
 - b. "Duralprep A.C.," by Euclid.
 - c. "Planibond 3C," by MAPEI.
 - d. "Armatec 110 EpoCem", by Sika.
 - e. "B-1 Rebar Coating," by Tomes.
- B. Bonding Grout: Bonding grout shall consist of prepackage repair material mixed with sufficient water to form stiff slurry to achieve consistency of "pancake batter."
- C. Clear, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- D. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- E. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Epoxy Bonding Agent Extended Open Time:
1. In strict accordance with manufacturer's recommendations, mix and apply epoxy bonding agent to all areas as indicated on Drawings.
 2. Allow epoxy bonding agent to dry a minimum 2 hours, but no more than the Manufacturer's recommended open time prior to placing repair mortar.
- B. Bonding Grout:
1. Mix bonding grout and scrub into SSD repair substrate with a stiff broom to all areas as indicated on Drawings.
 2. Place repair material prior to initial set of grout. If grout sets prior to placement of repair material, completely remove grout from surface and re-clean prior to proceeding with new grout placement and repair mortar.
- C. Mortar Placement: Mortar materials shall be placed in strict accordance with manufacturer's instructions. Properly proportioned and mixed mortar material shall be placed using tools to consolidate mortar so that no voids exist within new material and continuous contact with base concrete is achieved.
- D. Form and Pour Repair Mortar Placement: Mix and apply in strict accordance with manufacturer's written instructions, to achieve a maximum 9" slump. Consolidate mortar so that no voids exist and continuous contact with base concrete is achieved.
- E. Vertical and Overhead Repairs: Mortar materials shall be placed in strict accordance with manufacturer's instructions. Properly proportioned and mixed mortar material shall be placed using tools to consolidate mortar 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.

F. Finishing:

1. Apply a nonslip broom finish to top of floor patches and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Provide a surface finish similar to adjacent surfaces for vertical and overhead partial depth repairs.
3. Finish formed surfaces similar to adjacent surfaces.

3.2 CONCRETE PROTECTION AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during placement. Keep concrete continually moist prior to final curing by evaporation retarder, misting, sprinkling, or using absorptive mat or fabric covering kept continually moist.
- B. Immediate upon conclusion of finishing operation cure concrete in accordance with ACI 308.1 for duration of at least three days by curing methods listed below. Provide additional curing immediately following initial curing and before concrete has dried.
1. During initial and final curing periods maintain concrete above 50°.
 2. Prevent rapid drying at end of curing period.
- C. Concrete surfaces to receive slab coatings or penetrating sealers shall be cured with moisture curing or moisture-retaining-cover curing.
- D. Curing Methods: Cure formed and non-formed concrete moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 3. Curing compound: Apply curing compound in accordance with manufacturer's instructions.

3.3 FIELD QUALITY CONTROL

3.4 EVALUATION AND ACCEPTANCE OF WORK

A. Acceptance of Repairs (ACI 301):

1. Acceptance of completed concrete Work will be according to provisions of ACI 301.
2. Repair areas shall be sounded by Engineer 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 repair area when initial curing period is completed, repair shall be considered defective, and it shall be removed and replaced by Contractor at no extra cost.
4. Patches shall be considered defective if average strength does not meet minimum strength at 28 days or if average bond strength does not meet minimum requirements of 150 psi.

END OF SECTION 03 37 60

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SECTION 03 63 00 - EPOXY INJECTION SYSTEMS

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 2-component, moisture-insensitive, 100 percent solids, low-viscosity epoxy 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 "General Concrete Surface Preparation."
 - 4. Division 02 Section "Surface Preparation for Patching and Overlay."

1.3 QUALITY ASSURANCE

- A. Testing Agency will be independent testing laboratory employed by Owner and approved by Engineer/Architect.
- B. Testing Agency is responsible for conducting, monitoring and reporting to Owner results of all field tests of epoxy injection and installation required under this Section with copy of all reports to Engineer and Contractor.
- C. Submit following information for Field Testing of Epoxy Injection Installation 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. Epoxy material supplier.
 - 5. Date of report.
 - 6. Testing Agency technician's name (sampling and testing).
 - 7. Placement location within structure.
 - 8. Epoxy material data:
 - a. Epoxy type.
 - b. Gel 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 epoxy.
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 epoxy in crack or void.
- D. Qualifications:
- 1. Contractor Qualifications: Contractor shall be qualified in the field of concrete repair and protection with a minimum of 5 years experience in application of similar systems and products on projects of similar size and scope.
 - a. Successful completion of a minimum of 3 projects of similar size and complexity to specified Work.
 - b. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
 - c. Install materials in accordance with all safety and weather conditions required by the manufacturer, or as modified by applicable rules and regulations of local, state, and federal authorities having jurisdiction.
 - 2. Manufacturer Qualifications: The manufacturer of the specified product shall be ISO 9001:2000 Certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis. The manufacturer shall have a minimum 15 years of experience in manufacturing of surface hardener.
- E. Pre-Construction Meetings: Conduct Pre-Construction meeting at Project site to comply with requirements of Division 01 and as specified in this Section.
- 1. Schedule and convene meeting a minimum of 1 week prior to commencing Work of this Section.
 - 2. Review requirements for application, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details, installation procedures, testing and inspection procedures, protection, and repair.
 - 3. Discuss procedures for protecting adjacent finished Work.

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.
 - 2. "Causes, Evaluation, and Repair of Cracks in Concrete Structures" (ACI 224.112), American Concrete Institute.
 - 3. "State-of-the-Art Report on Parking Structures" (ACI 362), American Concrete Institute.
 - 4. "Specification for Crack Repair by Epoxy Injection" (ACI 503.7), American Concrete Institute.
 - 5. "Guide for the Application of Epoxy and Latex Adhesives for Bonding Freshly Mixed and Hardened Concretes", (ACI 503.6), American Concrete Institute.
 - 6. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.
 - 7. "Guide for Repair of Concrete Bridge Superstructures" Reported by ACI Committee 546 (ACI 546.1).
- C. Contractor shall have following ACI/ICRI publications at Project construction site at all times:
 - 1. "Specification for Crack Repair by Epoxy Injection" (ACI 503.7), American Concrete Institute." Structural Crack Repair by Epoxy Injection", ACI RAP Bulletin 1, American Concrete Institute.
 - 2. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.

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 epoxy injection equipment.
- C. Testing Agency: Promptly report all test results to Engineer/Architect and Contractor. Include following information:
 - 1. See Article "Quality Assurance," paragraph "Submit following information for Field Testing..."
 - 2. Visual examination of epoxy 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 epoxy resin 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:
 - 1. Any adhesive or cohesive failure.
 - 2. Cracking or other weathering deficiency.
 - 3. Normal abrasion or tear failure.
- 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. Injection epoxy shall be one of following:
 - 1. "MasterInject 1380" or "MasterInject 1500" as manufactured by BASF Construction Chemicals., Shakopee, MN.
 - 2. "Sikadur 35 Hi-Mod LV" or "Sikadur 52" as manufactured by Sika Chemical Corporation, Lyndhurst, NJ.
 - 3. "Epoxy HP-LV" as manufactured by Hunt Process Corp-Southern, Ridgeland, MS.
 - 4. "Pro-Poxy 50 Super LV" as manufactured by Unitex, Kansas City, MO.
 - 5. "Eucopoxy" or "Duralcrete LV" as manufactured by The Euclid Chemical Company, Cleveland OH.
 - 6. "Sure Inject J56 SLV" as manufactured by Dayton Superior Corp., Miamisburg OH.
 - 7. "KonTek 11 LV" as manufactured by Contech Group, Inc. Seattle, WA.
 - 8. "Kemko 038" as manufactured by ChemCo Systems, Inc., Redwood City, CA.
- B. Epoxy gel shall be as specified by the selected injection epoxy manufacturer.
- C. Equipment:
 - 1. Epoxy injection unit shall be portable and equipped with positive displacement-type pumps with interlock to provide positive ration control of epoxy injection resin components. Pumps shall be air or electric powered and shall provide in-line mixing and metering system and shall be equipped with drain-back plugs.
 - 2. Equipment used to inject epoxy shall be capable of following:

- a. Automatic proportioning of materials within mix ratio tolerances set by epoxy resin manufacturer.
- b. Delivery of components, resin and hardeners, from separate reservoirs to mixing type discharge head.
- c. Complete and uniform mixing of components at discharge head.
- d. Injection of resin system at constant pressures not to exceed 150 psi.

PART 3 - EXECUTION

3.1 PREPARATION

A. Crack Identification:

1. All cracks 0.03 in. wide or greater that are designated by Engineer/Architect, and not coincident with principal delamination, shall be injected. Cracks that occur coincident with principal delaminations shall not be injected.
2. Cracks requiring repair shall be located by Contractor at time of construction and marked with chalk.

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 may be damp or dry as per injection material manufacturer's recommended installation procedures.
3. All cracks shall be properly sealed along their exposed length with an approved epoxy gel.
4. Epoxy injection ports shall be uniformly spaced along crack and shall be installed as recommended by system manufacturer. If concrete member being injected is exposed on both sides, provide injection ports on opposite sides at staggered intervals.
5. Apply epoxy gel around injection port to provide an adequate seal to prevent escape of injection resin from perimeter of port while under pressure.
6. Apply epoxy gel for sealing in manner that will result in minimal defacing or disorganization of concrete substrate.

3.2 INSTALLATION

A. Epoxy Injection:

1. Dispense epoxy injection resin under constant pressure in accordance with manufacturer's recommended procedures or as required to achieve maximum filling and penetration of crack without inclusion of air voids in epoxy resin material.
2. Injection shall begin at lowest port and progress incrementally higher.
3. Appearance of epoxy resin at next higher port shall be considered evidence of successful crack filling.

4. If penetration of epoxy resin into cracks is not possible, notify Engineer/Architect prior to discontinuing injection procedures. If alternate injection procedures are possible, submit procedure in writing to Engineer/Architect for review.
5. Contractor shall adhere to all limitations and cautions for epoxy resin injection material as per manufacturer's current printed literature.

B. Cleaning:

1. When cracks are completely filled, allow adhesive to cure for sufficient time to allow the removal of the surface seal without any draining or runback of epoxy material from the cracks.
2. Remove the surface seal material, ports, and injection adhesive runs or spills from concrete surfaces.
3. Finish the face of the crack flush to the adjacent concrete, removing any indentations or protrusions caused by the placement of entry ports.
4. Match work area to adjacent surface including any surface treatments.

3.3 FIELD QUALITY CONTROL BY TESTING AGENCY

A. Core Testing:

1. Testing Agency shall obtain 3- 2 in. minimum diameter core samples in first 100 ft of repaired cracks and 1 core for each 100 ft thereafter. Cores shall be taken after injection resin has cured for period of 7 days. Core sample shall be for full crack depth. Core locations and sizes shall be submitted to Engineer/Architect for review prior to taking core samples. Care should be taken not to damage or cut existing reinforcement (ESPECIALLY POST-TENSIONING TENDONS).
2. Core samples shall be visually examined to determine degree of epoxy penetration. Minimum of 90% of crack shall be full of epoxy adhesive.

B. Evaluation and Acceptance of Epoxy Injection:

1. Results of visual examination will be reviewed by Engineer/Architect for compliance with Article "Field Quality Control by Testing Agency," paragraph "Core Testing."
2. If results of initial cores fail by lack of penetration, work shall not proceed further until area represented by cores has been re-injected and re-tested for acceptance.
3. After cracks have been re-injected, additional cores shall be taken as directed by Engineer/Architect. Cores shall be tested for compliance with Article "Field Quality Control by Testing Agency," paragraph "Core Testing" by Owner's Testing Agency at Contractor's expense.
4. Core 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. Materials and procedures for filling testing core holes shall be submitted to Engineer/Architect for review prior to starting work.

C. Acceptance of Structure:

1. Acceptance of completed concrete injection work will be according to requirements of Article "Field Quality Control by Testing Agency," paragraph "Core Testing."
2. Grouted core holes shall be sounded by Engineer/Architect and Contractor with hammer or rod after curing for 48 hours.

END OF SECTION 03 63 00

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SECTION 07 18 00 – TRAFFIC COATINGS

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 following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
- B. This Section includes traffic coating: Fluid applied, waterproofing, traffic-bearing elastomeric membrane with integral wearing surface, where surface to which membrane is to be applied is one or more of following:
 - a. Incidental to floor repairs.
- C. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
- D. Related Sections: Following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section, "Cast-in-Place Concrete - Restoration."

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Distribute reviewed submittals to all others whose Work is related.
- B. Pre-installation Conference: Meet at project site well in advance of time scheduled for Work to proceed to review requirements for Work and conditions that could interfere with successful coating performance. Require every party concerned with coating Work or required to coordinate with it or protect it thereafter, to attend. Include manufacturer's technical representative and warranty officer.
- C. 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.
 - 2. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

- D. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data 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 cost of Engineer's services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.
- E. Requests For Information
1. Engineer reserves right to reject, unprocessed, any Request for Information (RFI) that Engineer, at its sole discretion, deems frivolous and/or deems already answered in the Contract Documents.
 2. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in Contract documents.

1.4 ACTION SUBMITTALS

- A. Product Data: For each system indicated, submit the following at least 60 days prior to application.
1. Product description, technical data, appropriate applications and limitations.
 2. Primer type and application rate
 3. Material, and wet mils required to obtain specified dry thickness for each coat.
 4. Type, gradation and aggregate loading required within each coat.
- B. Samples:
1. One 4 in. by 4 in. stepped sample showing each component for each system indicated.
- C. Sample Warranty: For each system indicated.

1.5 INFORMATION SUBMITTALS

- A. Certificates
1. Certification that products and installation comply with applicable federal, state where project is located, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
 2. Evidence of applicator's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
 3. Certification from Manufacturer that finishes as specified are acceptable for system to be installed at least 1 month before placement of any concrete which will receive traffic coating.

4. Certification stating static coefficient of friction meets minimum requirements of Americans with Disabilities Act (ADA).
5. Certification stating materials have been tested and listed for UL 790 Class "A" rated materials/system by UL for traffic coating application specified on project. Containers shall bear UL labels.
6. Certification from manufacturer confirming compatibility with existing underlying coatings and/or substrate.

B. Manufacturer's Instructions: for each system indicated.

1. Crack treatment and surface preparation method and acceptance criteria.
2. Method of application of each coat.
3. Maximum and minimum allowable times between coats.
4. Final cure time before resumption of parking and/or paint striping.
5. Any other special instructions required to ensure proper installation.

C. Field Quality Control:

1. Quality Control Plan as defined in Part 3.
2. Two copies each of manufacturer's technical representative's log for each visit.
3. Testing agency field reports.

D. Qualification Statements

1. Manufacturer's qualifications as defined in "Quality Assurance" article.
2. Installer's qualifications as defined in "Quality Assurance" article.
3. Signed statement from applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Three copies of System Maintenance Manual.
- B. Five copies of snow removal guidelines for areas covered by Warranty.
- C. Final executed Warranty.

1.7 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.
- C. Installer's Qualifications: Owner retains right to reject any manufacturer.
 - 1. Evidence of compliance with Summary article paragraph "A single installer. . ."
 - 2. Evidence that installer has successfully performed or has qualified staff who have successfully performed at least 5 verifiable years of installations similar to those involved in this Contract, and minimum 10 projects with submitted system.
 - 3. Listing of 5 or more installations in climate and size similar to this Project performed by installer's superintendent.
- D. Certifications
 - 1. Traffic coating shall satisfy current National Volatile Organic Compound (VOC) Emission Standards for Architectural Coatings.
 - 2. Licensing/certification document from manufacturer that confirms system installer is a licensed/certified applicator for the manufacturer and is legally licensed to perform work in Ohio.
 - 3. Licensing/certification agreement shall include following information:
 - a. Applicator's financial responsibility for warranty burden under agreement terms.
 - b. Manufacturer's financial responsibility for warranty burden under agreement terms.
 - c. Process for dispute settlement between manufacturer and applicator in case of system failures where cause is not evident or cannot be assigned.
 - d. Authorized signatures for both Applicator Company and Manufacturer.
 - e. Commencement date of agreement and expiration date (if applicable).

1.8 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.

1.9 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.

1.10 WARRANTY

- A. System Manufacturer New Application and Complete System Recoating: Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and applicator with regard to warranty requirements (Joint and Several). Warranty shall provide that 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. Spalling surfaces.
 3. Weathering.
 4. Surface crazing (does not apply to traffic coating protection course).
 5. Abrasion or tear failure resulting from normal traffic use.
 6. Failure to bridge cracks less than 0.0625 in. or cracks existing at time of traffic coating installation on double tees only.
- B. System Manufacturer Partial System Recoating: Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and applicator with regard to warranty requirements (Joint and Several). Warranty shall provide that system will be free of defects, chemical damage related to system design, workmanship or material deficiency, consisting of:
1. Any adhesive or cohesive failures.
 2. Spalling surfaces.
 3. Weathering.
 4. Surface crazing (does not apply to traffic coating protection course).
 5. Abrasion or tear failure resulting from normal traffic use.
- C. 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.
- D. Warranty period shall be a 5 year Joint and Several Warranty commencing with date of acceptance of work.
- E. Perform any repair under this warranty at no cost to Owner.
- F. Address following in terms of 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.
- G. 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. Advanced Polymer Technology (APT), Harmony, PA
 2. BASF Building Systems (BASF), Shakopee, MN
 3. Deneef Construction Chemicals (Deneef), Houston, TX.
 4. Lymtal International Inc. (Lymtal), Lake Orion, MI.
 5. Neogard Division of Jones-Blair Company (Neogard), Dallas, TX.
 6. Pacific Polymers, Inc. a Division of ITW (Pacific Polymers), Garden Grove, CA
 7. Poly-Carb Inc. (Poly-Carb), Twinsburg, OH.
 8. Polycoat Products Division of Amer. Polymers (Polycoat), Santa Fe Springs, CA.
 9. Pecora Corporation (Pecora), Harleysville, PA
 10. Sika Corporation (Sika), Lyndhurst, NJ.
 11. Technical Barrier Systems, Inc. (TBS), Oakville, Ontario.
 12. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, TRAFFIC COATING

- A. Acceptable low odor coatings are listed below. Coatings shall be compatible with all other materials in this Section and related work.
1. Heavy Duty:
 - a. Autogard HD-48, Autogard E, Neogard.
 - b. Elasto-Deck 5000-HT, Pacific Polymers.
 - c. Iso-Flex 750U-HL HVT/760U-HL HVT Deck Coating System, LymTal.
 - d. MasterSeal Traffic 1500, BASF.
 - e. Qualideck Heavy Vehicular (152/252/372/512), APT
 - f. Sikalastic 710/715, Sika.
 - g. Vulkem 350/950NF/951NF Deck Coating System, Tremco.
 - h. Pecora-Deck 800 Series.
 - i. Kelmar TE Exposure 3, TBS.
 - j. Flexodeck Mark 170.2 Solvent Free Heavy Duty, Poly-Carb.
 - k. Poly-I-Gard 246HD, Polycoat.
 2. VOC Compliant, **Extreme** Low Odor, High-Solids, Fast Cure, Heavy Duty Coating System:
 - a. AutoGard FC HD-48, Autogard E, Neogard.
 - b. Flexodeck Mark 170.2, Poly-Carb.
 - c. Iso-Flex 760 U HL AR and 760 U HL AL, Lymtal.
 - d. Kelmar FCW III, Exposure 3, TBS.
 - e. MasterSeal Traffic 2500, BASF.
 - f. Qualideck Heavy Vehicular (152/252/372/512), APT
 - g. Sikalastic 720/745 or 390/391/395, Sika.

- h. Vulkem 360NF/950NF and 951NF, Tremco.
3. Hybrid VOC Compliant, Extreme Low Odor, High-Solids, Heavy Duty Coating System:
- a. AutoGard E, Neogard.
 - b. Mark-170.2 Flexodeck II, Poly-Carb.
 - c. Iso-Flex 750EU HVT, Lymtal.
 - d. Kelmar FCW III, Exposure 3, TBS.
 - e. MasterSeal Traffic 2530, BASF.
 - f. Qualideck (152/252/532E/512), APT
 - g. Sikalastic 22 Lo-Mod Hybrid (720/22 LM/745 AL), Sika.
 - h. Vulkem EWS, Tremco
- B. Recoating Complete System: Provide complete traffic coating system with all components specified for new, heavy-duty applications, including all waterproofing and wearing courses.
- C. Recoating Partial System: Provide all wearing course components specified for new heavy-duty applications.
- D. Provide ultraviolet screening for all traffic coating placed on this project.
- E. Finish top coat shall be colored grey.
- F. Substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

2.3 MATERIALS, CRACK SEALER

- A. Repair for isolated random horizontal cracks 0.01 in. to 0.06 in. wide. Acceptable products:
- 1. Denedeck Crack Sealer, Deneef.
 - 2. Iso-Flex 609 Epoxy Crack Sealer, Lymtal.
 - 3. MasterSeal 630, BASF.
 - 4. Sikadur 55 SLV Epoxy Crack Healer/Sealer, Sika.
 - 5. SikaPronto 19TF, Sika.

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 surface preparation and application:
 - 1. Concrete surfaces are finished as acceptable for system to be installed. Correct all high points, ridges, and other defects in a manner acceptable to Engineer/Architect.
 - 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.
 - 4. Joint Sealants are compatible with traffic coatings.

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. Acid etching is prohibited.
- C. Remove all laitance and surface contaminants, including oil, grease and dirt as specified by manufacturer's written recommendations.
- D. Remove all debonded traffic coatings. Remove all laitance and surface contaminants, including oil, grease and dirt, by shotblasting and appropriate degreasers, or as specified by manufacturer's written recommendations to provide warranty.
- E. Before applying materials, apply system to small area to assure that it will adhere to substrate and joint sealants and dry properly and to evaluate appearance.
- F. All cracks on concrete surface shall be prepared in accordance with manufacturer's recommendations.
- G. All random cracks on concrete surface less than 0.03 in. wide and showing no evidence of water and/or salt water staining on ceiling below shall receive detail coat unless more complete treatment required in accordance with manufacturer's recommendations. Rout and seal random cracks, construction joints and control joints prior to installation of primer or base coat. Crack preparation including installation of joint sealant material, where required, is incidental to traffic coating work.
- H. Mask off adjoining surfaces not to receive traffic coating and mask off drains to prevent spillage and migration of liquid materials outside membrane area. Provide neat/straight lines at termination of traffic coating.

3.3 INSTALLATION/APPLICATION

- A. Installation should include all of the following steps:
 - 1. Surface Preparation: Prepare concrete for system application.
 - 2. Crack/Construction/Control/Cove Joint Sealing: Detail for crack bridging.

3. Primer Coat: Insure proper adhesion of membrane to substrate.
 4. Base Coat: Provide crack spanning in conjunction with Crack Detail noted above.
 5. Aggregate Coat – to hold aggregate in system, providing skid and wear close up resistance.
 6. Aggregate: Correct size, shape, hardness and amount necessary to insure proper skid and wear resistance.
 7. Top Coat: Lock aggregate into place, provide a maintainable surface and provide resistance to ponding water, UV degradation, color loss and chemical intrusion.
- B. Do all Work in accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), coverages, mil thicknesses and texture, and as shown on Drawings.
- C. A primer coat is required for all systems. No exception.
- D. Do not apply traffic coating material until concrete has been air dried at temperatures at or above 40°F for at least 30 days after curing period specified.
- 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.
- F. All adjacent vertical surfaces shall be coated with traffic coating minimum of 4 in. above coated horizontal surface. Requirement includes, but is not limited to pipes, columns, walls, curbs (full height of vertical faces of all curbs) and islands.
- G. Complete all Work under this Section before painting line stripes.
- H. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturers.

3.4 FIELD QUALITY CONTROL

- A. Develop a quality control plan for assured specified uniform membrane thickness that utilizes grid system of sufficiently small size to designate coverage area of not more than 5 gallons at specified thickness. In addition, employ wet mil gauge to continuously monitor thickness during application. Average specified wet mil thickness shall be maintained within grid during application with minimum thickness of not less than 80% of average acceptable thickness. Immediately apply more material to any area not maintaining these standards.

END OF SECTION 07 18 00

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SECTION 26 05 00 - COMMON WORK RESULTS FOR ELECTRICAL

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 and the other Sections of Division 26.
- B. References.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products".
 - 2. ANSI/NFPA 70:
 - a. "National Electrical Code (NEC)", latest edition.
 - 3. National Fire Protection Association (NFPA).
 - 4. Federal Specification (FS).
 - 5. ANSI/IEEE C.2:
 - a. "National Electrical Safety Code (NESC)", latest edition.
 - 6. Underwriters' Laboratories, Inc. (UL).
 - 7. Insulated Cable Engineers Association, Inc. (ICEA).
 - 8. National Electrical Manufacturers Association (NEMA).

1.2 SUMMARY

- A. This Section includes limited scope general construction materials and methods for application with electrical installations as follows:
 - 1. Submittals.
 - 2. Coordination/Scheduling/Temporary Power/Quality Assurance
 - 3. Record documents.
 - 4. Maintenance manuals.
 - 5. Rough-ins.
 - 6. Electrical installations.
 - 7. Cutting and patching.
 - 8. Testing/Demonstration/Guarantee
 - 9. Conduit.
 - 10. Encasement for Underground Conduit.
 - 11. Conductors (under 600V).

12. Wiring Devices.
13. Electrical Boxes & Fittings.
14. Equipment Supports Sleeves and Guards.
15. Miscellaneous Metals.
16. Joint Sealers.

B. Related Sections: Following Sections contain requirements that relate to this Section:

1. The remainder of Division 26, plus general related specifications including:
 - a. Access to electrical installations.
 - b. Excavation for electrical installations within the building boundaries and from building to utility connections.

1.3 DEFINITIONS

A. Hazardous Areas:

1. Open parking structures used for parking and storage are not classified as hazardous by National Electrical Code, ANSI/NFPA 70, Article 511.
2. Term "Contractor" used throughout Division 26 shall mean Electrical Subcontractor.
3. Term "provide" shall mean to furnish all necessary labor, materials, equipment, accessories, transportation, services, installation and adjustment under Contract amount, including Contractor's profit, overhead and payment of all taxes and fees.

1.4 SUBMITTALS

A. General: Submit the information specified in accordance with Conditions of Contract and Division 01 Specification Sections.

B. Catalog sheets with notation of proposed materials. Include:

1. Conduit, fittings and supports.
2. Boxes.

C. Substitutions

1. Products are referenced in Specification and Drawings to establish standard of quality, style, design, and function of materials, equipment, apparatus, or product.
2. There are often several satisfactory substitutes for standardized utilitarian items which satisfy design objectives.
3. Since it is impractical to name all possible brands that might be furnished, substitutes may be proposed unless specifically stated otherwise.
4. Submit substitutions in accordance with Division 01 and General Conditions of Specification and as follows:

- a. Submit proposed substitute material or equipment to be considered for approval as equivalent to Engineer/Architect at least 7 days before time set for receiving Bids.
- b. Provide IES photometric reports on MS-WINDOWS floppy disk for substitute lighting fixtures.
- c. Contractor shall assume all costs for engineering studies required to evaluate substitute material or equipment.
- d. Contractor assumes all engineering and construction costs necessary for revision in Work due to substitute material or equipment.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel".
 1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

- A. Conditions Affecting Selective Demolition: Following project conditions apply:
 1. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

1.7 COORDINATION/SCHEDULING/TEMPORARY POWER/CODES AND STANDARDS

- A. Coordination
 1. Visit site before Bidding to note apparent features which may affect Work. No subsequent allowance will be made because of failure to make examination before Bidding.
 2. Check conditions in actual Project against Drawings for all dimensions door swings, ceiling heights or other features affecting electrical Work.
 3. Verify all dimensions in field before ordering any material or doing any Work.
 4. No extra compensation will be allowed because of differences between actual measurements and dimensions and those indicated on Drawings.
 5. Notify Engineer/Architect in writing of any differences which may be found before proceeding with Work.
- B. Scheduling
 1. Schedule Work so as not to delay other Contractors.

2. Before starting Work, prepare and submit to Prime Contractor schedule of operations outlining proposed order of procedure, giving dates of execution and estimated time required for completion of each step.
3. Coordinate shut-off and disconnection of electrical service with the Owner and the utility company.
4. After schedule has been accepted by Prime Contractor and Engineer/Architect, do not deviate from schedule without written consent of Prime Contractor.
5. No subsequent extras will be allowed for materials and labor not included by Bidder for electrical Work due to lack of familiarity with Contract Documents as they relate to Work of all other trades required for Project.

C. Temporary Power

1. Provide temporary electric service as defined in Division 01 Section "Temporary Facilities and Controls".

D. Codes and Standards:

1. Comply with:
 - a. State electrical administration and local inspection department recognized by state as having jurisdiction.
 - b. Requirements of state and federal Occupational Safety and Health Acts.
 - c. Latest edition of "National Electrical Code", ANSI/NFPA 70.
 - d. Latest edition of "National Electrical Safety Code", ANSI C2.
 - e. Underwriters Laboratories (UL).
 - f. National Electrical Manufacturers' Association (NEMA).
 - g. Institute of Electrical and Electronics Engineers (IEEE).
 - h. Illumination Engineering Society (IES).
 - i. National Fire Protection Association (NFPA).
 - j. International Building Code (IBC):
 - 1) IBC International Building Code.
 - 2) IBC International Mechanical Code.
 - 3) IBC International Plumbing Code.
 - 4) IBC International Fire Prevention Code.

1.8 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01 Section "Closeout Procedures". In addition to the requirements specified in Division 01, indicate installed conditions for:
1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.
 2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.

- B. Engage services of a land surveyor or professional engineer registered in the state in which the project is located as specified in Division 01 Section "Execution Requirements" to record locations and invert elevations of underground installations.

1.9 MAINTENANCE MANUALS

- A. Prepare maintenance manuals in accordance with Division 01 Section "Closeout Procedures". In addition to requirements specified in Division 01, include the following information for equipment items:
 - 1. Description of function, normal operating characteristics and limitations, performance curves, engineering data and tests, and complete nomenclature and commercial numbers of replacement parts.
 - 2. Manufacturer's printed operating procedures to include start-up, break-in, and routine and normal operating instructions; regulation, control, stopping, shutdown, and emergency instructions; and summer and winter operating instructions.
 - 3. Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.
 - 4. Servicing instructions and lubrication charts and schedules.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to the project properly identified with names, model numbers, types, grades, compliance labels, and other information needed for identification.
- B. Deliver materials to project in good condition. Store materials off ground and protected from elements.
- C. Identify distribution equipment, contactors, control stations, and other devices with permanent, engraved nameplates attached with screws proportional to size of equipment stating name of item and system of which it is part.

1.11 SEQUENCE AND SCHEDULING

- A. Coordinate shut-off and disconnection of electrical service with the Owner and the utility company.

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide:
 - 1. Materials that are new and listed by Underwriters' Laboratories, Inc., bearing their label.

2. Materials suitable for environment and exposure
3. Weatherproof or raintight outdoor equipment.

B. Conform with:

1. National Electrical Code (ANSI/NFPA 70).
2. All state and local codes.
3. National Electrical Manufacturers Association (NEMA).
4. American National Standards Institute (ANSI).
5. National Fire Protection Association, Inc. (NFPA).
6. Insulated Cable Engineers Association, Inc. (ICEA).
7. Underwriters' Laboratories, Inc. (UL).
8. Institute of Electrical and Electronic Engineers (IEEE).

2.2 CONDUIT

- A. Exposed: Rigid hot-dipped galvanized steel with threaded fittings. (EMT conduit shall not be used in any location.)

1. Acceptable Manufacturers:

- a. Allied Tube & Conduit Corp.
- b. Western Tube & Conduit Corp.
- c. Wheatland Tube Co.

2. Acceptable Manufacturers:

- a. Carlon.
- b. Condux International, Inc.
- c. Certainteed Products Corp.
- d. Thomas & Betts.

- B. At building expansion joints provide at exposed conduit runs only:

1. O.Z. Gedney Type AX Expansion Fittings.

2.3 CONDUCTORS (UNDER 600 V)

- A. Use copper wire, sized as indicated on the drawings or per NEC when not indicated with No. 10 AWG being minimum allowable power conductor size. Control wiring shall not be less than No. 12 AWG unless otherwise indicated on Drawings.
- B. No. 10 AWG and No. 12 AWG; provide solid wire, No. 8 AWG and larger; provide stranded wire.
- C. Conductor Insulation: THWN
- D. Conductors in fluorescent fixture channels: "THHN"

- E. Insulation types of better quality or ratings may be used with Engineer/Architect's approval.
- F. Include green colored grounding conductors, sized as indicated on Drawings or per NEC 250 when not indicated, but no smaller than #10, in conduits to provide electrical grounding continuity to all boxes, devices, and outlets.
- G. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

<u>208Y/120 Volts</u>	<u>Phase</u>	<u>480Y/277Volts</u>
Black	A	Brown
Red	B	Orange
Blue	C	Yellow
White	Neutral	Natural Gray
Green	Ground	Green

Phasing at terminals shall be A-B-C, from front to back, top to bottom, or left to right as viewed from the front.

- H. The phase rotation of all normal power, generator power, and UPS systems must be aligned. Reduced size neutral conductors are not permitted.

2.4 WIRING DEVICES:

- A. Wiring devices shall be specification grade with rugged plastic housing and brown in color.
- B. All receptacles will be Ground Fault Circuit Interruptor (GFCI) Type.
- C. Switches shall be heavy duty, AC quiet type, toggle handle, 20 amp, 120-277 volts, Hubbell No. 1221.
- D. Device plates shall be Hubbell (302/304) brushed stainless steel in enclosed finished areas, hot-dip galvanized steel in enclosed unfinished areas and weather proof type cast metal in other areas or approved equivalents.
- E. Fractional Horsepower Manual Starters with thermal overloads (Square "D" Class 2510 or approved equivalent) shall be used to protect all equipment with fractional horsepower motors not controlled from magnetic starter.

2.5 ELECTRICAL BOXES AND FITTINGS:

- A. Outlet, device, pull and junction boxes, conduit bodies and fittings shall be sized per NEC Article 370. All conduit connections shall be threaded.
- B. Surface boxes and covers: (Aluminum boxes are not acceptable)
 - 1. Weatherproof hot-dip galvanized cast metal or malleable iron with threaded fittings.

2. Weatherproof zinc electroplated cast metal or malleable iron with threaded fittings.
- C. Boxes for other areas and uses: Gasketed screw cover boxes, 14 or 12 gage, G-90 grade galvanized bodies, 12 or 10 gage G-90 grade galvanized steel covers, NEMA 3R GSC with threaded hubs.

2.6 MATERIAL AND EQUIPMENT SUPPORTS, SLEEVES, AND GUARDS:

- A. Provide supports, foundations, stands, platforms, anchor bolts, and other necessary material required to install electrical equipment and systems. When anchor bolts for lighting poles, or other fasteners, are embedded in structure as it is being erected, provide templates and coordinate installation. Anchor bolts and baseplates shall be hot-dip galvanized in accordance with ASTM A153. Bond 1 anchor bolt to structural rebar.
- B. Provide hot-dipped galvanized steel sleeves in walls and floors for passage of exposed conduit. Make sleeves watertight and extend sleeves through floors 6 in. above finished floor. Caulk space between conduit and sleeve.
- C. Provide approved, hot-dipped galvanized steel guards around junction boxes, conduits, and equipment which may be exposed to vehicle damage.

2.7 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.
- B. Cold-Formed Steel Tubing: ASTM A 500.
- C. Hot-Rolled Steel Tubing: ASTM A 501.
- D. Steel Pipe: ASTM A 53, Schedule 40, welded.
- E. Nonshrink, Nonmetallic Grout: Premixed, factory-packages, nonstaining, noncorrosive, nongaseous grout, recommended for interior and exterior applications.
- F. Fasteners and Anchors: Hot dipped galvanized or stainless steel, type, grade, and class as required. Mounting holes for all fasteners must be drilled. The use of powder, gas, or other types of power propelled fasteners is prohibited.

2.8 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application as specified in Division 07 "Joint Sealants".
- B. Colors: As selected by Engineer/Architect from manufacturer's standard colors.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting installation and application of joint sealers and access panels. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 ROUGH-IN

- A. Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

3.3 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Maintain competent superintendent at site throughout progress of Work until work completed.
 - 2. Use only skilled workers experienced in electrical construction.
 - 3. Coordinate electrical systems, equipment, and materials installation with other building components so as not to delay contractors.
 - 4. Verify all dimensions by field measurements.
 - 5. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 6. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
 - 7. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 8. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 9. Install systems, materials, and equipment to conform with approved submittal data to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to Engineer/Architect.
 - 10. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 - 11. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - 12. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.

13. Provide and install or arrange for installation of anchors supports, support frames, light pole anchor bolts, and other items required for installation of materials or equipment specified under this Division.
14. Review location of all electrical conduit with Engineer/Architect before construction.
15. Cooperate with others to locate electrical conduit out of public view.
16. After equipment suppliers are selected and exact power requirements known, Contractor shall verify that all components of power supply system are sized properly per NEC and any other governing codes. If any component of power supply system is found to be too small, Contractor shall increase component size to meet codes.
17. In case interferences between Work develop, Engineer/Architect will decide which Work is to be relocated regardless of which was first installed.

3.4 CONDUIT INSTALLATION

- A. Conduit shall be sized to provide maximum 40% fill per NEC with 3/4 in. being minimum allowable size. Use large radius sweeps in all bends.
- B. In parking areas and unfinished equipment storage/utility rooms, run conduit under slab on grade or exposed unless otherwise indicated. Coordinate location with Engineer/Architect.
- C. Terminate conduits at all outlets and switches in suitable outlet boxes. Where 2 or more compatible devices are set side by side, set in gang boxes.
- D. Coordinate with Engineer/Architect to locate exposed conduit runs. All exposed conduit shall be run square with building except where specifically noted otherwise on Drawings.
- E. Securely fasten exposed conduits to ceiling or walls with 1 hole malleable iron hot-dip galvanized pipe straps and clamp backs at 8 ft on center maximum. Provide nest backs or other spacers or extensions as required to achieve proper mounting heights. Using blockouts or other structural members as a source of support is prohibited.
- F. Close all unused open knockouts.
- G. Take precautions to prevent water, dirt, concrete, or other material from entering conduit and junction boxes.
- H. Coring and drilling of walls and beams to conceal conduit and risers are responsibility of this Contractor. Slots in double tees are by precaster. Verify exact locations of penetrations with Engineer/Architect before coring and drilling. Seal all such openings in accordance with Division 07 “Joint Sealants”.
- I. Use seal tight flexible conduit in lengths not greater than 2 ft to connect motors, transformers, and for whips connecting trunnion mounted fixtures to junction boxes. Do not install flexible conduit at other locations without written approval of Engineer.
- J. Conduit containing emergency circuits shall not contain any other type of circuit.

- K. Box covers located less than 8 ft above the floor shall be equipped with tamperproof screws.
- L. All empty conduits shall be labeled at termination points.
- M. Any conduit that is cut, scratched or threaded shall be coated with a zinc rich coating (ZRC or approved equivalent) at these locations.
- N. All conduit connections must be threaded. All conduit connections to panels, boxes, fixtures and other equipment must be made with gasketed threaded hubs.

3.5 ELECTRICAL BOXES AND FITTINGS INSTALLATION:

- A. Replace existing corroded boxes and conduit.
- B. Close unused openings in all boxes in accordance with NEC.
- C. All boxes and enclosures for emergency circuits shall be marked so they will be readily identified as component of emergency circuit.

3.6 TESTING/ DEMONSTRATION/GUARANTEEE

- A. Testing:
 - 1. Provide installation free from any faults or grounds and in operating condition.
 - 2. Provide all equipment necessary to make tests.
 - 3. Test all completed electrical systems and components for proper operation.
 - 4. Test motors for proper rotation.
 - 5. If faults or grounds are present, correct problem and retest system.
- B. Demonstration:
 - 1. After the Electrical Contractor states that the structure is ready to be checked by the Engineer/Architect for the electrical punchlist, the Electrical Contractor shall arrange for the Electrical superintendent to demonstrate the proper operation of all electrical components and systems to the Engineer/Architect. If it is discovered that any component or system does not operate properly the Electrical Contractor must pay all costs associated with return trips required to verify proper operation by the Engineer/Architect.
- C. Guarantee:
 - 1. Leave entire electrical system in proper working order.
 - 2. Provide Owner guarantee that all material, equipment and wiring furnished and installed are free from all electrical and mechanical defects for 1-yr period from date of acceptance of work.
 - 3. Make good any defects which become apparent within that 1-yr guarantee period without expense to Owner.

4. Provide Owner with any other guarantees extended by manufacturers of equipment furnished and installed in Project.

END OF SECTION 26 05 00

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Columbus Metropolitan Library Standard Contract Terms and Conditions

Contract Components, Entirety, Changes Interpretation

Contract Components: This contract consists of this document, the Standard Contract Terms and Conditions, the Special Contract Terms and Conditions (if any), the specifications or scope of work (SOW), and any written amendments to this document, valid Columbus Metropolitan Library (CML) purchase orders or other ordering documents (together referred to as the "Contract").

Entire Agreement; Parties to the Contract: This contract is the entire agreement between the individual or entity selected to provide equipment, supplies and/or services on the basis of a SOW submitted to CML in response to a request (referred to as the Contractor in these Terms and Conditions) and Columbus Metropolitan Library (CML).

Contract Changes: Waivers, Changes or Modifications to this Contract must be made in writing and signed by both parties. If a party to this Contract does not demand strict performance of any item of this Contract, the party has not waived or relinquished any of its rights; the party may at any later time demand strict and complete performance of the term.

Contract Orders: CML will order supplies or services under this Contract from the Contractor directly. The Contractor may receive purchase orders by telephone, facsimile, electronically or in person by authorized employees of CML. The Contractor is not required to fill an order date more than 30 days beyond the date of Contract expiration, termination or cancellation, unless the Contract provides for a quarterly delivery or quarterly service. Under a Contract that provides for quarterly delivery, the Contractor is not required to fill an order with a delivery date of more than 90 days beyond the date of Contract expiration, termination or cancellation.

Standard Invoice and Payment

Invoice: The Contractor shall submit invoices to accountspayable@columbuslibrary.org. The invoice must be a proper invoice to receive consideration for payment. A "proper Invoice" is defined as being free of defects, discrepancies, errors or other improprieties. Improper invoices will be returned to the Contractor noting the areas of discrepancy.

Payment: In consideration for the Contractor's performance, CML will pay the Contractor at the rate specified in the contract. *Payments will be made by electronic funds transfer (EFT).* For all transactions, the Contractor must have a valid W9 form on file with the Finance Department.

The completed form should be mailed to: Finance Department, Columbus Metropolitan Library, 96 South Grant Avenue, Columbus, Ohio 43215.

Payment Due Date: CML will pay invoices 30 days after it has received an invoice for supplies and services it has received and accepted, unless otherwise indicated herein.

Taxes: Columbus Metropolitan Library is exempt for all federal, state and local taxes as CML is part of Franklin County Government and has a 501 nonprofit status.

Term of Contract: This contract is effective upon the projected beginning date of the Contract Cover Page or upon signature of CML by the Fiscal Officer, whichever comes later in time. This Contract will remain in effect until the Contract is fully performed by both parties or cancelled in accordance with the Terms found herein.

Contract Renewal: This contract may be renewed solely at the discretion of CML for a period of one month. Any further renewals will be by agreement of both parties, any number of times for any period of time. The cumulative time of all renewals may not exceed two years.

Delivery

F.O. B. The Place of Destination: The Contractor must provide the supplies or services under this Contract F.O.B., the place of delivery/destination, unless otherwise stated. The address of delivery will be specified by the purchase order or other ordering document. Freight will be prepaid unless otherwise stated.

Time of Delivery: If the Contractor is not able to deliver the supplies or services on the date and time specified by CML ordering department on the ordering document, the Contractor must coordinate an acceptable date and time for delivery. If the Contractor is not able to, or does not, provide the supplies or services to an ordering department by the time and date agreed upon, CML may obtain any remedy provided below or any other remedy at law.

Minimum Orders-Transportation Charges: For purchase orders placed that are less than the stated minimum order, the transportation will be prepaid and added to the invoice by the Contractor to the delivery location designated in the ordering documents. Shipment is to be made by private or commercial freight service, airmail, water, parcel post, express or commercial package delivery, whichever is the most economical and expeditious method for proper delivery of the item. Failure of the Contractor to utilize the most economical mode of transportation shall result in the Contractor reimbursing CML the difference between the most economical mode of transportation and the mode of transportation used by the contractor. Failure to reimburse CML shall be considered a default.

Contract Cancellation; Termination; Remedies

Contract Cancellation: If a Contractor fails to perform any one of its obligations under this Contract, it will be in default, and CML may cancel this Contract in accordance with this section. The cancellation will be effective on the date delineated by CML.

- A. **Contract Performance is Substantially Endangered:** If the Contractor's default is substantial and cannot be cured within a reasonable time, or if CML determines that the performance of the contract is substantially endangered through no fault of CML, CML may cancel this Contract by written notice to the Contractor.
- B. **Cancellation by Unremedied Default:** If a Contractor's default may be cured with a reasonable time, CML will provide written notice to the Contractor specifying the default and the time within which the Contractor must correct the default. If Contractor fails to cure its default in the time required, CML may cancel this Contract by providing written notice to the Contractor. If CML does not give timely notice of default to Contractor, CML has not waived any of its rights or remedies concerning the default.

- C. Cancellation by Persistent Default: CML may cancel this Contract by written notice to Contractor for defaults that are cured but persistent. "Persistent" means three or more defaults. After CML has notified Contractor of its third default, CML may cancel this Contract without providing Contractor with an opportunity to cure, if the Contractor defaults a fourth time. CML shall provide written notice of the termination to the Contractor.
- D. Cancellation for Financial Instability: CML may cancel this Contract by written notice if Contractor does not pay its subcontractors and material suppliers within 10 days of payment to the Contractor by CML. To the extent permitted by law, CML may cancel this Contract by written notice to Contractor if a petition in bankruptcy or similar proceedings has been filed by or against the Contractor.

Contract Termination: CML may terminate this Contract for convenience after issuing 30 days written notice to the Contractor.

Remedies for Default:

- A. Actual Damages. The Contractor is liable to CML for all actual and direct damages caused by the Contractor's default. CML may buy substitute supplies or services, from a third party, for those that were to be provided by the Contractor, and CML may recover the costs associated with acquiring substitute supplies or service, less any expenses or costs saved by the Contractor's default, from the Contractor.
- B. Deduction of Damages for Contract Price. CML may deduct all or any part of the damages resulting from Contractor's default from any part of the price still due on the Contract, after CML has provided prior written notice to Contractor of such default and intent to deduct damages from the Contract Price.

Force Majeure: If CML or Contractor is unable to perform any part of its obligation under this Contract by reason of force majeure, the party is excused from its obligations, to the extent that its performance is prevented by force majeure, for the duration of the event. The party must remedy with all reasonable dispatch the cause preventing it from carrying out its obligations under this Contract. The term "force majeure" means without limitation: Acts of God, such as epidemics, lightning, earthquakes, fires, storms, hurricanes, tornadoes, floods, washouts, droughts, and any other severe weather; explosions; arrests; restraint of government and people; strikes; and any other like events or any other cause that could not be reasonable foreseen in the exercise of ordinary care, and that is beyond the reasonable control of the party.

CML Consent to Assign or Delegate: The Contractor may not assign any of its rights under this contract unless CML consents to the assignment or delegation in writing. Any purported assignment or delegation made without CML's written consent is void.

Indemnification: Contractor will indemnify CML, its employees, members of the Board of Trustees, and its Officers and administrators for any and all claims, damages, lawsuits, costs, judgments, expenses, liabilities that may arise out of, or are related to, the Contractor's performance under this Contract, including the performance by Contractor's employees and agents and any individual or entity for which the Contractor is responsible.

Confidentiality: Contractor may learn of information, documents, data, records and other material that is confidential in the performance of this Contract. Contractor may not disclose any information obtained by it as a result of the Contract without written permission from CML. Contractor must assume that all CML information, documents, data, records or other material is confidential.

Publicity: Contractor and any of its subcontractors may not use or refer to this Contract to promote or solicit Contractor's or subcontractor's supplies or services. Contractor and its subcontractors may not disseminate information regarding this Contract, unless agreed to in writing by CML.

Governing Laws; Severability: The Laws of the State of Ohio govern this Contract, and venue for any dispute will be exclusively with the appropriate court of competent jurisdiction in Franklin County, Ohio. If any provision of the Contract or the application of any provision is held by a court of competent jurisdiction to be contrary to law, the remaining provisions of the Contract will remain in full force and effect to the extent that the remaining provisions continue to make sense.

Workers Compensation: The Contractor shall carry Workers' Compensation Liability Insurance as required by Ohio law for any work to be performed within the State of Ohio. Failure to maintain Workers Compensation Liability Insurance for the duration of the contract and any renewal hereto will be considered a default.

Automobile and General Liability Requirements: During the term of the Contract and any renewal hereto, the Contractor, and any agent of the Contractor, at its sole cost and expense, shall maintain a policy of automobile liability and commercial general liability insurance as described in this clause. Copies of the respective insurance certificates shall be filed with the Procurement Department within seven (7) calendar days after notification by the CML of its selection of the Contractor to provide the specified supplies and/or services. Failure to submit the insurance certificates within the time period may result in the Contractor being considered in default. Said certificates are subject to the approval of the CML Procurement Manager and shall contain a clause or endorsement providing thirty (30) days prior written notice of cancellation, non-renewal or decrease in coverage will be given to the Procurement Manager. Failure of the Contractor to maintain this coverage for the duration of the Contract, and any renewals, thereto may be considered a default.

Automobile Liability: Automobile Insurance is required for anyone coming onto CML branches and/or property to deliver goods or perform services using a vehicle, which is owned, leased, hired, or rented by the Contractor. Any Contractor, broker, or subcontractor who will be on CML property, but not delivering goods or performing services, is required to carry Automobile Liability Insurance that complies with the state and federal laws regarding financial responsibility. Automobile liability insurance, including hired, owned, and non-owned vehicles used in connection with the Work, shall have a combined single limit coverage covering personal injury, bodily injury (including death) and property damage of not less than \$2,000,000 per accident.

Commercial General Liability: Insurance coverage with a \$2,000,000 annual aggregate and \$1,000,000 per occurrence limit for bodily injury, personal injury, wrongful death and property damage. The defense cost shall be outside of the policy limits. Such policy shall designate CML as an Additional Insured, as its interest may appear. The policy shall also be endorsed to include a blanket waiver of subrogation. The certificate shall be endorsed to reflect a per project/per location General Aggregate limit of \$2,000,000. If the Contractor uses an umbrella/excess policy to meet the required limits, it is understood that the policy shall follow from per project/per location basis. It is agreed upon that the Contractor's commercial general liability insurance shall be primary over any other coverage. The Procurement Department reserves the right to approve all policy deductibles and levels of self-insurance retention

Contract Compliance: The participating CML branches and departments will be responsible for the administration of the Contract and will monitor the Contractor's performance and compliance with the terms, conditions and specifications of the Contract. If a branch or department observes any infraction such shall be documented and conveyed to the Contractor for immediate correction. If the Contractor fails to rectify the infraction, the department/branch will notify the Procurement Department in order to resolve the issues. These terms and conditions will be used by the Procurement Department to resolve the issues

Warranties: Unless otherwise stated, all supplies shall be new and unused. All products shall carry manufacturer's warranties in addition to implied warranties. The Contractor warrants all supplies to be free from defects in labor, material, and workmanship (manufacturing) and be in compliance with the contract specifications.

ADDITIONAL TERMS:

1. This Contract represents the entire agreement of the parties hereto, and may not be amended except in writing signed by both parties.
2. All times referenced herein are Columbus, Ohio local times.
3. *CML is not responsible for any work or services provided by Contractor prior to the issuance of a P.O. by CML.*
4. Contractor will supply its own tools and materials.
5. Contractor will make arrangements for EFT (electronic funds transfer).
6. A completed W9 form is required on file with CML prior to CML issuing payment for services provided by Contractor. The W9 form can be found at <http://www.irs.gov/pub/irs-pdf/fw9.pdf>. Please fill out the form and return with the signed contract to the Procurement Department of the Columbus Metropolitan Library at 96 S. Grant Avenue, Columbus, OH 43215 or email: procurement@columbuslibrary.org.

Appendix A
Main Garage Restoration: CML #22-026
Bid Price Form

The Bid Price Form can be found as a separate link located under the link to this ITB on the CML website page "*Doing Business With Us*"

Appendix B
Main Garage Restoration: CML #22-026
Drawings

The Drawings can be found as a separate link located under the link to this ITB on the CML website page "*Doing Business With Us*"

Appendix C
Main Garage Restoration: CML #22-026
Bidder's Diversity & Inclusion Participation Form

A completed Bidder's Diversity & Inclusion Participation Form or documentation of good faith efforts must accompany the completed Form of Bid or Bid Form.

_____ ("Bidder") submits the following information regarding its levels of MBE/WBE Participation:

List all MBE/WBE subcontractors and suppliers, with contract amounts, that Bidder will use for its work on the Project. (Continue list on additional sheets of paper if necessary.)

Name of Subcontractor / Supplier	MBE or WBE	Subcontract Amount
1.		\$
2.		\$
3.		\$
4.		\$
A. TOTAL AMOUNT OF MBE/WBE SUBCONTRACTS		\$
PROPOSED TOTAL		\$
B. PERCENTAGE OF DIVERSITY PARTICIPATION* (A ÷ B x 100)		%

The Bidder's commitment of total workforce hours for Minority Workforce participation on the project is: _____%.

The Bidder's commitment of total workforce hours for Women Workforce participation on the project is: _____%.

I certify under penalty of perjury that the forgoing and/or attached statements and information are true and correct. The undersigned will immediately notify the Owner in the event that any of the information provided in this Diversity & Inclusion Participation Form changes in any material way.

By: _____ Date: _____

Print Name and Title: _____

***If the Bidder does not indicate that it has achieved the Diversity & Inclusion Participation Goal set forth in the Instructions to Bidders, the Bidder must attach to this Form, a narrative, including exhibits, demonstrating and certifying that good faith efforts, as set forth in the Instructions to Bidders, were actively and aggressively undertaken by the Bidder, to reach such goals.**

Appendix D
Main Garage Restoration: CML #22-026
Acknowledgement of Addenda

Project Description: Main Garage Restoration

Instructions: The respondent is to complete Part I or Part II of this form, whichever is applicable, and sign and date this form. This form serves as the respondent's acknowledgment of the receipt of the Addenda to this solicitation which may have been issued by the CML prior to the Bid Due Date and Time.

Part I: Check Box if Applicable:

Listed below are the dates of issue for each Addendum received in connection with this solicitation.

Addendum # 1, dated: ____/____/____ Addendum # 2, dated: ____/____/____

Addendum # 3, dated: ____/____/____ Addendum # 4, dated: ____/____/____

Addendum # 5, dated: ____/____/____ Addendum # 6, dated: ____/____/____

Part II: Check Box if Applicable: NO ADDENDUM WAS RECEIVED IN CONNECTION WITH THIS COMPETITIVE SEALED BID.

NOTE: THE BIDDER MUST SIGN AND COMPLETE THIS FORM

Company Name: _____

Authorized Representative:

Name: _____

Signature: _____

Title: _____

Date: _____