

# **PROJECT MANUAL**

for the

## **ENTRANCE RAMP GARAGE REPAIRS**

at

### **THE ORGANIZATION OF AMERICAN STATES**

Prepared By

CAGLEY & ASSOCIATES, STRUCTURAL ENGINEERS

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## SECTION 02070 - SELECTIVE DEMOLITION

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section requires the selective removal and subsequent offsite disposal of the following:
  - 1. Isolated areas of damaged concrete as noted on the drawings to be repaired.
  - 2. Other miscellaneous items incidental to the concrete repair process.

#### 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Schedule indicating proposed sequence of operations for selective demolition work to Owner's Representative for review prior to start of work. Include coordination for shutoff, capping, and continuation of utility services as required, together with details for dust and noise control protection.
  - 1. Provide detailed sequence of demolition and removal work to ensure uninterrupted progress of Owner's on-site operations.
  - 2. Coordinate with Owner's continuing occupation of portions of existing building and with Owner's partial occupancy of completed work. Clearly indicate number of parking stalls to be unavailable to the Owner during a given phase of work, and obtain Owner's approval of same before starting work.
  - 3. Contractor shall review with the Owner and Engineer the types of equipment which he proposed to use during operations and obtain Owner's approval for such use.
- C. Photographs of existing conditions of structure surfaces, equipment, and adjacent improvements that might be misconstrued as damage related to removal operations. File with Owner's Representative prior to start of work.
- D. Shoring plans, details and calculations, signed and sealed by a professional engineer registered in the project's jurisdiction for all shoring required for construction.

#### 1.4 JOB CONDITIONS

- A. Occupancy: Owner will occupy portions of the building immediately adjacent to, and under, areas of selective demolition. Conduct selective demolition work in manner that will minimize need for

disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities that will affect Owner's normal operations.

- B. Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.
  - 1. Examine areas and conditions under which the Work is to occur. Notify the Engineer immediately in writing of any conditions detrimental to the proper and timely completion of this Work.
  - 2. Proceed with the Work only after unsatisfactory conditions have been acceptably remedied.
  - 3. Conditions existing at time of inspection for bidding purposes will be maintained by Owner insofar as practicable.
  
- C. Partial Demolition and Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.
  - 1. Storage or sale of removed items on site will not be permitted.
  
- D. Protections: Provide temporary barricades and other forms of protection to protect Owner's personnel and general public from injury due to selective demolition work.
  - 1. Provide protective measures as required to provide free and safe passage of Owner's personnel and general public to occupied portions of building.
  - 2. Erect temporary covered passageways as required by authorities having jurisdiction.
  - 3. Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of structure or element to be demolished and adjacent facilities or work to remain.
  - 4. Protect from damage existing finish work, signs, windows, doors, parking equipment, etc. that is to remain in place during demolition operations.
  - 5. Protect floors with suitable coverings when necessary.
  - 6. Construct temporary insulated dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks.
  - 7. Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces and installation of new construction to ensure that no water leakage or damage occurs to structure or interior areas of existing building.
  - 8. Remove protections at completion of work.
  - 9. Protect adjoining properties, public thoroughfares, sidewalks and utilities from damage due to demolition operations.
  - 10. Take adequate precautions to prevent unauthorized personnel from entering the job site.
  
- E. Damages: Promptly repair damages caused to adjacent facilities by demolition work.
  
- F. Traffic: Conduct selective demolition operations and debris removal to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.
  - 1. Do not close, block, or otherwise obstruct streets, walks, or other occupied or used facilities without written permission from the Owner and Authority having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

2. Protect vehicles and their occupants within or adjacent to the building from hazards or damages. Provide clean and unobstructed driveways and parking areas.
- G. Flame Cutting: Not allowed on site.
- H. Utility Services: Maintain existing utilities indicated to remain in service and protect them against damage during demolition operations.
1. Do not interrupt utilities serving occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to governing authorities.
  2. Maintain fire protection services during selective demolition operations.
  3. Temporarily shore utilities as necessary should hanger supports need to be temporarily removed as a result of concrete demolition and repair operations, until such supports can be suitably reestablished.
- I. Environmental Controls: Use water sprinkling, temporary enclosures, and other methods to limit dust and dirt migration. Comply with governing regulations pertaining to environmental protection.
1. Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.
  2. Provide necessary protection to prevent airborne construction material, debris, fumes, etc from entering adjacent building, air intakes, etc.
  3. Provide necessary ventilation systems, independent of building systems, to remove dust and fumes from work area.

## PART 2 - PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. General: Provide interior and exterior shoring, bracing, or support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.
1. Cease operations and notify Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.
  2. Cover and protect furniture, equipment, and fixtures from soilage or damage when demolition work is performed in areas where such items have not been removed.
  3. Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

### 3.2 DEMOLITION

- A. General: Perform selective demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.
  - 1. Demolish concrete and masonry in small sections. Cut concrete at junctures with construction to remain using power-driven masonry saw or hand tools.
  - 2. The Contractor shall size and locate demolition equipment throughout structure and promptly remove debris in a manner to avoid imposing excessive loads on supporting walls, floors, or framing.
  - 3. Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.
  - 4. Perform demolition using procedures and equipment which will avoid spalling, cracking or other damage to existing concrete or finishes.
- B. If unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative, rearrange selective demolition schedule as necessary to continue overall job progress without undue delay.
- C. Perform selective partial demolition of delaminated or spalled areas of the concrete structure to prepare the areas for repair in accordance with the Drawings and the following Article 3.3.

### 3.3 DELAMINATED CONCRETE SURFACE PREPARATION

- A. Location and Marking of Work Areas
  - 1. The Contractor shall locate floor slab surface delaminations by sounding the slab surface with a hammer or rod, or dragging a chain. Mark the limits of the delaminated area with chalk or paint.
  - 2. Slab soffit (ceiling) delaminations shall be located by sounding the appropriate member with a hammer or rod. These limits or "boundaries" shall be marked with chalks or paint. Mark the limits of the delaminated area with chalk or paint.
  - 3. Prior to concrete removal, assign a unique designation to each repair location, and record on a drawing to be maintained by the Contractor.
- B. Concrete Removal and Surface Preparation
  - 1. Delaminated, spalled and unsound concrete floor areas shall have their marked boundaries saw cut to a depth of 1/2 inch into the floor slab. For curbs and ceilings the marked boundary may be either saw cut or ground to a depth of 1/2 inch into the existing concrete, measured from the original surface. All edges shall be straight and patch areas generally square or rectangular shaped, avoiding reentrant corners. A diamond blade saw or grinder with abrasive disk suitable for cutting concrete is acceptable for performing this work. The edge cut at the delamination boundary shall be dressed perpendicular to the member face. It shall also be of uniform depth for the entire length of the cut.
  - 2. All concrete shall be removed from within the marked boundary to a minimum depth of 3/4 inch using maximum 15 pound chipping hammers equipped with chisel point bits. If

delaminations exist beyond the minimum removal depth or beyond the marked boundary, chipping shall continue until all unsound and delaminated concrete has been removed.

3. Where reinforcing bars are exposed by concrete removal, extra caution shall be exercised to avoid damaging the reinforcement during removal operations. Concrete removal of 3/4 inch minimum around and beyond the perimeter of the bar for the entire exposed length is required.
4. If rust is present on reinforcing bars where they enter sound concrete, then additional removal of concrete along the reinforcement is required, until uncorroded grey reinforcement is exposed.

C. Inspection of the Surfaces and Exposed Reinforcing

1. After removals are completed, but prior to final cleaning, the cavity and all exposed reinforcement shall be inspected by the Contractor. The inspection shall include sounding the exposed concrete to determine completeness of delamination removals, examination of dressed edges to verify depth and vertical edge of cut, and uniformity of excavation to insure compliance with minimum limits specified.
2. The Contractor shall inspect all reinforcement exposed within the cavity for defect due to corrosion or damage. Replacement of defective or damaged reinforcement shall be performed in accordance with the Drawings.
3. The Owner's representative may also review repair areas in a similar fashion to determine conformance with the Contract Documents.

D. Preparation of Concrete Bonding Surface

1. The Contractor shall abrasive-blast or high pressure water blast all exposed surfaces within the repair areas to remove laitance and any foreign material that may impair bonding.

E. Cleaning and Securing of Reinforcing

1. Where noted on the Drawings, all exposed steel shall be cleaned and epoxy coated in accordance with Section 03300.
2. Loose reinforcing steel shall be secured by either tying loose top reinforcing bars to partially bonded reinforcing bars or drilling supplemental anchors into the existing floor and installing tie downs. Lead anchors are not permitted. Securing loose reinforcement is incidental to surface preparation and no extras will be allowed for this work.

F. Final Preparation

1. All concrete bonding surfaces shall be abrasive blasted prior to concrete placement.
2. Air blasting is required as a final step to remove debris.

### 3.4 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove from building site debris, rubbish, and other materials resulting from demolition operations. Transport and legally dispose off site.

1. If hazardous materials are encountered during demolition operations, comply with applicable regulations, laws, and ordinances concerning removal, handling, and protection against exposure or environmental pollution.

2. Burning of removed materials is not permitted on project site.

### 3.5 CLEANUP AND REPAIR

- A. General: Upon completion of demolition work, remove tools, equipment, and demolished materials from site. Remove protections not required for subsequent construction activities and leave interior areas broom clean.
  1. Repair demolition performed in excess of that required. Return elements of construction and surfaces to remain to condition existing prior to start operations. Repair adjacent construction or surfaces soiled or damaged by selective demolition work.
  2. Clean adjacent facilities of dust, dirt and debris resulting from demolition operations.

END OF SECTION 02070

SECTION 02150 - SHORING AND BRACING

PART 1 GENERAL

1.1 RELATED DOCUMENTS:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

1.2 SUMMARY:

- A. Extent of shoring and bracing work includes, but is not limited to, the following:
  - 1. Shoring and bracing necessary to protect existing structure, buildings, utilities, and other improvements and excavation against damage, deflections, collapse, and loss of ground or caving embankments.
  - 2. Maintenance of shoring and bracing.
  - 3. Removal of shoring and bracing, as required.
- B. Types of shoring and bracing system includes, but is not limited to, the following:
  - 1. Shoring towers and post shores.
  - 2. Structural steel struts.
  - 3. Cable bracing.

1.3 SUBMITTALS:

- A. Layout Drawings: Provide layout drawings for shoring and bracing system and other data prepared and sealed by a registered Professional Engineer licensed in the project's jurisdiction. System design and calculations must be acceptable to the Engineer prior to the Start of Work.

1.4 QUALITY ASSURANCE:

- A. Supervision: Engage and assign supervision of shoring and bracing work to a qualified Registered Engineer.
  - 1. Submit name of engaged consultant and qualifying technical experience for approval.
- B. Regulations: Comply with local codes and ordinances.

1.6 EXISTING UTILITIES:

- A. Protect existing active sewer, water, gas, electricity and other services and structures.



PART 2 - PRODUCTS

2.1 MATERIALS:

- A. General: Provide suitable shoring and bracing materials which will support loads imposed. Materials need not be new, but shall be in serviceable condition.

PART 3 - EXECUTION

3.1 SHORING:

- A. Wherever shoring is required, locate the system to clear permanent construction and to permit selective demolition, and subsequent forming and finishing of concrete surfaces. Provide shoring system adequately anchored and braced to resist lateral loads.

3.2 BRACING:

- A. Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move a brace, install new bracing prior to removal of original brace.
- B. Do not place bracing where it will be cast into or included in permanent concrete work.
- C. Install internal bracing, if required, to prevent spreading or distortion to braced frames.
- D. Maintain bracing until structural elements are rebraced by other bracing or until permanent construction is able to safely withstand all applied loads.
- E. Remove shoring and bracing in stages to avoid damage to structures, facilities, and utilities.
- F. Repair or replace, as acceptable to Owner, adjacent work damaged or displaced through the installation or removal of shoring and bracing work.

END OF SECTION 02150

## SECTION 03300 - CAST-IN-PLACE CONCRETE

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section specifies non-specialty cast-in place concrete, including mix design, placement procedures, and finishes.
- B. This Section also specifies formwork and reinforcing for both non-specialty cast-in-place concrete and specialty repair concretes.
- C. Specialty repair concretes are specified in other Division 3 specifications.

#### 1.3 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, curing compounds, epoxy coating and others items as may be requested by Engineer.
- C. Shop drawings and calculations for formwork, prepared, signed and sealed by a registered Professional Engineer for fabrication and erection of forms for specific finished concrete surfaces. Show form construction including jointing, special form joint or reveals, location and pattern of form tie placement, and other items that affect exposed concrete visually. Formwork, shoring and reshoring shop drawings, and calculations must bear the seal and signature of an engineer registered in the jurisdiction where the project is located.
  - 1. Engineer's review is to confirm that the base building information shown is in general conformance with the Contract Documents. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- D. Concrete mix designs.
- E. Laboratory test reports for concrete materials and mix design test, in accordance with ACI 318-02.
- F. Materials certificates in lieu of materials laboratory test reports when permitted by Engineer. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture

manufacturers that chloride content complies with specification requirements. Provide the Engineer with written certification from the coating manufacturer that the coating resin for steel reinforcement has been approved by the National Bureau of Standards.

- G. Minutes of Pre-Construction Conference.

#### 1.4 QUALITY ASSURANCE

- A. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:
1. ACI 318, "Building Code Requirements for Reinforced Concrete."
  2. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
  3. ACI 301, "Specifications for Structural Concrete for Buildings."
  4. ACI 347, "Recommended Practice for Concrete Formwork."
  5. ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures", as published by the American Concrete Institute.
  6. CRSI "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Bars at the Jobsite."
  7. Standards of the American Society for Testing and Materials (ASTM) as cited.
- B. Concrete Testing Service: The Owner shall engage a testing laboratory to perform material evaluation tests and quality control.
- C. Materials and installed work may require testing and retesting at any time during progress of work. Contractor shall cooperate with the laboratory to facilitate the execution of testing services.
- D. The expense of any and all re-inspection, re-testing, re-design and/or replacement of work that is required due to failure of concrete to meet all contract documents' requirements shall be borne by the Contractor.
- E. Pre-Construction Conference: Conduct conference at Project site to comply with the following.
1. At least 14 days prior to submittal of design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Request that representatives of each entity directly concerned with cast-in-place concrete attend conference, including, but not limited to, the following:
    - a. Contractor's superintendent.
    - b. Laboratory responsible for concrete design mixes.
    - c. Laboratory responsible for field quality control.
    - d. Ready-mix concrete producer.
    - e. Concrete subcontractor.
    - f. Engineer and Owner's representative.

2. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all parties concerned within 5 days of the meeting.
- G. Materials and installed work may be reviewed by the Engineer at any time during the progress of the Work. Allow free access to facilities for this purpose.

## PART 2 - PRODUCTS

### 2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints.
- B. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 mg/l that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
- D. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1-1/2 inches to exposed surface.

### 2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615, Grade 60, deformed.
- B. Steel Wire: ASTM A 82, plain, cold-drawn steel.
- C. Welded Wire Fabric: ASTM A 185, welded steel wire fabric, epoxy coated.
- D. Fibrous Reinforcement: Engineered polypropylene fibers designed for secondary reinforcement of concrete slabs.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Fiberstrand 100," Euclid Chemical Co.
    - b. "Fibermesh," Fibermesh, Inc.
    - c. "Forta CR," Forta Corp.
    - d. "Grace Fibers," W.R. Grace & Co.
- E. Supports for Reinforcement
  1. Provide stainless steel or plastic tipped supports for reinforcement in contact with formwork, including bolsters, chairs, spacers and other devices for spacing, supporting, and fastening

reinforcing bars in place. Use wire bar type supports complying with CRSI recommendations.

2. Supports, including bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing in place shall be manufactured from a dielectric material; or wire bar supports shall be coated with dielectric material, such as epoxy or vinyl; compatible with concrete.
3. Supports for welded wire fabric shall be placed at 2'-0" maximum spacing. Supports for bars shall be placed at 4'-0" maximum spacing. Supports shall be placed a maximum of 6 inches from ends of the reinforcement.

F. Epoxy Coating for Mild Reinforcement

1. Shop applied epoxy coating for mild steel reinforcement shall conform to ASTM A775-81. Brown or red coatings are not permitted. Provide one of the following epoxy coatings for mild steel reinforcement and steel accessories as noted on the Drawings and Specifications:
  - a. "Scotchkote 213" by the 3M Company.
  - b. "Flintflex 531-6086" by the E.I. DuPont DeNemours Company, Inc.
  - c. "Epoxiplate R346 or R349" by the Armstrong Products Company.
  - d. "Epoxy Powder 720-A-009" by the Cook Paint and Varnish Company.
  - e. Or Approved Equivalent.
2. Use patching material recommended by the epoxy powder manufacturer, compatible with the epoxy coating and inert in concrete. Provide one of the following materials:
  - a. "Scotchkote 213 PC" by the 3M Company.
  - b. Or Approved Equivalent.

G. Field Applied Epoxy Coating

1. Field applied epoxy coating materials for existing steel reinforcement and embedded items; provide one of the following epoxy coatings for existing steel reinforcement after abrasive blasting to Near White Metal, as noted on the Drawings and Specifications:
  - a. "Sikatop 32 Hi-Mod", by Sika Chemical Corp., Lyndhurst, NJ.
  - b. "Concresive 1170", by Adhesive Engineering Company, San Carlos, CA.
  - c. "Niklepoxy Concrete Injection Resin, Product No. 3", Rocky Mountain Chemical Co., Jasper, WY.
  - d. "Scotchkote 213PC or 214PC", 3M Company.
  - e. Or Approved Equivalent.

H. Tie Wire

1. Tie wire shall be plastic or vinyl coated for all epoxy coated reinforcement.

I. Delivery, Storage and Handling

1. Deliver all reinforcement to the project site bundled, tagged and marked. Use metal tags indicating bar sizes, lengths and other information corresponding to markings shown on

- placement diagrams. Handle and store materials to prevent damage, rust, or contamination. Store reinforcing steel on supports above ground level. Protect from weather.
2. Epoxy coated reinforcement:
    - a. Comply with requirements of ASTM A 775 "Epoxy Coated Reinforcing Steel Bars" and CRSI "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Bars at the Job Site."
    - b. Provide adequately padded contact areas on all systems used for handling epoxy coated bars.
    - c. Pad all bundling bands and lift all bundles with a strong back, multiple supports or platform bridge so as to prevent bar to bar abrasion due to sags in the bar bundle.
    - d. Do not drop or drag bars or bundles.
    - e. Adequately support bars or bundles during transit to prevent damage to the coating.
    - f. Store bars on wooden cribbing.
    - g. If bars are to be stored on site for more than 1 month before placement, cover bars with opaque polyethylene sheeting, properly secured. Do not store bars at the job site unprotected over the winter.

### 2.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C 150, Type I.
  1. Use one brand of cement throughout project unless otherwise acceptable to the Engineer.
- B. Normal Weight Aggregates: ASTM C 33 and as herein specified. Provide aggregates from a single source for exposed concrete.
  1. For exterior exposed surfaces, do not use fine or coarse aggregates containing spalling-causing deleterious substances.
  2. Local aggregates not complying with ASTM C 33 but that special tests or actual service have shown to produce concrete of adequate strength and durability may be used when acceptable to Architect.
- C. Water: Drinkable.
- D. Admixtures, General: Provide admixtures for concrete that contain not more than 0.05 percent chloride ions.
- E. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.
  1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Air-Tite," Cormix.
    - b. "Air-Mix" or "Perma-Air," Euclid Chemical Co.
    - c. "Darex AEA" or "Daravair," W.R. Grace & Co.
    - d. "MB-VR" or "Micro-Air," Master Builders, Inc.
    - e. "Sealtight AEA," W.R. Meadows, Inc.

- f. "Sika AER," Sika Corp.
- F. Water-Reducing Admixture: ASTM C 494, Type A.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Chemtard," ChemMasters Corp.
    - b. "PSI N," Cormix.
    - c. "Eucon WR-75," Euclid Chemical Co.
    - d. "WRDA," W.R. Grace & Co.
    - e. "Pozzolith Normal" or "Polyheed," Master Builders, Inc.
    - f. "Prokrete-N," Prokrete Industries.
    - g. "Plastocrete 161," Sika Corp.
- G. High-Range Water-Reducing Admixture (Super Plasticizer): ASTM C 494, Type F or Type G.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Super P," Anti-Hydro Co., Inc.
    - b. "PSI Super," Cormix.
    - c. "Eucon 37," Euclid Chemical Co.
    - d. "WRDA 19" or "Daracem," W.R. Grace & Co.
    - e. "Rheobuild," Master Builders, Inc.
    - f. "PSP," Prokrete Industries.
    - g. "Sikament 300," Sika Corp.
- H. Water-Reducing, Accelerating Admixture: ASTM C 494, Type E or Type C.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Q-Set," Conspec Marketing & Manufacturing Co.
    - b. "Gilco Accelerator," Cormix.
    - c. "Accelguard 80," Euclid Chemical Co.
    - d. "Daraset," W.R. Grace & Co.
    - e. "Pozzutec 20," Master Builders, Inc.
- I. Corrosion Inhibitor: ASTM C 494, Type C, containing no chloride ions. Use a calcium nitrate based corrosion inhibitor.
- 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "DCI-S", W.R. Grace & Co.
- J. Prohibited Admixtures: Calcium chloride, thiocyanates or admixtures containing more than 0.05% chloride ions are not permitted.

- K. Certification: Written conformance to the requirements and the chloride-ion content of the admixture will be required from the admixture manufacturer prior to mix design review by the Engineer.

## 2.4 CONCRETE ACCESSORIES

- A. Delivery, Storage and Handling
  - 1. Deliver concrete accessories to the Project site bundled or packaged, tagged and marked indicating the product, size, manufacturer and other identifying information.
  - 2. Store materials at the site in such a way to maintain them dry, undamaged and clean.
- B. Reglets: Unless noted otherwise in Division 7 Specification Sections, where resilient or elastomeric sheet flashing or membranes are terminated in reglets, provide reglets of not less than 0.0217 inch thick (26-gage) galvanized sheet steel. Fill reglet or cover face opening to prevent intrusion of concrete or debris.
- C. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 9 oz. per sq. yd., complying with AASHTO M 182, Class 2.
- D. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
  - 1. Waterproof paper.
  - 2. Polyethylene film.
  - 3. Polyethylene-coated burlap.
- E. Water-Based Acrylic Membrane Curing Compound: ASTM C 309, Type I, Class B.
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated in the work include, but are not limited to, the following:
    - a. "Conhard," Conspec Marketing and Mfg. Co.
    - b. "Safe Cure and Seal," Dayton Superior Corp.
    - c. "Aqua-Cure," Euclid Chemical Co.
    - d. "Dress & Seal #18WB," L&M Construction Chemicals, Inc.
    - e. "Masterseal W," Master Builders, Inc.
    - f. "Intex," W.R. Meadows, Inc.
    - g. "Sika Membrane," Sika Corp.

## 2.5 PROPORTIONING AND DESIGN OF MIXES

- A. Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch method used, use an independent testing facility acceptable to Engineer for preparing and reporting proposed mix designs. The testing facility shall not be the same as used for field quality control testing.



- B. Submit written reports to Engineer of each proposed mix for each class of concrete at least 15 days prior to start of work. Do not begin concrete production until proposed mix designs have been reviewed by Engineer.
- C. Design mixes to provide normal weight concrete with properties, as indicated on drawings and schedules.
- D. Adjustment to Concrete Mixes: Mix design adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mix design and strength results must be submitted to and accepted by Engineer before using in work.
- E. The total water soluble chloride ion content of the mix, including all constituents and admixtures, shall not exceed 0.15 percent by weight of cement.
- F. Slump Limits: Proportion and design mixes to result in concrete slump at point of placement that provides required workability characteristics without segregation or separation of the aggregate.

## 2.6 ADMIXTURES

- A. Use water-reducing admixture or high-range water-reducing admixture (Superplasticizer) in concrete as required for placement and workability.
- B. Use nonchloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F (10 deg C).
- C. Use air-entraining admixture in all concrete unless otherwise indicated, except for surfaces to receive a steel trowel finish. Add air-entraining admixture at manufacturer's prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1-1/2 percent within following limits:
  - 1. Concrete structures and slabs exposed to freezing and thawing, deicer chemicals, or hydraulic pressure:
    - a. 5.5 percent 1-1/2-inch max. aggregate.
    - b. 6.0 percent 1-inch max. aggregate.
    - c. 6.5 percent 3/4-inch max. aggregate.
    - d. 7.0 percent 1/2-inch max. aggregate.
- E. Use admixtures for water reduction and set control in strict compliance with manufacturer's directions.
- F. Use calcium nitrate based corrosion inhibitor at a rate of 2.0 gallons per cubic yard of concrete used in structural slabs. The water in the corrosion inhibitor shall be included in the calculations for the water/cement ratio of the concrete mix.

## 2.7 CONCRETE MIXING

- A. Job-Site Mixing: Mix materials for concrete in appropriate drum-type batch machine mixer. For mixers of one cu. yd. or smaller capacity, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released. For mixers of capacity larger than one cu. yd., increase minimum 1-1/2 minutes of mixing time by 15 seconds for each additional cu. yd. or fraction thereof.
- B. Provide batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mix type, mix time, quantity, and amount of water introduced.
- C. Ready-Mix Concrete: Comply with requirements of ASTM C 94, and as specified.
  - 1. When air temperature is between 85 deg F (30 deg C) and 90 deg F (32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes, and when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

## PART 3 - EXECUTION

### 3.1 GENERAL

- A. Inspect area to receive the work and report immediately in writing to the Engineer, as required in the General Conditions, any unacceptable conditions. Starting work constitutes acceptance of conditions.

### 3.2 FORMS

- A. General: The Contractor shall design, erect, support, brace, and maintain formwork to support vertical and lateral, static and dynamic loads that might be applied until concrete structure can support such loads. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation, and position. Maintain formwork construction tolerances complying with ACI 347.
- B. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- C. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
- D. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary

openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

- E. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
- G. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.

### 3.3 PLACING REINFORCEMENT

- A. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Provide standard reinforcement splices as shown on the Drawings or by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements of ACI 318 for minimum lap of spliced bars.

### 3.4 EXISTING REINFORCEMENT

- A. Existing reinforcing and miscellaneous metal to remain shall be cleaned of rust and laitance to Near White Metal. Where noted on the drawings, epoxy coat in accordance with epoxy coating manufacturer recommendations.
  - 1. Epoxy cure time must be extended as directed by the Engineer during cold weather application.
  - 2. Epoxy must be properly cured prior to concrete placement. Epoxy must not be tacky.
  - 3. Remove epoxy spillage from adjacent concrete surfaces.

### 3.5 EPOXY COATING INSPECTION AND REPAIR

- A. Uncoated ends of bars must be coated at the job site.

- B. Repair is required on damaged areas of coating larger than 1/4 inch by 1/4 inch.
- C. If more than 2 percent of the total coating on bar is damaged, bar shall be repaired or replaced.
- D. Repair damaged epoxy coating in accordance with ASTM A775-81 by cleaning and field applying epoxy coating using materials and methods recommended by the epoxy power manufacturer.
- E. Inspection and acceptance of epoxy coated reinforcement will be per CRSI "Guidelines for Inspection and Acceptance of Epoxy Coated Reinforcing Bars at the Jobsite".

### 3.6 JOINTS

- A. Construction Joints: Locate and install construction joints as indicated or, if not indicated, locate so as not to impair strength and appearance of the structure, as acceptable to Engineer.
- B. Provide keyways at least 1-1/2 inches deep in construction joints in slabs. Accepted bulkheads designed for this purpose may be used for slabs.
- C. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Do not continue reinforcement through sides of strip placements.

### 3.7 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to or supported by cast-in-place concrete. Use setting drawings, diagrams, instructions, and directions provided by suppliers of items to be attached thereto. All embedded items used for attachment of formwork to concrete and other miscellaneous items shall be epoxy coated.
- B. The Contractor shall be responsible for controlling the proper placing of all embedded pipe, conduit, and other fixtures. Refer to ACI 318 for requirements pertaining to embedded items within cast-in-place concrete. Minimum cover requirements for reinforcing shall apply to all embedded items unless shown otherwise on the Drawings.
- C. Use suitable templates to accurately set and support against displacement all bolts, inserts, sleeves or other embedded items.
- D. Install reglets to receive top edge of membranes and other conditions.
- E. Forms for Slabs: Set edge forms, bulkheads, and intermediate screed strips for slabs to obtain required elevations and contours in finished surfaces. Provide and secure units to support screed strips using strike-off templates or compacting-type screeds.

### 3.8 PREPARATION OF FORM SURFACES

- A. General: Coat contact surfaces of forms with an approved, nonresidual, low-VOC, form-coating compound before reinforcement is placed.
- B. Do not allow excess form-coating material to accumulate in forms or to come into contact with in-place concrete surfaces against which fresh concrete will be placed. Apply in compliance with manufacturer's instructions.
- C. Remove form coating and residue from reinforcement or surfaces not requiring form coating.
- D. Coat steel forms with a nonstaining, rust-preventative material. Rust-stained steel formwork is not acceptable.

### 3.9 CONCRETE PLACEMENT

- A. Inspection: Before placing concrete, inspect and complete formwork installation, reinforcing steel, and items to be embedded or cast in.
- B. General: Comply with ACI 304, "Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete," and as herein specified.
- C. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete that has hardened sufficiently to cause the formation of seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete to avoid segregation at its final location.
- D. Placing Concrete in Forms: Deposit concrete in forms in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
  - 1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete in accordance with ACI 309.
  - 2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within limits of construction joints, until the placing of a panel or section is completed.
  - 1. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.
  - 3. Maintain reinforcing in proper position during concrete placement.

- F. Cold-Weather Placing: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
- G. When air temperature has fallen to or is expected to fall below 40 deg F (4 deg C), uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F (10 deg C) and not more than 80 deg F (27 deg C) at point of placement.
  - 1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 2. Do not use calcium chloride, salt, and other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.
- H. Hot-Weather Placing: When hot weather conditions exist that would seriously impair quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified.
  - 1. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 deg F (32 deg C). Mixing water may be chilled, or chopped ice may be used to control temperature provided water equivalent of ice is calculated to total amount of mixing water. Use of liquid nitrogen to cool concrete is Contractor's option.
  - 2. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedment in concrete.
  - 3. Fog spray forms, reinforcing steel, and subgrade just before concrete is placed.

### 3.10 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed to view in the finish work or concealed by other construction. This is the concrete surface having texture imparted by form-facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4 inch in height rubbed down or chipped off.
- B. Smooth Form Finish: For formed concrete surfaces exposed to view or to be covered with a coating material applied directly to concrete. This is an as-cast concrete surface obtained with selected form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch defective areas with fins and other projections completely removed and smoothed.
- C. Grout-Cleaned Finish: Provide grout-cleaned finish to concrete surfaces that have received smooth form finish treatment.
  - 1. Combine one part portland cement to 1-1/2 parts fine sand by volume, and a 50:50 mixture of acrylic or styrene butadiene-based bonding admixture and water to consistency of thick paint. Blend standard portland cement and white portland cement, amounts determined by trial patches, so that final color of dry grout will match adjacent surfaces.
  - 2. Thoroughly wet concrete surfaces, apply grout to coat surfaces, and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces, strike-off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

### 3.11 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces to receive broom finish and other finishes as hereinafter specified; slab surfaces to be covered with membrane or elastic waterproofing, and as otherwise indicated.
  - 1. After screeding, consolidating, and leveling concrete slabs, do not work surface until ready for floating. Begin floating, using float blades or float shoes only, when surface water has disappeared, when concrete has stiffened sufficiently to permit operation of power-driven floats, or both. Consolidate surface with power-driven floats or by hand-floating if area is small or inaccessible to power units. Check and level surface plane to tolerances of Ff 18 - Fl 15. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- B. Nonslip Broom Finish: Apply nonslip broom finish to all concrete decks, and ramps, and elsewhere as indicated.
  - 1. Immediately after float finishing, slightly roughen concrete surface by brooming with fiber-bristle broom perpendicular to main traffic route.

### 3.12 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. In hot, dry, and windy weather, protect concrete from rapid moisture loss before and during finishing operations with an evaporation-control material. Apply in accordance with manufacturer's instructions after screeding and bull floating, but before power floating and troweling.
- B. Start initial curing as soon as free water has disappeared from concrete surface after placing and finishing. Weather permitting, keep continuously moist for not less than 7 days.
- C. Curing Methods: Perform curing of concrete by curing and sealing compound, by moist curing, by moisture-retaining cover curing, and by combinations thereof, as herein specified. Curing methods used on slabs shall be compatible with waterproofing materials to be applied to the slabs.
- D. Provide moisture curing by following methods.
  - 1. Keep concrete surface continuously wet by covering with water.
  - 2. Use continuous water-fog spray.
  - 3. Cover concrete surface with specified absorptive cover, thoroughly saturate cover with water, and keep continuously wet. Place absorptive cover to provide coverage of concrete surfaces and edges, with 4-inch lap over adjacent absorptive covers.

- E. Provide moisture-retaining cover curing as follows:
  - 1. Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3 inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
  - 2. Inspect the concrete surface at the beginning and end of each work day. If the surface appears to be dry, remove the cover, apply water to the surface and replace the cover.
- F. Curing Formed Surfaces: Cure formed concrete surfaces, including underside of supported slabs, and other similar surfaces, by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.
- G. Curing Unformed Surfaces: Cure unformed surfaces, such as slabs and other flat surfaces, by application of appropriate curing method.

### 3.13 SHORES AND SUPPORTS

- A. General: Comply with ACI 347 for shoring and reshoring in multistory construction, and as herein specified.
- B. Shore floor directly under floor or roof being placed, so that loads from construction above will transfer directly to these shores. Space shoring in stories below this level in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members where no reinforcing steel is provided. Extend shores beyond minimums to ensure proper distribution of loads throughout structure.
- C. Remove shores and reshore in a planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to support work without excessive stress or deflection.
- D. Keep shores and reshores in place until concrete has attained its required 28-day compressive strength and heavy loads due to construction operations have been removed.

### 3.14 REMOVAL OF FORMS

- A. General: Formwork not supporting weight of concrete may be removed after cumulatively curing at not less than 50 deg F (10 deg C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form-removal operations, and provided curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as slabs, and other structural elements, may not be removed until concrete has attained at least 75 percent of design minimum compressive strength. Determine compressive strength of in-place concrete by testing lab-cured specimens representative of concrete location or members. Reshore concrete immediately after removal of formwork.
- C. Form-facing material may be removed 4 days after placement only if shores and other vertical supports have been arranged to permit removal of form-facing material without loosening or disturbing shores and supports.



### 3.15 REUSE OF FORMS

- A. Clean and repair surfaces of forms to be reused in work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.
- B. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces except as acceptable to Architect.

### 3.16 MISCELLANEOUS CONCRETE ITEMS

- A. Filling In: Fill in holes and openings left in concrete structures for passage of work by other trades, after work of other trades is in place. Mix, place, and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and steel-toweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

### 3.17 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Owner.
  - 1. Cut out honeycomb, rock pockets, voids over 1/4 inch in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1 inch. Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water, and brush-coat the area to be patched with specified bonding agent. Place patching mortar before bonding compound has dried.
  - 2. For exposed-to-view surfaces, blend white portland cement and standard portland cement so that, when dry, patching mortar will match color surrounding. Provide test areas at inconspicuous location to verify mixture and color match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface.
- B. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defects cannot be repaired to satisfaction of Owner. Surface defects, as such, include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets, fins and other projections on surface, and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry-pack mortar, or precast cement cone plugs secured in place with bonding agent.

1. Repair concealed formed surfaces, where possible, that contain defects that affect the durability of concrete. If defects cannot be repaired, remove and replace concrete.
- C. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish. Correct low and high areas as herein specified. Test unformed surfaces sloped to drain for trueness of slope and smoothness by using a template having required slope.
1. Repair finished unformed surfaces that contain defects that affect durability of concrete. Surface defects, as such, include crazing and cracks in excess of 0.03 inch wide or that penetrate to reinforcement or completely through nonreinforced sections regardless of width, spalling, popouts, honeycomb, rock pockets, and other objectionable conditions.
  2. Correct high areas in unformed surfaces by grinding after concrete has cured at least 14 days.
  3. Correct low areas in unformed surfaces during or immediately after completion of surface finishing operations by cutting out low areas and replacing with patching compound. Finish repaired areas to blend into adjacent concrete.
  4. Repair defective areas, except random cracks and single holes not exceeding 1 inch in diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- D. Repair isolated random cracks and single holes not over 1 inch in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry-pack before bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.
- E. Repair methods not specified above may be used, subject to acceptance of Engineer.

### 3.18 QUALITY CONTROL TESTING DURING CONSTRUCTION

- A. General: The Owner shall employ a testing laboratory to perform tests and to submit test reports.
- B. Sampling and testing for quality control during placement of concrete may include the following:
- C. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  1. Slump: ASTM C 143; one test at point of discharge for each day's pour of each type of concrete; additional tests when concrete consistency seems to have changed.
  2. Air Content: ASTM C 173, volumetric method for lightweight or normal weight concrete; ASTM C 231 pressure method for normal weight concrete; one for each day's pour of each type of air-entrained concrete.

3. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and each time a set of compression test specimens is made.
  4. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens.
  5. Compressive Strength Tests: ASTM C 39; one set for each day's pour plus additional sets for each 25 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; two specimens tested at 7 days and two specimens tested at 28 days.
  6. When frequency of testing will provide fewer than 3 strength tests for a given class of concrete, conduct testing from at least 3 randomly selected batches or from each batch if fewer than 5 are used.
- D. Test results will be promptly reported in writing to Owner, Structural Engineer, and Contractor. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength, and type of break for both 7-day tests and 28-day tests.
- E. Nondestructive Testing: Calibrated Windsor Probe testing or other nondestructive device may be permitted but shall not be used as the sole basis for acceptance or rejection.
- F. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests when unacceptable concrete is verified.

END OF SECTION 03300

## SECTION 03350 CONCRETE REPAIRS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 WORK INCLUDED

- A. Provide labor, equipment, materials, and supervision to install concrete patching materials, as shown on the Drawings and as hereinafter specified.
- B. Perform all work in strict accordance with all applicable laws and regulations of the Building Code and with all other authorities having jurisdiction, which shall take precedence over the requirements of the Specifications, except that where the requirements of the Specifications are more exacting or stringent, they shall govern.
- C. Before commencing work, examine all adjoining work on which this work is dependent and report in writing to the Owner or Engineer any condition that prevents Contractor from performing the work. Starting work constitutes acceptance of adjoining work.
- D. Verify exact sizes and locations of all openings, pipe sleeves, concrete pads or curbs, etc., well in advance so that any required Engineer approved adjustments, in reinforcing or locations may be made without interruption of the work schedule.
- E. Install all materials specified under other sections that are required to be built into the work covered by this section such as anchors, ties, etc. Embedded items shall have been inspected and tests for mechanical operations, if any, shall have been completed and approved by the Owner before placement of any concrete.
- F. Remove and reinstall all electrical conduit, mechanical conductors, light fixtures, mechanical equipment, etc. necessary for the proper completion of repairs. Remove and discard all abandoned conduit located in patching areas. Replace corroded embedded conduit with new metal surface mounted conduit.

#### 1.3 RELATED WORK

- A. The following work is related to this Section:
  - 1. Selective Demolition           Section 02070
  - 2. Shoring and Bracing           Section 02150
  - 3. Cast-in-Place Concrete       Section 03300
  - 4. Deck Coating and Sealants   Section 07100

#### 1.4 REFERENCE STANDARDS

- A. Conform to the latest edition of the following Codes and Standards:
1. ACI-301 "Specification for Structural Concrete for Buildings," by the American Concrete Institute.
  2. ACI-318 "Building Code Requirements for Reinforced Concrete," by the American Concrete Institute.
  3. ACI-347 "Recommended Practice for Concrete Formwork," by the American Concrete Institute.
  4. ACI 306 "Recommended Practice for Cold Weather Concreting," by the American Concrete Institute.
  5. ACI 305 "Recommended Practice for Hot Weather Concreting," by the American Concrete Institute.
  6. ACI 614 "Recommended Practice for Measuring, Mixing, and Placing Concrete," by the American Concrete Institute.
  7. Standards of the American Society for Testing and Materials (ASTM), as cited.
  8. FHWA-RD-77-85, "Sampling and Testing for Chloride Ion in Concrete," by the Federal Highway Administration.
- B. Any material or operation specified by reference to the published specifications of a manufacturer, The American Society for Testing and Materials (ASTM), The American Institute of Steel Construction (AISC), American National Standards Institute (ANSI), The American Welding Society (AWS), The American Concrete Institute (ACI), Concrete Reinforcing Steel Institute (CRSI), or other published standards shall comply with the requirements of the standard listed. In case of a conflict between the referenced specification and the project specifications or the Code, the more stringent specifications shall govern.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Cold weather concreting: In accordance with ACI 306.
- B. Hot weather concreting: In accordance with ACI 305.

#### 1.6 SCHEDULING

- A. Coordinate work with that of other trades to allow reasonable time to set sleeves, inserts and other accessories.
- B. Notify the Owner, Engineer and the testing agency at least 48 hours prior to placing any concrete.

#### 1.7 EXPERIENCE AND QUALIFICATIONS

- A. The Contractor, or Restoration Subcontractors, shall have not less than two years experience in the field of structural concrete restoration work.

- B. Upon request from the Engineer, the Contractor shall submit a written description of construction ability including equipment, facilities, personnel and a list of similar completed projects to the Engineer.

### 1.8 SUBMITTALS

- A. Submit all materials and methods for concrete curing to the Engineer for approval prior to beginning concreting work.
- B. Design Mix
  - 1. For each strength and type of concrete, the Contractor shall be responsible for mix proportions and have a concrete design mix prepared by an independent testing laboratory. Proper proportions for the design mixes shall be in accordance with "Recommended Practice for Selecting Proportions for Normal Weight Concrete," ACI Standard 211 or according to ACI 318. The proper water cement ratio shall be determined by preliminary test made in accordance with "Method of Making and Curing Concrete Compression and Flexure Tests Specimens in the Laboratory," ASTM C192. Tests shall be conducted in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders," ASTM C39. Each design mix shall be furnished to the Engineer and his approval must be obtained prior to commencing any concrete operations.
  - 2. Mix designs are required for:
    - a. Structural slab patching material.
  - 3. Submit to the Engineer mix designs for review of the concrete specified herein including the following information:

a.	Design mix method	ACI 318
b.	Weight of material per cubic yard	ASTM C29
c.	Type of cement and manufacturer	ASTM C172
d.	Cement content, bags per cu. yd.	
e.	Amount of superplasticizing agent	
f.	Water/cement ratio	
g.	Amount of air-entraining agent	ASTM C231
h.	Volumetric air content- percent	ASTM C173
i.	Sieve analysis & source, coarse aggregate	ASTM C13, C33, C330
j.	Sieve analysis & source, fine aggregate	ASTM C136, C33, C330
k.	Weight, hardened - lbs.per cu.ft.	ASTM C138
l.	Slump range	ASTM C143
m.	Seven day compressive strength	ASTM C31 C39
n.	Twenty-eight day compressive strength	ASTM C31 C39
  - 4. The Contractor shall warrant by the submission of the design mix that such mix is totally representative of the concrete(s) that he intends to supply to meet the requirements of the

Contract Documents. The Contractor shall submit new design mixes for review when any change in materials is required or needed.

- C. Upon request from the Engineer the Contractor shall submit certified cement mill test reports to the Engineer for each type and run of cement used in the work (ASTM C150).
- D. Upon request from the Engineer the Contractor shall submit certified laboratory chemical and other analyses for aggregates and admixtures as deemed necessary.
- E. Contractor shall maintain plan drawing sepias or mylars locating all concrete repairs performed under this section. Location, size of patches, and final quantities are to be clearly noted on Drawing. Added reinforcement shall be noted on these Drawings. Separate Drawing shall be maintained for each slab surface level and slab soffit plan. Measurement of all repair areas and quantities shall be made upon completion of demolition and preparation work noted in Section 02070 and on the Drawings.

## 1.9 STORAGE OF MATERIALS

- A. Store materials on platforms off ground; protect stored cement against elements. Handle and store aggregates separately in a manner to prevent intrusion of foreign material. Protect all material hereinafter specified until used. Any material which has deteriorated or which has been damaged shall not be used.

## PART 2 - PRODUCTS

### 2.1 CONCRETE MATERIALS

- A. Portland Cement shall conform to ASTM "Standard Specifications for Portland Cement C150 Type I.
- B. Aggregates for concrete shall conform to ASTM Standard Specifications for Concrete Aggregate, ASTM C33, Exposure 4S.
  - 1. Fine aggregate shall be natural sand, or sand prepared from stone or gravel. Grains shall be clean, hard, durable, uncoated and free from silt, loam and clay.
  - 2. Coarse aggregate shall be crushed stone, gravel, or other approved inert materials of similar characteristics. Maximum size shall be nominal 3/4". See C33 size number 67 for gradation requirements.
  - 3. Aggregate to be certified by the supplier to be non-reactive with alkalis when evaluated in accordance with Appendix A of ASTM C33.
- C. Water is to be clean and potable.
- D. Ready-Mix Concrete
  - 1. Ready-mix concrete shall conform to ASTM C94. The mixing agitation shall begin within 30 minutes, and the concrete shall be discharged from the truck within 90 minutes after the water has been added to the concrete mix.

2. Delivery tickets are to accompany each concrete truck and shall be kept in the job superintendent's file. Delivery tickets must indicate the following information or be subject to rejection:
  - a. Name of project
  - b. Supplier of concrete
  - c. Truck identity & ticket
  - d. Serial number
  - e. Batching time
  - f. Point of deposit
  - g. Total amount of water
  - h. Strength classification
  - i. Number of cubic yards in load
  - j. Date of delivery
  - k. Brand of cement
  - l. Cement content
  - m. Weight of aggregate
  - n. Admixture contents
  - o. Name of contractor
  - p. Name of driver
  - q. Admixture volume
  - r. Daily temperature
  
3. Ready-mix concrete shall be certified by supplier in writing to the Engineer to conform to Contract Documents and design mix.

E. Volumetric Batching / Continuous Mix

1. Volumetric batching or continuous mixers shall conform to "Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing" ASTM C685.
2. Batch tickets are to accompany each batching operation and shall be kept in the job superintendent's file. Batch tickets must indicate the following information or be subject to rejection:
  - a. Name of product
  - b. Supplier of concrete
  - c. Mixer identity and ticket
  - d. Serial number
  - e. Batching time
  - f. Point of deposit
  - g. Strength classification
  - h. Weight of aggregate
  - i. Daily temperature
  - j. Number of cubic yards produced
  - k. Date of delivery
  - l. Brand of cement
  - m. Cement content
  - n. Admixture contents
  - o. Admixture volume
  - p. Name of contractor



3. Batched concrete shall be certified by supplier in writing to the Engineer to conform to Contract Documents and design mix.

F. Site Batched Concrete for Slab Patching

1. Latex or microsilica modified concrete shall be used for partial depth slab patching. Redi-mix concrete may be used for full-depth repairs.
2. Contractor may batch latex or microsilica modified concrete patch material on site. The concrete shall be mixed in a rotary mixer capable of producing sufficient concrete so that placement and finishing operations can proceed at a steady pace.
3. All components of the concrete mix must be proportioned by weight. Components shall be individually weighed using a calibrated scale sufficient for such purposes. Calibration certificate will be required.
4. All materials must be stored in dry conditions, protected from rain or runoff.
5. For each day Contractor site batches concrete, testing agency shall obtain from Contractor one sample each of coarse and fine aggregate and proceed to measure moisture content. Contractor to adjust mix accordingly.
6. Contractor to submit laboratory determined moisture content of coarse and fine aggregate to determine Saturated Surface Dry (SSD) condition.

G. Concrete Properties

1. Minimum strength for micro-silica concrete and latex-modified concrete at 28 days shall be 4500 psi.
2. Maximum water-cement ratio; where cement refers only to Cement in accordance with Paragraph 2.1A to be 0.35 for all concrete.
3. Latex mix shall contain a minimum of 3.5 gallons of latex (50 percent solids) per 94 pound cement.
4. Microsilica mix shall contain a minimum of 10 percent microsilica by weight of cement.
5. Total air content in concrete as determined by "Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method" ASTM C173, or "Air Content of Freshly Mixed Concrete by Pressure Method", ASTM C231, shall be:
  - a. Microsilica Concrete: 62% plus or minus 1% by volume.
  - b. Latex Concrete: 52% plus or minus 12% by volume.
6. Concrete temperatures as placed shall be between 55 degrees and 80 degrees Fahrenheit. Concrete shall be placed within 90 minutes of adding water to the mix.
7. The total water soluble chloride ion content of the mix, including all constituents and admixtures, shall not exceed 0.15 percent by weight of cement.
8. Calcium nitrate based corrosion inhibitor admixture shall be added to concrete mixes at a rate of 2.0 gallons per cubic yard of concrete. The water in the admixture shall be included in the calculations for the water/cement ratio of the concrete mix.

## 2.2 ADMIXTURES

- A. Admixtures may be used by the Contractor at no additional expense to the Owner in order to provide workability at low water/cement ratios, increased compressive strength, retarding or acceleration of the concrete if approved in writing by the Engineer; however, the cement factor

shall not be reduced, and changes shall be made in the other mix proportions to insure the minimum strength requirements.

- B. Air-entraining Admixtures shall conform to ASTM C260.
- C. Water-Reducing Admixture shall conform to ANSI/ASTM C 494, Type A.
- D. High-Range Water-Reducing Admixture (Superplasticizer) shall conform to ASTM C 494, Type G or Type F.
- E. Water-Reducing, Accelerator Admixture shall conform to ASTM C 494, Type C or E. Accepted materials are:
  - 1. "Accelguard 80", by Euclid Chemical Co.
  - 2. "Darex Set Accelerator", by W.R. Grace
  - 3. "Pozzutec 20" by Master Builders
  - 4. or Approved Equivalent.
- F. No calcium chloride shall be used. Chlorides in admixtures shall not exceed 0.05% by weight of admixture.
- G. Latex emulsion shall be:
  - 1. "Dow Modifier A" by Dow Chemical Company, Midland, MI.
  - 2. "Styrofan 1186" by BASF, Chattanooga, TN
  - 3. or Approved Equivalent.
- H. Microsilica shall be:
  - 1. "Emsac" By Elkem Chemicals, Inc., Pittsburgh, PA
  - 2. "Force 10,000" By W.R. Grace Concrete Admixtures, Cambridge, MA
  - 3. "MB-SF" by Master Builders, Cleveland, OH
  - 4. or Approved Equivalent.
- I. Calcium nitrate based corrosion inhibitor shall conform to ASTM C494, Type C specifications such as:
  - 1. "DCI-S", W.R. Grace & Co.

## 2.3 RELATED MATERIALS

- A. Trowel-applied mortar may be used for patching vertical and overhead surfaces as noted on the Drawings shall be one of the following:
  - 1. "Renderoc HB or HBA," by Fosroc, Inc., Plainview, NJ
  - 2. "Sikatop 123," by Sika, Lyndhurst, NJ
  - 3. or Approved Equivalent.

- B. Grout shall achieve 28-day strength of 6000 psi per ASTM C109. Exposed grout color shall match surrounding concrete.
- C. Moisture-Retaining Cover shall be one of the following, complying with ANSI/ASTM C 171:
  - 1. Waterproof paper over burlap.
  - 2. Polyethylene film over burlap.
  - 3. Polyethylene-coated burlap.
- D. Where noted to be provided, bonding grout using same materials as repair material shall be brushed into the concrete surface immediately prior to repair material placement. The slurry shall be applied evenly to a uniform minimum thickness of 1/16 inch to 1/8 inch throughout. Grout shall not be allowed to dry or dust prior to placement of the concrete material.
  - 1. Latex and microsilica bonding grout shall be proportioned by the manufacturer.
  - 2. As a minimum, concrete bonding grout shall consist of equal parts of volume of sand and cement with sufficient water to achieve consistency of stiff pancake batter.
  - 3. Epoxy bonding materials shall not be used without approval of the Engineer.

### PART 3 - EXECUTION

#### 3.1 JOINTS

- A. Construction or control joints in slabs passing through patches shall be tooled through the patch for continuity.

#### 3.2 PLACING CONCRETE PATCHING MATERIALS

- A. Prior to concrete placement, all preparation, including inspection, must be completed as outlined in Section 02070.
- B. All concrete bonding surfaces must be abrasive blasted prior to concrete placement.
- C. Immediately prior to the placing of concrete, the Contractor shall thoroughly clean all cavities and forms of foreign matter and remove all wood spreaders. Convey concrete from mixer to destination as rapidly as practicable and by methods that will prevent segregation or loss of ingredients. Concrete shall be poured in one operation up to temporary bulkheads. If construction joints are permitted, new concrete shall not be placed until the contact surface of the concrete in place has been swept with a stiff brush or scraped to remove laitance and roughened. One hour prior to placing concrete, pre-wet bonding surface with a uniform spray application of water, puddles shall be blown clean. Surface shall be maintained in a surface-dry damp condition until the concrete is placed.
- D. All concrete shall be placed with the aid of mechanical vibrators of approved type. Enough vibration shall be used to cause all concrete to flow or settle readily into place. The vibrators shall be of the internal type. Form vibrators or vibrating screeds may also be employed. Vibrators must not be allowed to touch reinforcement embedded in partially set concrete nor used to lead concrete immediately prior to placement of concrete material.

1. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than visible effectiveness of the vibrator. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing segregation of mix.
- E. Place concrete only when temperature is at least 40 deg. F. and rising. If these conditions are not met, refer to ACI 306 "Cold Weather Concreting."
- F. When concrete is placed under conditions of hot weather concreting or hot weather conditions exist at any time during the day of the pour, provide extra protection of the concrete against excessive placement temperatures and excessive drying throughout the placing and curing operations. Hot weather is defined as air temperature which exceeds 80 degrees F or any combination of high temperature, low humidity and/or high wind velocity which caused a rate of evaporation in excess of 0.2 pounds per square feet per hour as determined by Figure 2.1.5 of ACI Report 305, "Hot Weather Concreting".
  1. Cool the forms, reinforcement and the air by water fog spraying immediately before placing concrete.
  2. The placement temperature of the concrete shall be 55 degrees to 80 degrees F.
  3. Protect concrete during finishing operations by continuous fog spray between finishing operations. Excessive water on surface during finishing is not accepted.
- G. When bleed water has left the surface, apply a medium broom finish to exposed concrete surfaces not receiving a deck coating. Areas to receive a deck coating shall have a finish approved by the coating manufacturer. Finish shall be approved by the Owner.
- H. Check and level surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10 foot straight edge. Cut down high spots and fill low spots. Uniformly slope surfaces to drains. No refloating is required.
- I. Maximum variation between slab surfaces at joints shall not exceed 1/16 inch.

### 3.3 CURING

- A. Concrete and concrete patching materials shall be cured according to the manufacturer's recommendations and according to the following minimum requirements:
  1. The surface shall be covered with a single layer of clean, wet burlap as soon as the surface will support it without deformation.
    - a. For conventional or microsilica concrete, maintain burlap in saturated condition for seven days.
    - b. For latex modified concrete, maintain burlap in saturated condition for a minimum 2 days. Then allow the burlap to dry slowly for an additional 24 hours. Keep traffic off of the material until the concrete has been surface-dry for a minimum 2 days.
  2. Curing time shall be extended when the curing temperature falls below 50 degrees F.

- B. If shrinkage cracks appear in the concrete material prior to completion of the initial 72 hour curing period, the concrete shall be considered defective, and it shall be removed and replaced by the Contractor at no extra cost to the Owner.
- C. Curing compounds may not be used without prior approval of the Engineer.
- D. During the period of curing the patch shall be protected from traffic; slab demolition from above or below shall be halted. During the period of initial concrete set, no traffic shall be permitted on the adjacent bays.
- E. Prior to reopening patches to traffic and loading, Contractor must confirm that patch concrete has attained a minimum compressive strength of 70 percent of the specified 28 day strength.

### 3.4 QUALITY CONTROL

- A. General: The Owner shall employ a testing agency to perform the required testing and submit reports on the tests.
- B. Notify the Testing Agency of scheduled pour dates, and notify the Testing Agency 48 hours in advance of placing concrete.
- C. Addition of water to concrete trucks at the site will not be permitted; however, initial adjustments to air and slump will be permitted by site added superplasticizer or air entraining agents. Retest of air content, slump, unit weight and recasting of cylinders will be required. Additional discharge time will not be permitted beyond the maximum 90 minutes.
- D. Sampling and testing for quality control during placement of concrete includes the following:
  - 1. Sampling Fresh Concrete: ASTM C 172, except modified for slump to comply with ASTM C 94.
  - 2. Slump: ASTM C 143; one test for each concrete load at point of placement.
  - 3. Air Content: ASTM C173, "Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method" for lightweight or normal weight concrete; or ASTM C231 "Air Content of Freshly Mixed Concrete by the Pressure Method" for normal weight concrete; one test for each day's pour of each type of air entrained concrete.
  - 4. Concrete Temperature: Test hourly when air temperature is 40 deg F (4 deg C) and below, when 80 deg F (27 deg C) and above, and each time a set of compression test specimens is made.
  - 5. Compression Test Specimen: ASTM C 31; one set of 4 standard cylinders for each compressive strength test, unless otherwise directed. Mold and store cylinders for laboratory-cured test specimens.
  - 6. Compressive Strength Tests: ASTM C 39; one set for each day's pour plus additional sets for each 25 cu. yds. more than the first 25 cu. yds. of each concrete class placed in any one day; two specimens tested at 7 days and two specimens tested at 28 days.
  - 7. When frequency of testing will provide fewer than 3 strength tests for a given class of concrete, conduct testing from at least 3 randomly selected batches or from each batch if fewer than 5 are used.

- E. Sampling and testing for quality control during placement of trowel-applied mortar includes the following:
1. Concrete Compressive Strength:
    - a. Mold test cubes in accordance with ASTM C 109 as follows:
      - 1) Take minimum of six cubes for each 10 cubic feet, or fraction thereof, of each repair mortar placed in any one day. Use 2" x 2" cubes.
      - 2) Additional two cubes shall be taken and field cured under conditions of cold weather concreting, and when directed by Engineer.
    - b. Cover specimens properly, immediately after finishing. Protect molds from contact with sources of water for first 24 hours after molding.
    - c. Fabricate and cure test cubes per ASTM C 109, except as follows:
      - 1) Do not remove specimens from molds before 24 hours.
      - 2) To verify 7 and 28-day compressive strengths:
        - a) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80 degrees F. and prevent loss of moisture from specimens.
        - b) Remove test specimens from molds at end of 24 hours and air dry in laboratory until moment of test.
      - 3) To verify compressive strength of test cubes required due to cold weather concreting conditions:
        - a) Store test specimens on structure as near to point of sampling as possible and protect from elements in same manner as that given to portion of structure as specimen represents.
        - b) Transport to test laboratory no more than 4 hours before testing. Remove molds from specimens immediately before testing.
    - d. Compression Test:
      - 1) Test 3 cubes at 3 days.
      - 2) Test 3 cubes at 7 days.
      - 3) Test 3 cubes at 28 days.
      - 4) Hold 3 cubes in reserve for use as Engineer directs.
    - e. Unless notified by Engineer, reserve cubes may be discarded without being tested after 60 days.
  - F. Test results will be reported in writing to Engineer and Contractor. Reports of compressive strength tests shall contain the project identification name and number, date of concrete placement, name of concrete testing agency, concrete supplier, Contractor's name, technician's name, weather data, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials, compressive breaking strength and type of break for both 3 or 7-day tests and 28-day tests.

G. Additional Tests

1. The testing agency will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Engineer. Testing agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42, or by other methods as directed. Contractor shall pay for such tests conducted, and any other additional testing as may be required, when unacceptable concrete is verified.
2. Additional compressive strength tests of at least two additional compression test specimens for each test may be made to verify that the concrete has attained sufficient early strength to allow removal of forms or shoring or resumption of traffic on the area. The Contractor shall pay for such tests unless the contract documents or written directive by the Owner note that early attainment of strength is required.

- H. The patched areas will be sounded by the Engineer with a chain drag or hammer a minimum of 7 days after concrete placement. The Contractor shall repair all hollowness detected by removing and replacing the patch or affected area at no extra cost to the Owner.

END OF SECTION 03350

SECTION 07100 DECK COATING AND SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. A single installer shall be responsible for providing a complete and compatible sealant and waterproofing system.
- B. The work includes furnishing all labor, materials, equipment and supervision to install in accordance with the Drawings and Specifications, all items listed, but not limited to:
  - 1. Deck Coating: A fluid applied, waterproof, traffic bearing elastomeric membrane.
    - a. New system over elevated concrete parking slabs
    - b. Repairs to existing deck coating system on ramps where required due to surface repairs or previous damage to integrity of coating.
  - 2. Joint Sealant System: For cracks, construction and control joints, and cove joints.

1.3 DESCRIPTION

- A. Provide a deck coating system over all supported slabs and curbs in the drive aisles and parking areas and pedestrian areas to waterproof the concrete. System shall include all surface preparation, detailing and incidental work required to ensure complete and homogeneous system.
- B. Rout and seal cracks of 1/16 inch or larger on all supported slabs. Seal all construction and control joints as required by the coating manufacturer.

1.4 RELATED WORK

- A. The following work is related to this Section:
  - 1. Cast-in-Place Concrete                      Section 03300
  - 2. Concrete Repair                              Section 03350
  - 3. Pavement Marking                          Section 09920
- B. Materials shall be compatible with the materials of related work with which they come into contact, and with the materials covered by this Section.



1.5 SUBMITTALS

A. General

1. Submit an "Installation Schedule" which shows the planned production rates for each of the items below along with the sequence of placement within the structure. This shall be coordinated with concrete cure times for structural repairs.
2. Submit certification that each of the items below is compatible with all of the products in Divisions 3 and 7 to which it will come in contact.
3. Submit "Health and Safety Data Sheets," and manufacturer's Spec Data Sheet" for each product, solvent, or related chemicals to be used on site.
4. Submit a copy of the proposed warranty language for each system or product below.
5. Submit product Data, specifications, installation instructions, maintenance instructions and general recommendations by manufacturer covering each material required for work. Include data substantiating that materials comply with requirements.

B. Deck Coating

1. Submit a complete description of the system proposed including the materials, surface preparation, and cure times.
2. Submit standard color chart.
3. Submit two (2) 12 inch square samples representative of color, thickness, and surface texture.
  - a. Include aggregate topping on samples.
  - b. Provide "stepped" samples for multiple coat systems.
4. Submit copies of purchase order showing quantities and dates of material purchased.
5. Submit a letter from the manufacturer certifying that the manufacturer has visually reviewed the project and that the deck coating has been installed in accordance with the manufacturer's written recommendations.
6. Submit dry film thickness test results performed by manufacturer. Measurements are to be taken every 25,000 square feet. Test damage is to be repaired by Contractor. For each 25,000 sf area, three readings shall be taken in a single 100 sf area. The average dry film thickness shall be within 10 percent minus or 30 percent plus of the manufacturer's recommended average dry film thickness (total system). No individual reading shall be more than 50 percent plus or minus of the manufacturer's recommended wet film thickness. If thickness check fails the above requirements, more frequent testing will be required as directed by the Engineer. See paragraph 3.3B, Section 07100, for additional required testing.
7. Manufacturer to review and provide written approval of surface preparation.
8. Submit two copies of the Applicator's Manual.
9. Submit Maintenance Manual to Owner with instructions for specific care of coating system.

C. Joint Sealant System: For cracks, construction and control joints, and cove joints.

1. Submit a complete description of the Joint Sealant System including sealant material and backer rods or bond breakers. Also indicate material working requirements, shelf life and performance data.
2. Submit materials, including color samples of sealants.
3. Submit any other information necessary to show placement and installation procedures of concrete joint sealant system.

1.6 WARRANTY

A. Sealants and Coating System

1. Provide to the Owner a "Joint and Several" warranty by the Installer and Manufacturer guaranteeing that the system will be free of defects, water penetration, and chemical damage related to design, workmanship or material deficiency, consisting of, but not limited to:
  - a. Surface crazing or other weathering deficiency.
  - b. Abrasion or tear failure resulting from normal traffic use.
  - c. Tear failure resulting from anticipated movement.
  - d. Debonding from the substrate or delaminating between layers.
  - e. Defective installation.
2. If the sealants or coatings show any of the defects indicated above, supply labor and material to repair all defective areas and repaint all damaged parking stall line stripes.
3. Perform any repair under this guarantee at no cost to the Owner.
4. The warranty period shall be five (5) years commencing with the date of project acceptance.
5. Vandalism, abrasive maintenance equipment, and construction traffic are not normal traffic use and are exempted from the warranty. Failures due to fire or failure of substrate are also exempted from the warranty.
6. During the warranty period, the Owner will be responsible for maintaining the parking structure in a clean, safe and serviceable condition. This involves periodic sweeping, periodic flush downs and removal of grease spots and oil spills. The Owner should also perform any and all inspections necessary to ensure that the structure is maintained at a satisfactory level of service.
7. This warranty shall be in addition to, and not a limitation of, other rights the Owner may have against the Contractor under the Contract Documents.

1.7 JOB CONDITIONS

- A. Proceed with deck coating or sealant work only after substrate repair and preparation work have been completed.
- B. Pre-Installation Conference: Meet at project site well in advance of time scheduled for work to proceed, and review requirements for work and conditions that could possibly interfere with successful performance. Require every party who is concerned with deck-coating work, or required to coordinate with it or to protect it thereafter, to attend conference.
  1. Where coating is required to be warranted by manufacturer, require manufacturer's technical representative to participate in conference.
- C. Weather Conditions: Proceed with installation when weather conditions are in compliance with manufacturer's recommended limitations.
- D. V.O.C. Compliance: All materials used shall meet the limits on volatile organic contents (V.O.C.) stipulated by all government agencies in whose jurisdiction this project occurs.

1.8 BASIS OF PAYMENT

- A. Pay unit for traffic deck coating system including sand-blasting, shot-blasting, filling of surface voids, cove sealants, routing and sealing of cracks, and construction joints, and installation of coating materials is a lump sum value for the coating of all elevated parking slab areas not already coated, plus repairs to existing coatings. The coating contractor shall visit the site, review the condition of the concrete surface and determine the quantities of cracks and construction joints to be sealed, areas of surface voids to be filled, cove sealant required and any other material required.

PART 2 - PRODUCTS

2.1 DECK COATING SYSTEM

- A. The Deck Coating system shall be a liquid one-component or two-component mixture which when cured shall prevent penetration of the concrete by water, gasoline, oils, greases, salts, deicer chemicals, battery acids and radiator coolants.
- B. The materials used in the deck coating system shall produce no toxic, hazardous, irritating or otherwise offensive fumes or odors which can cause noticeable discomfort to any person outside of the work area.
- C. Deck Coating Wear Balance System
  - 1. Contractor to provide a deck coating wear balance system for the project. The heavy duty system shall be installed in all the drive lanes and turning areas for a width of 20 feet and the full width of the entrances and exits. The medium duty system shall be installed in the remaining areas.
  - 2. Approved deck coating wear balance systems are:
    - a. "Odor-Free Autogard II", 52 mil/40 mil application by Neograd, Dallas, TX.
    - b. or Approved Equivalent.
- D. Color of deck coating shall be selected by Owner within 15 working days of standard color chart submittal.
- E. Grit shall be applied until refusal.
- F. The deck coating material applied in areas exposed to direct sunlight shall be formulated to prevent deterioration due to ultra-violet light exposure.

2.2 JOINT SEALANT SYSTEM

- A. Sealant for Horizontal Joints (except cove joints)
  - 1. Traffic-bearing, two component, Type I self-leveling or non-sag unmodified polyurethane sealant, or single component aliphatic urethane, gray in color containing no coal tar, asphalt or other adulterants and conforming to Federal Specification TT-S-00227E. Approved Horizontal Joint Sealants are:

- a. "Dynaflex SL 301 Joint Sealant" by Nox Chem, Omaha, NE
- b. "Isoflex Crack Control Joint System" using "Isoflex 880GB or 881" by Harry S. Peterson Companies, Pontiac, MI
- c. "Tremco THC-900" by Tremco, Cleveland, OH
- d. "Paving Joint Sealant" by Sonneborn Contech, Minneapolis, MN
- e. Vulkem 245, 924, 926 by Mameco, Cleveland, OH
- f. Or Approved Equivalent.

B. Sealant for Vertical and Cove Joints

1. Two-component, Type II, non-sag unmodified polyurethane sealant, or single component aliphatic urethane, gray in color containing no coal tar, asphalt or other adulterants and conforming to Federal Specification TT-S-00227E. Approved Vertical and Cove Joint Sealants are:
  - a. "Dynaflex SL 301 Joint Sealant" by Nox Chem, Omaha, NE
  - b. "Isoflex 881" sealant by the Harry S. Peterson Companies, Pontiac, MI
  - c. "Sonolastic NP2" by Sonneborn Building Materials, Minneapolis, MN
  - d. "Tremco Dymeric" by Tremco, Cleveland, OH
  - e. "Tremco THC-901" by Tremco, Cleveland, OH
  - f. Vulkem 922, by Mameco, Cleveland, OH
  - g. Or Approved Equivalent.

PART 3 - EXECUTION

3.1 GENERAL

- A. Inspect surfaces to receive the work and report immediately in writing to the Owner any deficiencies in the surface which render it unsuitable for proper execution of this work. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner. Commencement of work implies acceptance of related work.
- B. Coordinate and verify that related work meets the following requirements.
  1. Concrete surfaces are finished, cleaned and prepped, as specified by the Manufacturer for the system to be installed.
  2. Curing compounds used on concrete surfaces are compatible with the work to be installed.
  3. Concrete surfaces have completed the proper curing period for the system selected.
  4. Systems selected for use are compatible with each other.
- C. Contractor shall take necessary precautions against injury to personnel or building occupants during application of sealants, deck coating, etc. Contractor personnel shall use protective equipment and area shall be well vented to the outside.

### 3.2 PREPARATION

A. Deck Coating - Comply with manufacturers' instructions for preparation of substrates to receive traffic coating system including removing of all oil, grease spots, and striping and with the following minimum requirements:

1. Existing concrete surface preparation shall require shot blasting in accordance with paragraph 3.2D.
2. One hundred percent of the existing paint striping shall be removed.
3. Excessive amount of coarse aggregate shall not be exposed.
4. Remove debris immediately after the surface preparation. Debris includes, but is not limited to, shot, aggregate and dust.
5. The surface preparation shall extend up the vertical surfaces.
6. A 100 square foot test area shall be provided incorporating all of the above. The Owner, deck coating manufacturer and Contractor shall be in agreement with this test area being satisfactory for surface preparation before preparation is continued. Deck coating manufacturer shall certify in writing approval of test area.
7. Debris shall be placed in a covered dumpster or a covered area where it will not be rebroadcast.
8. Before applying materials, apply the system to a small area to assure that it will adhere and dry properly.
9. Cracks, coves, terminations and all unusual situations shall be detailed per the manufacturer's recommendations.
10. Do not apply the deck coating until the surface voids patch material and the crack, control, construction, and cove sealants are fully cured.
11. Do not apply the coating material over concrete repair areas until the concrete has been air dried in temperatures at or above 40 degrees F. for at least 28 days after the curing period specified in Section 03350, or as required by the coating manufacturer.
12. The contractor shall be responsible for repair or replacement of all materials damaged by surface preparation operations.
13. Filling of voids and detail coats over cracks, construction joints, cold joints, etc. are to be incidental to deck coating cost.
14. Rout and seal cracks greater than 1/16 inch or as required by the deck coating manufacturer.
15. Metal surfaces that are to be deck coated shall be abrasive blasted to Near White Metal. Primer shall be installed in accordance with manufacturer's recommendations.
16. Test substrate for excessive moisture content, in manner recommended by manufacturer.
17. Mask off adjoining surfaces not to receive traffic topping, and close off roof and floor drains, to prevent spillage and migration of liquid materials outside membrane area.
18. All surfaces which after preparation have excessive exposed coarse aggregate shall be repaired in accordance with the deck coating manufacturer's requirements at no additional cost to the Owner.

B. Concrete Joint and Sealant System

1. Correct unsatisfactory conditions in a manner acceptable to the installer before installation of sealant system.
2. Grind all joints prior to sealing to provide clean, smooth and straight joints. All surfaces that are to receive sealant shall be dry and thoroughly cleaned of all loose particles, laitance, dirt, dust, oil, grease or other foreign matter. Remove all laitance and contaminants from the surface. Obtain written approval of the method from the system manufacturer prior to beginning cleaning.

3. Check preparation of substrate for adhesion of sealant.
4. Prime all joints to receive sealant. Seal joints according to the manufacturer's directions and protect as required until sealant is fully cured. Apply bond breaker according to the Drawings.
5. Cease installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

C. Shotblast Performance Requirements

1. Equipment shall be capable of traveling at a constant speed to provide uniform profile. The speed and the size of the equipment and the size of the steel shot shall be selected to provide desired preparation without causing unnecessary damage to the concrete surface.
2. Equipment shall vacuum up, or otherwise retain all dirt, dust, and debris from the blasting operation.
3. All surfaces shall be air, blown with sufficient pressure to remove excess dirt, dust and debris, and to assure that concrete pores are open.
4. Shotblasted surface must be clean with a profile in which the fine aggregates must be exposed; however, large aggregate must not be exposed. All laitance must be removed.
5. A 100 square foot test area shall be provided incorporating all of the above. The Owner, sealer manufacturer and Contractor shall be in agreement with this test area being satisfactory for surface preparation before preparation is continued.

D. Provide written certification by appropriate manufacturer that surface preparation methods and final condition meet with his approval and do not in any way detract from sealer warranty.

E. Equipment used during floor slab preparation cleaning shall not exceed the weight limitation of 50 psf.

3.3 INSTALLATION/APPLICATION

A. General

1. Do all work in strict accordance with manufacturer's written instructions and specifications and as shown on the Drawings.
2. Do not apply waterproofing materials until the concrete has been air dried at temperatures at or above 40 degrees F. for at least 28 days after the curing period specified in Sections 03300 or 03350 or as otherwise approved by manufacturer.

B. Deck Coating

1. Apply membrane liquids by spraying, roller coating, or distributing with notched squeegee as directed by manufacturer to provide uniform thickness.
2. Start installation of deck covering in presence of manufacturer's technical representative where terms of warranty require inspection and acceptance of installation as it proceeds.
3. Apply total thickness of traffic topping in number of coats recommend by manufacturer, using special top coating to achieve wear resistance and weather resistance as required and to provide color and texture required.
4. Check membrane wet film thickness by taking five wet film readings within a one square foot area. The average film thickness shall be within 10 percent minus or 30 percent plus of the

- manufacturer's recommended average wet film thickness. No individual reading shall be more than 50 percent plus or minus of the manufacturer's recommended wet film thickness.
5. Check wet film thickness (per the above) a minimum of once per every 1000 square feet of membrane placed or per individual section placed per day. If thickness check fails the above requirements, more frequent testing will be required as directed by the Engineer.
  6. Record all wet film thickness test results and submit immediately to Owner and Engineer showing location, date, weather, and other pertinent information.
  7. All edges where deck coating terminates shall be taped to provide straight edges and to protect adjacent surfaces.
  8. Complete all work under this Section before painting line stripes.
  9. Extend deck coating up vertical surface.
  10. All construction joints, control joints, cold joints and cracks (sealed and unsealed) shall receive a detail coat, minimum of 4 inches wide, in addition to specified procedure. Detail coat shall be the same thickness as base coat unless manufacturer's requirements are stricter. Detail coat cost shall be incidental to deck coating cost.
  11. Engineer may check base membrane dry film thickness each 5000 sf by taking 3 readings within a 100 sf area. If thickness check fails, more frequent testing may be required, and an additional membrane coat will be required prior to, and independent of, aggregate coat to assure average base membrane thickness is within +30%, or -10% of that required.
  12. All repairs for deck coating necessary because of dry film testing is to be repaired by waterproofing contractor.
  13. A 100 square foot trial area shall be provided incorporating all preparation and installation procedures as stated within the Specification Section. The Owner, deck coating manufacturer, and Contractor shall be in agreement with this trial area prior to continuing with deck coating operation.

C. Concrete Joint Sealant System

1. Install primer in all joints. Install bond breaker or backer rod as necessary for a proper installation.
2. Check preparation of substrate to insure the sealant will adhere according to the manufacturer's directions and protect as required until sealant is fully cured.
3. Completely fill the joint without sagging or smearing onto adjacent surfaces.
4. Perform adhesion test at the rate of one test per 1000 lineal feet of joint. Procedure is as follows:
  - a. Make a knife cut from one side of the joint to the other.
  - b. Make two cuts approximately two inches long at the sides of the joint, meeting the first cut at the top of the two inch cuts.
  - c. Grasp the two inch piece of sealant and try to pull the uncut sealant out of the joint.
  - d. If adhesion is proper, the sealant should tear adhesively in itself or be very difficult to adhesively remove from the surface.
  - e. Sealant shall be replaced by applying more sealant in the same manner it was originally installed.

If test results are unsatisfactory, testing frequency will be doubled until satisfactory results are consistently obtained.

5. Replace all sealant which proves defective per above test at no additional cost to Owner.
6. Cease installation of sealants under adverse weather conditions, or when temperatures are below or above manufacturer's recommended limitations for installation.

D. Clean-up

1. Remove all excess primer, sealant, deck coating, nosing material and masking materials from the structure.

3.4 PERFORMANCE REQUIREMENTS

- A. It is required that the deck coating be watertight and not deteriorate excessively for normal weather exposure and for normal traffic in applications indicated, nor for manufacturer-recommended cleaning procedures, for period of warranty.
  1. It is required that the deck coating work not deteriorate under spillage of motor oil, transmission fluids, and other motor vehicle operating compounds, nor for exposure to normal ice/snow melting substances not specifically excluded by manufacturer's product information.

PART 4 - PROTECTION

- A. Provide protections to ensure that work will be without damage or deterioration at time of final acceptance.

END OF SECTION 07100



SECTION 09920 PAVEMENT MARKING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Furnish all labor, equipment and services to paint pavement marking of the types, patterns, sizes and colors to match existing conditions in accordance with Specifications.

1.3 RELATED WORK

- A. The following work is related to this Section:
  - 1. Concrete Repair Section 03350
  - 2. Deck Coating and Sealants Section 07100

1.4 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each product required including instructions for surface preparation and paint application.
- B. Sample color chips for all colors available.
- C. Pavement marking Contractor shall obtain and submit certification of compatibility from deck coating, sealers and/or joint sealant manufacturers for the paint materials proposed for use.
- D. Contractor to submit drawings showing existing layout of parking stripes, traffic arrows and special markings prior to the removal of the existing stripes and markings.

PART 2 - PRODUCTS

2.1 MATERIALS FOR PAVEMENT MARKINGS

- A. All materials shall meet the Type III requirements of U.S. Federal Specification TTP-115-F for paints and the Type I, Gradation A.
- B. Color of Yellow Paint - The paint shall visually match color chip No. 13538 of U.S. Federal Standard 595A when a wet film of 0.015" thickness is applied to a tin panel and let dry for 24 hours. In case of dispute, the color shall be within the green and red tolerance limits when compared with

the latest Highway Yellow Tolerance Chart, PR Color No. 1, U.S. Department of Transportation, Federal Highway Administration.

- C. Other Colors: To be selected from manufacturer's standard range.
- D. Drying Time - The paint shall have a no-pick-up maximum drying time of 20 minutes, when tested according to ASTM D711, using a wet film thickness of 0.015" and when applied and tested at 77 degrees F.
- E. Approved striping and marking paints for use on exposed concrete surfaces are:
  - 1. "Ultra-Hide Heavy Duty Chlorinated Rubber Traffic Paint, by Glidden, Cleveland, OH
  - 2. "Set Fast Chlorinated Rubber Traffic Paint, by Sherwin-Williams Company, Cleveland, OH
  - 3. Or Approved Equivalent.
- F. Approve striping and marking paints for use on deck coating systems are:
  - 1. "Jones-Blair Acrylithane 'C'", by Neogard, Dallas, Texas.
  - 2. Or Approved Equivalent.

### PART 3 - EXECUTION

#### 3.1 INSPECTION

- A. Inspect area to receive the work and report immediately in writing to the Engineer, as required in the General Conditions, any unacceptable conditions. Do not proceed with work until unsatisfactory conditions have been corrected in an acceptable manner. Commencement of work implies acceptance of related work.

#### 3.2 PREPARATION

- A. Before commencing work, make certain that the surface to be painted is in proper condition to receive painting materials, that these surfaces are clean, dry, smooth, and at the proper temperature as recommended by paint manufacturer.
- B. Work Areas
  - 1. Store, mix and prepare paints only in areas designated by the Contractor for that purpose.
  - 2. Provide clean cans and buckets required for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At the close of each day's work remove used rags and other waste materials associated with painting.
  - 3. Take precautions to prevent fire in or around painting materials. Provide and maintain hand fire extinguisher near paint storage and mixing area.
- C. Mixing
  - 1. Do not intermix materials of different character or different manufacturer.
  - 2. Do not thin material except as recommended by manufacturer.

3.3 INSTALLATION

- A. Layout all striping and marking on each level before painting that level. Report any discrepancies, interferences or changes in striping due to field conditions to Owner prior to painting. Paint contractor shall be required to remove paint, repair surface treatment and repaint markings not applied in strict accordance with the plans.
- B. Apply painting and finishing materials in accordance with the manufacturer's directions. Use applicators and techniques best suited for the material and surfaces to which materials will be applied.

3.4 TOLERANCE

- A. Parking space striping tolerances are as follows:
  - 1. Parking space length = indicated length  $\pm$  2 inches.
  - 2. Parking space width = indicated width  $\pm$  2 inch.
  - 3. Base line length = indicated length  $\pm$  2 inch.
  - 4. Stripe width = 4 inches  $\pm$  1/2 inch.
  - 5. Total overall string base line dimensions = indicated length  $\pm$  6 inches.
  - 6. Striping shall come to within 3 inches of all vertical surfaces.

END OF SECTION 09920

SECTION 16060 GENERAL ELECTRICAL REQUIREMENTS, MATERIALS AND METHODS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 WORK INCLUDED

- A. Provide all materials, labor, equipment and services necessary to modify, furnish and install all electrical items noted in this specification or on the construction drawings.

1.3 RELATED WORK

- A. The following work is related to this Section:
  - 1. Selective Demolition Section 02070
  - 2. Concrete Repairs Section 03350
- B. Coordinate all Work specified in this Division with the Work of all other trades required for Project.
- C. Locate, identify and protect other services passing through demolition area and serving other areas outside the demolition limits.

1.4 SYSTEM DESCRIPTION

- A. Prior to submitting Bid for the Work specified in this Division, review Contract Documents, including as they relate to the Work of all other trades required for the Project. All fees and costs necessary to work electrical modifications into the project shall be included in the Bid.
- B. Visit the site prior to Bidding. Review existing field conditions for location of panels, fixtures and other Electrical Work. Notify the Engineer immediately, and confirm in writing, of any conflicts.
- C. Electrical circuits within the slab may not necessarily only serve the electrical system within the parking garage. These circuits are included in the scope of this Work and must be traced and relocated with the other circuits.
- D. The Contractor shall install and connect all equipment and materials in accordance with the best engineering practice and, unless otherwise shown or specified, follow the manufacturer's instructions and recommendations and furnish and install all required auxiliary items complete.

- E. Permits: Take out all necessary permits, arrange for all required inspections, and pay all fees and expenses associated with performing Electrical Work.

#### 1.5 QUALITY ASSURANCE

- A. Workmanship, equipment, materials and testing shall conform to the requirements of the latest specifications of:
  - 1. American National Standards Institute (ANSI).
  - 2. American Society for Testing and Materials (ASTM).
  - 3. National Fire Protection Association (NFPA).
  - 4. Underwriters' Laboratories, Inc. (UL).
  - 5. National Electric Code (NEC).
  - 6. All local, state and federal rules and regulations.
  - 7. Public utilities within the jurisdiction.
- B. If any change in the Drawings and Specifications is required to comply with local regulations, notify Engineer at least 5 days before Bids are to be submitted. After entering into contract, Contractor will be held to complete all Work necessary to meet local requirements without extra expense to Owner.
- C. Complete testing as required by local jurisdictions or to verify the system is functioning properly.
- D. All equipment installed shall be new and shall conform in all respects to the latest approved standards of IEEE, ANSI, NEMA and Underwriters Laboratories, Inc. (unless indicated otherwise).
- E. The Contractor shall notify the Owner when the project is approximately 75% completed in order to schedule a pre-final review of construction. Final review shall be scheduled at 100% completion. All punch list items must be accomplished prior to final acceptance.

#### 1.6 SUBMITTALS

- A. Submit shop drawings and manufacturer's catalog sheets. Include:
  - 1. Switch and fixture layout.
  - 2. Panel modifications and circuitry.
- B. At completion of construction, submit all testing and inspection certificates.

#### 1.7 DELIVERY AND STORAGE

- A. Deliver materials to Project in good condition. Store materials off ground and protected from elements.

#### 1.8 EXISTING CONDITIONS

- A. Verify existing field conditions for location of panels, fixtures, circuitry and other Electrical Work.

- B. Verify dimensions in the field prior to beginning Work. Verify ceiling heights or other architectural and structural conditions before installing any Work.
- C. Notify Engineer, in writing, of any difference which may be found before proceeding with Work.
- D. Maintain a minimum clearance of 6 ft-8 in between top of slab and all overhead Work at the lowest point, including fittings and fixtures.

#### 1.9 WARRANTY

- A. Furnish to the Owner a written guarantee against defects in materials, workmanship for all equipment and materials furnished, and for entire workmanship of installation for period of one year from date of acceptance of the Work.
- B. Repair all defects in workmanship or material provided under this Section during the guarantee period and without expense to Owner.

### PART 2 - PRODUCTS

#### 2.1 MATERIALS

A. Raceways, Boxes and Conduits:

1. Outdoors (In Garage) Wiring Methods: Using the following wiring methods:

- a. Exposed: Rigid or intermediate metal conduit.
- b. Concealed: Rigid or intermediate metal conduit.
- c. Boxes and Enclosures: NEMA Type 3R or Type 4.

B. Wire and Cable:

1. All conductors shall be copper, minimum #10, with 600 volt type "THHN-THWN" insulation. Conductors shall be stranded.

C. Electrical Identification:

1. Conductor Color Coding: Provide color coding for feeders and branch circuit conductors as follows:

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

D. Grounding:

1. All circuits shall contain an insulated ground conductor.

E. Panelboards:

1. Panelboard shall be equal to Square D Type NEHB, unless otherwise noted.

PART 3 - EXECUTION

3.1 GENERAL

- A. Inspect areas to receive the Work and report immediately in writing to the Engineer as required in the General Conditions any deficiencies which render it unsuitable for proper execution of this Work. Do not proceed with Work until unsatisfactory conditions have been corrected in an acceptable manner. Commencement of Work implies acceptance of related Work.

- B. Coordinate with related Work.

3.2 PREPARATION/INSTALLATION

- A. Schedule Work so as to coordinate with other Contractors.

- B. Provide temporary service if necessary for lighting and power equipment (drills, saws, etc.). Verify temporary requirements with general contractor. Temporary lighting and power shall meet OSHA requirements and local code.

- C. All existing lighting, switches and associated circuitry are to remain. Circuitry to be removed and relocated (surface mounted) shall be all conductors embedded in concrete that becomes exposed upon removal of deteriorated concrete. Fixtures to be reused shall be cleaned before inspection. New lamps for light fixtures with defective lamps will be furnished by Owner.

- D. Install circuitry to occupy a minimum of space. Install parallel and close to walls, ceilings, columns or other members.

- E. Where possible, locate all runs in areas which are out of direct public view.

F. Supporting Devices:

1. Install supporting devices to fasten electrical components securely and permanently in accordance with NEC requirements and any additional local codes.
2. Coordinate with the building structural system and with other electrical installations.

G. Grounding:

1. Ground electrical systems and equipment in accordance with NEC, except where grounding in excess of NEC requirements is indicated.

H. Panelboards:

1. Panelboard circuiting shall meet code requirements. Circuiting changes must be approved by the Owner.

I. Cleanup:

1. At completion of Work under this contract, remove from site and dispose of all rubbish and discarded materials and restore disturbed facilities and surfaces.

3.3 FINAL TESTING

- A. At the time of final inspection and tests, all connections at panelboards, devices and equipment and all splices must be completed. Each branch circuit and its respective connected equipment must test free of short circuits.

END OF SECTION 16060



**GENERAL STRUCTURAL AND CONSTRUCTION NOTES**

THESE NOTES SUPPLEMENT THE SPECIFICATIONS WHICH SHALL BE REFERRED TO FOR ADDITIONAL REQUIREMENTS.

**A. CODES AND STANDARDS**

1. THE FOLLOWING CODES AND STANDARDS, INCLUDING ALL SPECIFICATIONS REFERENCED WITHIN, SHALL APPLY TO ALL WORK PERFORMED ON THE PROJECT. USE THE LATEST EDITIONS UNLESS NOTED OTHERWISE.
  - a. "THE INTERNATIONAL BUILDING CODE - 2015", INTERNATIONAL CODE COUNCIL.
  - b. "DISTRICT OF COLUMBIA CONSTRUCTION CODES/2013 SUPPLEMENT (D.C. SUPPLEMENT TO THE 2012 INTERNATIONAL BUILDING CODE).
  - c. "MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES" (ASCE 7), AMERICAN SOCIETY OF CIVIL ENGINEERS.
  - d. "BUILDING CODE REQUIREMENTS FOR STRUCTURAL CONCRETE, ACI 318", AMERICAN CONCRETE INSTITUTE.
  - e. "STANDARD SPECIFICATIONS FOR TOLERANCES FOR CONCRETE CONSTRUCTION AND MATERIALS", ACI 117, AMERICAN CONCRETE INSTITUTE.
  - f. "SPECIFICATIONS FOR STRUCTURAL CONCRETE, ACI 301", AMERICAN CONCRETE INSTITUTE.
  - g. "MANUAL OF STANDARD PRACTICE", CONCRETE REINFORCING STEEL INSTITUTE.

**B. DESIGN DATA**

1. GRAVITY - FLOOR LIVE LOAD: 50 PSF

**C. MATERIALS**

THE FOLLOWING ASTM STANDARDS AND DESIGN STRESSES SHALL BE USED FOR THE APPROPRIATE MATERIALS USED IN THE CONSTRUCTION OF THIS PROJECT.

1. CEMENT: ASTM C150; TYPE I OR III
2. AGGREGATES: ASTM C33 (NORMAL WEIGHT)
3. ADMIXTURES:
 

AIR ENTRAINING ADMIXTURES	ASTM C260
CHEMICAL ADMIXTURES	ASTM C494
4. CONCRETE: AIR ENTRAIN ALL EXPOSED CONCRETE  $\pm 1-1/2\%$  BY VOLUME UNLESS OTHERWISE NOTED. NO AIR FOR STEEL TROWEL FINISH.

APPLICATION	MINIMUM COMPRESSIVE STRENGTH AT 28-DAYS (PSI)	MIX TYPE
a. PARTIAL DEPTH SLAB REPAIRS	4500	LATEX OR MICROSILICA MODIFIED CONCRETE.
b. FULL DEPTH SLAB SURFACE REPAIRS	4500	REDI-MIX CONCRETE OR BAG MIX MEETING ALL SPECIFIED CRITERIA.
c. SLAB SOFFIT REPAIRS	4500	POLMER- OR MICROSILICA-MODIFIED REPAIR MORTAR, OR NORMAL WEIGHT FORM & PUMP CONCRETE.
<b>5. REINFORCEMENT:</b>		
DEFORMED REINFORCING BARS	ASTM A615, GRADE 60	
WELDED WIRE REINFORCEMENT (WWF)	ASTM A1064	
EPOXY COATED REINFORCING BARS	ASTM A775	
FULL MECHANICAL CONNECTION SPICES (THREADBAR AND COUPLER)	ACI 318 SECTION 12.14.3	
ADHESIVE REINFORCING BAR DOWELING SYSTEMS	HILTI HIT HY-200 SYSTEM OR EQUAL	
SYNTHETIC MACRO FIBERS	ASTM C1116, TYPE III	
6. ELASTOMERIC TRAFFIC BEARING MEMBRANE/DECK COATING -	SEE SPECIFICATIONS	

**D. CONSTRUCTION**

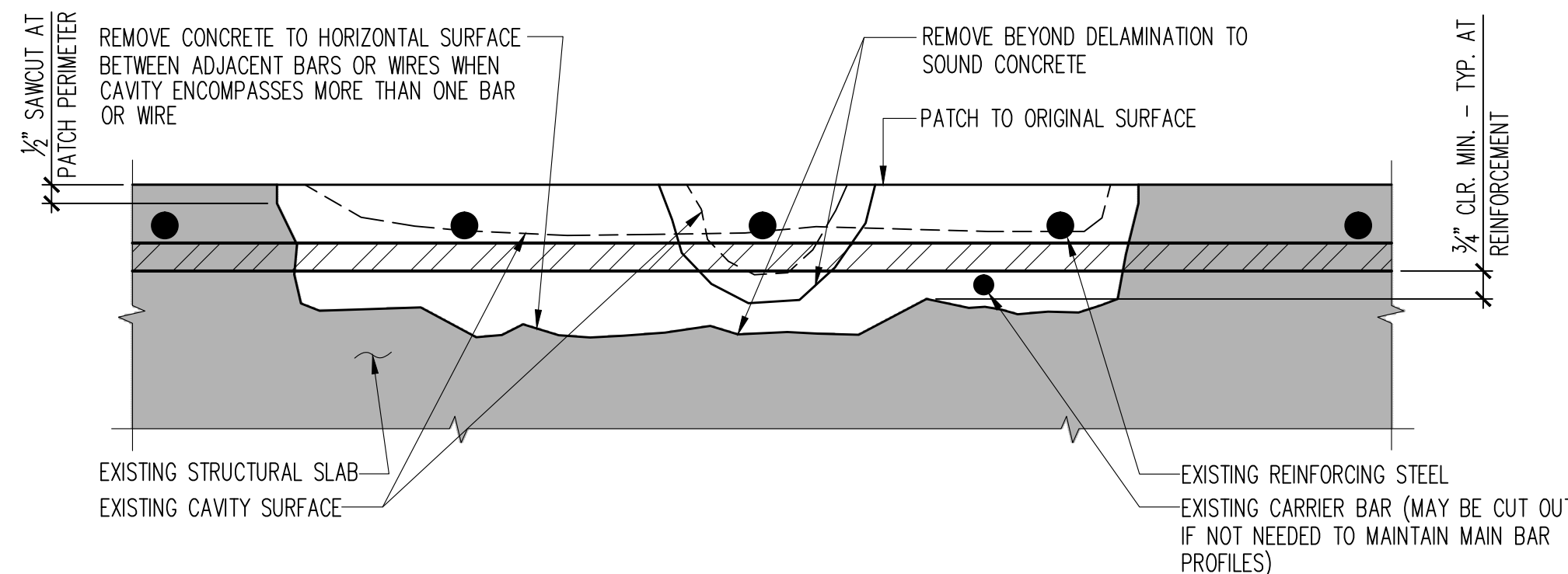
1. GENERAL
  - a. DO NOT SCALE DRAWINGS.
  - b. THESE DRAWINGS REPRESENT THE COMPLETED PROJECT WHICH HAS BEEN DESIGNED FOR THE WEIGHTS OF THE MATERIALS INDICATED ON THE DRAWINGS AND FOR THE SUPERIMPOSED LOADS INDICATED IN THE DESIGN DATA. IT IS THE CONTRACTOR'S RESPONSIBILITY TO DETERMINE ALLOWABLE CONSTRUCTION LOADS AND PROVIDE PROPER DESIGN AND CONSTRUCTION OF FALSEWORK, FORMWORK, STAGIONS, BRACING, SHEETING AND SHORING, ETC. CONTRACTOR HAS SOLE RESPONSIBILITY FOR MEANS AND METHODS, SEQUENCES AND PROCEDURES OF CONSTRUCTION. THE STRUCTURE IS STABLE ONLY IN ITS COMPLETED FORM.
  - c. IMPLEMENTING JOB SITE SAFETY AND CONSTRUCTION PROCEDURES IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR.
  - d. ENERGIZED ELECTRICAL CIRCUITS (MOSTLY BELIEVED TO BE POWERING LIGHT FIXTURES) EXIST WITHIN THE CONCRETE SLABS. CONTRACTOR TO PROCEED WITH DEMOLITION USING APPROPRIATE SAFEGUARDS.
  - e. EXISTING BUILDING INFORMATION SHOWN IS AS INDICATED ON EXISTING BUILDING DRAWINGS PROVIDED BY OTHERS. FIELD VERIFY ALL EXISTING BUILDING INFORMATION SHOWN (DIMENSIONS, ELEVATIONS, ETC.) AND NOTIFY THE OWNER OF ANY DISCREPANCIES PRIOR TO STARTING WORK.
  - f. PRIOR TO STARTING CONSTRUCTION, SURVEY GARAGE TO THE EXTENT NECESSARY TO RECORD SIZE AND LOCATIONS OF OPENINGS, SLEEVES, CONCRETE HOUSEKEEPING PADS, INSERTS, EMBEDS, CURBS, RAMPS, DRAINS, DEPRESSIONS, ETC. AFFECTED BY REPAIRS. ALL SUCH EXISTING FEATURES ARE TO BE REPLICATED IN THE COMPLETED PROJECT UNLESS OTHERWISE NOTED.
  - g. IN CASE OF CONFLICT WITHIN THE CONTRACT DOCUMENTS, INCLUDING DRAWINGS AND SPECIFICATIONS, THE MOST RIGID REQUIREMENTS GOVERN.
  - h. REPRODUCTION OF ANY PORTION OF THE CONTRACT DRAWINGS FOR RESUBMITTAL AS SHOP DRAWINGS IS PROHIBITED. SHOP DRAWINGS PRODUCED IN SUCH A MANNER WILL BE REJECTED AND RETURNED.
  - i. PAY ALL COSTS, INCLUDING INVESTIGATION AND/OR REDESIGN, DUE TO CONTRACTOR MISLOCATION OF STRUCTURAL ELEMENTS OR OTHER LACK OF CONFORMANCE WITH THE CONTRACT DOCUMENTS TO BRING WORK IN COMPLIANCE WITH THE CONTRACT DOCUMENTS.
  - j. WORK NOT INCLUDED ON SOME OF THE DRAWINGS, BUT IMPLIED TO BE SIMILAR TO THAT SHOWN AT CORRESPONDING PLACES ON OTHER DRAWINGS SHALL BE REPEATED.
  - k. ANY DAMAGE TO THE EXISTING FACILITIES OR SITE CAUSED BY THE CONTRACTOR'S OPERATIONS SHALL BE REPAIRED BY THE CONTRACTOR AT HIS OWN EXPENSE.
  - l. THE CONTRACTOR SHALL PERFORM HIS WORK IN A MANNER WHICH CAUSES THE LEAST DISRUPTION TO THE EXISTING BUILDING OPERATIONS OF FACILITIES. THE CONTRACTOR SHALL CONSULT WITH AND FOLLOW THE DIRECTION OF THE BUILDING MANAGER CONCERNING ACCEPTABLE TIME OF CONSTRUCTION ACTIVITIES, NOISE CONTROL, ACCESS, SAFETY, EMPLOYEE PARKING, USE OF BUILDING FACILITIES, ETC.
  - m. THE CONTRACTOR SHALL PROVIDE DUST AND NOISE CONTROL PARTITIONS, DAMS OR OTHER METHODS AS REQUIRED TO PREVENT DUST, WATER OR EXCESSIVE NOISE FROM ENTERING OCCUPIED AREAS OF THE BUILDING. THE CONTRACTOR SHALL CLEAN ALL AREAS IN WHICH DUST, WATER OR DEBRIS FROM CONSTRUCTION OPERATIONS ENTERS.

**E. CONCRETE**

1. CAST-IN-PLACE:
  - a. COMPLY WITH REQUIREMENTS OF "SPECIFICATIONS FOR STRUCTURAL CONCRETE (ACI 301) EXCEPT AS MODIFIED BY THESE NOTES AND PROJECT SPECIFICATIONS.
  - b. EPOXY COAT ALL REINFORCING STEEL (NEW & EXISTING) WHEN SURROUNDING REPAIR CONCRETE DOES NOT CONTAIN CORROSION INHIBITING ADMIXTURE.
  - c. ADD 2 GAL. OF CORROSION INHIBITING ADMIXTURE CONFORMING TO ASTM C494, TYPE C, TO EACH CUBIC YARD OF BATCHED CONCRETE AT ALL FRAMED PARKING LEVELS.
  - d. SPLICE REINFORCEMENT AS DETAILED. MAKE BARS CONTINUOUS AROUND CORNERS. SPLICES SHALL BE MADE BY CONTACT TENSION LAP SPLICES, UNLESS OTHERWISE NOTED.
  - e. WELDING OF REINFORCING IS NOT PERMITTED UNLESS OTHERWISE NOTED.
  - f. FIELD BENDING OF REINFORCING PARTIALLY EMBEDDED IN CONCRETE IS NOT PERMITTED UNLESS OTHERWISE NOTED.
  - g. SUPPLY WELDED WIRE FABRIC REINFORCEMENT IN SHEETS. LAP TWO FULL MESH LENGTHS AT SPLICES AND WIRE TOGETHER.
  - h. FURNISH ALL ACCESSORIES, CHAIRS, SPACE BARS, SUPPORTS, ETC. NECESSARY TO SECURE REINFORCING.
  - i. PROVIDE PLASTIC TIPPED BOLSTERS AND CHAIRS AT ALL LOCATIONS WHERE THE CONCRETE SURFACE IS IN CONTACT WITH THE BOLSTERS OR CHAIRS IS EXPOSED.
  - j. CAST IN PLACE INSERTS AND SLEEVES WHENEVER FEASIBLE.
  - k. FINISH CONCRETE SLABS FLAT AND LEVEL WITHIN TOLERANCE, TO THE ELEVATION OF THE CONCRETE SURFACE IMMEDIATELY SURROUNDING THE REPAIR AREA. MAINTAIN EXISTING DRAINAGE PATTERNS.
2. CORE DRILLING FOUNDATIONS, BEAMS, JOISTS, SLABS OR COLUMNS IS NOT PERMITTED UNLESS OTHERWISE NOTED.
3. POWER DRIVEN FASTENERS PERMITTED WHEN PROVEN TO THE SATISFACTION OF THE STRUCTURAL ENGINEER OF RECORD THAT THE FASTENERS WILL NOT SPALL THE CONCRETE AND HAVE THE SAME CAPACITY AS CAST-IN-PLACE INSERTS. TAKE MEASURES AS NEEDED TO AVOID DRILLING EXISTING REINFORCING AND DESTRUCTION OF CONCRETE.
4. WHEN INSTALLING EXPANSION BOLTS OR ADHESIVE ANCHORS, TAKE MEASURES TO AVOID DRILLING OR CUTTING OF EXISTING REINFORCING AND DESTRUCTION OF CONCRETE. BLOW HOLES CLEAN PRIOR TO PLACING BOLTS OR ADHESIVE ANCHORS.
5. EMBEDDED CONDUIT IS NOT ALLOWED IN THE NEW REPAIRS. SPLICE EXISTING CIRCUITS & ALLOW FOR NEW CONDUIT TO BE SURFACE MOUNTED ON SLAB SOFFIT AT REPAIR LOCATIONS.

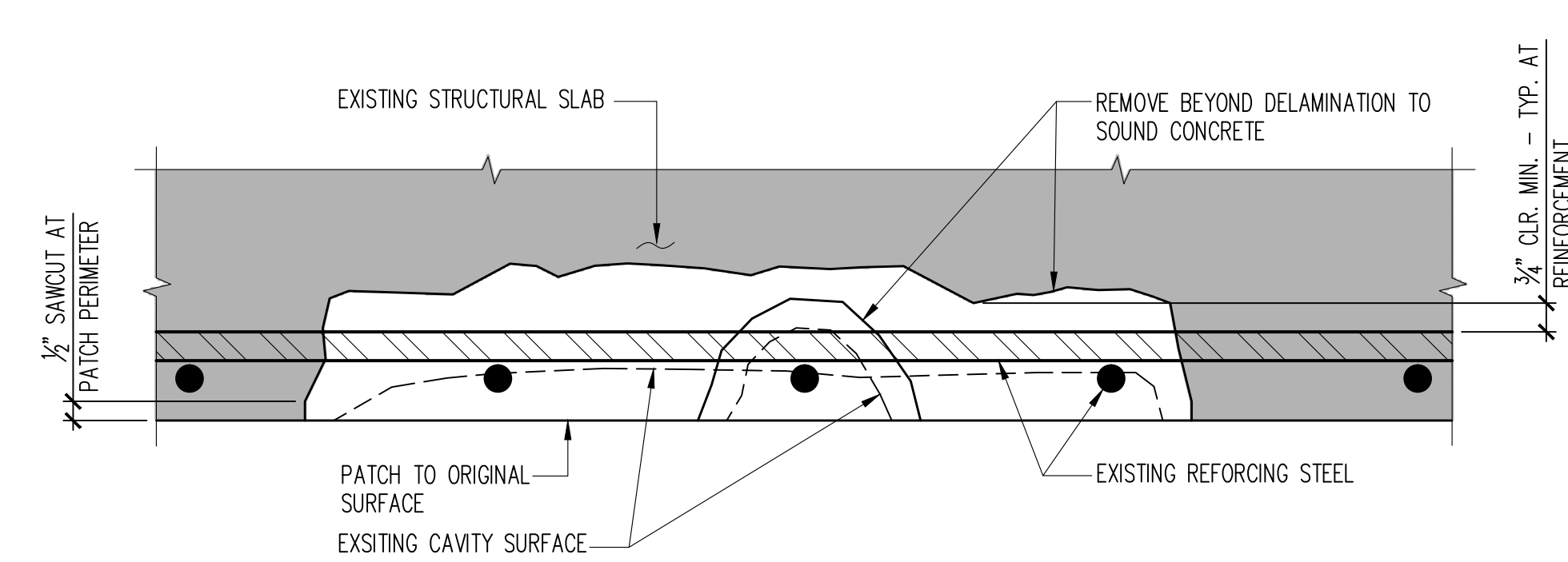
**F. DEMOLITION:**

1. PRIOR TO BEGINNING DEMOLITION, THE CONTRACTOR SHALL INSTALL SHORING AND BRACING ADEQUATE TO FULLY SUPPORT THE LOADS NORMALLY SUPPORTED BY THE SLABS, BEAMS OR FOUNDATION WALLS (INCLUDING SELF WEIGHT). ALL SHORING SHALL BE THE TOTAL RESPONSIBILITY OF THE CONTRACTOR. SHORING SHALL BE SIGNED BY AN ENGINEER REGISTERED IN THE PROJECT'S JURISDICTION. ALL SUBMITTALS SHALL BEAR HIS SEAL AND SIGNATURE.
2. THE CONTRACTOR SHALL TAKE PRECAUTIONS TO PROTECT ALL EXISTING OCCUPIED SPACES, STRUCTURES, STREETS, ETC. FROM DAMAGE BY CONSTRUCTION DEBRIS, WATER OR EQUIPMENT. THE CONTRACTOR SHALL NOT DISPOSE OF ANY DEBRIS, LIQUIDS, SLURRY, SPOILS OR CHEMICALS ON THE SITE EXCEPT AS DIRECTED BY THE CONTRACTING OFFICER.
3. REMOVE DEMOLISHED MATERIALS IN A TIMELY MANNER. DO NOT OVERLOAD PORTIONS OF THE STRUCTURE BY STORING DEBRIS ON THE STRUCTURE.
4. THE CONTRACTOR SHALL PROTECT ALL EXISTING MECHANICAL, ELECTRICAL AND PLUMBING SYSTEMS DURING CONSTRUCTION. ANY DAMAGE TO THE SYSTEMS CAUSED BY THE WORK SHALL BE REPAIRED BY THE CONTRACTOR AT NO COST TO THE OWNER. TEMPORARY SHORING OF LARGE CONDUITS MAY BE NECESSARY TO CARRY OUT STRUCTURAL REPAIRS IN SOME AREAS.



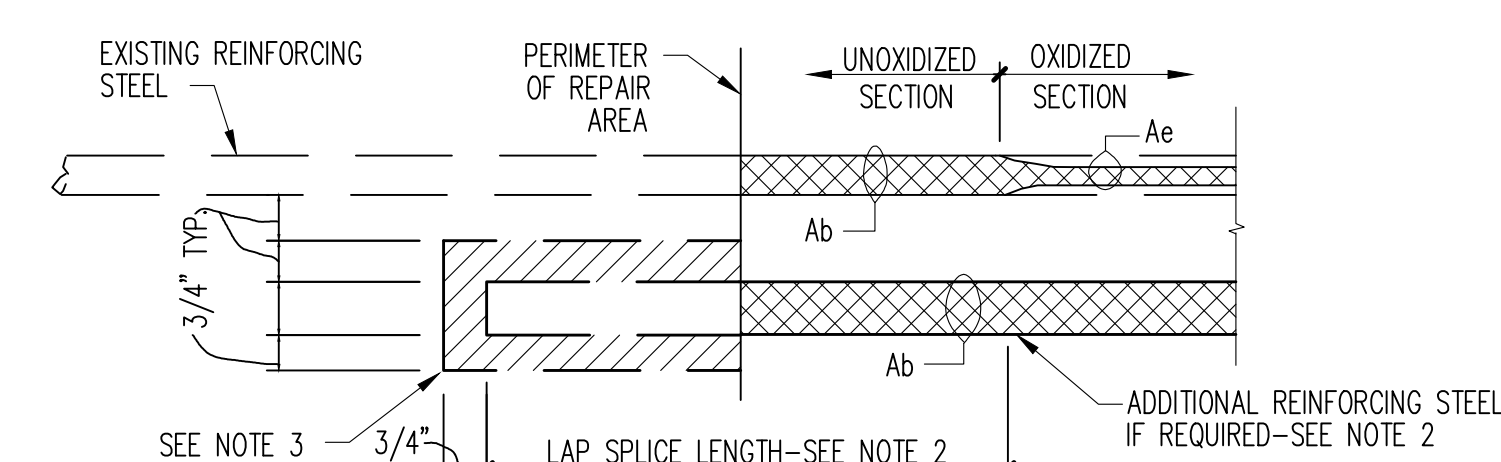
- NOTES:
- 1) REPLACE HEAVILY CORRODED REINFORCING STEEL AS REQUIRED - SEE 4/S-1.
  - 2) REMOVE CONDUIT WITHIN REPAIR AREA. REPLACE WITH SURFACE MOUNTED CONDUIT.
  - 3) IF THE CONCRETE REMOVAL EXPOSES LESS THAN HALF OF ANY CLEAN EXISTING REINFORCING BAR TO WHICH THE REMAINING CONCRETE IS STILL TIGHTLY BONDED, DO NOT CHIP OUT THE REMAINING CONCRETE AROUND THE BAR.
  - 4) PROVIDE SHORING OF SLAB IF AREA OF REPAIR EXCEEDS 5 SQ. FT. OR IF SUM OF INDIVIDUAL REPAIR AREAS EXCEED 10 SQ. FT. IN ANY 100 SQ. FT. AREA OF THE SLAB.
  - 5) FINISH CONCRETE SURFACE & RECEIVE TRAFFIC MEMBRANE. COORDINATE WITH MEMBRANE SUPPLIER.

**1 SPALLED/DELAMINATED PARTIAL DEPTH SLAB REPAIR DETAIL**



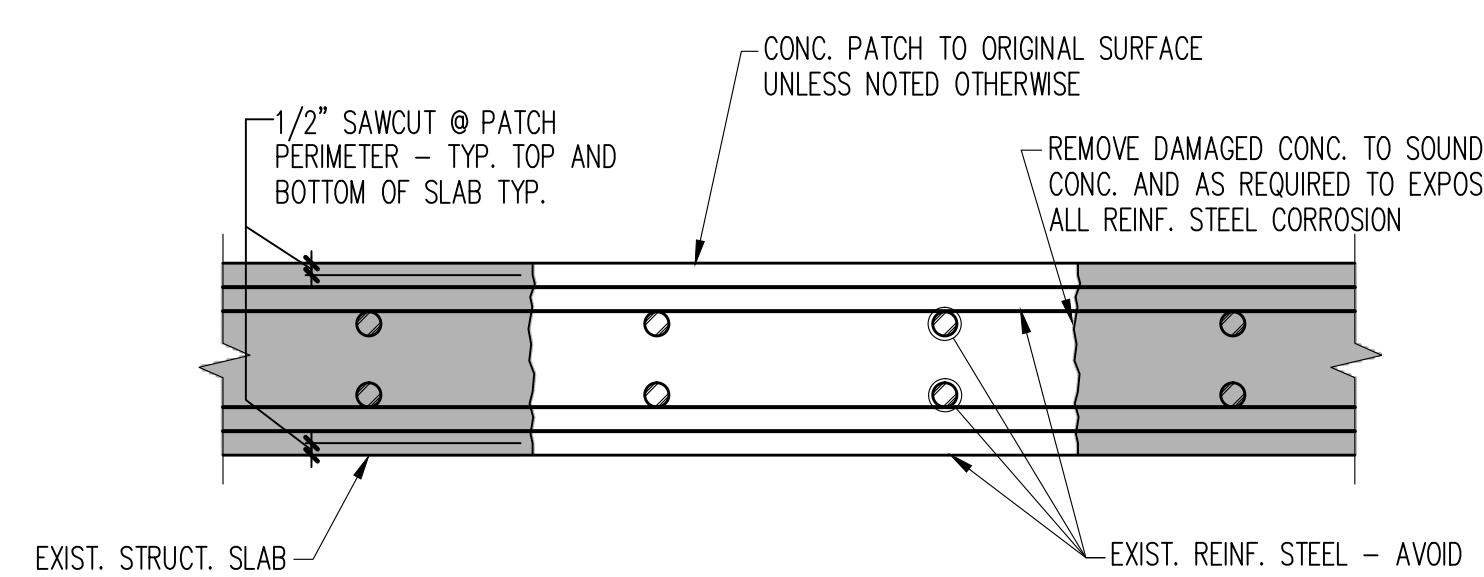
- NOTES:
- 1) REPLACE HEAVILY CORRODED REINFORCING STEEL AS REQUIRED - SEE 4/S-1.
  - 2) REMOVE CONDUIT WITHIN REPAIR AREA. REPLACE WITH SURFACE MOUNTED CONDUIT.
  - 3) PROVIDE SHORING OF SLAB IF AREA OF REPAIR EXCEEDS 5 SQ. FT. OR IF SUM OF INDIVIDUAL REPAIR AREAS EXCEED 10 SQ. FT. IN ANY 100 SQ. FT. AREA OF THE SLAB.
  - 4) FINISH SOFFIT SURFACE TO SMOOTH STEEL TROWEL FINISH.
  - 5) DETAIL 3/S-1 MAY BE USED @ NO ADDITIONAL COST TO THE OWNER, OR WHERE SOFFIT REPAIRS ARE COINCIDENT WITH SURFACE REPAIRS ABOVE.

**2 SPALLED/DELAMINATED CEILING REPAIR DETAIL**



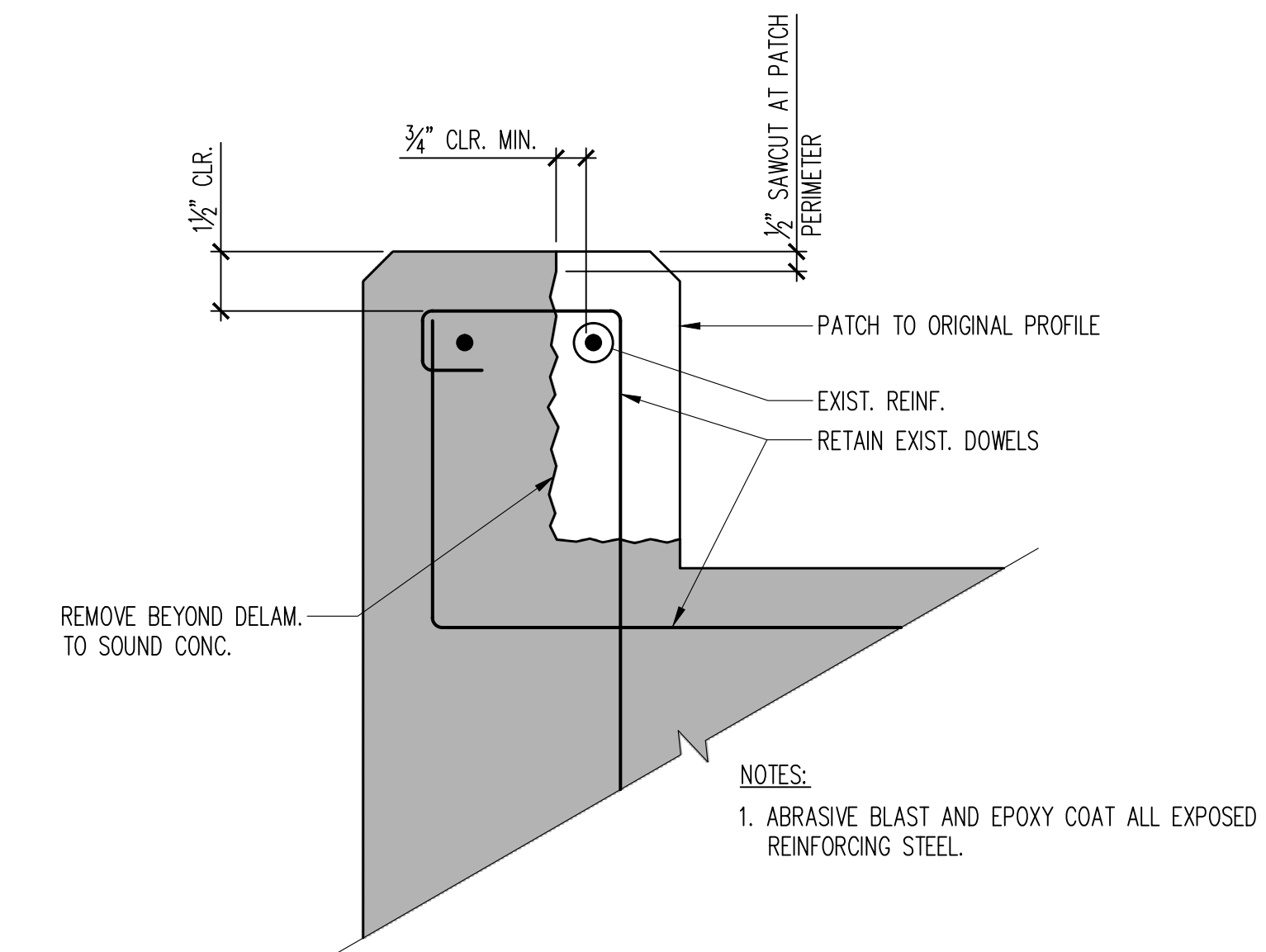
- NOTES:
- 1) CLEAN EXPOSED REINFORCING STEEL OF OXIDATION AND SCALE BY AN OIL-FREE ABRASIVE-BLAST METHOD, THEN EPOXY COAT IF SURROUNDING CONCRETE DOES NOT CONTAIN CORROSION INHIBITOR.
  - 2) IF OXIDIZED AREA  $A_{ox}$  IS LESS THAN 75% OF ORIGINAL AREA  $A_b$ , ADD ADDITIONAL GRADE 60 REINFORCING STEEL OF AREA  $A_b$  OR GREATER. AT EACH END OF THE OXIDIZED SECTION PROVIDE A MINIMUM LAP SPICE LENGTH OF 44 TIMES THE EXISTING STEEL DIAMETER. IF THE ADDITIONAL STEEL ENCOUNTERS THE END OF THE MEMBER, PROVIDE A HOOK OR MECHANICAL ANCHORAGE CAPABLE OF DEVELOPING THE FULL TENSION CAPACITY OF THE STEEL.
  - 3) IF LAP SPICE OF ADDITIONAL STEEL EXTENDS BEYOND THE REPAIR AREA PERIMETER, DEMOLISH ADDITIONAL CONCRETE TO PROVIDE A 3/4" CLEAR SPACE BEHIND AND ON EACH SIDE OF THE ADDED STEEL.
  - 4) AT CONTRACTORS OPTION, UPON APPROVAL BY OWNER, IN LIEU OF CLEANING EXISTING REINFORCING STEEL, IT MAY BE REPLACED WITH REINFORCING HAVING PROPER SPICE LENGTHS.
  - 5) AT CONTRACTORS OPTION, OR WHERE ROOM OR ACCESS FOR LAP SPICE LENGTH IS NOT AVAILABLE, CUT OFF DAMAGED PORTION OF STEEL AND ADD NEW REINFORCING STEEL WITH ENGINEER APPROVED MECHANICAL TENSION SPICE COUPLER IN LIEU OF LAP SPICE DETAIL.

**4 EXISTING REINFORCING STEEL PREPARATION DETAIL**



- NOTES:
- 1) REPLACE HEAVILY CORRODED REINFORCING STEEL AS REQUIRED - SEE 4/S-1.
  - 2) REMOVE CONDUIT WITHIN REPAIR AREA. REPLACE WITH SURFACE MOUNTED CONDUIT.
  - 3) PROVIDE SHORING OF SLAB IF AREA OF REPAIR EXCEEDS 5 SQ. FT. OR IF SUM OF INDIVIDUAL REPAIR AREAS EXCEED 10 SQ. FT. IN ANY 100 SQ. FT. AREA OF THE SLAB.
  - 4) FINISH CONCRETE SURFACE & RECEIVE TRAFFIC MEMBRANE. COORDINATE W/MEMBRANE SUPPLIER.
  - 5) THIS DETAIL MAY BE USED WHERE SLAB AND SOFFIT REPAIRS ARE COINCIDENT IN LOCATION.

**3 FULL DEPTH SLAB REPAIR DETAIL**



**5 PARTIAL CURB REPAIR FOR SPALL DEPTH  $\leq 4$ "**

**CONTRACTOR BID INSTRUCTIONS:**

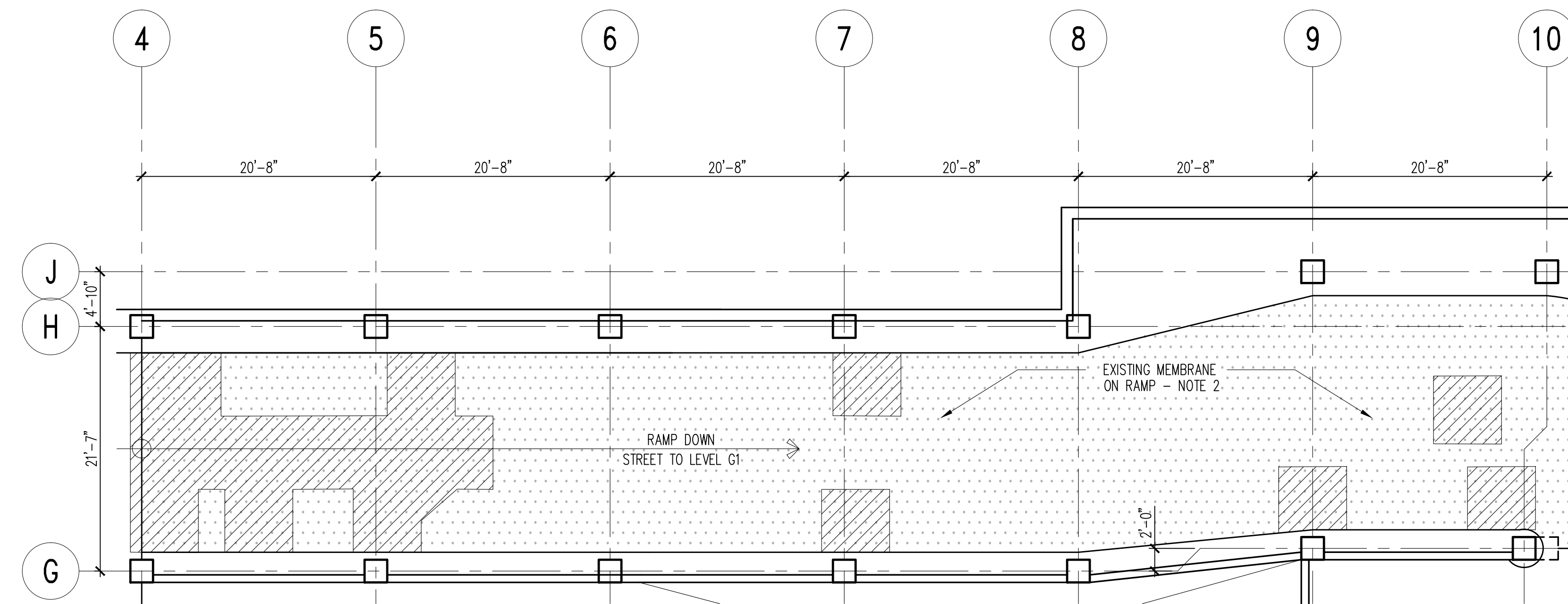
1. THESE DOCUMENTS REFLECT REPAIR QUANTITIES ESTIMATED BY CAGLEY & ASSOCIATES DURING A STRUCTURAL SURVEY OF THE GARAGE IN DECEMBER 2017. IT IS UNDERSTOOD THAT ACTUAL REPAIR QUANTITIES MAY DEVIATE SIGNIFICANTLY FROM ESTIMATED QUANTITIES.
2. THE CONTRACTOR IS TO PROVIDE THE OWNER A LUMP SUM BID THAT INCLUDES ALL COSTS, OVERHEAD, GENERAL CONDITIONS, PROFIT, ETC. TO PERFORM THE WORK REQUIRED BY THE CONTRACT DOCUMENTS.
  - A. INSTALL AN ELASTOMERIC TRAFFIC BEARING MEMBRANE OVER ENTIRE SURFACE OF RAMP. THIS ITEM INCLUDES ALL SURFACE PREPARATION.
  - B. REPAIR OF 855 SQ. FT. OF SLAB SURFACE REPAIRS.
  - C. REPAIR OF 315 SQ. FT. OF SLAB SOFFIT REPAIRS.
  - D. PROVIDE AND INSTALL 50 LINEAR FEET OF BOTH #4 AND #5 BARS TO REPLACE CORRODED REINFORCING.
  - E. ALL OTHER MISCELLANEOUS REPAIRS AND WORK REQUIRED BY THE CONTRACT DOCUMENTS.
3. THE CONTRACTOR IS TO PROVIDE THE OWNER UNIT PRICES TO ADJUST THE LUMP SUM BID SHOULD THE REPAIR QUANTITIES DIFFER FROM THOSE CONTAINED IN THE LUMP SUM, AS FOLLOWS:
  - A. SLAB SURFACE REPAIRS PER SQUARE FOOT.
  - B. SLAB SOFFIT REPAIRS PER SQUARE FOOT.
  - C. REINFORCING STEEL REINFORCEMENT PER LINEAR FOOT (BOTH #4 & #5 BARS)

REVISIONS	
NO.	DATE

DRAWN:  
DESIGNED:  
CHECKED:  
DATE: January 03, 2018

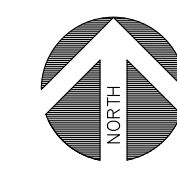
DRAWING TITLE:  
**GENERAL NOTES AND DETAILS**

DRAWING NUMBER:

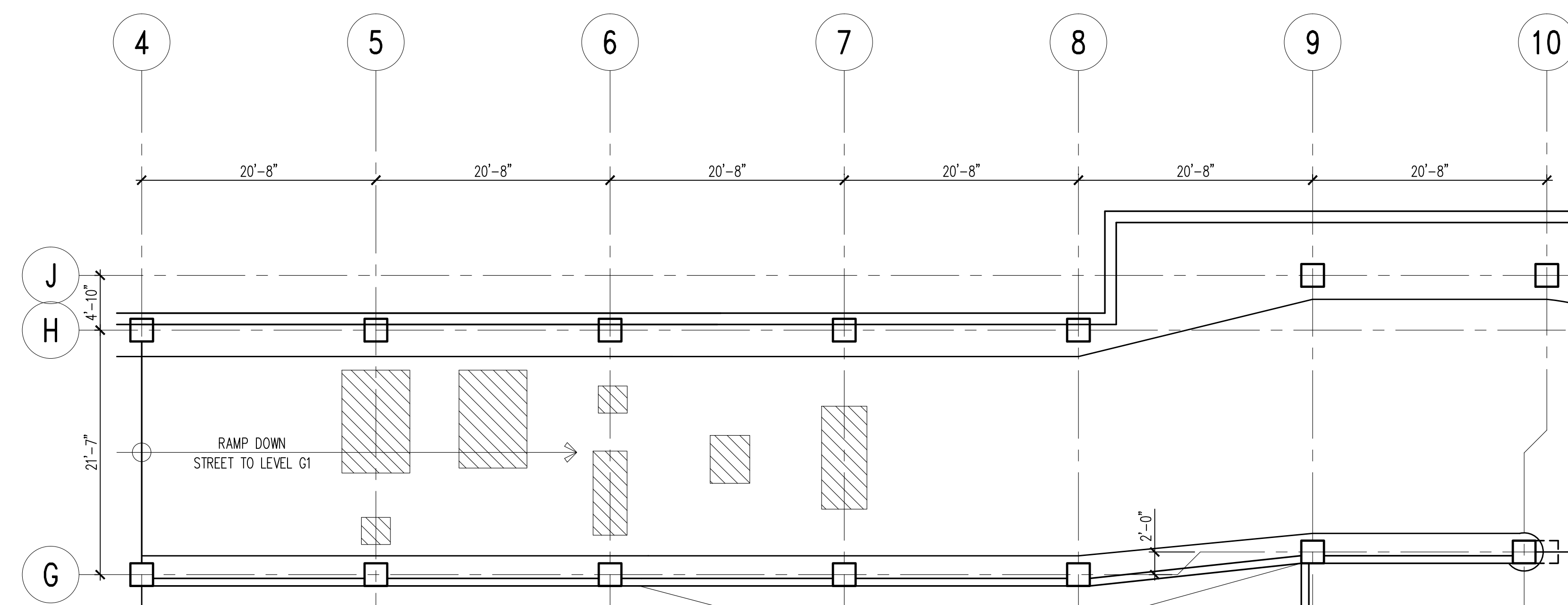


**1 LEVEL G1 SLAB SURFACE PARTIAL PLAN**  
 1/8"=1'-0"

1. EXISTING CONSTRUCTION CONSISTS OF 8" THICK CONCRETE TWO WAY SLAB, WITH DROP PANELS AS INDICATED.
2. CONTRACTOR TO REVIEW EXISTING DECK COATING ON RAMP SURFACES AND PERFORM SPOT REPAIRS AS NECESSARY TO RESTORE MEMBRANE INTEGRITY, INCLUDING ALL LOCATIONS WHERE CONCRETE SURFACE REPAIRS ARE NECESSARY.
3. ALL EXPOSED GARAGE DECKS NOT CURRENTLY PROTECTED WITH DECK COATING ARE TO RECEIVE AN ELASTOMERIC TRAFFIC BEARING MEMBRANE - SEE SPECIFICATIONS.
4. CONTRACTOR TO CHAIN DRAG DECK SURFACE TO CONFIRM EXTENT OF ALL SURFACE REPAIRS.
5. REPAIR DAMAGED/DELAMINATED SURFACES IN ACCORDANCE WITH 2/S-1 OR 3/S-1.
6. EVALUATE AND REPLACE IF NECESSARY CORRODED REINFORCING STEEL IN ACCORDANCE WITH 4/S-1.

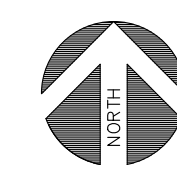


- APPROX. AREA OF SLAB SURFACE TO BE REPAIRED
- EXISTING MEMBRANE



**2 LEVEL G1 SLAB SOFFIT PARTIAL PLAN**  
 1/8"=1'-0"

1. THIS PLAN INDICATES DAMAGE ON THE UNDERSIDE OF THE G-1 LEVEL.
2. EXISTING CONSTRUCTION CONSISTS OF 8" THICK CONCRETE TWO WAY SLAB, WITH DROP PANELS AS INDICATED.
3. REPAIR DAMAGED/DELAMINATED SURFACES IN ACCORDANCE WITH 2/S-1 OR 3/S-1.
4. EVALUATE AND REPLACE IF NECESSARY CORRODED REINFORCING STEEL IN ACCORDANCE WITH 4/S-1.



- APPROX. AREA OF SLAB SOFFIT TO BE REPAIRED

ORGANIZATION OF AMERICAN STATES GARAGE RAMP REPAIRS

1889 F STREET NW  
 Washington, D.C. 20006

REVISIONS	
NO.	DATE

DRAWN:  
 DESIGNED:  
 CHECKED:  
 DATE: January 03, 2018  
 DRAWING TITLE:  
**LEVEL G-1 SLAB SURFACE AND SOFFIT PARTIAL PLANS**

DRAWING NUMBER:  
**S-2**