# TECHNICAL SPECIFICATIONS
# 2014/15 Concrete and Waterproofing Repairs

**U.S. CELLULAR FIELD**
**CHICAGO, ILLINOIS**

**September 15, 2014**

**Guaranteed Rate Field**
**Concrete Bed and Radial Joint Repairs FY24-FY25 - June 01, 2023**
Technical Specifications dated September 15, 2014, apply to **Radial Joint** repairs at 100, and 300 Levels.
See Concrete Bed and Radial Joint Repairs FY24-FY25 Status Diagrams for Impacted Areas.


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**TECHNICAL SPECIFICATIONS**

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# DIVISION 1

# GENERAL REQUIREMENTS

# SECTION 01 00 00

# SUMMARY OF WORK

## PART 1 GENERAL

### 1.1 WORK INCLUDED UNDER THE CONTRACT

A. The Work of this Contract is comprised of a Lump Sum Base Bid with unit prices for work beyond the lump sum scope.

B. Contractor's duties:
   1. Except as specifically noted, provide and pay for:
      a. Labor, materials and equipment
      b. Tools, construction equipment and machinery
      c. Water and electricity required for construction beyond the existing utilities in place. The Contractor may make use of existing lights.
      d. Other facilities and services necessary for the proper execution and completion of the Work.
   2. Secure and pay for, as necessary for the proper execution and completion of the Work, and as applicable at the time of receipt of the bids:
      a. Permits, including Building Permits
      b. Government fees
      c. Licenses
   3. Give required notices.
   4. Comply with codes, ordinances, rules, regulations, orders and other legal requirements of public authorities which bear on the performance of the Work.
   5. Enforce strict discipline and good order among employees. Do not employ on the Work unfit persons or persons not skilled in their assigned tasks.

### 1.2 PRECONSTRUCTION MEETING

A. General: Prior to the start of construction, the Contractor shall meet with the Engineer and the Owner to coordinate the Construction Schedule and to discuss other requirements which may be of concern to any of the parties involved; conditions mutually agreed upon at this meeting may be incorporated into the Contract. When the time and place of the conference is set, the Engineer will notify all interested parties; any party wishing to place a subject on the agenda for the meeting shall notify the Engineer not less than 24 hours prior to time set.

B. Attendance is required of the following:
   1. Contractor's Superintendent and Project Manger
   2. Engineer
   3. Subcontractors
   4. Others, as appropriate

C. Engineer will:

1. Preside and conduct meeting
2. Record, reproduce, and distribute copies of minutes within seven days of meeting to all meeting participants.

D. Agenda shall include:
1. Communications chain and persons authorized to direct changes.
2. The Work
3. Major subcontractors and tentative construction schedule
4. Work sequence, phasing, and occupancy
5. Contractor use of premises
    a. Office and storage areas.
    b. Owner's requirements.
6. Special project procedures
7. Procedures and processing
    a. Application for payment
    b. Modification proposal requests
    c. Change orders
    d. Request for Information (RFI)
    e. Field decisions
    f. Submittals
    g. Other
8. Record Documents
9. Construction facilities, controls, and construction aids
10. Temporary utilities
11. Security procedures
12. Safety and first-aid procedures
13. Housekeeping procedures
14. Utility shutdowns
15. Parking
16. Other

## 1.3 PROGRESS MEETINGS

A. Contractor's Duties: The Contractor shall perform the following duties:
1. General: Schedule and administer construction progress meetings, called meetings, and pre-installation conferences, throughout the progress of the Work.
2. Make physical arrangements, prepare agenda, and distribute notice of each meeting to participants, including the Engineer, Engineer's representative, Engineers/consultants, and Owner four days in advance of meeting date.
3. Preside at meetings, record minutes, and distribute copies within two days after meeting to participants.

B. Location of Meetings: As mutually agreed between Owner, Contractor and Engineer.

C. Attendance: Owner, Engineer, Contractor and job superintendent. Subcontractors, suppliers and consultants to attend as appropriate to agenda.

D. Minimum Agenda:
1. Approval of previous meeting minutes.
2. Review of work progress.
3. Field observations, problems, and decisions.
4. Review of submittals schedule and status of submittals.

5. Review of off-site fabrication and delivery schedules.
6. Maintenance of quality and work standards.

## 1.4 CONTRACTOR USE OF PREMISES

A. Confine operations at the Project Site to areas permitted by:
   1. Law
   2. Ordinance
   3. Permits
   4. Contract Documents

B. Do not unreasonably encumber the Project Site with materials or equipment.

C. The Contractor shall keep corridors, stairways, driveways, walks, parking lot, fire lanes, entrances and exit ways clear and unencumbered at all times.

D. All systems (electrical, mechanical, smoke detection, plumbing, etc.) in the building are to be kept in operation at all times, except when specific permission is made with the Owner to do required Work at a time most convenient to the occupants. This procedure may involve working at night, on Saturday or Sunday, with the length of time of the interruption agreed upon in advance.

E. Take all precautions to protect the building, its occupants, and the public during the construction period.

F. Contractor shall protect the Owner's property and the Work from damage, and shall protect existing finishes, and equipment from damage by Contractor's employees and subcontractors. The Contractor shall repair, restore and replace damaged property and Work as required by the Owner.

G. Assume full responsibility for the protection and safekeeping of products stored on the premises. Construction equipment, shoring, tools, etc., shall not be stored in areas of the Owner’s continued use.

H. Move any stored products which interfere with the operations of the Owner.

I. Obtain and pay for the use of additional storage or work areas needed for operations.

## PART 2 PRODUCTS

**REFER TO SPECIFIC TECHNICAL SPECIFICATIONS.**

## PART 3 EXECUTION

**REFER TO SPECIFIC TECHNICAL SPECIFICATIONS.**

**END OF SECTION**

# SECTION 01 30 00

# SUBMITTALS

## PART 1 GENERAL

### 1.1 SUMMARY

A. General administrative and procedural requirements for submittals required for performance of the Work.

### 1.2 TIMING OF SUBMITTALS

A. Submit all data and information required by the Contract Documents to the Engineer allowing ample time for his review, checking for conformance with the design concept, and approval, in any event allowing not less than 15 working days from date of receipt.

### 1.3 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

A. General: Except as otherwise specified, submit required shop, layout and setting drawings, product data and samples in accordance with requirements of the General Conditions.

B. Contractor's Review of Submittals: Contractor shall review and approve all submittals before forwarding for Engineer's review.
   1. The Contractor's mark or stamp of approval shall constitute representation that he has, at a minimum, satisfied the review requirements of the General Conditions and shall, in effect, so state. The Contractor's stamp of receipt will not be acceptable for this purpose.
   2. Submittals which have clearly not been reviewed by the Contractor will not be checked and will be returned to the Contractor for completion of his review. No claim for delay due to Contractor's failure in this regard will be accepted.
   3. Any deviation from the Contract Documents shall be clearly identified in the submittal.

C. Engineer's Review of Submittals: The Engineer will review Contractor's submittals for conformance with the design concept and requirements of the Contract Documents in accordance with the General Conditions and will approve or take other appropriate action as indicated by his stamp on the returned submittal.

D. Any item which has been "Approved" or "Approved as Noted" and which is subsequently revised by the Contractor beyond noted corrections shall be resubmitted for review and approval.

E. Partial Submittals: Submittals which are partial or contain only a portion of the data required to describe the item or installation will be rejected unless such partial submittal is coordinated with the Engineer prior to submission, and final approval of all such items will be withheld pending receipt of all required information.

F. Resubmittal: Major deviations from design concepts or from the requirements of the Contract Documents will require complete resubmittal. If resubmittal is required, correct and resubmit in the same form as before.

G. Shop Drawings: Process and submit required shop drawings required by the technical specifications.
   1. Contractor's Review: Check and verify field measurements, and coordination requirements, and incorporate on drawings. Where items portrayed are to connect to or interface with other elements of the structure, drawings shall specifically show such connections or interfaces and the materials involved.
   2. Engineer's Review: The Engineer will review for conformance with design concept and requirements of the Contract Documents only and will mark corrections and comments on the transparency and return it to the Contractor. Reproducible and copies will be returned except for copies retained by the Engineer and Owner for use in coordination and administration of the Contract. Distribute copies of the approved submittal as required for the execution of the Work.

H. Product Data: Product data, where required by the Technical Specifications, shall be in the form of catalog cuts, performance characteristics, and/or other descriptive data sufficient for verification of compliance with requirements of the Contract Documents.
   1. Form and Content of Submittal: Of the submitted copies, a minimum of two (2) shall be original printed copies. Photocopies ("Xerox") will be rejected if not fully legible (photos, illustrations, graphs, screened data must be easily read).
      a. Manufacturer's standard drawings and other data shall be modified to delete inapplicable information or supplemented to furnish additional information specifically applicable to the Work.
      b. Catalog sheets, brochures, diagrams, schedules, performance charts and descriptions, illustrations and other standard descriptive data shall be clearly marked to identify pertinent materials, products, and models and shall include dimensions and clearances required. Product data which is not clearly marked to indicate inapplicable options will be rejected.
   2. Engineer's Review: The Engineer will review for conformance with design concept and requirements of the Contract Documents and will return one copy to the Contractor for revision or distribution as required.

I. Samples: Where required by the technical specifications, submit physical examples to illustrate materials, equipment or workmanship and to establish standards by which the Work will be judged.
   1. Form of Submittal: Submit samples in duplicate; sizes, types and requirements as specified in the Technical Specification and in as nearly the form in which the material will appear in the Work as practicable, unless otherwise noted. Samples shall show functional characteristics of product or material with integrally related parts and attachment devices, as applicable, and shall show proposed colors and textures or other finishes.
   2. Engineer's Review: The Engineer will review the submitted samples for compliance with requirements of the Contract Documents and compare them with file samples where applicable; will make final selection of colors and finishes, and will approve sample for application on the Work. Samples not in accordance with requirements will be returned to the Contractor for resubmittal in conformance with requirements.
   3. Disposition of Approved Samples: If approved, sample will be returned to the Contractor as a standard for approval of the completed work, two samples will be retained by the Engineer and Owner for project files.
      a. Where permitted by the technical specifications, approved samples may be incorporated into the Work. In such instances, all samples will be returned. Note location of incorporated samples on project record documents prior to installation of sample unit.

## PART 2 PRODUCTS - NOT APPLICABLE

## PART 3 EXECUTION - NOT APPLICABLE

**END OF SECTION**

## SECTION 01 50 00

## CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

### PART 1 GENERAL

### 1.1 SUMMARY

A. Provide temporary construction, equipment, power and convenience utilities for use, convenience and safety of personnel engaged in the Work of the contract.

### 1.2 QUALITY ASURANCE

A. Materials: Construct temporary facilities on site using only new materials, unless otherwise approved by Engineer; make connections of utility lines and services in approved manner and in accordance with Code requirements.

B. Installation: Immediately after receipt of the Notice to Proceed, provide temporary services, utilities and construction for use and convenience of those engaged in the Work of the Project.

### 1.3 TEMPORARY UTILITIES

A. Electrical Service: Provide fixtures, wiring, and equipment, and make connections required for temporary electrical service during the construction period; coordinate power and lighting requirements with the Owner.

B. First Aid Facilities: Furnish personnel trained and certified in first aid. Provide first aid kits on site; types and quantities as required.

C. Temporary Fire Protection: Provide temporary fire protection as required. Provide minimum of one portable fire extinguisher at each work location.

### 1.4 GUARDRAILS AND BARRICADES

A. Guardrails: Provide guardrails as necessary.

B. Barricades: Provide barricades as may be directed or required for public protection.

### 1.5 SECURITY

A. Equipment and materials: It is the Contractor's responsibility to furnish security as required for the protection of his equipment and materials.

### 1.6 PARKING AREAS

A. Parking: To be designated by Owner.

### 1.7 CONSTRUCTION SITE CONTROL

A. General: Confine construction operations and storage to area of site as indicated or as directed; maintain in neat, orderly fashion until completion.

B. Materials and Equipment: Store all equipment and materials neatly when not in use or until installed on the Work in areas set aside for storage; protect from damage.

C. Trash and Debris Removal: Remove all trash and debris resulting from the Contractor's work from site daily; dispose of at Contractor's expense. Do not allow debris, broken or open cartons, or other refuse to collect in or around the project. At completion of the Work, remove waste materials, rubbish, tools, equipment, machinery, surplus materials.

## PART 2 PRODUCTS - NOT APPLICABLE.

## PART 3 EXECUTION - NOT APPLICABLE.

**END OF SECTION**

# DIVISION 2

# SITE WORK

# SECTION 02 21 20

# REMOVAL OF EXISTING CONCRETE AND SURFACE PREPARATION

## PART 1 GENERAL

### 1.1 WORK INCLUDED

A. This work shall consist of providing the necessary labor, materials, equipment and supervision for the removal of unsound concrete or unsound previous repairs, examination of all exposed reinforcing steel bars, sandblasting of existing reinforcing steel, selected replacement of deteriorated reinforcing steel with new reinforcing steel, and the cleaning of the newly exposed underlying sound concrete.

### 1.2 RELATED WORK

A. Section 01 00 00: Summary of Work

B. Section 03 60 30: Epoxied-in Anchors and Coating Existing Reinforcing Bars with Epoxy

### 1.3 PAYMENT

A. The Work of this Section shall be on a lump sum basis in accordance with the Contractor's bid.

## PART 2 PRODUCTS

### 2.1 EQUIPMENT

A. Power chipping hammers of nominal 15-lb class or less for removal of concrete.

B. Sandblasting equipment capable of removing all rust from the exposed reinforcement, and laitance from exposed concrete surfaces after chipping. This will require equipment capable of maintaining at least 100 psi.

C. Compressed air equipment capable of removal of dust and dirt from concrete repair areas, and exposed concrete surfaces.

## PART 3 EXECUTION

### 3.1 CONCRETE REMOVAL

A. Areas which require removal of unsound concrete will be identified and marked by the Architect/Engineer. Unsound concrete shall be removed to sound concrete.

B. Remove concrete in an area extending a minimum of 3/4 in. beyond the outer boundary mark of unsound concrete. The shape of each patch shall not be irregular. Angles between adjacent saw cuts around the perimeter of the patch shall not be less than 90 degrees, in any case. Edges

shall be saw cut on a beveled plane, with the base of the cut slanted outward away from the center of the patch.

C. During the concrete removal (chipping) process, care shall be exercised to avoid cracking of the underlying sound concrete.

D. During the removal of unsound concrete, if more than half of a reinforcing bar circumference is exposed, or if the bar is not firmly bonded to the surrounding concrete, then the remaining concrete around the bar shall be removed. The clearance between the bar and the concrete shall be a minimum of 3/4 in., measured radially from the surface of the bar.

E. The newly exposed sound concrete shall be cleaned by blowing away loose material with a sandblast, followed by cleaning with a compressed air jet. The saw cut edges around the perimeter of the patch area should be thoroughly sandblasted.

F. The Architect/Engineer shall be allowed a minimum of 24 hours for the inspection of properly prepared concrete surfaces and reinforcement, before the scheduled concrete placement.

G. If more than 48 hours has elapsed since the patch area was sandblasted and cleaned with high pressure compressed air at the point in time when the patch material is to be replaced, then the patch area must be blown clean again with high pressure compressed air immediately prior to placement of the patch material.

## 3.2 REINFORCEMENT CLEANING AND/OR REPLACEMENT

A. Exposed reinforcing shall be thoroughly cleaned by sandblasting to remove all rust and unsound concrete.

B. Reinforcing bars that are damaged or that have lost more than 20 percent of their original cross-sectional area at any point shall be brought to the attention of the Architect/Engineer for inspection. The Architect/Engineer will determine if the bars should be removed and replaced, or if supplemental reinforcing bars should be added.

C. Where portions of reinforcing bars are exposed, the Architect/Engineer will determine if the embedded portion of the bar is soundly bonded to the remaining concrete. If, in the Architect/Engineer's judgment, the bar is not soundly bonded, the Contractor shall remove concrete around and under the bar for a length as determined by the Architect/Engineer.

D. If during removal of unsound concrete, the Contractor encounters existing reinforcing with less than 2 in. cover from the existing concrete surface he shall notify the Architect/Engineer before repairs are implemented. A decision can then be made by the Architect/Engineer on whether to remove or modify that reinforcing, or to build out the patch over the bar(s) to provide additional cover. The Contractor shall at no time remove existing reinforcing steel without the prior approval of the Architect/Engineer.

## 3.3 CLEAN-UP

A. The Contractor shall be responsible for the safe removal of all loose concrete from the building, and for proper and legal disposal of that loose concrete, off site.

B. All areas of the building and the surrounding site shall be left broom clean and the end of each working day.

**END OF SECTION**

# DIVISION 3

# CONCRETE

# SECTION 03 01 34

# CONCRETE PATCHING

## PART 1 GENERAL

### 1.1 SUMMARY

A. This work shall consist of providing the necessary labor, materials, equipment and supervision to place, cure and finish polymer-modified concrete and patching mortar which is placed over properly prepared existing concrete surfaces in repair areas. This section refers to horizontal, vertical, and shallow underside concrete repairs.

### 1.2 RELATED WORK

A. Section 02 42 00 - Removal of Existing Concrete and Surface Preparation

B. Section 03 60 30 - Epoxied-In Anchors and Field Coating of Reinforcing Bars

### 1.3 STANDARDS

A. American Society for Testing and Materials
   1. Specification for Concrete Aggregates (ASTM C33)
   2. Standard Method of Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (ASTM C42)
   3. Standard Test Method for Slump of Portland Cement Concrete (ASTM C143)
   4. Specification for Portland Cement (ASTM C150)
   5. Test for Air Content of Freshly Mixed Concrete by the Pressure Method (ASTM C231)
   6. Specification for Chemical Admixtures for Concrete (ASTM C494)
   7. Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction (ASTM E329)

B. American Concrete Institute
   1. Recommended Practice for Selecting Proportions for Normal and Heavyweight Concrete, ACI Committee 211 (ACI 211.1)
   2. Specification for Structural Concrete in Buildings (ACI 301)
   3. Recommended Practice for Hot Weather Concreting (ACI 305R)
   4. Recommended Practice for Cold Weather Concreting (ACI 306R)
   5. Building Code Requirements for Reinforced Concrete (ACI 318)

### 1.4 SUBMITTALS

A. Submit reports of concrete tests at the end of each day's testing, in accordance with Section 01 45 23, and as described in this section.

B. Submit a list of all proposed materials and material sources for the polymer-modified concrete and the patching mortar to the Architect/Engineer at the start of the job, as detailed in subsection 2.5, of this section of the Specifications.

## 1.5 UNIT PRICES

A. The Contractor shall submit unit prices as required on the Bid Proposal Form.

B. For the portion of work to be performed on a unit price basis, quantities shall be measured.

## 1.6 WARRANTY

A. All concrete repairs shall be guaranteed for a period of three years after the completion of the Contract Work against all surface defects, delamination of the patch material from the substrate concrete, delamination within the patch material itself, and patch deterioration.

## 1.7 MOCKUPS

A. All work procedures and materials shall be demonstrated in mockups for review and approval prior to beginning any production work. Mock-ups shall match color, appearance, and texture of existing precast concrete.

B. Contractor shall make field samples and mock-ups for all methods and materials to be used in concrete patching for review prior the pre-installation conference.

C. Adjust or repeat installation until mockup meets with Owner's approval.

# PART 2 PRODUCTS

## 2.1 CONCRETE TYPES, STRENGTHS, AND USES

A. The strength indicated is 28-day design compressive strength.
   1. Polymer-modified concrete, 5,000 psi, concrete for large concrete patches
   2. Patching mortar, 5,000 psi, mortar for small patches (approximately 1-1/2 in. in depth and relatively small in plan area)

## 2.2 MATERIALS

A. Portland Cement, ASTM C150, Type I. Convertible Portland Cements and Portland Cement Type III are not permitted.

B. Calcium chloride shall not be permitted as an additive in the polymer-modified concrete or in the patching mortar or in any admixture.

C. Fine and coarse aggregate shall be clean and conform to the requirements of ASTM C33, 4S.

D. Water shall be potable and free from substances known to be harmful to Portland Cement.

## 2.3 POLYMER-MODIFIED CONCRETE MIX DESIGN

A. The primary requirements for the polymer-modified concrete are the compressive strength as specified herein; workability that facilitates placement and the achievement of the desired finish; and proper finishing and curing practices to ensure achievement of a low permeability.

B. The entrained air content shall be no more than 6.5 percent, as measured according to ASTM C231. No air-entraining agent shall be added to the mix. Defoaming agent shall be used to control air content.

C. Water/cement ratio (including water in the latex emulsion and the aggregate) shall not exceed 0.40.

D. Pre-packaged mixes may be used in lieu of site mixing. Form Flo P-38, as manufactured by J.E. Tomes or approved equal. Contractor shall submit data sheets for approval prior to use.

## 2.4 PATCHING MORTAR MIX DESIGN

A. The primary requirements for the patching mortar mix are a minimum compressive strength as specified herein, and workability that facilitates placement and achievement of the desired finish.

B. The patching mortar shall not be installed in layers, and shall not be installed in depths exceeding 1-1/2 inches.

C. MasterEmaco N 400 as manufactured by BASF Corporation Construction Systems or approved equal.

## 2.5 TESTING OF POLYMER-MODIFIED CONCRETE MIX DESIGNS

A. The contractor shall submit a list of all proposed materials, and material sources, to the Architect/Engineer at the initiation of the project. The following data shall be submitted to the Architect/Engineer:
   1. Sieve analysis for the fine and coarse aggregate
   2. Proposed mixing methods
   3. Mill certificates from the cement supplier
   4. List of materials and sources

B. At least (3) weeks prior to the start of concrete placement the Contractor shall manufacture four (4) separately mixed test batches of concrete under job conditions, in quantities large enough to accommodate production of the following samples and tests:
   1. Four sets of 4 in. x 8 in. test cylinders for use in determining compressive strength of the concrete
   2. Two slump test
   3. Two air content tests

C. All samples and tests will be conducted by the Architect/Engineer or the Owner's testing agency. The Contractor is responsible for providing the labor and materials to manufacture the concrete for the samples, and for disposal and cleanup of surplus materials.

D. The Owner and the Architect/Engineer reserve the right to request production of additional test batches of polymer-modified concrete if the material produced does not comply with these Specifications.

## 2.6 TESTING OF PATCHING MORTAR MIX DESIGNS

A. The Contractor shall notify the Architect/Engineer at least four (4) weeks in advance of the start of placement of patching mortar, in writing, of the type of patching mortar proposed for use on the project. The following data shall be submitted to the Architect/Engineer at that time.
   1. List of material sources
   2. Proposed mixing methods

B. At least (3) weeks prior to the start of placement of patching mortar, the Contractor shall manufacture four (4) separately mixed test batches of patching mortar under job conditions in quantities large enough to accommodate the following samples and tests:
   1. Eight, 2 in. cube specimens, for testing to determine compressive strength of the mortar, in accordance with ASTM C109, "Standard Test Method for Compressive Strength of Hydraulic Cement Mortars."

# PART 3 EXECUTION

## 3.1 BATCHING AND MIXING

A. All batching and mixing operations shall be performed in a manner such that quality control is guaranteed, accurate mix proportions are maintained and all ingredients are combined and mixed to a uniform consistency.

B. Mix components shall be measured and partially combined in a controlled environment prior to final mixing and placing at the repair location.

C. No polymer-modified concrete or patching mortar shall be placed at surface and ambient temperatures lower than 40 degrees F, or when the temperature is projected to fall below 40 degrees F in the 24 hours following placement.

D. At temperatures above 85 degrees F, the Architect/Engineer may require placements to be made at night or early morning hours, if in his opinion a satisfactory placement is not being achieved during normal working hours.

E. Water may be added to the polymer-modified concrete to obtain slump within the prescribed limits. Concrete with a slump less than 3 in. may be rejected if it is not placed satisfactorily, with a closed tight surface. Retempering of concrete is not permitted.

## 3.1 SURFACE PREPARATION

A. Surface preparation shall be in accordance with Section 02 21 00, Removal of Existing Concrete and Surface Preparation.

## 3.2 PLACING AND FINISHING CONCRETE

A. Before placing concrete, all equipment for mixing and transporting concrete shall be cleaned. Vibrators shall be checked for workability. All frost, ice, mud, debris, and water shall be

removed from equipment. Forms shall be thoroughly wetted. Reinforcement shall be securely tied in place and thoroughly cleaned of ice and other coatings which may destroy or reduce bonding with concrete. No concrete shall be placed until the Architect/Engineer has observed the forms and condition and placement of reinforcement. Conveying the concrete from mixer to place of deposit shall not cause separation or loss of materials.

B. Placing of concrete shall be such that it shall be deposited as nearly as possible in its final position to avoid segregation due to rehandling or flowing. Placing shall be at such a rate that at all times concrete shall be plastic and flow readily into corners of forms and into spaces between rebars. No concrete that has partially hardened or that has been contaminated by foreign materials shall be deposited. When being deposited, concrete shall not be allowed to fall a vertical distance greater than 2 ft. from point of discharge to point of deposit. Internal vibrators shall be used, as appropriate, to ensure that proper consolidation of the concrete is achieved.

C. Placement of the polymer-modified concrete shall be a continuous operation at each patch location. Materials sufficient to complete a patch shall be available prior to commencing a repair.

D. For areas where new concrete will be cast against existing concrete surfaces, wet the existing surface one hour prior to placement but do not allow puddles to form. At time of placement of concrete, existing concrete surfaces shall be in a saturated, surface dry condition.

E. The concrete shall be continuously rodded or vibrated during placement to consolidate the pour and fill all corners of the patch. External vibration of the formwork may also be used (or be used in lieu of internal vibration), by placing the internal vibrators against the wood forms for short periods of time.

## 3.3 CONCRETE PROTECTION AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Maintain concrete above 55 degree F and in a moist condition for at least 7 days after placing.

B. Unformed Top Surfaces: Begin curing immediately after finishing concrete. Use a moisture-retaining cover, as follows:
   1. Cover concrete surfaces with a moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches.
   2. Seal sides and ends of cover by holding them down with soil, concrete pieces, or some other weight, or by using waterproof tape or adhesive.
   3. Immediately repair any holes or tears in cover during curing period using cover material and waterproof tape.
   4. Re-wet concrete surface at least twice daily or as necessary to maintain moist concrete surface.

C. Protect concrete from falling below 55 deg F with insulating blankets or enclosures with heaters.

## 3.4 FIELD QUALITY CONTROL

A. At the time of the first field placement of concrete and mortar, and at least four appropriate intervals as directed by the Architect/Engineer, four standard 4 in. x 8 in. cylinders will be made, cured and tested in accordance with ACI 301, except as noted herein.

B. All cylinders shall be tested by a qualified approved testing laboratory which meets the requirements of ASTM E329, and their reports sent to the Architect/Engineer and the Contractor. Costs for these tests will be paid for by the Owner. The Contractor or Testing Lab will be responsible for making these cylinders and for seeing that they are transmitted to a testing laboratory. The Contractor shall provide the necessary concrete to make the cylinders.

C. All four cylinders shall be cured under field conditions for one day. The cylinders shall then be transported to the testing agency laboratory and cured in air at 73 degrees F, 50 percent relative humidity. Two cylinders shall be tested for compressive strength at seven days and two at 28 days. One cylinder shall be stored for potential future testing.

D. For each set of cylinders made, a slump and air content test shall also be made. The temperature of the concrete shall be taken at the same time cylinders are made. Slump tests shall be made in accordance with ASTM C143. Air content tests shall be made in accordance with ASTM C231.

E. Testing of cylinders shall be in accordance with ASTM C39, and shall be conducted by the Owner's testing agency. Each test report shall contain the following information for each set of cylinders:
   1. Individual test specimen strength, type of failure
   2. Slump
   3. Air content
   4. Concrete and air temperature
   5. Specimen number
   6. Portion of structure represented by the concrete tested
   7. Date cast
   8. Date tested
   1. Concrete properties specified
   2. Notice if tests indicate concrete is not in conformance with Specifications

F. Strength shall be considered satisfactory if the average of the two 28-day tests meets or exceeds 5,000 psi, and neither of the 28-day tests is below 4,500 psi.

G. Coring
   1. If tests results are not in conformance with Specifications, the Contractor shall take 2-in. diameter core samples from completed patches. This additional testing of the concrete mortar will be performed under the direction of the Architect/Engineer. The cost of these additional tests will be borne by the Contractor.

H. Hammer tap concrete patches to verify their soundness. Remove and recast any unsound patch areas at Contractor’s expense.

**END OF SECTION**

## SECTION 03 21 16

## EPOXY-COATED REINFORCING STEEL

# PART 1 GENERAL

## 1.1 SUMMARY

A. Section Includes: Supply, fabrication, and installation of new epoxy-coated reinforcement.

B. Related Sections:
   1. Section 02 21 00 - Removal of Existing Concrete and Surface Preparation
   2. Section 03 30 00 - Cast-in-Place Concrete.

## 1.2 REFERENCES

A. Reference Standards: Latest edition as of Specification date.
   1. American Society for Testing and Materials (ASTM) International:
      a. A82: Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
      b. A185: Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
      c. A615: Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
      d. A775: Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
      e. A884: Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.
      f. D3963: Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars.
   2. Concrete Reinforcing Steel Institute (CRSI):
      a. Manual of Standard Practice.

## 1.3 SUBMITTALS

A. Test Reports:
   1. Mill test reports for steel reinforcement, including adequate information on chemical and physical properties to demonstrate conformance with ASTM A615.

B. Samples: Submit samples of plastic-coated tie wire devices proposed for use on this Project.

C. Certificates:
   1. Coating application plant certification.
   2. Material, coating process, and coating properties certification.

## 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle reinforcement to prevent bending and damage.

B. Store reinforcement and accessories off ground and floors on platforms, skids, cribbing, or other supports.

C. Avoid damaging reinforcing coating. Use padded or nonmetallic slings and straps when transporting. Handle bundled and individual bars in manner which will prevent excessive sagging of bars that may damage coating. Do not drop or drag bundled or individual bars. Do not expose to moisture. If, in the opinion of the Engineer, coated bars have been extensively damaged, bars will be rejected.

## PART 2 PRODUCTS

### 2.1 MATERIALS

A. Reinforcing steel: All reinforcing steel shall be Grade 60 as defined in ASTM A615, epoxy coated.

B. Welded Wire Fabric Reinforcing:
   1. As-drawn plain steel wire: ASTM A82, 65,000 pounds per square inch minimum yield strength; epoxy-coated.
   2. Fabric: ASTM A185, flat sheets of orthogonal plain wires welded at wire-to-wire intersections.
   3. Mesh and wire sizes as shown on Drawings.
   4. Epoxy Coating: ASTM A884.
      a. Coating material: Powdered epoxy resin conforming to ASTM A884.
      b. Fusion-bonded protective coating of powdered epoxy resin applied by electrostatic spray method or electrostatic fluidized-bed method, to form uniform, smooth film with thickness after curing of at least 7, measured in accordance with ASTM A884.
      c. Coated reinforcing shall be free of slivers, visible holes, voids, contamination, cracks, and other defects, with less than 1 percent of coating damaged in given length of bar.
      d. Continuity and flexibility of coating shall be checked in accordance with ASTM A884 and shall meet requirements described therein.
      e. Repair Material: Liquid, two-part, epoxy repair coating; conforming with and ASTM A884; compatible with and suitable for repairing damaged epoxy coating; inert in concrete; supplied by epoxy resin manufacturer.

C. Epoxy Coating: ASTM A775.
      a. Coating material: Powdered epoxy resin conforming to ASTM A775.
      b. Fusion-bonded protective coating of powdered epoxy resin applied by electrostatic spray method or electrostatic fluidized-bed method, to form uniform, smooth film with thickness 7 to 12 mils for bar sizes Nos. 3 to 5, measured in accordance with ASTM A775. Thickness requirements for other bar sizes are in accordance with ASTM A775.
      c. Coated reinforcing shall be free of slivers, visible holes, voids, contamination, cracks, and other defects, with less than 1 percent of coating damaged in given length of bar.
      d. Continuity and flexibility of coating shall be checked in accordance with ASTM A775 and shall meet requirements described therein.
      e. Repair Material: Liquid, two-part, epoxy repair coating; conforming with ASTM A775; compatible with and suitable for repairing damaged epoxy coating; inert in concrete; supplied by epoxy resin manufacturer.

## 2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars in place. Support welded wire fabric with slab bolsters.
   1. Bar supports shall be manufactured from steel wire, plastic, or precast concrete in accordance with "Bar Support Specifications and Standard Nomenclature" in CRSI Manual of Standard Practice.
   2. Metal chairs and supports shall be coated with epoxy, plastic, or other inert dielectric polymer coating.

B. Tie Wire: ASTM A82; 16 gauge; plastic-coated.

## 2.3 FABRICATION

A. Fabricate and detail steel reinforcement to shapes and dimensions shown on Drawings, in accordance with and within fabricating tolerances shown in CRSI Manual of Standard Practice.

B. Bends and hooks shall conform to standard hook dimensions in CRSI Manual of Standard Practice unless otherwise shown on Drawings.

C. Do not bent or straightened reinforcing bars in manner that will injure coating. Reduce rate of bending as necessary to minimize cracking or debonding of coating.
   1. Remove debonded coating and promptly patch areas with visible cracking or debonded coating after bending. Hairline cracks, 0.003 inches or less in width, at base of deformation do not need to be patched and will not be cause for rejection.

# PART 3 EXECUTION

## 3.1 PLACING REINFORCEMENT

A. General: Comply with CRSI Manual of Standard Practice and Drawings for placement of reinforcement.

B. Bar spacing, concrete cover, and bar splices shall conform to Drawings and CRSI Manual of Standard Practice.

C. Accurately position, support, and secure reinforcement to prevent displacement during concrete placement. Locate and support reinforcement with bar supports to maintain specified minimum concrete cover. Wire dowels securely in place before depositing concrete.

D. Place welded wire fabric in conformance with CRSI Manual of Standard Practice.
   1. Place welded wire fabric in longest practicable lengths on bar supports spaced to minimize sagging.
   2. Lap edges and ends of adjoining sheets at least one and a half mesh spaces. Offset laps of adjoining sheets to prevent continuous laps in either direction. Lace overlaps with wire.

E. Place reinforcement continuous between expansion and control joints. Stop reinforcement at expansion joints.

F. Bend tie wires and turn ends toward inside of concrete section, away from exposed concrete surfaces.

G. During concrete placement, protect reinforcement from damage from transporting or pumping equipment with runways or other means.

H. Before placing concrete, clean reinforcement of loose rust and mill scale, earth, ice, dust, and other foreign materials that would reduce bond to concrete.

## 3.2 PATCHING OF DAMAGED EPOXY COATING

A. Promptly patch sheared ends, areas of coating damage, and contact areas for hangers or couplers in conformance with ASTM D3963 and resin manufacturer's recommendations, before detrimental oxidation occurs.
   1. Areas to be patched shall be clean and free of rust and other surface contaminants.

**END OF SECTION**

## SECTION 03 30 00

## CAST-IN-PLACE CONCRETE

# PART 1 GENERAL

## 1.1 DESCRIPTION

A. The Work of this Section includes furnishing, placing, finishing and curing the portland cement concrete slab-on-grade.

B. Related work specified elsewhere:
   1. Section 02 21 00: Removal of Existing Concrete and Surface Preparation

## 1.2 REFERENCE STANDARDS

A. The most recent edition of standard shall apply.

B. American Concrete Institute (ACI)
   1. Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete (ACI 211.1)
   2. Specification for Structural Concrete (ACI 301)
   3. Guide for Concrete Floor and Slab Construction (ACI 302.1R)
   4. Guide for Measuring, Mixing, Transporting, and Placing Concrete (ACI 304R)
   5. Recommended Practice for Hot Weather Concreting (ACI 305R)
   6. Recommended Practice for Cold Weather Concreting (ACI 306R)
   7. Building Code Requirements for Structural Concrete (ACI 318)

C. American Society for Testing and Materials
   1. Standard Practice for Making and Curing Concrete Test Specimens in the Field (ASTM C31/C31M)
   2. Specification for Concrete Aggregates (ASTM C33)
   3. Test Method for Compressive Strength of Cylindrical Concrete Specimens (ASTM C39)
   4. Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete (ASTM C42)
   5. Specification for Ready-Mixed Concrete (ASTM C94)
   6. Test Method for Slump of Hydraulic Cement Concrete (ASTM C143)
   7. Specification for Portland Cement (ASTM C150)
   8. Specification for Sheet Materials for Curing Concrete (ASTM C171)
   9. Standard Practice for Sampling Freshly Mixed Concrete (ASTM C172)
   10. Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method (ASTM C231)
   11. Specification for Air-Entraining Admixtures for Concrete (ASTM C260)
   12. Specification for Liquid Membrane-Forming Compounds for Curing Concrete (ASTM C309)
   13. Specification for Chemical Admixtures for Concrete (ASTM C494)
   14. Specification for Concrete Made by Volumetric Batching and Continuous Mixing (ASTM C685)
   15. Classification for Standard Sizes of Aggregate for Road and Bridge Construction (ASTM D448)
   16. Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction (ASTM E329)

## 1.3 QUALIFICATIONS

A. Contractor performing the Work of this Section shall be capable of demonstrating experience in at least five projects, satisfactorily completed within the past five years, of similar scope and complexity to this Project.

## 1.4 SUBMITTALS

A. Delivery Tickets: Furnish copies of delivery tickets for each load of concrete delivered to the site.

B. Field Test Reports: Submit reports of concrete tests at the end of each day's testing, as described later in this section.

C. Laboratory Test Reports: Submit copies of laboratory test reports for concrete materials and mix design tests.

D. Product Data: Submit copies of manufacturer's specifications with application and installation instructions for propriety materials and items upon request.

E. Mill Certificates: Submit copies of steel producer's certificates of mill analysis, tensile and bend tests for reinforcing steel, upon request.

F. Shop Drawings: Submit shop drawings sealed by a registered engineer for fabrication, bending, and placement of concrete reinforcement. Comply with the ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures." Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements and assemblies, as required for the fabrication and placement of concrete reinforcement.

## 1.5 PAYMENT

A. The work of this section shall be on a lump sum basis in accordance with the Contractor's bid.

# PART 2 PRODUCTS

## 2.1 CONCRETE MIX REQUIREMENTS

A. Minimum 28-day design compressive strength shall be 4,500 psi.

B. Mix designs for normal weight concrete shall be proportioned in accordance with ACI 211 and this Specification. Mix designs proposed for use, when tested in a laboratory, shall have an average 28-day compressive strength in excess of design strength as required in Chapter 4 of ACI 318.

C. Maximum water-cement ratio shall not exceed 0.45 by weight of cement for structural topping concrete.

D. Slump
   1. Concrete to be mixed with a high range water-reducing admixture (superplasticizer) shall be delivered to the Project Site with a slump of not less than 2 in. and not more than 4 in. before addition of the superplasticizer. Slump after Project Site addition of superplasticizer shall not be less than 5 in. or more than 7 in. Alternately, a high range water reducer with added retarder for reducing rate of slump loss may be used.

2. Slump of non-superplasticized concrete shall not exceed 4 in. at the time of discharge from the truck.

E. The entrained air content shall be 6.0 percent by volume, plus or minus 1.5 percent, and shall be measured according to ASTM C231.

## 2.2 CONCRETE MATERIALS

A. Portland Cement shall conform to ASTM C150, Type I.

B. The following types of admixtures may be used when approved by the Engineer.
   1. Air-entraining Admixtures ASTM C260
   2. Chemical Admixtures ASTM C494

C. Calcium chloride shall not be permitted in the concrete as an intentional additive or as an unintended contaminant on aggregates or any other concrete materials.

D. Coarse aggregate shall be normal-weight crushed stone or gravel, unless otherwise noted. Fine aggregate shall be natural or manufactured sand. Aggregate particles shall be clean, hard, and angular, of uniform quality, and free from soft, thin elongated pieces, disintegrated stone, dirt, organic, or other injurious materials occurring either free or as a coating. Aggregates shall be supplied from a source approved by the Engineer. Aggregate gradation shall conform to ASTM C33 with the following limitations:
   1. Minimum percentage of coarse aggregate by weight of total aggregate shall be 55 percent.
   2. Maximum aggregate size shall be ¾ in.

E. Mixing water shall be potable, clean and free of injurious quantities of substances known to be harmful to portland cement.

## 2.3 TESTING OF CONCRETE MIX DESIGNS

A. Mix designs of each separate mix shall be prepared and the following data shall be submitted to the Engineer for each mix design.
   1. Sieve analysis for fine and coarse aggregate
   2. Test for aggregate organic impurities
   3. Proportions of all materials
   4. Mill certificates for cement
   5. Slump, during laboratory tests
   6. Air content, during laboratory tests
   7. Three-, 7- and 28-day laboratory compression test results (Minimum three cylinders for each test age for a total of nine cylinders)

B. A mix design previously used and which complies with specifications may be submitted for approval. Include all information listed above. During construction, tests will be made by an approved Testing Agency to determine if the concrete complies with the specified requirements. The Contractor shall cooperate in the making of such tests to the extent of allowing free access to the Work for the selection of samples and the storage of specimens, and in affording protection to specimens against injury or loss through his operations. The Contractor shall furnish all concrete for testing.

## PART 3 EXECUTION

### 3.1 BATCHING AND MIXING

A. All concrete shall be delivered to the Project Site ready-mixed. Ready-mix concrete shall be batched, mixed, and transported in accordance with applicable provisions of ASTM C94. Batch plants used in production of ready-mixed concrete shall comply with standards set forth by Plant Manufacturers Bureau of National Ready-Mix Concrete Association. Truck mixers, agitators, and nonagitating units used to mix and transport ready-mix concrete production facilities shall comply with Standards of Truck Mixers Manufacturers Bureau of National Ready-Mixed Concrete Association. Ready-mix concrete production facilities shall be currently certified by National Ready-Mix Concrete Association and the Contractor shall submit a copy of that certification to the Owner's Representative.

B. Concrete shall be delivered to Project Site and discharged within 90 minutes or before 300 revolutions of mixer drum, after introduction of mixing water. When air temperature is between 85 and 90 degrees F, reduce mixing and delivery time to 75 minutes; when air temperature is above 90 degrees F, reduce mixing and delivery time to 60 minutes. Concrete that exceeds the specified time limits shall be rejected.
   1. Indiscriminate addition of water to increase slump is prohibited.
   2. When non-superplasticized concrete arrives at Project Site with slump below that suitable for placing, water may be added providing the maximum permissible slump is not exceeded. In the event water is added at Project Site, it shall be incorporated by additional mixing equal to at least 30 revolutions of the drum at mixing speed recommended by manufacturer. If additional water is added, the amount added shall be noted on delivery ticket and ticket signed by person authorizing addition of water.
   3. Concrete to which water has been added in such amounts as to cause the water/cement ratio to exceed the specified maximum allowable value will be rejected. When concrete arrives at job Project Site with a slump exceeding maximum specified slump, concrete shall be rejected.
   4. For superplasticized concrete, the quantity of superplasticizer added shall be in accordance with the approved mix design and the recommendations of the manufacturer, and may be adjusted for variations in initial slump.
      a. Initial, or "water" slump shall be tested for each truckload prior to addition of superplasticizer.
      b. Where superplasticizer is added manually at the back of the drum, mixing vanes and sides of drum shall be washed by hose spray with a nominal amount of water prior to mixing.
      c. Following addition of superplasticizer, concrete shall be re-mixed for not less than 100 revolutions of the drum.
      d. Retempering of the mix with additional superplasticizer may be done only with the approval of the Engineer.
      e. No further addition of water shall be made after the superplasticizer is added to each truckload of concrete.

C. Plant-batched air-entraining and chemical admixtures, when used, shall be incorporated into the mix in amounts and manner recommended by the manufacturer and approved by the Achitect/Engineer. Accuracy of measurement of any admixture shall be within plus or minus three percent. Two or more admixtures may be used in the same concrete provided such admixtures are added separately and that the combination is compatible and has no deleterious effect on the concrete.

D. The temperature of the concrete, when discharged, shall be not less than 65 deg F when the air temperature is below 40 deg F. If heated water or aggregates are used, the water shall be

combined with the aggregates in the mixer before cement is added. Cement shall not be added to mixtures of water and aggregate when the temperature of the mixture exceeds 70 deg F.

E. The temperature of the concrete, when discharged, shall not exceed 85 deg F.

## 3.2 PLACING CONCRETE

A. Before placing concrete, all equipment for mixing and transporting concrete shall be cleaned, vibrators shall be checked for workability, all frost, ice, mud, debris, and water shall be removed from concrete surfaces and forms, forms shall be thoroughly wetted or oiled, and reinforcement shall be securely tied in place and thoroughly cleaned of ice and other coatings which may destroy or reduce bonding with concrete. No concrete shall be placed until the Engineer has approved the forms and the condition and placement of reinforcement.

B. Where new concrete is cast against existing concrete surfaces, thoroughly wet the existing surface between 4 to 12 hours prior to placement but do not allow puddles to form. Blow dry any visible moisture 2 hours prior to placement with clean, dry air. At time of placement of concrete, existing concrete surfaces shall be in a saturated, surface dry condition, showing no visible moisture.

C. Conveying the concrete from the mixer to the place of deposit shall not cause separation or loss of materials.

D. Placing of concrete shall be such that it shall be deposited as nearly as possible to its final position to avoid segregation due to rehandling or flowing. Placing shall be at such a rate that at all times concrete shall be plastic and flow readily into corners of forms and into spaces between rebars. No concrete that has partially hardened or has been contaminated by foreign materials shall be deposited.

E. When concreting is commenced, it shall be carried on as a continuous operation until the section is completed. When being deposited, concrete shall not be allowed to fall a vertical distance greater than four feet from point of discharge to point of deposit.

F. Concrete placement shall not disturb or displace reinforcing bars, floor drains, or other slab embedments.

G. All newly placed concrete shall be consolidated by means of vibration. Generally, vibration shall be accomplished by means of an internal vibrator running at a minimum speed of 7000 rpm or higher, depending on the nature of the concrete being consolidated. Extra vibrators shall be kept at the project site to be used in case a vibrator does not work. When immersion-type vibrators are used to consolidate concrete around epoxy-coated reinforcing, the vibrators shall be equipped with rubber or non-metallic vibrators heads.

## 3.3 FINISHING

A. After screeding, fresh concrete surfaces shall be bullfloated. The concrete surface shall have a smooth trowel finish, followed by a medium broom drag.

B. Slope finished surfaces of topping as indicated on the Drawings.

C. The maximum variation in slab surface from planar shall be 3/16 inch in 10 ft using an approved ten foot straight edge as described in ACI 302.R-89. If variations greater than this exist, the Engineer may direct the Contractor to grind the slab to bring the surface within requirements; patching of low spots shall not be permitted. Grinding shall be done as soon as possible,

preferably within 3 days, but not until concrete is sufficiently strong to prevent dislodging coarse aggregate particles

D. Control joints 1/4 the slab thickness shall be cut into the overlay as shown on the Drawings. Joints shall be made with a power blade within 4 to 12 hours after the slab has been placed and finished. Joints shall be cut as soon as the concrete surface is firm enough not to be torn or damaged by the blade, and before random shrinkage cracks can form in the concrete slab.

## 3.4 CONSTRUCTION JOINTS

A. Locate and install construction joints, to match existing, so as not to impair strength and appearance of the structure. Construction joint placement is subject to submittal by Contractor and approved by Engineer.

## 3.5 CURING

A. Concrete shall be maintained above 55 degrees F and in a moist condition for at least the first 7 days after placing. Curing shall be accomplished by burlap covers kept continuously wet and covered with 4 mil polyethylene sheets conforming to ASTM C171 with edges lapped and tightly sealed by sand, wood slabs, pressure-sensitive tape, mastic, or glue.

B. Adequate protection shall be provided for concrete during freezing or near freezing weather. All concrete materials, reinforcement, forms, filler, and ground with which concrete is to come in contact shall be free of frost, ice, and snow. Whenever air temperature is below 40 degrees F, the minimum temperature of concrete when discharged shall be 65 degrees F, and concrete during the required curing period shall be maintained at a temperature not less than 50 degrees F. Throughout heating period, concrete shall be kept moist as specified. The concrete temperature shall be monitored automatically or manually each half-hour during cold weather.

C. Placement and curing of concrete during hot weather shall be in conformance to the requirements of ACI 305R.

## 3.6 FIELD QUALITY CONTROL

A. Testing of concrete
   1. A set of six 6-in. diameter by 12-in. long test cylinders shall be made at a frequency of once per day, or once for each 20 cubic yards of ready-mixed concrete placed, whichever results in a larger number of tests. Four in. diameter by 8 in. long test cylinders may be substituted when the maximum aggregate size does not exceed ¾ in. or as allowed by ASTM specification.
   2. All cylinders shall be made and tested by a qualified approved Testing Agency which meets the requirements of ASTM E329, and their reports will be sent to the Engineer and Contractor. Costs for these tests shall be paid by the Owner, except where specifically indicated otherwise in this Section.
   3. Two cylinders from each set shall be tested at seven days, and an additional two cylinders at 28 days, in accordance with ASTM C31. The remaining cylinders shall be laboratory-cured and held in reserve for strength testing beyond 28 days, if necessary and if directed by Engineer. Additional cylinders may be made and tested at the Contractor's expense where it is desired to demonstrate 75 percent of specified 28-day strength earlier than seven days after placement, and where high early strength is expected. All cylinders to be tested earlier than 7 days shall be field-cured in the part of the structure in which the concrete is placed, and shall be removed from the structure not more than 24 hours before the time of the test.

4. At the time each set of cylinders is made, the fresh concrete shall be tested for slump and air content in accordance with ASTM C143 and C231, respectively, and the concrete mix temperature and air temperature shall be measured and recorded.
5. Concrete which fails to meet the slump or air content requirements shall be tested again using a different concrete test sample from the same source. If the second series of tests reveals the concrete does not meet the slump or air content requirements, the nonconforming concrete shall be rejected and properly disposed. A new batch of concrete shall be mixed or obtained at the Contractor's expense.
6. Unless directed otherwise by the Engineer, samples of concrete for test specimens shall be taken from the transport vehicle during discharge.
7. Test specimens shall be molded promptly after the sample is taken and then placed in Project Site storage provided by the Contractor. Storage shall be in a shed, box or other enclosure maintained at a temperature between 60 and 80 deg F. Specimens shall be stored for a minimum of 16 hours prior to removal from the sampling location.
8. Strength of concrete shall be considered satisfactory if:
    a. The average compressive strength results of two 28-day tests in each set of cylinders equals or exceeds the specified 28-day strength, and neither of the 28-day tests results is 500 psi or more below specified 28-day strength; or
    b. Compressive strength equals or exceeds the specified 28-day strength for each of two successive cylinder tests made before 28 days. In this case, additional scheduled tests may be waived.

B. Testing of cylinders shall be in accordance with ASTM C39. Each test report shall contain the following information for each set of cylinders:
    a. Individual test specimen strength, type of failure
    b. Slump
    c. Air content
    d. Concrete and air temperature
    e. Specimen number
    f. Concrete pour location
    g. Date cast
    h. Date tested
    i. Concrete properties specified
    j. Notice if tests indicate concrete is or is not in conformance with specifications.

C. Should results of cylinder tests, including testing of reserved cylinders after 28 days if directed by Engineer, not meet preceding strength requirements, the Contractor shall submit a revised mix design data for concrete which will conform to the specifications. In the event of failure of test cylinder specimens for any portion of work, the Contractor, at the Contractor's expense, shall have sample cores cut from that portion of structure represented by unsatisfactory test specimens. Three cores shall be taken from each area in question according to ASTM C42. Concrete in the area represented by core tests will be considered structurally adequate if the average of the three cores is equal to at least 85 percent of specified 28-day cylinder strength, and if no single core has a strength less than 75 percent of the 28-day strength. If these strength acceptance criteria are not met by core tests, the Contractor shall remove and replace all questionable areas of concrete at the Contractor's expense.

## 3.7 LIMITATIONS OF OPERATIONS

A. No vehicular or construction traffic shall be permitted in an adjacent bays for at least 72 hours after a concrete pour.

B. No vehicular or construction traffic shall be permitted on a concrete deck pour for at least 3 days and until the concrete has achieved its specified 28-day compressive strength.

**END OF SECTION**

## SECTION 03 60 30

## EPOXIED-IN ANCHORS AND FIELD COATING OF REINFORCING BARS WITH EPOXY

### PART 1 GENERAL

### 1.1 WORK INCLUDED

A. This work shall consist of providing the necessary labor, materials, equipment and supervision to install epoxied-in anchors and to epoxy coat exposed reinforcing bars.

### 1.2 RELATED WORK

A. Section 02 21 00: Removal of Existing Concrete and Surface Preparation

### 1.3 STANDARDS AND QUALITY ASSURANCE

A. The most recent edition of standard shall apply.

B. Applicator Qualifications
   1. The Contractor shall have three years of experience in performing work similar to that shown on the drawings and described in these specifications.
   2. An on-site supervisor shall be provided by the Contractor for the duration of the epoxied-in anchor work. This supervisor shall have had 2 years documented supervisory experience with the products to be used.

C. Source quality control
   1. The material supplier shall provide (via the Contractor) the following test data for each production run or batch of epoxy formulation to be used:
      a. Tensile strength by ASTM D638
      b. Elongation at break by ASTM D638
      c. Flexural strength by ASTM D790
      d. Flexural modulus by ASTM D790
      e. Compressive yield strength by ASTM D695
      f. Compressive modulus by ASTM D695
      g. Heat deflection temperature by ASTM D648
      h. Slant shear by AASHTO

D. Reference standards
   1. American Society for Testing Materials Standards
      a. Test for Sag Flow of Highly Viscous Resins (ASTM D2730)
      b. Test for Gel Time and Peak Exothermic Temperature of Reacting Thermosetting Resins (ASTM D2471)
      c. Test for Flexural Strength of Concrete (Using Simple Beam with Third-Point Loading) (ASTM C78)
      d. Test for Compressive Properties of Rigid Plastics (ASTM D695)
      e. Test for Deflection Temperature of Plastics Under Flexural Load (ASTM D648)
      f. Test for Tensile Properties of Plastics (ASTM 638)
      g. Tests for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials (ASTM D790)

h. Specifications for Stainless and Heat-Resisting Steel Bars and Shapes (ASTM A276)
2. American Association of State Highway and Transportation Officials Test for Slant Shear Strength of Epoxy Bonding Agent (AASHTO 237)
3. American Concrete Institute "Manual of Standard Practice for Detailing Concrete Structures" (ACI 315)
4. Concrete Reinforcing Steel Institute "Manual of Standard Practice".

## 1.4 SUBMITTALS

A. The Contractor shall submit the following to the Architect/Engineer:
   1. Technical data sheets for each epoxy product or formulation to be used showing that his products meet the requirements of the specifications. Technical data shall include:
      a. Intended use
      b. Pot life (neat)
      c. Initial cure time (1000 psi)
      d. Tack free (thin film)
      e. Final cure (75% ultimate strength)
      f. Tensile strengths by ASTM D638 (14 days)
      g. Tensile elongation by ASTM D638 modified (14 days)
      h. Flexural strength and modulus per ASTM D790 at 24 hrs, 3 days, and 7 days at 77ºF
      i. 24-hr compressive strength by ASTM C109 modified (1 part epoxy to 3-1/4 parts aggregate)

## 1.5 PRODUCT DELIVERY

A. The product shall be delivered and handled according to the manufacturer's recommendations.

B. Damaged, open containers shall not be used.

## 1.6 JOB CONDITIONS

A. Existing and environmental conditions: The Contractor shall examine the condition of surfaces where epoxied-in anchors are required. He shall follow the recommendations of the manufacturer with regard to limitations of the materials in various moisture and temperature conditions.

# PART 2 PRODUCTS

## 2.1 MATERIALS

A. Epoxy for Anchors: The Epoxy shall be “Hilti HIT-HY 200" manufactured by Hilti Corporation, or an approved equal.

B. Epoxy coating for steel reinforcing bars shall be " MasterProtect P 8100 AP," manufactured by BASF Corporation Building Systems, or an approved equal.

C. Stainless Steel Anchors: Type 304 ¼ in. diameter stainless steel threaded rods cut and bent to shapes indicated on drawings.

Maximum yield strength - 30 ksi
Minimum tensile strength - 75 ksi

## PART 3 EXECUTION

### 3.1 INSPECTION

A. Examine surfaces where epoxied-in anchors are to be installed for unsound concrete that would adversely affect the execution and quality of work.

B. Where such conditions are found, notify the Architect/Engineer and proceed with work at other locations.

### 3.2 PREPARATION

A. Lay out the locations of epoxied-in anchors according to the drawings and specifications.

B. The Contractor is advised to use a magnetic reinforcing steel detector to avoid drilling into existing embedded reinforcing. He should also refer to the original drawings for information on the approximate size, number and location of existing reinforcing bars. These drawings are available from the Owner.

### 3.3 INSTALLATION OF STAINLESS STEEL ANCHORS

A. Drilling holes:
   1. Holes may be wet-or dry-drilled using either percussive or rotary machines.
   2. Wet-drilled holes shall be flushed with clean water to remove residue, then blown out using oil-free compressed air, or allowed to air dry.
   3. Dry-drilled holes shall be blown out using oil-free compressed air to remove all loose concrete debris.
   4. Hole diameter shall be in accordance with adhesive manufacturer's requirements for size anchor being installed.

B. Anchors shall be dry and free from contaminants, such as dirt, oil, and grease.

C. Installation:
   1. Install the anchors in accordance with the adhesive manufacturer's instructions.
   2. The epoxied-in anchors shall be installed by injection of a pre-measured quantity of epoxy to the back of the hole and insertion of the anchor in accordance with the adhesive manufacturer's instructions.
   3. The method of installation is intended to achieve 100 percent filling of the annular space between the anchor and the drilled hole.

### 3.4 FIELD COATING EXISTING REINFORCING BARS WITH EPOXY

A. Segments of existing bars with more than ½ in. cover from the original concrete surface which are partially or fully exposed in concrete removal operations shall receive one coat of epoxy which fully covers the bar with no pin holes or holidays. A touch-up coat shall be applied if pin holes or holidays remain after the first coat. The dry film thickness of the coating shall be approximately 10 to 12 mils. A second coat of epoxy shall be applied to existing bars with ½ in. or less of cover from the original concrete surface.

## 3.5 CLEAN-UP

A. The epoxied-in anchors shall be cleanly installed and squared up as shown on the drawings. Excess epoxy shall be cleaned up. Wood shims shall be removed.

B. Safety of Personnel:
   1. Avoid skin contact with epoxy materials, solvents and epoxy strippers. Epoxy resins and particularly epoxy hardeners may cause skin sensitization.
   2. Wear rubber gloves (preferably with a cloth liner) and protective clothing. Where splashing may occur, wear goggles or face shields. Barrier creams are recommended but do not substitute for protective clothing.
   3. If skin contact occurs, wash immediately with a waterless cleaner, followed by soap and water. Should eye contact occur, flush immediately with plenty of water for 15 minutes and call a physician.

**END OF SECTION**

## SECTION 05 12 00

## STRUCTURAL STEEL

# PART 1 GENERAL

## 1.1 REFERENCE: STANDARDS

A. AISC - Code of Standard Practice for Steel Buildings and Bridges, April 2010

B. AISC - Manual of Steel Construction, 14th Edition.

C. AISC - Specification for Structural Steel Buildings, June 22, 2010

D. AISC - Specification for Structural Joints Using High-Strength Bolts, December 31, 2009.

E. ASTM A6 - General Requirements for Rolled Steel Plates, Shapes, Sheet Piling, and Bars for Structural Use.

F. ASTM A36 - Standard Specification for Carbon Structural Steel.

G. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products

H. ASTM A325 - High Strength Bolts for Structural Steel Joints.

I. ASTM A490 - Quenched and Tempered Alloy Steel Bolts for Structural Steel Joints.

J. ASTM A572 - High Strength Low-Alloy Columbium-Vanadium Structural Steel.

K. AWS - American Welding Society (most recent edition applies)

1. A2.4 Welding Symbols
2. A3.0 Terms and Definitions
3. A5.1 Specifications for Mild Steel Covered Arc-Welding Electrodes.
4. A5.20 Specification for Carbon Steel Electrodes for Flux Cored Arc Welding.
5. A5.5 Specification for Low-allow Steel Covered Arc-welding Electrodes.
6. A5.17 Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc Welding.
7. A5.23 Specification for Low Alloy Steel Electrodes and Fluxes for Submerged Arc Welding.
8. D1.1 Structural Welding Code - Steel
9. D1.4 Reinforcing Steel Welding Code, including Metal Inserts and Connections in Reinforced Concrete.

L. ASTM F436 - Standard Specification for Hardened Steel Washers.

## 1.2 QUALITY ASSURANCE

A. Fabricator/Erector: Must have plant, facilities, and personnel sufficient to fabricate and/or erect structural steel as indicated on Drawings. Must have minimum of five years experience

and be able, upon request, to show framing of size, materials, and scope similar to Work of this contract.

B. Material: Provide only structural steel certified as conforming with specified requirements and fabricate especially to the requirements of this contract. Material which does not conform to the requirements of this contract may be rejected at any time.

C. Allowable Tolerances: Unless otherwise specified or noted on Drawings or in this Specification, provide structural steel work in accordance with the following minimum tolerances:
   1. Fabrication Tolerances: In accordance with requirements of AISC Specification unless noted otherwise, and as required to maintain the erection tolerances specified herein.
   2. Erection Tolerances: In accordance with requirements of AISC. The Contractor alone shall be responsible for the correct fitting of all structural members.

D. Connection Identification: Each person installing connections shall be assigned an identifying symbol or mark, and all shop and field connections shall be so identified so that the Owners Testing Lab can refer to the person making the connection.

E. Test and Inspections: Work is subject to special testing and inspection. Refer to Section 01400. The fabricator/erector shall provide the Owner's Testing Lab and Engineer access to places where material is being fabricated/erected. Notice shall be given for joints requiring inspection for proper end preparation, root opening, etc., prior to welding.

F. Engineering by Contractor: Design and calculations shall be prepared by a structural Engineer, licensed in Illinois, for the support of hoisting equipment, welding machines, and other superimposed loads, for the stacking of materials, and where required for temporary bracing, shoring and other safety related construction procedures. Contractor shall obtain and pay for such Engineering services.

G. Welder Qualifications:
   1. Each welder performing work on this project shall be qualified in accordance with the American Welding Society, AWS D1.1 and AWS D1.4.
   2. He shall have been qualified a minimum of six (6) months before commencement of welding on this project.
   3. Copies of each welder's qualification records shall be made available to the Engineer for inspection.

H. Inspections: Field welds shall be continuously inspected by a qualified inspector. Refer to paragraph 3.03 of this specification section for inspection of shop and field installed bolts.

I. Vendor Quality Assurance: The fastener supplier shall visit the project site during the bolting start-up to demonstrate proper installation procedures and verify inspection procedure with the Owner's Testing Lab. The fastener supplier must provide documentation of quality assurance including mill reports and descriptions of bolt origin. Submit performance records from two prior projects of similar size. Records should include percentage of bolt failure during erection and rate of replacement required during inspection. Supplier quality assurance program shall also be outlined. Program must include assurance that bolts from only one heat will be included in a keg.

J. Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the Work of this section.

## 1.3 SUBMITTALS

A. Submit the following in accordance with Section 01 30 00.

B. Shop Drawings: Submit shop drawings for review prior to commencing any fabrication of structural steel.
   1. Before shop drawings are submitted, fabricator shall backcheck drawings to discover obvious drafting and detailing errors.
   2. Show framing layout, dimensions, connections with adjoining materials and construction, finishes, welds, bolts and fasteners, anchoring, and all fabrication or erection accessories required.
   3. Show field welds, cuts, holes and fasteners.
   4. Verify all dimensions and correlate with adjoining construction and materials.
   5. Indicate size, type and grade of all members.
   6. Include with each detail shown on the shop drawings a reference to the Engineer's drawings and details, where applicable.

C. Submit fabricator's quality assurance procedures to the Engineer, Owner and Owner's Testing Lab.

D. Indicate welded connections on shop drawings using standard AWS welding symbols. Show all welded connections with details showing size, length, location, and type of welds.

E. Mill Reports: Submit certified copies of mill reports indicating heat and melt numbers of steel.
   1. If test reports are not submitted or test reports cannot be identified with material proposed for use in the Work, then secure and perform structural tests on five percent of all such unidentified steel.
   2. Contractor shall furnish all such material for testing and pay for all such tests.
   3. Furnish Owner and Engineer certified copies and fabricator one certified copy of all test reports.

F. Inspection Test Reports: Upon request, submit to Engineer copies of ultrasonic testing reports.

G. Placement Plans: Submit placement plans and details as required for the satisfactory placing, connection, and anchorage of all structural members.

H. Welding Procedures: For welded joints prequalified and non-prequalified by AWS D1.2, submit detailed description of welding procedures proposed for use on structural metals, including welding of reinforcing steel in accordance with AWS D1.4. Obtain approval prior to any welding operation. Furnish joint welding procedure qualification tests as required by AWS D1.1, for non-prequalified welded joints.

I. Manufacturer's Certification: Required as follows:
   1. Bolts, Nuts and Washers: Furnish complete manufacturer's mill test reports conforming to ASTM A325, Type 1, or ASTM A490. Markings and chemistry must also comply to specification. Certification numbers must appear on product containers and correspond

to certification numbers on mill test report to be accepted. Mill test report must be supplied to both purchaser and Owner's Testing Lab.
2. Filler material for welding.

J. Erection Procedures: Submit a comprehensive erection procedure including sequencing and crane or lift requirements. The specific means and methods, sequencing and safety procedures are the responsibility of the Contractor. The Engineer's review is solely to determine that the Contractor has complied with the Specification requirements.

## 1.4 DELIVERY, STORAGE, HANDLING

A. Comply with the requirements of the general conditions and of ASTM A6, including the following.

B. Store materials to permit easy access for inspection and identification.
1. Keep steel members off the ground, using pallets, platforms, or other supports.
2. Protect steel members and packaged materials from erosion and deterioration.

C. Do not store materials on the structure in a manner that might cause distortion or damage to the members of the supporting structures. Repair or replace damaged materials or structures at no additional expense to Owner.

D. All Fasteners shall be stored and protected in accordance with the current requirements of the "Specification for Structural Joints using High-Strength Bolts."

## 1.5 JOB CONDITIONS

A. Temporary Bracing: Temporary bracing and guidelines shall be provided to adequately protect all persons and property and to ensure proper alignment.

B. Temporary Platforms: All temporary flooring, planking, and scaffolding necessary in connection with the erection of the structural steel or support of erection machinery shall be provided. The temporary floors or use of steel decking shall be as required by law and governing safety regulations.

C. Holding and Protection: During assembling and welding, the component parts shall be held with sufficient clamps or other adequate means to keep parts straight and in close contact. In welding, precautions shall be taken to minimize "lock-up" stress and distortion due to heat.

# PART 2 PRODUCTS

## 2.1 MATERIALS AND COMPONENTS

A. Carbon Steel: Provide steel plates of structural quality, sizes, and types noted on Drawings, for use in welded and bolted construction. Structural steel plates shall be ASTM A36 unless indicated otherwise on drawings. Plates shall be hot-dipped galvanized, in accordance with ASTM A123, where indicated on drawings.

B. High-Strength Fasteners: Quenched and tempered steel bolts and nuts conforming to requirements of ASTM A325.
1. Provide heavy hexagonal head bolts and nuts, and hardened steel washers.

2. Any proposed substitutions must have documentation submitted for review and approval of the Engineer prior to construction.
3. ASTM A325 bolts and nuts shall be galvanized as noted on the Drawings. Only ASTM A325 Type 1 bolts shall be supplied. In addition, galvanized A325 bolts and nuts shall be considered as an assembly, purchased from a single supplier as such, and shipped together to the construction site.

C. Weld Electrodes:
1. For base metal conforming with ASTM A36, A53, and A500, shielded metal arc, flux-cored arc and submerged arc welding, use E70XX, E7XT-X, and F7X-EXXX electrodes in accordance with AWS A5.1, AWS A5.20, or ASW A5.17.
2. For base metal conforming with ASTM A572, A588, and A441, shielded metal arc, flux-cored arc and submerged arc welding, use E70XX low hydrogen, E7XT-X, and F7X-EXXX electrodes in accordance with AWS A5.5, AWS A5.20, or AWS A5.23.

D. Other Materials: Provide all incidental and accessory materials, tools, methods, and equipment required for fabrication and erection of structural steel framing as indicated on Drawings.

## 2.2 FABRICATION

A. Fabricate all steel in accordance with requirements of AISC Specifications and in accordance with details indicated on the Drawings or as approved on shop drawings.
1. Identify all steel at mill showing grade and yield points.
2. Identify each piece with an erection mark corresponding to identifications noted on erection drawings.

B. Cutting: All holes and openings must be approved by the Owner's Engineer.
1. Do no flame cutting by hand of opening greater than one half the depth of the member, unless approved by Engineer.
2. All flame-cut holes shall be smoothed by chipping, planing or grinding members to required AISC tolerances.
3. Sharp bends or kinks will not be allowed.
4. Flame cutting by hand will not be allowed for holes at connections.

C. Materials shall be properly marked and match-marked where field assembly requires. The sequence of shipments shall be such as to expedite erection and minimize the field handling of material.

D. Milled surfaces shall be completely assembled or welded before milling. Milled surfaces to provide full bearing over the cross section.

E. Beam connections shall be as shown or noted on the Drawings.
1. Unless noted otherwise, standard connections shall be used.
2. Steel requiring adjustment shall be provided with slotted holes, as indicated on the Drawings.

F. Combination of bolts and welds shall not be used for stress transmission in the same faying face of any connection without prior approval by Engineer.

G. Welding, filler material, welding techniques and procedures shall conform to the requirements of the following:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges."
2. AISC "Manual of Steel Construction".
3. AWS "Structural Welding Code," and "Filler Metal Specifications."

H. Welds not specified shall be continuous fillet welds, using not less than the minimum fillet as specified by AWS.

I. Welding sequences, preheat methods, and detailing of joints shall be such as to reduce the residual stresses to a minimum.
   1. Engineer may authorize suitable testing to determine magnitude of residual stresses due to welding on several initial fabricated production units. Such testing will be performed in a timely manner coordinated with the fabricator's production schedule.
   2. Types of Welds: Required weld types are indicated by symbols on drawings; characteristics of welds in accordance with standard specifications or codes as applicable; each welder shall mark his identification symbol on his work.
   3. Welding: Shape edges to be joined as indicated on drawings; prepare and clean edges of all oil, grease, scale and rust in accordance with AWS D1.1.

J. The toughness and notch sensitivity of the steel shall be considered in the formation of all welding procedures to prevent brittle and premature fracture during fabrication and erection.

K. Detailing of connections, welding sequences, and preheat methods shall be such as to minimize restraint and the accumulation and concentration of through thickness strains due to weld shrinkage. Remove projecting ends of runoff tabs, backer bars, and any other erection aids, and grind flush with edges of plates.

L. Reference the general notes for additional requirements.

M. Fabrication Tolerances: In accordance with AISC specifications, except as required to maintain the erection tolerances specified herein.

## PART 3 EXECUTION

### 3.1 SURFACE CONDITIONS

A. Examine the areas and conditions under which Work of this section will be performed. Correct conditions detrimental to timely and proper completion of the Work. Do not proceed until unsatisfactory conditions are corrected.

### 3.2 ERECTION

A. General: Erect structural steel framing in accordance with governing codes and specifications. Conform with configurations and connections as approved on shop and erection drawings.

B. Bracing: Provide temporary shoring and bracing members as required and according to the AISC Code of Standard Practice.

C. Field Assembly: Accurately assemble structural framing to lines and elevations indicated within specified or noted tolerances.
   1. Align and adjust various members of framing system prior to fastening.

2. Prior to assembly, clean bearing surfaces and surfaces which will be in permanent contact.
3. Splice structural members only where indicated or where approved.
4. Cut holes by drilling only.
5. Fasten splices of compression members after bringing abutting surfaces completely into contact.
6. Make all field connections by high strength bolting or welding, unless otherwise noted.
7. Tighten and leave erection bolts in place after welding. Where high strength bolts are required, provide identified and marked bolts; install using procedure as hereinafter specified; mark tightened bolts.

D. Do not use gas cutting torches in the field, unless approved by Engineer for correcting fabrication errors in the structural framing.

E. Furnish shim plates or develop fillers where required to obtain proper fit and alignment.

F. Drift pins shall not be used to enlarge unfair holes in main material. Holes that must be enlarged shall be reamed up to a maximum of 1/16th in. larger to admit bolts. Burning, drifting and reaming may be used to align unfair holes in members only after approval by the Engineer.

G. The steel erector shall leave the steel clean of oil or other contaminants as outlined under Part 2 of this specification.

## 3.3 HIGH STRENGTH BOLT INSTALLATION AND INSPECTION

A. General: All high strength bolts, nuts and washers, as well as their installation and inspection, shall conform to requirements of current edition of "Specification for Structural Joints using High-Strength Bolts".

## 3.4 CUTTING

A. Do not field cut or alter structural members without the written approval of the Engineer.

B. Do not use gas cutting torches for correcting fabrication errors in structural framing.

C. Finish gas-cut sections equal to a sheared appearance.

**END OF SECTION**

# DIVISION 7

# THERMAL AND MOISTURE PROTECTION

# SECTION 07 18 10

# TRAFFIC COATING

## PART 1 GENERAL

### 1.1 SUMMARY

A. Section Includes: Surface preparation and installation of traffic coating.

B. Related Sections:
   1. Section 07 91 10 - Expansion Joint Seals
   2. Section 07 95 10 - Sealants

### 1.2 REFERENCES

A. Reference Standards: Latest edition as of Specification date.
   1. ASTM International.
      a. C 957 - Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane With Integral Wearing Surface.
      b. D 4258 - Standard Practice for Surface Cleaning Concrete for Coatings.
      c. D 4259 - Standard Practice for Abrading Concrete.
      d. D 4263 - Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.
   2. International Concrete Repair Institute.
      a. No. 03732 Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays.

### 1.3 SUBMITTALS

A. Product Data: Traffic-coating manufacturer's literature including written instructions for evaluating, preparing, and treating substrate; technical data including tested physical and performance properties; and application instructions.
   1. Include VOC content of components.
   2. Traffic-coating manufacturer's color chart.

B. Samples: For each type of traffic coating required, provide stepped samples on rigid backing large enough to illustrate build-up of traffic coatings, of same thickness and material indicated for Work.

C. Applicator Qualifications:
   1. Certification signed by traffic-coating manufacturer, certifying that Applicator complies with manufacturer's requirements to install specified, warranted, traffic coating.
   2. Submit evidence that Applicator's existing company has minimum of 5 years continuous experience in application of specified materials. Submit list of at least five completed projects of similar scope and size, including:
      a. Project name.

b. Owner's name.
c. Owner's Representative name, address, and telephone number.
d. Description of work.
e. Traffic-coating materials used.
f. Project supervisor.
g. Total cost of traffic-coating work and total cost of project.
h. Completion date.

D. Sample Warranties: Copies of traffic-coating manufacturer's warranty and Applicator's warranty, both stating obligations, remedies, limitations, and exclusions. Submitted with bid.

E. Moisture Test Results: Submit periodic moisture test results of substrate moisture content.

F. Following completion of Work, submit traffic-coating manufacturer's warranty inspection reports and completed warranty; submit completed Applicator's warranty.

G. Maintenance Manual: Upon completion of the work required by this Section, submit one Maintenance Manual, identified with project name, location and date; type of coating system applied; and surface to which system was applied, including sketches where necessary. Include recommendations for periodic inspections, care and maintenance. Identify common causes of damage with instructions for temporary patching until permanent repair can be made.

## 1.4 QUALITY ASSURANCE

A. Applicator Qualifications: Qualified firm that is approved, authorized, or licensed by traffic-coating manufacturer to apply traffic coating and that is eligible to receive traffic-coating manufacturer's warranty. Must have installations of specified materials in local area in use for minimum of five years.
1. Employ foreman trained by traffic-coating manufacturer and with minimum of 5-years experience as foreman on similar projects, who is fluent in English, to be on site at all times during Work.

B. Random tests to determine tensile bond strength of membrane to substrate shall be conducted by the Contractor at the job site using an Elcometer Adhesion Tester Model 106 or similar device. Performance of a manual pull test can be completed as additional testing using a hook probe. Contractor shall perform tests at the beginning of the Work, and at intervals as required to assure specified adhesion with a minimum of three (3) tests per 5000 square feet. Smaller areas shall receive a minimum of three (3) tests. Test results shall be submitted to the Owner and the Membrane Manufacturer. Contractor shall immediately notify the Owner and Membrane Manufacturer in the event bond test results are below specified values.
1. Tensile bond strength of membrane to substrate greater than or equal to 220 psi for pedestrian traffic.
2. Adequate surface preparation will be indicated by 135 degree peel bond strength of membrane to substrate such that cohesive failure of substrate occurs before adhesive failure of membrane/substrate interface.
3. Remove material that does not comply.

C. In the event the bond strengths are lower than the minimum specified, additional substrate preparation is required. Repeat testing to verify suitability of substrate preparation.

D. Mock-ups: Prior to start of Work or purchase of material, apply each traffic coating to at least 200 square feet of each substrate, at locations determined by Architect/Engineer, to demonstrate

surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.

1. If Architect/Engineer determines mock-up does not comply with requirements, modify mock-up or construct new mock-up until mock-up is approved.
2. Maintain approved mock-ups in undisturbed condition during Work as standard for judging completed Work. Mock-ups, if undamaged at time of Substantial Completion, may be incorporated into Work.

E. Pre-installation Meeting:
   1. Conduct meeting at Project site.
   2. Review requirements for traffic coating, including:
      a. Construction schedule and availability of materials, Applicator's personnel, equipment, and facilities needed to make progress and avoid delays.
      b. Site use, access, staging, and set-up location limitations.
      c. Ventilation requirements.
      d. Surface preparation and substrate condition.
      e. Temporary protection.
      f. Winter application methods and procedures.
      g. Application procedures.
      h. Special details and flashings.
      i. Minimum curing period.
      j. Forecast weather conditions.
      k. Testing and inspection requirements.
      l. Site protection measures.
      m. Governing regulations if applicable.
   3. Contractor's site foreman, traffic-coating manufacturer's technical representative, traffic-coating Applicator, Owner's Representative, and Architect/Engineer shall attend.

F. Project Start-up:
   1. Manufacturer's technical representative to review substrate conditions.
   2. Review substrate moisture testing to be performed prior to each phase or day's application.
   3. Review application techniques with authorized applicator at the site.
   4. Apply membrane and perform various details in mock-up area.
   5. Develop methods for thickness control that include the following:
      a. Material used verses area covered (GAL/SF) figured for fabric reinforced method of application.
      b. Gridded deck method of application.
      c. Established minimum thickness.
      d. Establish procedures and frequency for spot-checking thickness with a thickness gauge.
   6. Manufacturer shall establish criteria for bond testing of membrane.
   7. Review hands on detailing of various detailing conditions.

G. Technical Support during work:
   1. Manufacturer's representative shall review work in progress on a periodic basis (target at least one visit per phase).
   2. Manufacturer's representative shall inspect application of membrane including random measurements of membrane thickness.
   3. Manufacturer shall visit the site as needed or requested.

H. At completion of work:

1. Manufacturer's representative performs final inspection of completed work.
2. Issue warranty.

I. Membrane Manufacture Quality Control: Membrane manufacturer shall provide a technical representative to be on site at beginning of installation of the membrane system to establish the standard quality to be used on the remaining portion of the membrane work. Technical representative shall perform periodic site visit throughout remainder of membrane installation work.

J. Contractor shall, during construction, complete a daily field installation report which includes, project name, date, weather and temperature data, material installed, location and square footage of material installed, codes or batch identification for the product installed, any testing information including moisture testing of substrate, and any other relevant data or information. This daily report will be completed each day of installation of the traffic coating and submitted to the Architect/Engineer.

## 1.5 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with traffic-coating manufacturer's name, product brand name and type, date of manufacture, lot number, and directions for storing and mixing with other components.

B. Store materials in original, undamaged containers in a clean, dry, protected location on raised platforms with weather-protective, vented coverings, within temperature range required by traffic-coating manufacturer. Protect stored materials from direct sunlight. Traffic-coating manufacturer's standard packaging and covering is not considered adequate weather protection.

C. Limit stored materials on structures to safe loading of structure at time materials are stored.

D. Handle materials to avoid damage.

E. Conspicuously mark damaged or opened containers or containers with contaminated materials, and remove from site as soon as possible.

F. Remove and replace materials that cannot be applied within stated shelf life.

## 1.6 PROJECT CONDITIONS

A. Verify existing dimensions and details prior to installation of materials. Notify Architect/Engineer of conditions found to be different than those indicated in Contract Documents. Architect/Engineer will review situation and inform Contractor and Applicator of changes.

B. Observe Owner's limitations and restrictions for site use and accessibility.

C. Environmental Limitations: Apply traffic coating when existing and forecast weather conditions permit traffic coating to be installed according to traffic-coating manufacturer's written instructions and warranty requirements. Do not apply traffic coating under following conditions, unless otherwise recommended by traffic-coating manufacturer and approved by Architect/Engineer.

1. Apply traffic coating within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply when ambient temperature is below 40 degrees F or less than 5 degrees F above dew point.
2. Do not apply to damp or wet substrate; when relative humidity exceeds 85 percent; in snow, rain, fog, or mist; or when snow, rain, fog, or mist is forecast during application or curing period. Apply only to frost-free substrate.

D. Install materials in strict accordance with safety requirements required by traffic-coating manufacturer, Material Safety Data Sheets, and local, state, and federal rules and regulations.

E. Maintain adequate ventilation during preparation and application of traffic-coating materials. Notify Owner's Representative at least 1 week in advance of Work with materials with noxious vapors. Review application schedule and venting precautions with Owner's Representative prior to beginning application.

F. Protect adjacent surfaces and materials with covering, masking, drop cloths and as required to keep adjacent surfaces free of coating. Upon completion, remove protection and clean. Surfaces soiled or damaged by coating shall be cleaned or replaced at no cost to Owner.

G. Cleaning rags and waste materials shall be deposited in metal containers having tight covers or removed from the building each night. Every precaution shall be taken to avoid danger of fire. Provide dry chemical or CO2 fire extinguisher in area. Allow no smoking or open containers of solvents. Store solvents in safety cans.

## 1.7 CHANGES IN WORK

A. During rehabilitation work, existing conditions may be encountered which are not known or are at variance with drawings and specifications. Such conditions may interfere with Work and may consist of damage or deterioration of substrate or surrounding materials or components that could jeopardize integrity or performance of new traffic coating.

B. Notify Architect/Engineer of conditions that may interfere with proper execution of Work or jeopardize integrity of new traffic coating prior to proceeding with Work.

## 1.8 WARRANTY

A. Manufacturer's Warranty:
1. Written warranty, signed by traffic-coating manufacturer, including
    a. Repair or replace traffic coating that does not comply with requirements; that does not remain watertight; that fails in adhesion, cohesion, or general durability; that experiences abrasion or tearing failure not due to misuse; that experiences surface crazing, fading or chalking; or that deteriorates in manner not clearly specified by submitted traffic-coating manufacturer's data as inherent quality of material for application indicated. Warranty does not include deterioration or failure of traffic coating due to failure of substrate prepared according to requirements, formation of new substrate cracks exceeding 1/16 inch in width, fire, or vandalism.
    b. Provide access to warranty repair and replacement areas.
2. Warranty Period: 5 years after Substantial Completion date.

B. Applicator's Warranty:
1. Written warranty, signed by Applicator, including

a. Repair or replace traffic coating that does not comply with requirements; that does not remain watertight; that fails in adhesion, cohesion, or general durability; that experiences abrasion or tearing failure not due to misuse; that experiences surface crazing, fading, or chalking; or that deteriorates in manner not clearly specified by submitted traffic-coating manufacturer's data as inherent quality of material for application indicated. Warranty does not include deterioration or failure of traffic coating due to failure of substrate prepared according to requirements, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or snowplow damage.
b. Provide access to warranty repair and replacement areas.
c. Repair or replacement, to satisfaction of Owner, of other work or items which may have been displaced or damaged as consequence of defective work.
d. Make immediate emergency repairs within 48 hours of notice of leakage.

2. Warranty Period: 5 years after Substantial Completion date.

## PART 2 PRODUCTS

### 2.1 TRAFFIC COATING

A. Source Limitations: Obtain materials through one source from single traffic-coating manufacturer. Provide materials not available from traffic-coating manufacturer from sources approved by traffic-coating manufacturer. Provide new materials.

B. VOC Content: Provide materials that comply with local VOC limits.

C. For typical concourse/seating areas to receive membrane - use one of following traffic coatings:
1. Auto-Gard Heavy Duty Vehicular Traffic-Bearing Waterproofing, manufactured by Neogard, Dallas, TX. Total system thickness of 52 dry mils consisting of 20 dry mils of base coat, 8 dry mils of first wear course with 10 to 15 pounds of aggregate per 100 square feet 12 dry mils of second wear course with 10 to 15 pounds of aggregate per 100 square feet, and 12 dry mils of topcoat.
2. Iso-Flex 750U HVT, manufactured by LymTal International, Inc. Lake Orion, Michigan. Total system thickness of 55 dry mils consisting of 25 dry mils of urethane base coat, 15 dry mils of first top coat, and 15 dry mils of aliphatic urethane top coat, with aggregate as recommended per manufacturer.
3. Sonoguard Heavy Duty Traffic System, manufactured by BASF Corp. Building Systems. Shakopee, Minnesota. Total system thickness of 55 dry mils consisting of 20 dry mils of urethane base coat, 20 dry mils of first top coat, and 15 dry mils of aliphatic urethane top coat, with aggregate as recommended per manufacturer.

D. For slab on-grade seating areas adjacent to field to receive membrane - use the following traffic coating system with an epoxy base coat in lieu of the typical base coat material:
1. Epoxy base coat: Traficguard EP-35 100% Solids Epoxy, manufactured by BASF Corporation Building Systems. This base layer will consist of 25 wet mils of epoxy sanded to refusal with 16-30 sieve quartz aggregate.
2. First top coat: Sonoguard Top Coat manufactured by BASF Corporation Building Systems. Install top coat at 20 dry mils with aggregate as recommended by the manufacturer.
3. Second top coat: Sonoguard Top Coat (aliphatic) manufactured by BASF Corporation Building Systems. Install aliphatic top coat at 15 dry mils with aggregate as recommended by the manufacturer.

E. All components and materials shall be new and shall be the product of and supplied by the manufacturer of the selected membrane system.

F. Aggregate: Clean, dry silica sand, uniform in gradation, and approved by traffic-coating manufacturer.

G. Top Coat Color: Approved in advance in writing by Owner's Representative.

H. Sealant Primer: Sonneborn Primer 733 or as approved by traffic-coating manufacturer.

I. Sealant: Sonneborn SL-2 or as approved by traffic-coating manufacturer

J. Deep Joint Sealant: Sonneborn NP-2 or as approved by traffic-coating manufacturer

## 2.2 EQUIPMENT

A. Concrete cleaning equipment capable of removing contaminants and laitance from concrete surface.

B. Concrete cleaning equipment such as Blastrac Concrete Cleaning System, manufactured by Wheelabrator-Frye, Inc. or equal.

C. Sandblasting equipment capable of removing contaminants and laitance from concrete surface.

D. Compressed air equipment capable of removing dust and dirt from concrete surface, oil free.

E. Equipment to install traffic coating.

# PART 3 EXECUTION

## 3.1 EXAMINATION

A. Examine substrates and conditions with Applicator and traffic-coating manufacturer's representative, for compliance with requirements and other conditions affecting performance of traffic coating.
   1. Ensure that Work done by other trades is complete and ready to receive traffic coating.
   2. Verify compatibility with and suitability of substrates.
   3. Notify Architect/Engineer in writing of conditions which may adversely affect traffic-coating installation or performance. Do not proceed with traffic-coating installation until these conditions have been corrected and reviewed by Architect/Engineer.

## 3.2 SURFACE PREPARATION

A. Remove existing traffic coating and other materials to expose substrate.
   1. Remove only as much of existing traffic coating as can be prepared and new traffic coating installed in one day, unless provisions are implemented to maintain watertightness in interim or larger removal areas are approved by Owner's Representative.
   2. Provide temporary protection as needed if watertightness is compromised.
   3. Do not begin removal of existing traffic coating when weather conditions are not conducive to maintaining watertightness or for application of new traffic coating.

B. Clean and prepare concrete substrate according to traffic-coating manufacturer's written instructions. Provide clean, dust-free, and dry substrate.
   1. Verify that concrete has cured and aged for minimum time period recommended by traffic-coating manufacturer.
   2. Verify that substrate is sound and is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263 or Delmhorst moisture meter or manufacturer recommended procedure.
   3. Verify that concrete curbs, expansion joints, and transitions from one surface plane to another (inside and outside corners) are cleanly formed and free of broken edges and excess concrete.
   4. Remove concrete fins and projections, concrete splatter, and other irregularities which would prevent monolithic, continuous application of traffic coating.
   5. Properly patch substrate defects such as delaminations, spalls, voids, form tie holes, honeycombing, and cracks, with latex-modified concrete or another material acceptable to traffic-coating manufacturer and Architect/Engineer.
   6. Remove grease, oil, asphalt solids, form-release agents, paints, curing compounds, and other penetrating contaminants or film-forming coatings from concrete.
   7. Shotblast or scarify concrete to provide clean surface, free of laitance, dirt, and other loose or foreign material. Use care to avoid pockmarking concrete surface.
   8. Uniformly clean concrete surfaces by abrasive blast, according to ASTM D 4259, to expose top surface of fine aggregate and provide sound surface, free of laitance, dirt, and other loose or foreign material. Use self-contained, re-circulating, blast-cleaning apparatus. Remove remaining loose material and clean surfaces according to ASTM D 4258. Produce surface texture equal to CSP 3 or 4 from the International Concrete Repair Institute's Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays (No. 03732).
   9. Level areas of surface scaling or rough, uneven areas where surface roughness is unacceptable for traffic-coating application with skim coat of epoxy or other material compatible with traffic coating and recommended by traffic-coating manufacturer.
   10. Rout cracks and joints larger than 1/8 inch and those designated by traffic-coating manufacturer's representative and verified by Architect/Engineer, remove existing sealant, and install new sealant.
   11. Shot blast clean curb, column, and wall surfaces that will receive traffic coating.
   12. Thoroughly sweep substrate and clean with oil-free compressed air.

C. Mask adjoining surfaces not receiving traffic coating to prevent spillage and overspray affecting other construction.

D. Close off deck drains and other deck penetrations to prevent spillage and migration of traffic-coating fluids.

E. Applicator and traffic-coating manufacturer's representative shall examine substrate to ensure that it is properly prepared and ready to receive traffic coating. Traffic-coating manufacturer's representative shall report in writing to Applicator and Architect/Engineer conditions which will adversely affect traffic-coating system installation or performance. Do not proceed with traffic-coating installation until these conditions have been corrected and reviewed by Architect/Engineer.

F. Proceed with installation only after unsatisfactory conditions have been corrected. Commencing installation constitutes acceptance of work surfaces and conditions.

## 3.3 APPLICATION

A. Provide and maintain barricades for vehicular and pedestrian traffic at traffic-coating areas during application and curing period.

B. Allow sealant, patch materials, and skim coats to fully cure prior to installing traffic coating.

C. Apply traffic coating material according to traffic-coating manufacturer's written recommendations.
   1. Start traffic-coating application in presence of traffic-coating manufacturer's representative.
   2. Install joint reinforcement, centered on joints and horizontal edges of sheet-metal flashing and pans, in detail coat.
   3. Install sealant cant at intersections of horizontal and vertical surfaces.
   4. Apply detail coat at intersections of horizontal and vertical surfaces, at drains and other deck penetrations, and at cracks and joints.
   5. Apply traffic-coating system.
      a. Wipe detail coat to remove dust and contamination.
      b. Apply each coat in one uniform application, broadcast aggregate if required, and backroll for even coverage. Allow each coat to cure before applying next coat. Sweep or vacuum off excess aggregate.
      c. Apply at least 4 inches up sides of columns, walls, and other vertical surfaces, and up riser faces and across tread surfaces.
      d. If pinholes occur in base coat, apply additional base coat material using flat squeegee or other tool approved by traffic-coating manufacturer, to fill holes before proceeding with subsequent coats.
      e. Prevent contamination or damage during application and curing.
      f. Verify that wet film thickness of each component coat complies with requirements every 100 square feet.

## 3.4 FIELD QUALITY CONTROL

A. Architect/Engineer will take one 1-inch-square sample minimum of traffic-coating system for every 4,000 square feet of traffic-coating installed. Dry film thickness will be measured.
   1. Dry film thickness is satisfactory if not less than minimum thickness specified by traffic-coating manufacturer or this Section, whichever is greater.
   2. If dry film thickness too thin, apply additional material at no cost to Owner, or perform other remedial action recommended by traffic-coating manufacturer or Architect/Engineer.
   3. Patch sample areas with traffic-coating system.

B. Chain drag traffic-coating areas at conclusion of Work to locate debonded areas. Remove and replace debonded areas.

C. Bond strength testing of membrane to substrate shall be conducted by the Contractor at the job site using an Elcometer Adhesion Tester Model 106 or similar device including a minimum three (3) tests per 5000 square feet.
   1. Bond strength is satisfactory if tensile bond strength is greater than or equal to 220 psi.
   2. Contractor shall immediately notify Manufacturer and Architect/Engineer if results are lower than specified.
   3. Patch test areas with traffic-coating system.

## 3.5 CLEANING AND PROTECTION

A. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

B. Protect traffic-coating from damage and wear during remainder of construction period.

C. Replace Work or materials damaged beyond repair, in opinion of Architect/Engineer, at no cost to Owner.

**END OF SECTION**

## SECTION 07 91 10

## EXPANSION JOINT SEALS

# PART 1 GENERAL

1.1 SUMMARY

A. Section Includes: Surface preparation and installation of expansion joint seals in concrete structures.

B. Related Sections:
   1. Section 07 18 10 - Traffic Coating

1.2 SUBMITTALS

A. Product Data: Joint seal manufacturer's literature including written instructions for evaluating, preparing, and treating substrate; technical data including material descriptions and dimensions of individual components; and installation instructions and construction details.

B. Template Drawings: Showing typical expansion joint cross-sections indicating dimensions and relationship to adjacent construction.

C. Shop Drawings: For each joint system specified.
   1. Fabrication drawings showing steel retainer rail lengths and stud spacing and attachment.
   2. Placement drawings showing steel retainer rail splice and installation details.

D. Installer Qualifications:
   1. Certificate signed by joint seal manufacturer, certifying that Installer complies with requirements.
   2. Submit evidence that Installer's *existing company* has minimum of 5 years continuous experience in application of specified materials. Submit list of at least five completed projects of similar scope and size, including:
      a. Project name.
      b. Owner's name.
      c. Owner's Representative name, address, and telephone number.
      d. Description of work.
      e. Expansion joint seals used.
      f. Project supervisor.
      g. Total cost of expansion joint seal work and total cost of project.
      h. Completion date.

E. Submit in writing joint locations, joint width measurements, date and time of measurements, high and low daily temperatures for week preceding measurements, and recommended joint seal size.

F. Following completion of Work, submit completed joint seal warranty.

## 1.3 QUALITY ASSURANCE

A. Installer Qualifications: Qualified firm that is approved, authorized, or licensed by joint seal manufacturer to install joint seal. Must have installations of specified materials in local area in use for minimum of five years.
   1. Employ foreman with minimum of 5-years experience as foreman on similar projects, to be on site at all times during Work.

B. Mockups: Install first section of joint seal to demonstrate installation procedures and as standard for Work.
   1. Architect/Engineer and Owner's Representative will observe installation and completed seal. Notify Architect/Engineer 7 days in advance of mockup installation.
   2. If Architect/Engineer determines mockup does not comply with requirements, modify mockup or construct new mockup until mockup is approved.
   3. Approved mockups may become part of completed Work if undisturbed at time of Substantial Completion.

C. Pre-installation Meeting:
   1. Conduct meeting at Project site.
   2. Review requirements for expansion joint seal, including:
      a. Construction schedule and availability of materials, Applicator's personnel, equipment, and facilities needed to make progress and avoid delays.
      b. Site use, access, staging, and set-up location limitations.
      c. Surface preparation and substrate condition.
      d. Temporary protection.
      e. Winter application methods and procedures.
      f. Application procedures.
      g. Special details and flashings.
      h. Minimum curing period.
      i. Forecast weather conditions.
      j. Testing and inspection requirements.
      k. Site protection measures.
      l. Governing regulations if applicable.
   3. Contractor's site foreman, expansion joint seal manufacturer's technical representative, expansion joint seal Applicator, Owner's Representative, and Architect/Engineer shall attend.

## 1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to Project site in original packages with seals unbroken, labeled with joint seal manufacturer's name, product brand name and type, date of manufacture, lot number, and directions for storing and mixing with other components.

B. Store materials in original, undamaged containers in clean, dry, protected location on raised platforms with weather-protective coverings, within temperature range required by joint seal manufacturer.

C. Limit stored materials on structures to safe loading of structure at time materials are stored, and to avoid permanent deck deflection.

D. Handle materials to avoid damage.

1.5 PROJECT CONDITIONS

A. Verify existing dimensions and details prior to installation of materials. Notify Architect/Engineer of conditions found to be different than those indicated in Contract Documents. Architect/Engineer will review situation and inform Contractor and Installer of changes.

B. Comply with Owner's limitations and restrictions for site use and accessibility.

C. Environmental Limitations: Install joint seals when existing and forecast weather conditions permit joint seal system to be installed according to joint seal system manufacturer's written instructions and warranty requirements.
   1. Verify joint gap at installation will permit proper functioning of joint seal.

1.6 CHANGES IN WORK

A. During rehabilitation work, existing conditions may be encountered which are not known or are at a variance with drawings and specifications. Such conditions may interfere with Work and may consist of damage or deterioration of substrate or surrounding materials or components that could jeopardize integrity or performance of new joint seals.

B. Notify Architect/Engineer of conditions that may interfere with proper execution of Work or jeopardize integrity of new joint seals prior to proceeding with Work.

1.7 WARRANTY

A. Contractor's Warranty
   1. Written warranty, signed by Contractor, including:
      a. Repair or replace joint seal components that do not comply with requirements; that do not remain watertight; that fail in adhesion, cohesion, or general durability; or that deteriorate in manner not clearly specified by submitted joint seal manufacturer's data as inherent quality of material for application indicated.
      b. Labor and materials to perform warranty work.
   2. Warranty Period: Five years from date of Substantial Completion.

## PART 2 PRODUCTS

2.1 JOINT SEALS

A. Premold Expansion Joint System: Factory molded polyurethane expansion joint seal with two component polyurethane nosing and stainless steel traffic support plate at selected locations. Use one of following or approved equal.
   1. Iso-Flex Factory Molded Expansion Joint, manufactured by Lym Tal International, Inc.
   2. Wabo UreFlex, manufactured by Watson Bowman Acme Corporation

B. Preformed, flexible, closed cell neoprene, expanded rubber expansion joint seal. Use the following or approved equal.
   1. Wabo InverSeal, manufactured by Watson Bowman Acme Corporation.

C. Joint Seal Size:
   1. Seal sizes to be determined by Contractor based on joint locations and actual joint widths, and approved by Architect/Engineer. Use one of following or approved equal
   2. Measure average, maximum, and minimum joint widths at every joint.

3. Submit in writing joint locations, joint width measurements, date and time of measurements, high and low daily temperatures for week preceding measurements, and recommended joint seal size to Architect/Engineer for approval. Assume 160-degree thermal change, from -20 to 140 degrees, in sizing seal.

D. Accessories: Primers, bedding materials, bonding agents, lubricants, adhesives, sealants, and other accessories supplied or approved by joint seal manufacturer.

E. Fasteners: Provide stainless steel fasteners for attachment of plates, gutter and other related items.

2.2 FABRICATION

A. Prior to fabrication, field measure existing conditions to ensure proper fit.

B. Provide continuous joint seals in longest practical lengths, with minimum number of end joints.
1. For straight sections, provide continuous lengths.
2. Fabricate directional changes in shop whenever possible; use mitered and adhered or heat-welded corners.
3. Fabricate with end closures, transitions, and intersections to provide continuous assembly.

## PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions with Installer and joint seal manufacturer's representative for compliance with requirements and for other conditions affecting performance of joint seal.
1. Ensure that Work done by other trades is complete and ready to receive joint seal, including concrete construction and patching.
2. Notify Architect/Engineer in writing of conditions which may adversely affect joint seal installation or performance. Do not proceed with joint seal installation until these conditions have been corrected and reviewed by Architect/Engineer.
3. Installation of joint seal indicates acceptance of surfaces and conditions.

3.2 SURFACE PREPARATION

A. Prepare substrates according to joint seal manufacturer's written instructions.

B. Provide clean, sound, dry concrete surfaces.
1. Remove existing joint seals.
2. Form with rigid forms or saw-cut sides of joints straight and parallel. Adjust joint widths for temperature. Create shoulders for joint seals.
3. Saw-cut or chip blockouts along top sides of joints.
4. Accurately position and securely hold in position steel retainer rails.
5. Cast concrete.
6. Repair unsound concrete along joints to provide solid surface of clean, sound concrete, free of voids and honeycombing.
7. Install grout bed or other leveling device to accurately position joint seal.
8. Clean concrete surfaces by sandblast or other means recommended by joint seal manufacturer, to remove contaminants including form release agents, laitance, surface dirt and rust, and old sealant. Remove dust and other contaminants with compressed air.
9. Allow concrete and patching compounds to fully cure prior to joint seal installation.

## 3.3 INSTALLATION

A. Install joint seal according to joint seal manufacturer's written instructions. Field splices to be coordinated with and approved by joint seal manufacturer.

B. Verify that joint widths are suitable for seal size and movement capability.

## 3.4 FIELD QUALITY CONTROL

A. Water Test:
   1. Construct water-retention barriers along sides of joints.
   2. Pond water on top of joint seal for 24 hours, and observe underside of deck for leakage.
   3. Repair leaking portions of joint seal and re-test.

## 3.5 CLEANING AND PROTECTION

A. Clean excess primer, adhesive, sealant, and other products from components and adjacent surfaces.

B. Protect joint seals from traffic until materials have cured.

C. Protect joint seals from damage by construction activities.

END OF SECTION

# SECTION 07 95 10

# SEALANTS

## PART 1 GENERAL

### 1.1 DESCRIPTION

A. This work includes furnishing of all labor, materials, tools and equipment and performing all work necessary for and incidental to the sealing and caulking of joints and cracks, including back-up fillers, as shown in the drawings and specified herein.

### 1.2 QUALITY ASSURANCE

A. Sealant applicator shall have a minimum of five years experience in installation of similar caulking and sealants, and jobs of similar size. Submit a list of three completed projects of similar size and scope completed by sealant applicator within the past five years.

B. The Contractor shall meet with the sealant manufacturer's qualified representatives, prior to commencing with the work, to assure that all applications are in conformance with the manufacturer's recommendations. The manufacturer's qualified representatives shall periodically visit the job site during the course of the work to verify the proper installation of the sealant compounds. All such Project Site visits and meetings shall be documented in writing to the Architect/Engineer.

### 1.3 WARRANTY

A. Provide a single-source warranty against defects in materials and workmanship in crack and joint sealants, for a period of five years from date of installation. The warranty shall provide the Contractor will provide at no expense to the Owner all labor and materials necessary to correct any faults or defects in the work. The following problems shall be specifically covered under the warranty:
   1. Cohesive or adhesive failure of the seal.
   2. Weathering deficiencies resulting in failure of the seal.
   3. Abrasion or tear failure of the seal resulting from normal traffic use.

### 1.4 SUBMITTALS

A. Submit the following to the Architect/Engineer prior to beginning sealant work:
   1. Manufacturer's Literature: Materials description and installation instructions (including surface preparation) for each compound and filler.
   2. Samples: Samples of each compound and filler.

### 1.5 PRODUCT DELIVERY, HANDLING AND STORAGE

A. All materials shall be delivered to the job site in manufacturer's sealed packaging and suitably protected from damage and exposure to the elements while stored at the Project Site. Damaged or deteriorated materials shall be removed from the premises.

## 1.6 PAYMENT

A. The Work of this Contract shall be performed on a lump sum basis with unit prices for additions or deductions in the estimated quantity.

# PART 2 PRODUCTS

## 2.1 MATERIALS

A. Sealant Type 1 (to be used at all concrete-to-concrete joints): The sealant shall be a two-component polyurethane non-sag sealant of the chemical curing type, containing no asphalt, fillers or plasticizers. The sealant shall be suited with a compatible primer prescribed by the manufacturer. One of the following sealants, or an approved equal, shall be used:
   1. Iso-Flex 880 G.B. (self-leveling) or Iso-Flex 881 (non-sag), manufactured by LymTal International, Inc., Orion, Michigan.
   2. MasterSeal NP2 or SL2, manufactured by BASF Building Systems.

B. Sealant Type 2 (to be used at drain repair locations in conjunction with procured silicone weather-stripping): One Part Silicone, Non-Sag, ± 50 percent movement. GE Silpruf NB SCS9000 Sealant, Dow Corning 795 SMS Sealant, or approved equal.

C. Sealant Type 3 (to be used at drain repair locations): GE US1100 Precured Silicone Weather-stripping, Dow Corning 123 Silicone Seal, or approved equal.

D. Backer Rod: Non Gassing Closed Cell: Soft Backer Rod manufactured by BASF or approved equal, with configuration as shown on Drawings.

E. Joint cleaners, primers and sealers: As recommended by the sealant manufacturer for the specific joint surface and conditions.

F. Bond Breaker: Polyethylene tape.

G. Color samples of all sealant products shall be submitted to Owner and Architect/Engineer for approval.

# PART 3 EXECUTION

## 3.1 GENERAL

A. Unless otherwise noted, these procedures apply to all sealant applications.

B. Examine all surfaces to receive sealants. All surfaces which are found to be unsuitable for installation of sealants shall be brought to the attention of the Architect/Engineer. Application or installation of the material constitutes acceptance of the surface of the substrate.

C. Remove all existing sealants from the areas to be resealed. Care shall be used in the removal of sealants to prevent damage to existing construction to remain.

D. All surfaces to receive sealants shall be clean, dry, free of any loose materials including dirt, dust, laitance, rust, oil, frost, and other contaminants.

E. Along all existing cracks wider than 1/16 in., grind a grove 3/8 in. wide by 3/8 in. deep in concrete surface using a powered grinder.

F. Existing concrete surfaces shall be cleaned by grinding, power wire brushing, and blast cleaning withoil free compressed air to remove the dust of cleaning. Painted surfaces shall be sandblasted. Cleaning solvents shall not be used on the concrete.

G. Metal surfaces which will be in contact with new joint sealants shall be cleaned with new methyl ethyl ketone (MEK). Small areas shall be washed and then dried with clean cloth before the solvent evaporates. This final cleaning shall be done after other necessary preparations have been completed. Care shall be taken not to allow the MEK cleaner to come in contact with adjacent concrete or masonry surfaces which are to be sealed.

H. Use a primer on surfaces to receive sealants in accordance with the recommendations of the sealant manufacturer.

I. Prior to beginning joint sealant work, applicator shall make sample installations in representative types of prepared joints to demonstrate the adequacy of preparation procedures in providing optimum sealant adhesion. Sample applications shall be approved by the Manufacturer's Representative and Architect/Engineer prior to the start of work.

## 3.2 INSTALLATION

A. Prior to sealing, exposed joint or crack surface shall be thoroughly cleaned in accordance with the sealant manufacturer's recommendations. Installation procedures shall be in accordance with the manufacturer's recommendations and the following requirements.

B. Install bond breakers and backer rods where shown on the drawings and in locations and of the type recommended by the sealant manufacturer to prevent bond of sealant to surfaces where such bond might impair the performance of the sealant.

C. Apply joint sealant materials using cartridge-type caulking guns.

D. Install sealants and primers only when surface and ambient temperatures are at least 40 degrees F (or the minimum installation temperature recommended by the manufacturer, if higher) and rising, unless specifically approved by the Architect/Engineer. Do not install sealants when surface or ambient temperatures exceed 100 degrees F.

E. Run the sealant beads sufficiently slowly that the entire cavity is filled from the bottom up. Air pockets or voids along the edges are not acceptable.

F. Tool sealant surfaces to the profiles shown on the drawings where shown, or to flush or slighting concave surface.

## 3.3 PROTECTION

A. All surfaces adjacent to sealant joints shall be protected, unless otherwise approved by the Architect/Engineer. Use pressure sensitive tape to prevent staining of adjacent surfaces, or spillage and migration of sealant out of the joints, as required.

B. The sealants shall be protected from traffic and debris until fully cured.

## 3.4 CLEAN UP

A. As work progresses, remove excess sealant and clean adjoining surfaces as required. Remove all masking and other protection and clean up any remaining defacement caused by the work.

B. Clean up and remove from the project site all debris, refuse and surplus materials.

**END OF SECTION**

## SECTION 09 89 00

## STEEL COATINGS

# PART 1 GENERAL

## 1.1 DESCRIPTION

A. This work consists of providing the necessary labor, materials, equipment, and supervision to prepare and paint surfaces of the existing handrails to be reused.

## 1.2 REFERENCE STANDARDS

A. ASTM International (ASTM)
   1. ASTM D16 - Terminology Relating to Paint, Varnish, Lacquer, and Related Products
   2. ASTM D523 - Standard Test Method for Specular Gloss
   3. ASTM D610 - Standard Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces
   4. ASTM D714 - Standard Test Method for Evaluating Degree of Blistering of Paints
   5. ASTM D1186 - Standard Method for Nondestructive Measurement of Dry Film Thickness (DFT) of Nonmagnetic Coatings Applied to a Ferrous Base
   6. ASTM D1212 - Standard Test for Measurement of Wet Film Thickness of Organic Coatings
   7. ASTM D3359 - Test Method for Measuring Adhesion by Tape Test
   8. ASTM 3363 - Standard Test Method for Film Hardness by Pencil Test
   9. ASTM D4214 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films
   10. ASTM D4417 - Standard Test Methods for Field Measurements of Surface Profile of Blast Cleaned Steel
   11. ASTM D4541 - Test Method for Pull-Out Strength of Coatings Using Portable Adhesion-Testers
   12. ASTM D6386 - Standard Practice for Preparation of Zinc (Hot-Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting

B. The Society for Protective Coatings (SSPC)
   1. SSPB AB1 - Mineral and Slag Abrasives
   2. SSPC-PA 1 - Shop, Field, and Maintenance Painting of Steel
   3. SSPC-PA 2 - Measurement of Dry Coating Thickness with Magnetic Gages
   4. SSPC-PA Guide 3 - A Guide to Safety in Paint Application
   5. SSPC-SP 1 - Solvent Cleaning
   6. SSPC-SP 10/NACE No. 2 - "Near-White Blast Cleaning
   7. SSPC-SP 11 - Power Tool Cleaning to Bare Metal
   8. SSPC-Vis 1 - Standard Pictorial Surface Preparation Standards for Painting Steel Surfaces

## 1.3 SUBMITTALS

A. The Contractor shall submit the paint manufactuer's product data for all materials proposed for use. The data shall include a description of the system, and mixing and application instructions.

B. The Contractor shall submit two 12 in. long square samples and two 12 in. long round samples representative of the handrail steel. These samples shall be coated with the specified paint system in a positions to simulate actual field conditions.

C. The Contractor shall submit his plan for surface preparation and painting hand rails.

## 1.4 PAYMENT

A. The Work of this Section as it relates to painting of the existing metal hand rails shall be performed on a lump sum basis.

## 1.5 DELIVERY, HANDLING, AND STORAGE

A. Materials shall be delivered in their original, unopened containers bearing the manufacturer's name, product identification, and batch number.

B. Coatings, thinners, and cleaners shall be stored in tightly closed containers in a covered, well-ventilated area where they will be protected from exposure to extreme cold or heat, sparks, flame, direct sunlight, or weather.

C. All materials shall be stored in an approved location.

## 1.6 WARRANTY

A. The completed application of the paint coating on the exterior handrail components shall be guaranteed jointly and severally by the manufacturer and the applicator against defects in material and application, for a period of five (5) year from the completion of the application.

# PART 2 PRODUCTS

## 2.1 STEEL COATINGS, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. Provide products of same manufacturer for each coat in coating system.

B. Colors: Standard color as selected by Owner.

C. Gloss: As selected by Owner.

D. Use contrasting colors for each coating. The finish coat shall not be a half shade color of the preceding coat.

## 2.2 COATING FOR GALVANIZED STEEL

A. Tnemec Company, Inc, 6800 Corporate Drive, Kansas City, Missouri 64120. (800) 863-6321. www.tnemec.com
   1. Stripe Coat: Series N69 Hi-Build Epoxoline II, 4.0 - 6.0 mils DFT
   2. Intermediate Coat: Series N69 Hi-Build Epoxoline II, 4.0 - 6.0 mils DFT
   3. Finish Coat: Series 73 Endura Shield, 2.0 - 5.0 mils DFT

## PART 3 EXECUTION

### 3.1 SURFACE PREPARATION

A. Prepare galvanized surfaces in accordance with the coating manufacturer's recommendations and ASTM D6386.

B. All surfaces to receive paint shall be dry, clean, and free from dirt, dust, laitance, loose particles, or any foreign matter that would prevent proper adhesion of the coating.

### 3.2 APPLICATON

A. General
   1. Apply coatings according to manufacturer's written instructions.
   2. Use applicators and techniques suited for coating and substrate indicated.

B. Apply coatings in mist coat/wet coat fashion.

C. Follow manufacturer's written instructions for coating dry and wet film thickness.

D. Follow manufacturer's written instructions for recoat times for all coatings and fillers.

E. Coating system application shall be pinhole-free. If test confirms the presence of pinholes, repair pinholes according to the approved pinhole repair procedure and retest.

F. Surface preparation and painting operations shall be sequenced so that freshly applied coatings will not be contaminated by dust or foreign matter.

G. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

H. Brush apply stripe coat at welds, bolted connections, bolts, bolt-holes, edges, and corners with the intermediate coat prior to the application of the full intermediate coat.

I. Pinhole Repair Procedure - In accordance with manufacturer's written instructions.

J. Damaged Coating Repair Procedure - In accordance with manufacturer's written instructions.

### 3.3 CLEAN-UP

A. The Contractor is responsible for inspecting all completed work, identifying any defects and performing touch-up work where necessary.

B. On completion of the work, the equipment, surplus materials, and rubbish shall be removed and the site shall be left in a clean condition.

**END OF SECTION**