



# CITY OF HOUSTON

## INVITATION TO BID

Issued: August 6, 2010

### **Bid Opening:**

Sealed bids, in duplicate, will be received by the City Secretary of the City of Houston, in the City Hall Annex, Public Level, 900 Bagby, Houston, Texas 77002 until **10:30 A.M. Thursday, August 26, 2010**, and all bids will be opened and publicly read in the City Council Chamber, City Hall Annex, Public Level, 900 Bagby at 11:00 A.M. on that date for the purchase of:

### **THEATER DISTRICT PARKING GARAGE REPAIRS FOR THE GENERAL SERVICES DEPARTMENT**

**Bid No. S50-C23703**

**NIGP Code: 910-51**

### **Buyer:**

Questions regarding this solicitation should be addressed to Arturo Lopez, Senior Procurement Specialist, at **832-393-8731** or e-mail to [arturo.lopez@houstontx.gov](mailto:arturo.lopez@houstontx.gov).

### **Electronic Bidding:**

In order to submit a bid for the items associated with this procurement, you must fill in the pricing information on the "PLACE BID" page.

### **Prebid Conference:**

A Pre-Bid Conference will be held for all Prospective Bidders in the Strategic Purchasing Division, Concourse Level (Basement), Conference Room, #1 City Hall, 901 Bagby, at **10:00 a.m. on Wednesday, August 18, 2010**. **The site visit will be scheduled at the pre-bid conference.**

**All Prospective Bidders are urged to be present. It is the bidder's responsibility to ensure that they have secured and thoroughly reviewed all aspects of the solicitation documents prior to the Pre-Bid Conference. Any revisions to be incorporated into this solicitation document arising from discussions before, during and subsequent to the Pre-Bid Conference will be confirmed in writing by Letter(s) of Clarification prior to the bid due date. Verbal responses will not otherwise alter the specifications, terms and conditions as stated herein.**

**Bidding forms, specifications, and all necessary information should be downloaded from the Internet at [www.houstontx.gov/purchasing/index.html](http://www.houstontx.gov/purchasing/index.html). By registering and downloading this solicitation document, all updates to this solicitation document will be automatically forwarded via e-mail to any registered bidders. This information may also be obtained from the Supplier Assistance Desk, Strategic Purchasing Division, 901 Bagby, Concourse Level, Houston, Texas 77002.**

The place of the bid opening may be transferred in accordance with Paragraph (b), (5) of Section 15-3 of The Code of Ordinances, Houston, Texas. The bid-opening meeting may be rescheduled in accordance with Paragraph (b), (6) of said Section 15-3.

**The City reserves the right to reject any or all bids, or to accept any bid or combination of bids deemed advantageous to it.**

City employees are prohibited from bidding on this solicitation in accordance with the Code of Ordinances Section 15-1.

### **\*CONTENTS:**

- A. OFFER
- B. SCOPE OF WORK/SPECIFICATIONS
- C. GENERAL, SUPPLEMENTARY CONDITIONS AND BOND FORMS

\*NOTE 1: Actual page numbers for each section may change when the solicitation document is downloaded from the Internet or because of letters of clarification. Therefore, bidders must read the solicitation document in its entirety and comply with all the requirements set forth therein.

\*NOTE 2: **To be considered for award please submit the electronic bid form and the forms listed in section A, including the signature page, which must be signed by a company official authorized to bind the company and a 10% Bid Bond.**

## SECTION A



**FORMAL ONE-TIME BID  
THEATER DISTRICT PARKING GARAGE REPAIRS  
FOR THE GENERAL SERVICES DEPARTMENT  
Bid No. S50-C23678  
NIGP Code: 910-51**

To The Honorable Mayor  
and City Council Members  
of the City of Houston, Texas (the "City"):

The undersigned hereby offers to provide services necessary for **Theater District Parking Garage Repairs, located at 511 Rusk, Key Map (493L)** F.O.B. destination point Houston, Texas, in accordance with the City's Specifications and General Terms & Conditions and/or samples/drawings provided herein. When issued by the City of Houston, Letters of Clarification shall automatically become part of this bid document and shall supersede any previous specifications or provisions in conflict with Letters of Clarification. It is the responsibility of the bidder to ensure that it has obtained all such letters. By submitting a bid on this project, bidder shall be deemed to have received all Letters of Clarification and to have incorporated them into the bid.

The City may accept this bid offer by issuance of a Notice of Award Letter and/or a Purchase Order at any time on or before the 120th day following the day this Official Bid Form is opened by the City. This offer shall be irrevocable for 120 days after bid opening or for 90 days after City Council awards the bid, whichever comes last, but this period may be extended by written agreement of the parties.

**The City reserves the right to INCREASE quantities during the twelve-month period following the issuance of the first purchase order subject to agreement in writing by the Prime Contractor/Supplier to honor the same bid price.**

The City reserves the option, after bids are opened, to adjust the quantities listed on the electronic bid form upward or downward, subject to the availability of funds, and/or make award (s) on a line item basis.

## SECTION A

**Documents/forms must be downloaded from the City's Website**  
**<http://www.houstontx.gov/purchasing/index.html>**

### **Additional Required Forms to be Included with this bid:**

In addition to the electronic Bid Form and the Official Signature Page, the Forms listed in Table 1 **must be completed and submitted to the Office of the City Secretary on or before the date and time the bid is due:**

<b>Table 1</b>
Affidavit of Ownership
Fair Campaign Ordinance
Statement of Residence
Conflict of Interest Questionnaire
Pay or Play Contract Compliance Acknowledgement Form 1a
10% Bid Bond
Contractor References

Table 2 lists other documents and forms that should be viewed/downloaded from the City's website, but are not required to be submitted with the bid. The City will request these forms, as applicable, to be completed and submitted to the City by the recommended/successful bidder:

<b>Table 2</b>
Formal Instructions for Bid Terms
Drug Forms
Insurance Certificates Over \$50,000.00
OCP Insurance Certificate Over \$100,000.00
Pay or Play Form 2 / Certification of Agreement to Comply
Performance, Maintenance and Statutory Payment Bonds
2010 Building Construction Wage Rate

Questions concerning the Bid should be submitted in writing to: City of Houston, Strategic Purchasing Division, 901 Bagby, Room B405, Houston, TX 77002, Attn: Arturo Lopez or via fax: 832-393-8758 or via email (preferred method) to [arturo.lopez@houstontx.gov](mailto:arturo.lopez@houstontx.gov) no later than **4:00 PM, Friday, August 20, 2010.**

**PERMITS:**

The Contractor shall be responsible for securing any and all permits for proposed work. Any fee charged for these permits should be the responsibility of the Contractor and not the City of Houston.

**CITY BUILDING CODES:**

All work performed or equipment installed shall be in strict accordance with the City of Houston Building Codes. The Contractor will immediately correct any deficiencies discovered during work or after completion. Failure to correct deficiencies will result in the City having corrections made at the Contractor's expense.

**BID BOND:**

The Contractor shall be required to provide and submit with the bid a Bid Bond in the amount of 10% of the total amount bid by the Contractor. The Bid Bond shall be in the same form as that distributed by the City, and attached hereto, all duly executed by this Bidder (as "Principal") and by a corporate surety company licensed to do business in the State of Texas, and if the amount of the bond is greater than \$100,000.00 the surety must hold a certificate of authority from the United States Secretary of the Treasury, or a Cashier's or a Certified check in a like amount. Company or personal checks are not acceptable.

**PERFORMANCE BOND and PAYMENT BOND:**

The successful Contractor(s) shall be required to provide a Performance and Payment Bond in the total amount (100%) of the Contract if the award is in excess of \$25,000.00.

The Performance and/or Payment Bond shall be in the same form as that distributed by the City, and attached hereto, all duly executed by this bidder (as "Principal") and by an incorporated surety company licensed to do business in the State of Texas. If the amount of the bond is greater than \$100,000.00 the surety must hold a certificate of authority from the United States Secretary of the Treasury.

The Contractor(s) shall be required to provide a Performance and/or Payment Bond as outlined above, which will be delivered to the City Purchasing Agent of the City, on or before the tenth (10<sup>th</sup>) day following the day the bidder receives notice from the City.

**MAINTENANCE BOND:**

The Contractor shall furnish a maintenance bond in the total (100%) bid amount in the form required by the City (samples attached). One bond, also referred to as the One Year Maintenance Bond, will be conditioned upon Contractor's repair, replacement or restoration of any work or any portion of the work which is found to be defective or fails in any way to comply strictly with this contract or the plans and specifications for such work within a period of one (1) year from the date of acceptance of such work by the City Council or after the date that the "CO", or his designee in writing, determines, in a written notice to the Contractor, to be the date upon which the project is both substantially complete and available for the full and beneficial occupancy or use of the City.

**QUALITY AND WORKMANSHIP:**

The bidder must be able to demonstrate upon request that it has performed satisfactorily, services similar to the services specified herein. The bidder will provide records of warranty and repair services performed for others upon request. The City of Houston shall be the sole judge whether the services performed are similar to the scope of services specified herein. The City of Houston reserves the right to inspect the bidder's current place of business to evaluate equipment condition and capabilities, staff experience, training and capabilities, and storage capabilities as they relate to the performance of this contract.

**CONTRACTOR'S QUESTIONNAIRE**

In order to receive bid award consideration, the bidder must be able to demonstrate that they are currently providing or have had at least one contract, for **theater district parking garage repairs** that is similar in size and scope to this contract. **Bidder must have references documenting that it has performed theater district parking garage repairs.** The reference(s) should be included in the space provided below. Please attach another piece of paper if necessary. If references are not included with the bid, the bidder shall be required to provide such references to the City of Houston within five working days from receipt of a written request from the City of Houston to do so. **Bidder's capability and experience shall be a factor in determining the Contractor's responsibility.**

1. Business Name: \_\_\_\_\_

Business Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

**Name of Owner/Contact Person:**

\_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

No. of Years providing Service to this business: \_\_\_\_\_

2. Business Name: \_\_\_\_\_

Business Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

**Name of Owner/Contact Person:**

\_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

No. of Years providing Service to this business: \_\_\_\_\_

3. Business Name: \_\_\_\_\_

Business Address: \_\_\_\_\_

City, State, Zip: \_\_\_\_\_

**Name of Owner/Contact Person:**

\_\_\_\_\_

Phone: \_\_\_\_\_ Fax: \_\_\_\_\_ Email: \_\_\_\_\_

No. of Years providing Service to this business: \_\_\_\_\_

**SECTION B**

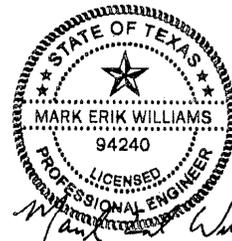
Theater District Garage Repairs - Phase II  
WBS No. B-000087-0002-4

**SEALS PAGE**

DOCUMENT 00 01 07

SEALS PAGE

I HEREBY CERTIFY THAT THESE PLANS AND TECHNICAL SPECIFICATIONS WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF TEXAS.



MARK ERIK WILLIAMS, P.E. 94240  
TBPE FIRM REGISTRATION NUMBER 1856

00 01 07-1  
04-13-2010

## SCOPE OF WORK

### **PART ONE - GENERAL**

- 1.0 The scope work for this phase of the project requires the construction contractor to furnish all material, labor, tools, supplies, permits, equipment, transportation, superintendence, barricades, temporary construction of every nature, for repairs to structural columns, stairwells and walls; investigation and repair of reinforcing steel cables within the concrete floor decks; removal and replacement of skylights; joint and crack repair; and addressing waterproofing throughout the garage facility.

### **PART 2 - PERFORMANCE TIME**

- 2.01 The Contractor shall have 120 calendar days to complete all work associated with this project after receipt of the Notice – To - Proceed.

### **PART 3 - RELATED SECTIONS**

- 3.01 All Documents and Sections that are not visible in the Technical Specifications can be viewed from the following Public Works and Engineering web link:

[http://pwecms.cityofhouston.net/forms-amp-policies/search\\_result-2.html](http://pwecms.cityofhouston.net/forms-amp-policies/search_result-2.html)

### **PART 4 – TABLE OF CONTENTS AND LIST OF DRAWINGS**

#### TABLE OF CONTENTS 00 01 10

<u>Doc. No.</u>	<u>Document Title</u>
00 01 07	Seals Page
00 01 10	Table of Contents
00 01 15	List of Drawings
01 01 15	Task Items
01 10 00	Summary of Work
01 31 00	Project Management and Coordination
01 33 00	Submittal Procedures
01 45 00	Quality Control
01 45 29	Structural Testing Laboratory Services
01 73 29	Cutting and Patching
01 74 23	Final Cleaning
01 77 00	Closeout Procedures
01 78 36	Product Warranties
03 01 30.70	Surface Preparation for Patching
03 01 30.71	Concrete Repair Materials
03 01 30.72	Fiber Reinforced Polymer (FRP)
03 38 00	Post-Tensioned Concrete
03 63 00	Epoxy Related Work

07 18 00 Traffic Coatings  
07 81 00 Applied Fireproofing  
07 92 00 Joint Sealants  
07 95 00 Expansion Joints

LIST OF DRAWINGS  
00 01 15

**Sheet No.**

**Drawing Title**

1	COVER SHEET
2	GENERAL NOTES
3	PLAN – STREET LEVEL – TASK ITEM REPAIRS
4	PLAN – CIVIC CENTER GARAGE – GREEN LEVEL (TASK ITEM REPAIRS)
5	PLAN – CIVIC CENTER GARAGE – GREEN LEVEL (PT TENDON REPAIR LOCATIONS)
6	PLAN – CIVIC CENTER GARAGE – ORANGE LEVEL (TASK ITEM REPAIRS)
7	PLAN – CIVIC CENTER GARAGE – ORANGE LEVEL (PT TENDON REPAIR LOCATIONS)
8	PLAN – CIVIC CENTER GARAGE – PURPLE LEVEL (TASK ITEM REPAIRS)
9	PLAN – SMALL TRANQUILITY GARAGE – BLUE LEVEL
10	PLAN – SMALL TRANQUILITY GARAGE – GREY LEVEL
11	PLAN – SMALL TRANQUILITY GARAGE – BROWN LEVEL
12	PLAN – LARGE TRANQUILITY GARAGE – YELLOW LEVEL
13	PLAN – LARGE TRANQUILITY GARAGE – AQUA LEVEL
14	PLAN – LARGE TRANQUILITY GARAGE – PINK LEVEL
15	TASK ITEM REPAIR DETAILS
16	TASK ITEM REPAIR DETAILS
17	PT TENDON REPAIR – REPAIR DETAILS
18	PT TENDON REPAIRS – PARTIAL PLANS AND REPAIR DETAILS
19	PT TENDON REPAIRS – PARTIAL PLANS AND REPAIR DETAILS
20	PT TENDON REPAIRS – PARTIAL PLANS AND REPAIR DETAILS

## SECTION 01 01 15

### TASK ITEMS

#### **PART ONE - GENERAL**

##### 1.1 RELATED DOCUMENTS

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

##### 1.2 TASK ITEM (T.I.) DESCRIPTION

###### T.I. 1.1 PROJECT MOBILIZATION

###### A. Scope of Work

- 1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work defined in this Contract.

###### T.I. 2.1 CONCRETE CURB REPAIR

###### A. Scope of Work

- 1. Work consists of furnishing all labor, materials, equipment, formwork, supervision, and incidentals necessary to locate existing spalls, locate, and remove delaminated and unsound concrete from curbs, prepare cavities and install repair materials to restore concrete curb to original condition and appearance. Refer to Detail 2.1 for specific requirements. Refer to Plan Sheets for location of work.

###### B. Materials

- 1. Material for repair areas shall be as specified in Section "Concrete Repair Materials."

###### C. Execution

- 1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
- 2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching."

3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.
7. Paint curb to match existing curb color.

T.I. 2.3 PARTIAL DEPTH CONCRETE FLOOR REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, formwork, supervision, and incidentals necessary to locate existing spalls, locate, and remove delaminated and unsound concrete from post-tensioned slab, conventionally cast-in-place slab or slab-on-grade, prepare cavities and install repair materials to restore concrete floor slab to original condition and appearance. Refer to Detail 2.3 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repair areas shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching."
3. All mild reinforcing steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section "Surface Preparation for Patching."

4. Exposed mild reinforcing steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I            2.4            FULL DEPTH CONCRETE FLOOR REPAIR

A.            Scope of Work

1.            Work consists of furnishing all labor, materials, equipment, shoring, formwork, supervision, and incidentals necessary to locate and remove full depth delaminated concrete surfaces, form and install concrete slab to original condition and appearance. Refer to Detail 2.4 for specific requirements. Refer to Plan Sheets for location of work.

B.            Materials

1.            Material for repair areas shall be as specified in Section "Concrete Repair Materials."

C.            Execution

1.            Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
2.            Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching." **EXERCISE EXTREME CAUTION NOT TO DAMAGE POST TENSIONED TENDONS.**
3.            Use care not to damage existing finishes on the top side of the slab during concrete demolition.
4.            All mild reinforcing steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section "Surface Preparation for Patching."
5.            Exposed mild reinforcing steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."

6. Contractor shall form concrete with a approved materials and prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
7. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 3.2 CONCRETE BEAM REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, and incidentals necessary to locate and remove delaminated/spalled concrete, prepare cavities, install patching materials to restore concrete beams to original condition and appearance. Refer to Detail 3.2. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repairs shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching."
3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.

T.I 3.6 CONCRETE WALL REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate and

remove unsound concrete from walls, prepare cavities, install patching materials to restore walls to original condition and appearance. Refer to Detail 3.6. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repairs shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching."
3. All mild reinforcing steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section "Surface Preparation for Patching."
4. Exposed mild reinforcing steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.
7. Paint repair area to match existing wall color.

T.I. 3.7 CONCRETE SOFFIT REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, formwork, supervision, and incidentals necessary to locate existing spalls, locate, and remove delaminated and unsound concrete from soffit, prepare cavities and install repair materials to restore soffit to original condition and appearance. **Work should proceed with caution in slabs with post-tensioning tendons to avoid causing structural damage to the slab.** Refer to Detail 3.7 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repair areas shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching." **EXERCISE EXTREME CAUTION NOT TO DAMAGE POST TENSIONED TENDONS WHEN APPLICABLE.**
3. All mild reinforcing steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section "Surface Preparation for Patching."
4. Exposed mild reinforcing steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
6. Patch installation procedures shall be in accordance with referenced specifications for selected material.
7. Provide proper concrete cover according to Detail 3.7 for all exposed rebar.

T.I.

4.1 CONCRETE COLUMN REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, signage, formwork, supervision, and incidentals necessary to locate existing spalls, locate, and remove delaminated, unsound concrete, prepare cavities, place patching materials to restore concrete column to original condition and appearance. Refer to Detail 4.1 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repair areas shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Marking will be done with methods approved by Engineer and Owner. Contractor shall identify all critical repair work areas before starting the work.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching."
3. All steel exposed within cavities shall be cleaned and coated in accordance with Section "Surface Preparation for Patching."
4. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
5. Install formwork and place patch material in accordance with referenced specifications for selected material.
6. Remove all formwork after concrete repair material has set for a minimum of 24 hours.

T.I.

4.2 CONCRETE BUMPER WALL REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, formwork, equipment, supervision, bracing, and incidentals necessary to locate and repair unsound concrete bumper walls, prepare cavities, install patching materials, epoxy inject cracks, and install NSM CFRP reinforcement to restore bumper walls to original condition and appearance. Refer to Detail 4.2 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Materials for concrete repairs shall be as specified in Section "Concrete Repair Materials."
2. Materials for crack repair by epoxy injection shall be as specified in Section "Epoxy Related Work."
3. Materials for concrete strengthening shall be as specified in Section "Fiber Reinforced Polymer (FRP) Reinforcement."

C. Execution

1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.

2. Procedure for delaminated, spalled, and unsound concrete removal shall be specified in Section "Surface Preparation for Patching." **EXERCISE EXTREME CAUTION NOT TO DAMAGE POST TENSIONED TENDONS AND ANCHORS EMBEDDED IN THE BASE OF THE WALLS.**
3. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods as specified in Section "Surface Preparation for Patching."
4. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
5. Install patching materials as specified in Section "Concrete Repair Materials."
6. Surface seal and inject cracks with epoxy in accordance with Section "Epoxy Related Work."
7. At completion of the injection work, contractor shall remove injection ports, and repair the concrete profile to match existing conditions.
8. Install FRP reinforcement on both sides of the wall as shown in Detail 4.2. and in accordance with Section "Fiber Reinforced Polymer (FRP) Reinforcement."
9. Paint wall to match existing surfaces after FRP has cured.

T.I.

6.1 EXPANSION JOINT REPLACEMENT – PREFORMED NEOPRENE

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, traffic controls, protection from water, and incidentals necessary to remove existing expansion joint system, prepare existing metal blockout to receive new expansion joint in accordance with manufacturer's recommendations, and furnish and install a new preformed closed cell neoprene expansion joint sealant system. Refer to Detail 6.1 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for expansion joint system shall be as specified in Section "Expansion Joints" and Detail 6.1.
2. Material for concrete repairs shall be as specified in Section "Concrete Repair Materials."
3. Primer shall be approved by the expansion joint manufacturer.

4. Galvanizing Repair Paint: Galvanizing repair paint shall be "ZRC Galvilite Repair Compound" as manufactured by ZRC Chemical Products or a paint complying with SSPC-Paint 20.

C. Execution

1. Contractor shall locate and mark all work areas. Contractor shall identify all critical repair work areas and coordinate work, protect of joint from exposure to water, and initiate vehicle lane closures before starting the work.
2. Contractor shall field verify installation width of joints in accordance with the manufacturer's recommendations.
3. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons and protect the joint from water exposure during installation.
4. Contractor shall remove existing expansion joint materials in manner that minimizes damage to the blockout. Alterations and repairs to existing expansion joint blockout required for installation of new expansion joint system shall be performed in accordance with manufacturer recommendations and Section "Surface Preparation for Patching" and are incidental to this Task Item.
5. Contractor shall protect the joint installation area from water exposure using methods approved by the owner's representative during installation and curing of the expansion joint materials. Protection of the joint from water is incidental to this Task Item.
6. All exposed steel in the blockout shall be cleaned to bare metal by abrasive methods or other approved methods in strict accordance with manufacturer's specifications. Steel surfaces shall be clean, i.e. devoid of grease, oil, mill scale, oxidation, loosely adherent rust, paint, etc. Abrasive blast steel surfaces to SSPC-SP6.
7. Exposed steel in the blockout shall be coated with primer approved by the joint manufacturer.
8. Installation procedures shall be in accordance with referenced specifications for selected material.
9. Apply cold galvanizing compound to exposed steel.
10. In-place testing: Prior to opening to traffic, test joint seal for leaks with 2 in. water depth maintained continuously for 12 hours. Repair leaks revealed by examination of seal underside. Repeat test and repair until all leaks are stopped for a full 12 hours.

- T.I. 6.2 EXPANSION JOINT INSTALLATION – PRECOMPRESSED (PEDESTRIAN TRAFFIC)
- A. Scope of Work
1. Work consists of furnishing all labor, materials, equipment, formwork, supervision, and incidentals necessary to locate Work area, remove existing expansion joint system and miscellaneous accessories, repair existing concrete blockout to conform to expansion joint manufacturer, and install a new precompressed foam expansion joint system. Refer to Detail 6.2 for specific requirements. Refer to Plan Sheets for location of work.
- B. Materials
1. Material for expansion joint system shall be as specified in Section “Expansion Joints” and Detail 6.2.
  2. Materials for concrete repairs shall be as specified in Section “Concrete Repair Materials.”
- C. Execution
1. Contractor shall field verify the joint width at each location indicated on the plan sheets by Task Item 6.2 and supply this information to the manufacturer for sizing of the joint prior to ordering materials.
  2. Contractor shall field verify installation width of joints in accordance with the manufacturer’s recommendations.
  3. Contractor shall remove existing expansion joint materials where applicable in manner that minimizes damage to adjacent concrete. Alterations and repairs to existing expansion joint blockout required for installation of new expansion joint system shall be performed in accordance with manufacturer recommendations and Section “Surface Preparation for Patching,” and are incidental to this Task Item.
  4. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons.
  5. Installation procedures shall be in accordance with referenced specifications for selected material and the manufacturer’s instructions.
- T.I. 6.3 EXPANSION JOINT INSTALLATION – PRECOMPRESSED (VERTICAL JOINT)
- A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, scaffolding, formwork, supervision, and incidentals necessary to locate Work area, remove existing expansion joint system, and miscellaneous accessories, repair existing concrete blockout to conform to expansion joint manufacturer and install a new vertical precompressed foam expansion joint system. Refer to Detail 6.3 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for expansion joint system shall be as specified in Section "Expansion Joints" and Detail 6.3.
2. Materials for concrete repairs shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall field verify the joint width at each location indicated on the plan sheets by Task Item 6.3 and supply this information to the manufacturer for sizing of the joint prior to ordering materials.
2. Contractor shall field verify installation width of joints in accordance with the manufacturer's recommendations.
3. Contractor shall remove existing expansion joint materials in manner that minimizes damage to adjacent concrete. Alterations and repairs to existing expansion joint blockout required for installation of new expansion joint system shall be performed in accordance with manufacturer recommendations and Section "Surface Preparation for Patching", and are incidental to this Task Item.
4. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons.
5. Installation procedures shall be in accordance with referenced specifications for selected material and the manufacturer's instructions.

T.I. 6.4 EXPANSION JOINT COVER PLATE REINSTALLATION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, traffic control, and incidentals necessary to remove and reinstall existing expansion joint cover plates with mechanical anchors. Refer to Plan Sheets for location of work.

B. Materials

1. Existing galvanized steel expansion joint cover plates.
2. Galvanizing Repair Paint: Galvanizing repair paint shall be "ZRC Galvilite Repair Compound" as manufactured by ZRC Chemical Products or a paint complying with SSPC-Paint 20.
3. Concrete anchors: 3/8" dia x 3-1/2" embedment (min.), flat head (countersunk), zinc plated. Approved materials are as follows:
  - (1.) KB3 Kwik Bolt 3 Countersunk Expansion Anchor by Hilti
  - (2.) Sleeve-All Phillips Flat Head Anchor by Simpson Anchors
  - (3.) Power Bolt Flat Head by Power Fasteners

C. Execution

1. Work shall be done after completion of Task Item 6.1.
2. Contractor shall locate and mark all work areas. Contractor shall identify all critical repair work areas and coordinate work and lane closures before starting the work.
3. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons.
4. Contractor shall remove existing expansion joint cover plates in manner that minimizes damage to adjacent steel and concrete. Alterations and repairs to existing expansion joint blockout required for reinstallation of existing expansion joint cover plates shall be performed in accordance Section "Surface Preparation for Patching" and are incidental to this Task Item.
5. Contractor shall provide countersunk holes, matching the profile of the concrete anchor head in existing expansion joint cover plates to ensure that concrete anchor heads do not protrude from the top surface of the cover plate. **Anchor installation holes shall be spaced no more than 1 foot on center across the entire drive lane.**
6. Contractor shall repair damage to hot-dipped galvanized coating with cold galvanized compound.
7. Contractor shall reinstall the cover plates with specified countersunk anchors snug and level with the existing steel blockout so to minimize vibration of the plate from vehicles. Provide neoprene shim pads as needed to level plates. Anchors shall be installed on one side only, on the side first contacted by vehicle traffic in the drive lane.

- T.I. 6.5 EXPANSION JOINT REPLACEMENT – ELASTOMERIC CONCRETE EDGED
- A. Scope of Work
1. Work consists of furnishing all labor, materials, equipment, traffic control, formwork, supervision, and incidentals necessary to locate Work area, remove existing expansion joint system, and miscellaneous accessories, repair existing concrete blockout to conform to expansion joint manufacturer, and install a new elastomeric concrete edged expansion joint system. Refer to Detail 6.5 for specific requirements. Refer to Plan Sheets for location of work.
- B. Materials
1. Material for expansion joint system shall be as specified in Section “Expansion Joints” and Detail 6.5.
  2. Materials for concrete repairs shall be as specified in Section “Concrete Repair Materials.”
- C. Execution
1. Contractor shall remove existing expansion joint materials in manner that minimizes damage to adjacent concrete. Alterations and repairs to existing expansion joint blockout required for installation of new expansion joint system shall be performed in accordance with manufacturer recommendations and Section “Surface Preparation for Patching” and are incidental to this Task Item.
  2. Contractor shall field verify installation width of joints in accordance with the manufacturer’s recommendations.
  3. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons.
  4. Installation procedures shall be in accordance with referenced specifications for selected material.
  5. Control joints in blockout shall be tooled and formed in plastic concrete. Sawcutting joints after concrete sets will not be allowed.
  6. Tooled joints shall be of proper dimension in plastic concrete.
  7. Installation procedures shall be in accordance with referenced specifications for selected material and the manufacturer’s instructions.

8. In-place testing: Prior to opening to traffic, test joint seal for leaks with 2 in. water depth maintained continuously for 12 hours. Repair leaks revealed by examination of seal underside. Repeat test and repair until all leaks are stopped for a full 12 hours.

T.I 6.6 EXPANSION JOINT REPLACEMENT – ADHERED EXTRUDED RUBBER

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, traffic controls, protection from water, and incidentals necessary to remove existing expansion joint system, repair existing concrete blockout to receive new expansion joint in accordance with manufacturer's recommendations, and furnish and install a new adhered extruded rubber expansion joint system. Refer to Detail 6.1 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for expansion joint system shall be as specified in Section "Expansion Joints" and Detail 6.6.
2. Material for concrete repairs shall be as specified in Section "Concrete Repair Materials."

C. Execution

1. Contractor shall remove existing expansion joint system materials, where indicated on the drawings, in manner that minimizes damage to adjacent concrete. Alterations, repairs and modifications to existing expansion joint blockout required for installation of new expansion joint systems shall be incidental in this task item.
2. Contractor shall field verify installation width of joints in accordance with the manufacturer's recommendations.
3. Coordinate this task item with owner representative in order to produce minimum disruptions to the patrons.
4. Remove existing metal cover plate and fasteners.
5. All sound and unsound concrete shall be removed by sawcutting and chipping to sufficient width and depth in accordance with section "Surface Preparation for Patching."
6. All steel exposed within cavities shall be cleaned to bare metal by abrasive methods or other approved methods as specified in Section "Surface Preparation for Patching."

7. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching."
8. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
9. Patch installation procedures shall be in accordance with referenced specifications for selected material.
10. Install new expansion joint system in strict accordance by manufacturer's instructions. Heat seam weld and install joint sealant between new joint to existing joint to create a watertight transition between new and existing joint.
11. In-place testing: Prior to opening to traffic, test joint seal for leaks with 2 in. water depth maintained continuously for 12 hours. Repair leaks revealed by examination of seal underside. Repeat test and repairs until all leaks stopped for full 12 hours.

T.I.

7.1 CRACK REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate, prepare, rout and seal random cracks in concrete floor slab. Refer to Detail 7.1 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Approved materials to be used in this Work are specified in Section "Joint Sealants."
2. Joint sealant material shall be compatible with traffic topping materials specified in Section "Traffic Coatings."

C. Execution

1. Contractor shall thoroughly inspect concrete slabs for cracks and failed joint sealant in the areas shown in the drawings. Those with open joints, cracks identified as either greater than 1/32 in. wide, or showing evidence of water and/or salt staining on ceiling below shall be sealed.
2. All joints and cracks identified for repair shall be marked to aid in precision routing. Obtain depths to top reinforcing bars in area of repair by use of non-destructive methods.
3. Contractor shall remove existing joint sealant, if present.

4. Determine depth of post tensioned tendons or electrical conduit (if applicable) by non-destructive methods. Do not exceed ½ of this depth of routing where the crack to be repaired crosses the embedded items. Damage to embedded items will require repair or replacement at no cost to the Owner.
5. Cracks shall be ground or saw-cut to an adequate width and depth as required by Detail. Routing shall be performed by mechanized device that has positive mechanical control over depth and alignment of cut.
6. Cavities shall be thoroughly cleaned by either abrasive methods or grinding to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion. Groove shall be air blasted to remove remaining debris.
7. Sealant materials and associated reference specifications are listed in Section "Joint Sealants." Sealant installation procedures shall be in accordance with referenced specifications for selected material.

T.I.

7.2 JOINT SEALANT REPLACEMENT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate, remove, prepare, and re-seal areas in concrete or CMU walls. Refer to Detail 7.2 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Approved materials to be used in this Work are specified in Section "Joint Sealants."
2. Close cell backer rod as required.

C. Execution

1. Contractor shall remove existing joint sealant.
2. Contractor shall thoroughly clean opening in areas to receive joint sealant.
3. Joints shall be ground or saw-cut to an adequate width and depth as required by Detail. Routing shall be performed by mechanized device that has positive mechanical control over depth and alignment of cut.
4. Cavities shall be thoroughly cleaned by either abrasive methods or grinding to remove all laitance, unsound

concrete and curing compounds which may interfere with adhesion. Groove shall be air blasted to remove remaining debris.

5. Install backer rod at wide joints in strict accordance with manufacturer's instructions.
6. Sealant materials and associated reference specifications are listed in Section "Joint Sealants." Sealant installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 7.3 JOINT SEALANT REPLACEMENT AT SKYLIGHTS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate, remove existing sealant and backer rod, prepare joints, and re-seal all glass block sky light assemblies. Refer to Detail 7.3 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Approved materials to be used in this Work are specified in Section "Joint Sealants."
2. Close cell backer rod as required.

C. Execution

1. Contractor shall locate and identify all location of work.
2. Remove existing joint sealant with minimal damage to adjacent concrete and glass block surfaces.
3. Cavities shall be thoroughly cleaned by either abrasive methods or grinding to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion. Groove shall be air blasted to remove remaining debris. Protect glass blocks during surface preparation.
4. Install backer rod at wide joints in strict accordance with manufacturer's instructions.
5. Sealant materials and associated reference specifications are listed in Section "Joint Sealants." Sealant installation procedures shall be in accordance with referenced specifications for selected material.

T.I. 7.5 COVE SEALANT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to prepare surfaces and install cove sealant between floor and vertical surfaces as shown on Drawings. Refer to Detail 7.5 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Approved materials to be used in this Work are specified in Section "Joint Sealants."
2. Joint sealant material shall be compatible with traffic topping materials specified in Section "Traffic Coating."

C. Execution

1. Wall or column to floor intersection to be sealed shall be thoroughly cleaned by abrasive blasting to remove all contaminants, existing sealant, and foreign material.
2. Entire work area shall then be cleaned with compressed air to assure that all loose particles have been removed and that intersection is dry.
3. Properly prepared intersection shall be coated evenly and completely with joint primer material on each of intersecting faces in accordance with sealant manufacturer's recommendations.
4. After primer has cured, apply cove sealant to intersection such that sealant extends  $\frac{3}{4}$ " onto each of intersecting faces.
5. Work cove sealant into joint so that all air is removed and tool to concave shape such that minimum throat dimension of no less than  $\frac{1}{2}$ " is maintained.
6. Remove excess sealant and allow to cure.
7. Apply coating on horizontal and vertical surfaces where shown on drawings in even layers in strict accordance with manufacturer's recommendations.

T.I. 7.6 EPOXY INJECTION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, scaffolding, supervision, and incidentals necessary to locate cracks, prepare, and inject approved cracks with epoxy resin.

B. Materials

1. Material for crack repairs shall be as specified in Section "Epoxy Related Work."

C. Execution

1. Contractor shall locate all cracks to receive injection and report them to Engineer for verification.
2. Install repair materials in strict accordance with manufacturer's recommendations and referenced specifications for selected material.
3. At completion of the injection work, contractor shall remove injection ports, and repair the concrete profile to match existing conditions.

T.I. 7.7 URETHANE INJECTION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, supervision, and incidentals necessary to locate cracks, prepare and inject approved cracks with polyurethane grout. At the completion, contractor shall clean the injection area in a manner that closely matches the adjacent concrete surfaces.

B. Materials

1. Acceptable polyurethane grouts are as follows:
  - (1) Hydro Active Combi Grout by De Neef Construction Chemicals
  - (2) Coneresive 1210 IUG by BASF
  - (3) SikaFix® HH Hydrophilic by Sika

C. Execution

1. Contractor shall locate all cracks to receive injection and report them to Engineer for verification.
2. Drilled and installs ports in strict accordance with manufacturer's recommendations.
3. Inject the product into the concrete beginning at the lowest packer or beginning with the first packer that was flushed on the horizontal crack.
4. Move to the next adjacent port when material appears from a packer. Repeat the injection of the first packer after pumping a number of ports. Pressure will vary from 200 –

2,500 psi, depending on crack thickness, concrete thickness, and contamination.

5. Re-inject water into the crack to cure resin left behind in the drill hole.
6. Remove surface residue after completion of crack injection.

T.I. 7.8 TRAFFIC TOPPING AROUND COLUMNS – NEW SYSTEM

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to prepare concrete surfaces and install a new traffic topping system.
2. Traffic topping is to be installed on elevations and all column faces as required in accordance to plan sheets. Application shall be for interior columns only (i.e. columns not located at expansion joints, pour strips, or the perimeter of the garage). Traffic topping shall not be installed where there are existing epoxy floor coatings.
3. Refer to Details 7.8 for specific requirements. Refer to Plan Sheets for typical location of work.
4. Payment for repainting of all line striping removed during traffic topping installation is incidental to this task item.

B. Materials

1. Approved “Heavy Duty” materials for use in this Task Item are as specified in Section “Traffic Coatings.”
2. Line re-striping: Two coats of chlorinated rubber paint, color to match existing line stripes.

C. Execution

1. Coordinate with Owner to test existing painted surfaces for lead prior to starting work. Employ lead abatement measures to prevent exposure to workers and garage occupants if lead in paint is detected above allowable levels per the governing regulatory guidelines.
2. Floor surface preparation shall be performed by topping system applicator or under its direct supervision. Shotblast surface preparation is required for floors.
3. Remove existing stripes using methods that will not cause damage to the concrete surface.

4. Traffic topping shall be installed by licensed applicators in strict accordance with manufacturer's recommendations.
5. Perform crack and construction joint preparation including installation of joint and cove sealants where required, per the respective repair task items.
6. Mask off traffic topping area in order to create a neat application edge.
7. Topping systems shall be thoroughly cured prior to work areas being returned to service.
8. Floor surfaces: Locate layout and paint parking stall stripes and traffic marking matching existing pattern. All line striping removed during surface preparation shall be repainted. Color of paint to match existing line striping.

T.I.

8.1 CMU TUCKPOINTING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to tuckpoint defective, cracked, broken or eroded joints in existing CMU work.

B. Materials

1. Masonry Cement: ASTM C91, Type S.
2. Hydrated Lime: ASTM C207, Type S.
3. Aggregate for Mortar: ASTM C 144
4. Water: Potable.
5. Mortar shall match existing cured color.

C. Execution

1. Contractor shall locate and mark all work areas.
2. All defective joints shall be tuckpointed.
3. Joints to be tuckpointed shall be cut back to depth of 3/4 in. to full depth of deterioration. Use mechanically operated blades only to perform cutting. Joint at back of cut shall have a square shoulder. Remove all mortar from upper and lower surfaces and sides of mortar being prepared.
4. Contractor shall flush all mortar joints thoroughly with air under pressure prior to tuckpointing to remove all dust, dirt, and laitance.

5. Tuckpointing shall be performed using Type S mortar. Mortar shall be dry and mixed thoroughly prior to adding sand. Add one-half required mixing water and allow to stand 1 hour, then add balance of mixing water.
6. Press mortar into prepared joint using pointing tool 0.125 in. smaller than width of joint until joint is packed full. Finish point joint with pointing tool at least 0.125 in. wider than prepared joint.
7. Prior to initial set of mortar, tool joints to match existing.
8. Allow 3 to 7 days for mortar to harden prior to cleaning CMU or brick wall.
9. Dispose of all accumulated material and leave premises in clean condition.
10. Masonry surfaces that become dirty or smeared during joint cutting and repointing of joint surfaces shall be cleaned with bristle brushes and plain water.
11. Unnecessary damage to surrounding CMU shall be repaired by contractor at not cost to owner.
12. Paint mortar joints to match existing wall color.

T.I.

8.2 CMU REPLACEMENT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, staging, supervision, and incidentals necessary for local CMU removal and replacement due to fractures, cracks, broken, and unsound CMU. Refer to Detail 8.2 for specific requirements. Refer to Elevation Sheets for location of work.

B. Materials

1. Concrete Masonry Units: ASTM C 90
  - (1) Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 1900 psi.
  - (2) Weight Classification: Normal Weight
  - (3) Size (Width): Manufactured to dimensions 3/8" less than nominal dimensions.
  - (4) Exposed Faces: Provide color and texture matching existing.
2. Masonry Cement: ASTM C91, Type S.
3. Hydrated Lime: ASTM C207, Type S.

4. Aggregate for Mortar: ASTM C 144
5. Water: Potable.
6. Mortar shall match existing cured color.

C. Execution

1. Contractor shall locate and mark all units to be replaced. Engineer shall verify replacement locations prior to start of work.
2. Contractor shall locate all existing CMU with a crack width exceeding 1/32", spalls, all structurally unsound CMU, and CMU damaged during removal work.
3. Internal steel exposed during removal process shall be wire-brushed to bare metal, primed, and coated with one coat of zinc chromate primer prior to brick replacement.
4. New CMU shall be laid in a full bed of mortar. All CMU repair shall be flush with existing.
5. New CMU is to be toothed into existing masonry work.
6. Adequate weather protection shall be installed over all areas left open at completion of each day's work.
7. Allow 3 to 7 days for mortar to cure before applying any coating to the wall.
8. Dispose of all accumulated material and leave premises in clean condition.
9. Masonry surfaces that become dirty or smeared during joint cutting and repointing of joint surfaces shall be cleaned with bristle brushes and plain water.
10. Unnecessary damage to surrounding CMU shall be repaired by Contractor at no cost to Owner.
11. Contractor shall provide protection for landscaping.
12. Paint replaced CMU to match existing wall color.

T.I. 9.0 EXPLORATORY PT TENDON EXCAVATION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to expose tendons for Engineer review of damage or deterioration to tendon or anchorage assembly. Refer to Plan Sheets for location of work. Refer to detail 9.0 for specific requirements.

Based upon the Engineer's review of the tendon and mild reinforcing conditions, the Task Item repair procedure will be selected from Tasks Items 9.1, 9.2, 9.3A, 9.3B, 9.3C, 9.3D, 9.3E, 9.3F, or 9.4. For bidding purposes, assume that the size of the exploratory opening will not exceed 4 SF in plan area.

B. Materials

1. High early strength repair materials: Refer to Section 03 01 30 "Concrete Repair Materials."
2. Refer to Section 03 38 00 "Post-Tensioned Concrete".

C. Execution

1. Locate existing PT tendons to be evaluated by Engineer. Also, locate adjacent PT tendons and mild reinforcement in the slab at and in the vicinity of the exploratory opening. Use ground penetrating radar (GPR) survey to locate existing PT tendons and mild reinforcement. Identify the location of tendons, anchors, and mild reinforcement and mark them on the structure.
2. Remove concrete at location indicated by the Engineer following procedures outlined in Section "Surface Preparation for Patching" sufficient to permit viewing of the PT tendon and/or anchorage. Contractor shall not damage tendons and mild reinforcement during concrete removal. Concrete shall be removed by using lightweight pneumatic or electric impact breakers or electric hammers with auto-shut-off capability of power interruption when contacting grounded metal. Contractor shall exercise extreme caution when removing concrete near PT anchorages to prevent failure or blowout of the anchor. Concrete bearing against an anchor (V-shaped region in front of an anchor) shall not be removed.
3. Clean exposed tendon and anchorage assembly for inspection and condition documentation. Provide advance notification to Engineer before exposing PT tendon and/or anchorages. Do not patch exposed tendon or anchorage until Engineer's review is complete and Engineer has given approval to patch and has selected a repair procedure from Task Items 9.1, 9.2, 9.3A, 9.3B, 9.3C, 9.3D, 9.3E, 9.3F, or 9.4.
4. Locations that are not being patched temporarily (pending completion of Engineer's evaluation and/or approval of engineer) shall be protected from traffic with an adequate cover plate and signage.

- T.I. 9.1 CLEAN AND COAT PT TENDON OR MILD REINFORCING
- A. Scope of Work
1. Work consist of furnishing all labor, materials, equipment, supervision, and incidentals necessary to expose post-tension tendons and mild reinforcing, clean and grease tendon and exposed mild reinforcing steel in accordance to procedures outlined in Section "Surface Preparation for Patching." Repair damaged PT tendon sheathing according to Section "Post-Tension Concrete" and Detail 9.1A, prepare cavities and install repair materials to restore concrete floor slab to original condition and appearance. Refer to Detail 9.1 for specific requirements. Refer to Plan Sheets for location of work.
- B. Materials
1. Rapid hardening repair mortar: Refer to Section 03 01 30 "Concrete Repair Materials."
  2. Refer to Section 03 38 00 "Post-Tension Concrete".
- C. Execution
1. Contractor shall locate and mark all work areas as specified in Section "Surface Preparation for Patching." Contractor shall identify all critical repair work areas before starting the work.
  2. All reinforcing steel exposed and PT tendons within cavities shall be cleaned to bare metal by abrasive methods as specified in Section "Surface Preparation for Patching."
  3. Exposed reinforcing steel shall be epoxy coated with an approved epoxy product as specified in Section "Surface Preparation for Patching." Apply grease to exposed PT tendon and repair damaged PT tendon sheathing according to Section "Post-Tension Concrete" and Detail 9.1A
  4. Contractor shall prepare cavities for repair placement as specified in Section "Surface Preparation for Patching."
  5. Concrete repair material installation procedures shall be in accordance with section "Concrete Repair Materials" to restore concrete floor slab to original condition and appearance. Strictly follow manufacturer's instructions for product installation.
- T.I. 9.2 CLEAN AND PROTECT PT TENDON ANCHOR
- A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, and incidentals necessary to locate and remove delaminated/spalled concrete, prepare cavities, and install post-tensioned anchor watertight protective assembly,

B. Materials

1. Refer to Detail 9.2 for additional information.
2. Cleaning and coating exposed anchors:
  - (1) Primer: Pre-Prime 167 by ICI Devoe Coatings.
  - (2) Finish Coat: Devran 224 HS by ICI Devoe Coatings.

C. Execution

1. Contractor shall locate and mark all work areas as specified in plan. Contractor shall identify all critical repair work areas before starting the work.
2. Locate existing PT anchorages, adjacent PT tendons and mild reinforcement in the slab at and in the vicinity of work area. Use ground penetrating radar (GPR) survey to locate existing PT tendons and mild reinforcement. Identify the location of tendons, anchors, and mild reinforcement and mark them on the structure.
3. Inform to Engineer of any PT tendons, or mild reinforcing around work area prior to sawcut, chip or grid slab.
4. Per Engineer approval, remove concrete per Detail 9.2 around the intrusive PT anchorage at expansion joint.
5. PT anchors exposed shall be cleaned to bare metal by abrasive methods as specified in Section "Surface Preparation for Patching."
6. Exposed steel shall be epoxy coated with an approved epoxy product as specified in Section "Materials" above.
7. Install watertight protective anchor assembly around PT anchor as shown in Detail 9.2.

T.I. 9.3 PT TENDON REPAIR WITH NSM CFRP BARS

A. Scope of Work

1. Work entails installing Near Surface Mounted (NSM) carbon fiber reinforced polymer (CFRP) bars near corroded or broken tendon. Any concrete work in association with this work will be paid under this task item. Work consists of removing concrete as shown in details for respective sub-task item; cutting and removing corroded or

broken cable; installing NSM CFRP bars and patching the chipped area and any miscellaneous task associated with preparing the cavities. All labor, materials, equipment, formwork, supervision, and incidentals necessary to perform the work shall be included in the task item.

2. Plan Sheets show the location of visually assessed or previously explored and temporary patched work areas only. Additional work locations may be determined by the Engineer during the course of other concrete repairs and after reviewing additional PT exploratory openings. The number of work locations indicated in the bid form is an engineering estimate to be used for pricing purposes.
3. Sub-task Items below describe general, conceptual procedures to perform PT tendon repair with NSM CFRP bars assuming different scenarios. The PT and fiber reinforced polymer contractor shall meet with the Engineer before any PT repairs are performed to discuss the repair procedure for each tendon in need of repair as previously identified by the Engineer. The Engineer, in coordination with the contractor, will determine what sub-task item would be applicable to a particular case. Subsequently, contractor shall submit shop drawings indicating a more detailed procedure and specific requirements for performing NSM bar placement. NOTE: Quantities given in Bid Form are for each scenario and include all the required items specified in each sub-task item

T.I. 9.3A PT TENDON REPAIR – SCENARIO A

Work consists of installing NSM CFRP bars at the corroded or broken interior high point column support line location. Additional NSM CFRP bars are required at high points along the broken or corroded post-tensioned tendon between concrete slab pour strips. For Detail 9.3A additional NSM CFRP bars are required at columns adjacent to slab pour strip; for Detail 9.3A.1 additional NSM CFRP bars are required at all column support lines between pour strips; for Detail 9.3A.2 additional NSM CFRP bars are required at interior, or end bay columns per broken location scenarios.

T.I 9.3B PT TENDON REPAIR – SCENARIO B

Work consists of installing NSM CFRP bars at the corroded or broken tendon located at the end bay high point (column support line) between pour strips. Additional NSM CFRP bars are required at the opposite high point end of the broken or corroded post-tensioned tendon next to the concrete slab pour strip.

T.I. 9.3C PT TENDON REPAIR – SCENARIO C

Work consists of installing NSM CFRP bars at the corroded or broken high point column support line when orthogonal broken tendons intercept adjacent to a column. Additional NSM CFRP bars are required along each orthogonal broken/corroded tendon direction per Details 9.3A; 9.3A.1; 9.3A.2; and 9.3B depending on the broken tendon location with respect to the slab pour strips (each direction).

T.I. 9.3D PT TENDON REPAIR – SCENARIO D

Work consists of installing NSM CFRP bars at the corroded or broken high point column support line when broken tendon runs through the column footprint. Additional NSM CFRP bars are required along the broken/corroded tendon per Details 9.3A; 9.3A.1; 9.3A.2; and 9.3B depending on the broken tendon location with respect to the slab pour strip.

T.I. 9.3E PT TENDON REPAIR – SCENARIO E

Work consists of installing NSM CFRP bars at the corroded or broken high point column support line when orthogonal broken tendons intercept and run through the column footprint. Additional NSM CFRP bars are required along each orthogonal broken/corroded tendon direction per Details 9.3A; 9.3A.1; 9.3A.2; and 9.3B depending on the broken tendon location with respect to the slab pour strips (each direction).

T.I. 9.3F PT TENDON REPAIR – SCENARIO F

Work consists of installing NSM CFRP bars at the corroded or broken interior high point column support line location. Additional NSM CFRP bars are required at high points along the broken or corroded post-tensioned tendon per Detail 9.3F. CMU wall removal and replacement may be required as shown in task item detail.

B. Materials

1. Refer to Section “Fiber Reinforced Polymer (FRP) Reinforcement”.

C. Execution

1. Refer to specification Section 01 33 00 for submittal requirements.
2. Contractor shall locate and mark all work areas. Locate existing PT tendons to be repaired along their entire length. Also, locate other PT tendons and mild reinforcement in the slab at the working areas (i.e. slab openings needed to perform tendon repairs). Use ground penetrating radar (GPR) survey to locate existing PT

tendons and mild reinforcement. Identify the location of tendons, anchors, and mild reinforcement and mark them on the structure. Refer to Section "Post-Tensioned Concrete" for required information for Engineer's evaluation of GPR results.

3. Procedure for surface preparation, installation, and testing of CFRP laminates for slab top reinforcement are specified in Section "Fiber Reinforced Polymer Reinforcement." Repair of cracks and spalls is incidental to this Task Item.
4. Apply FRP reinforcement in accordance with the manufacturer's printed directions.
5. Apply a final coat of thickened epoxy after all the layers are applied. Detail termination points with epoxy.
6. In order to achieve full strength, curing shall extend for a period of two weeks at an average ambient temperature of 68°F. The repaired structural element shall not be subject to the design loading during its curing period. Therefore, repaired locations shall be protected from traffic with adequate cover plate and signage.

T.I. 9.4 PT BUTTON-HEAD TO MONOSTRAND SPLICE

A. Scope of Work

1. Work entails installing and splicing a new (2) tendon replacement for a corroded or broken button-head wire tendon. Any concrete work in association with this work will be paid under this task item. Work consists of shoring the slab; removing concrete as shown in details for respective sub-task item; cutting and removing corroded or broken cable; installing new tendons, couplers, center-pull couplers, greasing and wrapping new and existing tendons; and patching the chipped area and any miscellaneous task associated with preparing the cavities.
2. De-tensioning of existing PT tendons and replacement with new PT tendons shall be performed only as directed by Engineer and should only be conducted by a qualified restoration contractor specialized in post-tensioned structures. Refer to Section "Post-Tensioned Concrete" for qualification requirements. All labor, materials, equipment, shoring, bracing, formwork, supervision, and incidentals necessary to perform the work shall be included in the task item.
3. Plan Sheets show the work location of a few areas only. Additional work locations may be determined by the Engineer during the course of other concrete repairs and after reviewing additional exploratory openings. The

number of work locations indicated in the bid form is an engineering estimate to be used for pricing purposes.

B. Materials

1. Concrete repair material: Refer to Section "Concrete Repair Materials."
2. Post-tensioning strand: Refer to Section "Post-Tensioned Concrete."
3. Tendon sheathing: Refer to Section "Post -Tensioned Concrete."
4. Tendon anchorages and couplers: Refer to Section "Post-Tensioned Concrete."
5. Tendon coating or grease: Refer to Section "Post-Tensioned Concrete."
6. Repair Tape: Refer to Section "Post-Tensioned Concrete."
7. Flexible, synthetic, multi-purpose rubber coating with high moisture, acid, alkaline, and abrasion resistance. Acceptable product is "Plasti Dip" manufactured by Plasti Dip International.

C. Execution

1. Refer to specification section 03 38 00 for submittal requirements.
2. Shoring Drawings: Contractor shall submit shoring drawings. Shoring shall meet the load requirements determined by Walter P Moore's Engineer. Shoring requirements are dependent on number of tendons being replaced, areas of slab affected, size and location of slab openings for repairs, etc. and will be determined by Engineer on a case by case basis. Shoring drawings shall be signed and sealed by an Engineer licensed in the State of Texas.
3. Contractor shall locate and mark all work areas. Shore slab at areas indicated by Engineer before de-tensioning any tendons. Prior to concrete removals, submit shoring and bracing plan for engineer review.
4. Locate existing PT tendons to be spliced along their entire length. Also, locate other PT tendons and mild reinforcement in the slab at the working areas (i.e. slab openings needed to perform tendon repairs). Use ground penetrating radar (GPR) survey to locate existing PT tendons and mild reinforcement. Identify the location of tendons, anchors, and mild reinforcement and mark them

on the structure. Refer to Section "Post-Tensioned Concrete" for required information for Engineer's evaluation of GPR results.

5. Perform slab openings at identified areas with tendon corrosion and at areas where new PT strand, couplers, and anchors are to be installed. Contractor shall not damage tendons and mild reinforcement during concrete removal. Concrete shall be removed by using lightweight pneumatic or electric impact breakers, or electric hammers with auto-shut-off capability of power interruption when contacting grounded metal. Contractor shall exercise extreme caution when removing concrete near PT anchorages to prevent failure or blowout of the anchor. Concrete bearing against an anchor (V-shaped region in front of an anchor) shall not be removed.
6. If corroded or broken tendon being replaced still has prestressing force, the tendon shall be de-tensioned. Provide protection at both ends of PT slab tendons being de-tensioned to guard against popping out of end anchorages. The release of the tendon force shall be controlled and slow.
7. De-tension tendons (if required) by using a torch and heating the strands over an 18 inch length. Do not de-tension the strands by saw-cutting. Minimize damage to existing sheathing as much as possible. Contractor shall barricade all areas in the vicinity of tendons being de-tensioned before de-tensioning any strand
8. Install new tendon splice couplers, as shown in repair details. Install center-pull splice coupling onto tendon with required overlap/extension.
9. Clean and coat exposed reinforcing steel in accordance to procedures outlined in Section "Surface Preparation for Patching." Grease and wrap new and existing tendons in repair area in accordance with section "Post-tensioning Concrete" and to Detail 9.1A. Protect PT hardware (i.e. center-pull stressing splices, tendon couplers, etc.) with heat-shrink sleeves (one or two pieces)
10. Repair slab openings with rapid setting repair mortar from Section 03 01 31 "Concrete Repair Materials" except at areas where repaired PT tendon will be stressed (i.e. center-pull coupler locations)
11. Re-stress slab tendons to restore their original effective prestressing force. Re-stress slab tendons after new repair mortar has reached a minimum compressive strength of 3,750 psi. Test cylinders to determine concrete strength.

Refer to Section "Post-Tensioned Concrete" for stressing procedure

12. Perform concrete patch repairs at remaining slab openings (i.e. areas for re-stressing strand) in accordance with specifications. Strictly follow manufacturer's instructions for product installation
13. Locations that are not being patched temporarily (pending completion of repairs) shall be protected from traffic with an adequate cover plate and signage

T.I. 9.5 POUR STRIP BOTTOM SLAB REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate areas with damaged slab tendons, prepare concrete surfaces, and install surface bonded CFRP laminates to provide supplemental slab bottom reinforcement. Refer to Detail 9.5 for specific requirements. Refer to Plan Sheets for location of work.

B. Materials

1. Material for repair areas shall be as specified in Section "Fiber Reinforced Polymer (FRP) Reinforcement."

C. Execution

1. Contractor shall locate and mark all work areas as indicated in the Contract Drawings. Contractor shall identify all critical repair work areas in close coordination with the Engineer before starting the work.
2. Procedure for surface preparation, installation, and testing of CFRP laminates for slab bottom reinforcement are specified in Section "Fiber Reinforced Polymer (FRP) Reinforcement." Repair of cracks and spalls is incidental to this Task Item.
3. Test for the tensile bond between the FRP and the existing concrete substrate and for overall conformance with other requirements of Section "Fiber Reinforced Polymer (FRP) Reinforcement." Report test results to ENGINEER for acceptance.
4. In order to achieve full strength, curing shall extend for a period of two weeks at an average ambient temperature of 68°F. The repaired structural element shall not be subject to the design loading during its curing period.

T.I

## 10.1 CLEAN AND FIREPROOF STEEL COLUMN JACKET

### A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, staging, and incidentals necessary to clean corroded steel corbel assemblies, including steel plates, angles, and connections. Provide surface preparation by abrasive blasting of steel plates/angles or miscellaneous steel members, and apply an intumescent fireproofing system to provide a fire rating of two hours. Refer to Detail 10.1 for specific requirements. Refer to Section Structural Testing Laboratory Services inspection and testing requirements. Refer to Plan Sheets for location of work.
2. After steel cleaning, Engineer will review the condition of the existing steel plates and angles to determine whether steel replacement is required. Steel plate replacement shall be conducted in accordance with Task Item 10.2. Steel angle replacement shall be conducted in accordance with Task Item 10.3.

### B. Materials

1. 2-Hr Fire Rating: Exposed intumescent mastic fire-resistive fireproofing: Single component, solvent based, factory mixed, asbestos free, intumescent material blended for uniform texture; conforming to the requirements specified in Section "Applied Fireproofing."
2. Primer material for adequate corrosion protection shall be compatible with the intumescent fireproofing.
3. Approved materials to be used in this Work are specified in Section "Applied Fireproofing."

### C. Execution

1. Remove existing fireproofing coating from steel surfaces and prepare surfaces in strict accordance with manufacturer's specifications. Steel surfaces to be coated shall be clean, i.e. devoid of grease, oil, mill scale, oxidation, loosely adherent rust, paint, etc. Abrasive blast steel surfaces to SSPC-SP6.
2. Engineer will observe and assess the steel surface condition.
3. Engineer shall determine if plates or angles require replacement. Refer to Task Item 10.2 for plate replacement and Task Item 10.3 for angle replacement requirements.

4. Seal all penetrations or open ended fireproofing termination by chamfering at a 45 degree angle and sealing with high heat silicone sealant.
5. Apply compatible primer according to primer manufacturer's recommendations. Provide primer "cut-back" three inches for bolted connections and 12 inches for welded connections.
6. Apply intumescent fireproofing coating in strict accordance with referenced specifications for selected material. Apply fireproofing in sufficient thickness to achieve rating, with as many passes necessary to cover with monolithic blanket of uniform hardness, density and texture.
7. Apply compatible top coat if color matching of existing surfaces is required by the Owner.

T.I.

10.2 REPLACE DETERIORATED PLATES

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, shoring, and incidentals necessary to remove and replace severely corroded plates. This task item shall be initiated if approved by Engineer (see Task Item 10.1). Refer to Detail 10.2 for additional information. See Plan Sheet for location of work.

B. Materials

1. Plates shall be new A36 steel. Size to match existing plates.
2. Welding electrodes as specified in the drawing General Notes.

C. Execution

1. Remove one corroded plate at a time using a grinding or cutting power tool. The contractor shall be responsible for repairs to concrete or other steel members damaged as a result of plate removal. Do not remove multiple plates at a time.
2. Prepare surfaces for welding in accordance with the recommendations of AWS D1.1.
3. Tack weld new plate in place to verify alignment.
4. Weld plates in accordance with Detail 10.2.
5. Refer to Task Item 10.1 for steel fireproofing requirements.

- T.I. 10.3 REPLACE DETERIORATED ANGLES
- A. Scope of Work
1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, shoring, and incidentals necessary to remove and replace severely corroded angles. This task item shall be initiated if approved by Engineer (see Task Item 10.1). Refer to Detail 10.3 for additional information. See Plan Sheet for location of work.
- B. Materials
1. Angles shall be new A36 steel. Size to match existing angles.
  2. Welding electrodes as specified in the drawing General Notes.
- C. Execution
1. Shore overhead slab adjacent to bracket connection prior to removing existing steel angles.
  2. Grind welds between plates and angle to be removed.
  3. Remove one corroded angle at a time using a grinding or cutting power tool. The contractor shall be responsible for repairs to concrete or other steel members damaged as a result of plate removal. Do not remove multiple angles at a time. Angle section to be removed shall not span more than two plates.
  4. Prepare surfaces for welding in accordance with the recommendations of AWS D1.1.
  5. Tack weld new angle in place to verify alignment.
  6. Weld in accordance with Detail 10.3.
  7. Refer to Task Item 10.1 for steel fireproofing requirements.
- T.I. 10.4 CLEAN AND COAT CORRODED METAL STAIR
- A. Scope of Work
1. Work consists of furnishing all labor, materials, equipment, supervision, scaffolding, and incidentals necessary to clean corroded metal stair components including all exposed surfaces on the underside of the stair. Provide surface preparation by power tool cleaning of stair

components, and apply an epoxy coating. See Plan Sheet for location of work.

B. Materials

1. Primer: Pre-Prime 167 by ICI Devoe Coatings.
2. Finish Coat: Devran 224 HS by ICI Devoe Coatings. Color to match existing surface.

C. Execution

1. Coordinate with Owner to restrict access to stairwell during repairs.
2. Coordinate with Owner to test existing painted surfaces for lead prior to starting work. Employ lead abatement measures to prevent exposure to workers and garage occupants if lead in paint is detected above allowable levels per the governing regulatory guidelines.
3. Prepare surfaces in strict accordance with manufacture's specifications. Steel surfaces to be coated shall be clean, i.e. devoid of grease, oil, mill scale, oxidation, loosely adherent rust, paint, etc. Power tool clean steel surfaces to SSPC-SP3.
4. Apply epoxy coating system (primer and finish coat) in strict accordance with manufacturer's specifications.

T.I. 11.1 RETIGHTEN PEDESTRIAN BARRIER CABLES

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals to locate existing loose pedestrian barrier cables and to tighten to original condition. Refer to Plan Sheets for location of work.

B. Materials

1. Anchorage hardware for barrier cables. All anchorages, turnbuckles, couplers, and other miscellaneous hardware shall be standard products of the same system as that installed in the facility unless otherwise approved by the Engineer. All anchorage hardware shall be hot dipped galvanized with a minimum of 1.8 oz. of zinc per square foot.
2. Galvanized Barrier Cable. Barrier cables shall be galvanized of the same diameter and type as that installed in the facility (3/8"  $\phi$  structural wire rope conforming to ASTM A603 Class C/A). Minimum weight of zinc coating shall be 0.85 oz. per square foot.

3. Calibrated shunt-type strand dynamometer.

C. Execution

1. Replace the cable and/or anchoring hardware in strict accordance to manufacture's specifications. Verify that the barrier cable is adequately stressed to withstand the force from any direction for pedestrian barriers (guards) as specified in the City of Houston Building Code. The cable shall be tested by a specialty consultant for appropriate tension.
2. If needed, contractor will re-tension the barrier cable after the cable tension has been tested.
3. Test the barrier cable immediately after re-tensioning.
4. Repeat steps 2 and 3 as necessary until the cable has reached the required tension force.

T.I. 11.2 HANDRAIL CONNECTION REPAIR (INSIDE STAIRWELL)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, signage, supervision, and incidentals necessary to install new epoxy anchor handrail connection in stairwell. Refer to Plan Sheets for location of work.

B. Materials

1. Epoxy Anchor system shall be 1/4" dia threaded anchor in HIT-HY150 Max by Hilti.
2. Epoxy Anchor screen tube by Hilti.

C. Execution

1. Contractor shall locate and mark all work areas.
2. Contractor shall temporarily remove loose hand rail connection.
3. Contractor shall remove existing anchor bolt. The contractor shall be responsible for repairs to CMU or concrete members damaged as a result of anchor removal.
4. Contractor shall install new epoxy anchor in screen tube into CMU wall.
5. Contractor shall reinstall hand rail connection to epoxy anchor.

END OF SECTION

Section 01 10 00

SUMMARY OF WORK

**PART ONE - GENERAL**

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including conditions included by Owner.

1.2 GENERAL DESCRIPTION OF WORK:

- A. The Work of this Contract will be performed in the parking garage as shown on Drawings.
- B. Contractor shall furnish all material, labor, tools, plant, supplies, permits, equipment, transportation, superintendence, barricades, temporary construction of every nature, insurance, taxes, contributions and all services and facilities, unless specifically excepted, and install all materials, items, and equipment required to complete the construction of the Project, as set forth in the Contract Documents.
- C. Refer to Section "Task Items" for a description of work. Task Item specifications, details, and drawings shall govern all repair operations. Locations where Task Items apply are shown on Drawings as symbols.
- D. Final Payment shall be made on basis of actual approved Work performed as measured in place.

1.3 MEASUREMENTS:

- A. Before ordering any material or doing any Work, Contractor shall verify all measurements at Project Site and shall be responsible for correctness of same.
- B. Before proceeding with each Task Item, Contractor shall locate, mark, and measure quantity of each item and report quantities to Engineer. If measured quantities exceed Engineer's estimate, Contractor shall obtain written authorization to proceed from Owner before executing Work required for that Task Item.
- C. Cost of Work included in each Task Item for quantities as indicated in Contract Documents shall be included in Base Bid.

1.4 WORK SEQUENCE:

- A. Prior to commencement of Work, meet with Engineer and Owner representatives to establish sequence and schedule of Work. Contractor

shall give Owner notice of areas to be cleared at least 7 working days in advance of actual Work.

- B. Contractor shall notify Owner's representative at least 24 hrs. prior to commencing any abrasive blasting such as sandblasting, etc. operations.
- C. Work will be conducted in phases to provide least possible interference to activities of Owner's personnel and facility users.
  - 1. Contractor's work hours shall be limited to comply with noise ordinances. Contractor is allowed to work as necessary to complete work within Owner's time schedule and conditions conducive to temperature sensitive materials.
- D. Contractor shall remove debris from Work area on daily basis and dispose of same at authorized sites.
- E. Contractor shall remove dust and air transported material from remainder of facility at conclusion of operations in Work area.

1.5 CONTRACTOR'S USE OF PREMISES:

- A. Contractor shall limit his use of adjacent premises for Work, construction operations and for storage to allow for:
  - 1. Public use, including parking.
  - 2. Owner Occupancy:
    - a. Where it is necessary for the Contractor to use portions of existing buildings and/or grounds for operations, such use shall be strictly in accordance with requirements and approval of the Owner.
    - b. Contractor shall organize his work in order that inconvenience to the people in the facility is minimized.
    - c. Keep driveways and entrances serving the premises clear and available to the Owner and Owner's employees at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on site.
    - d. Unless otherwise indicated or specified, or unless otherwise directed by Owner; water, gas, lighting, power and telephone conduits and wires, sewer lines, and other surface and subsurface structures and lines, shall be maintained by Contractor and shall not be disturbed, disconnected or damaged by him during progress of Work; provided that should Contractor in performance of Work disturb, disconnect or damage any of above, expenses

arising from disturbance or in replacing or repair shall be borne by Contractor.

- e. Elevators shall not be used for transfer of materials or equipment.

3. Contractor shall:

- a. Not unreasonably encumber Site with materials and equipment.
- b. Not load structure with weight that will endanger structure.
- c. Assume full responsibility for protection and safekeeping of stored products.
- d. Move stored products which interfere with operations of Owner.
- e. Obtain and pay for use of additional storage and work areas needed for operations.

4. Contractor Parking:

- a. Contractor's personal vehicles shall park outside of construction area. Only vehicles equipment or delivering materials should be in zone. Coordinate with owner's representative.

1.6 OWNER OCCUPANCY:

- A. Cooperate with the Owner's Representative in all construction operations to minimize conflict and to facilitate Owner usage.
- B. Contractor shall at all times conduct his operations as to ensure the least inconvenience to the general public.

1.7 SURVEY OF EXISTING CONDITIONS:

- A. Contractor acknowledges by submitting a Bid, that he has visited and inspected the Project Site in which the Work is to be performed, that he has satisfied himself as to the nature and location of the Work, including any obstructions, amount of work, actual levels, the equipment and facilities needed preliminary to and during the prosecution of the Work, and all other matters which can in any way affect the Work or the cost thereof under this Contract.
- B. Failure by Contractor to have acquainted himself with available information concerning Site conditions, including factors affecting costs and liabilities, shall not relieve Contractor of responsibility for performance of Work in accordance with requirements of Contract Documents, and for amount of consideration named or otherwise determined.

## 1.8 INFORMATION OR CLARIFICATION OF CONDITIONS

- A. When Contractor encounters a condition requiring further information or a clarification, Contractor shall submit to Walter P. Moore and Associates a written Request For Information (R.F.I.) numbered sequentially. Walter P. Moore and Associates will respond in writing to all R.F.I.'s.

END OF SECTION

## **TECHNICAL SPECIFICATIONS**

SECTION 01 31 00

PROJECT MANAGEMENT AND COORDINATION

### ***PART ONE - GENERAL***

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. General project coordination procedures.
  - 2. Coordination Drawings.
  - 3. Administrative and supervisory personnel.
  - 4. Project meetings.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Closeout Procedures" for coordinating Contract closeout.

#### 1.3 COORDINATION

- A. Coordination: Coordinate construction operations included in various Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, which depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends

on installation of other components, before or after its own installation.

2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  3. Make adequate provisions to accommodate items scheduled for later installation.
- B. If necessary, prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
1. Preparation of Contractor's Construction Schedule.
  2. Preparation of the Schedule of Values.
  3. Installation and removal of temporary facilities and controls.
  4. Delivery and processing of submittals.
  5. Progress meetings.
  6. Preinstallation conferences.
  7. Project closeout activities.

#### 1.4 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Indicate relationship of components shown on separate Shop Drawings.
  2. Indicate required installation sequences.
- B. Staff Names: Within [15] days of starting construction operations, submit a list of principal staff assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers,

including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone.

#### 1.5 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

#### 1.6 PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Engineer of scheduled meeting dates and times.
2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Engineer, within 3 days of the meeting.

- B. Preconstruction Conference: Schedule a preconstruction conference before starting construction, at a time convenient to Owner and Engineer, but no later than [15] days after execution of the Agreement. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.

1. Attendees: Authorized representatives of Owner, Engineer, and their consultants; Contractor and its superintendent; major subcontractors; manufacturers; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
2. Agenda: Discuss items of significance that could affect progress, including the following:
  - a Tentative construction schedule.
  - b Phasing.
  - c Critical work sequencing.
  - d Designation of responsible personnel.
  - e Procedures for processing field decisions and Change Orders.
  - f Procedures for processing Applications for Payment.

- g Distribution of the Contract Documents.
- h Submittal procedures.
- i Preparation of Record Documents.
- j Use of the premises.
- k Responsibility for temporary facilities and controls.
- l Parking availability.
- m Office, work, and storage areas.
- n Equipment deliveries and priorities.
- o First aid.
- p Security.
- q Progress cleaning.
- r Working hours.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Engineer of scheduled meeting dates.
2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
  - a. Contract Documents.
  - b. Options.
  - c. Related Change Orders.
  - d. Deliveries.
  - e. Submittals.
  - f. Compatibility problems.
  - g. Time schedules.
  - h. Weather limitations.
  - i. Manufacturer's written recommendations.
  - j. Warranty requirements.
  - k. Compatibility of materials.
  - l. Acceptability of substrates.
  - m. Temporary facilities and controls.
  - n. Space and access limitations.
  - o. Testing and inspecting requirements.
  - p. Protection of construction and personnel.
3. Record significant conference discussions, agreements, and disagreements.
4. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

- D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - b. Review present and future needs of each entity present, including the following:
      1. Sequence of operations.
      2. Status of submittals.
      3. Access.
      4. Site utilization.
      5. Temporary facilities and controls.
      6. Work hours.
      7. Hazards and risks.
      8. Progress cleaning.
      9. Quality and work standards.
      10. Change Orders.
      11. Documentation of information for payment requests.
  3. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present. Include a brief summary, in narrative form, of progress since the previous meeting and report.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

4. Attendees: In addition to representatives of Owner and Engineer, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work
5. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

END OF SECTION

SECTION 01 33 00

SUBMITTAL PROCEDURES

***PART ONE - GENERAL***

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other miscellaneous submittals.
- B. Related Sections include the following:
  1. Division 1 Section "Project Management and Coordination" for submitting Coordination Drawings.
  2. Division 1 Section "Quality Control" for submitting test and inspection reports and Delegated-Design Submittals.
  3. Division 1 Section "Closeout Procedures" for submitting warranties.

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Engineer's responsive action.

- B. Informational Submittals: Written information that does not require Engineer's approval. Submittals may be rejected for not complying with requirements.

#### 1.4 SUBMITTAL PROCEDURES

- A. Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.
- B. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Engineer for Contractor's use in preparing submittals.
- C. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.
  - 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.
  - 2. Coordinate transmittal of different types of submittals for related parts of the Work so processing will not be delayed because of need to review submittals concurrently for coordination.
    - a. Engineer reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Engineer's receipt of submittal.
  - 1. Initial Review: Allow 7 days for initial review of each submittal. Allow additional time if processing must be delayed to permit coordination with subsequent submittals. Engineer will advise Contractor when a submittal being processed must be delayed for coordination.
- E. Identification: Place a permanent label or title block on each submittal for identification.
  - 1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 4 by 5 inches on label or beside title block to record Contractor's review and approval markings and action taken by Engineer.
  3. Include the following information on label for processing and recording action taken:
    - (a) Project name.
    - (b) Date.
    - (c) Name and address of Engineer.
    - (d) Name and address of Contractor.
    - (e) Name and address of subcontractor.
    - (f) Name and address of supplier.
    - (g) Name of manufacturer.
    - (h) Unique identifier, including revision number.
    - (i) Number and title of appropriate Specification Section.
    - (j) Drawing number and detail references, as appropriate.
    - (k) Other necessary identification.
- F. Deviations: Highlight, encircle, or otherwise identify deviations from the Contract Documents on submittals.
- G. Additional Copies: Unless additional copies are required for final submittal, and unless Engineer observes noncompliance with provisions of the Contract Documents, initial submittal may serve as final submittal.
1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Engineer.
  2. Additional copies submitted for maintenance manuals will [not] be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Engineer will return submittals, without review, received from sources other than Contractor.
1. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Engineer on previous submittals, and deviations from requirements of the Contract Documents, including minor variations and limitations. Include the same label information as the related submittal.
  2. Include Contractor's certification stating that information submitted complies with requirements of the Contract Documents.
  3. Transmittal Form: Provide locations on form for the following information:
    - a Project name.
    - b Date.
    - c Destination (To:).

- d Source (From:).
  - e Names of subcontractor, manufacturer, and supplier.
  - f Category and type of submittal.
  - g Submittal purpose and description.
  - h Submittal and transmittal distribution record.
  - i Remarks.
  - j Signature of transmitter.
- I. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
  - J. Use for Construction: Use only final submittals with mark indicating action taken by Engineer in connection with construction.

## **PART TWO - PRODUCTS**

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
  - 1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Engineer will return two copies. Mark up and retain one returned copy as a Project Record Document.
  - 2. Number of Copies: Submit copies of each submittal, as follows, unless otherwise indicated:
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.
    - f. Mill reports.
    - g. Standard product operating and maintenance manuals.
    - h. Compliance with recognized trade association standards.
    - k. Compliance with recognized testing agency standards.

- I. Application of testing agency labels and seals.
    - m. Notation of coordination requirements.
- C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.
  - 1. Preparation: Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Schedules.
    - e. Compliance with specified standards.
    - f. Notation of coordination requirements.
    - g. Notation of dimensions established by field measurement.
- D. Coordination Drawings: Comply with requirements in Division 1 Section "Project Management and Coordination."

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  - 1. Number of Copies: Submit three copies of each submittal, unless otherwise indicated. Engineer will not return copies.
  - 2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  - 3. Test and Inspection Reports: Comply with requirements in Division 1 Section "Quality Control."
- B. Contractor's Construction Schedule: Comply with requirements in Division 1 Section "Construction Progress Documentation."
- C. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of Engineers and owners, and other information specified.
- D. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

- F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements and, where required, is authorized for this specific Project.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements. Include evidence of manufacturing experience where required.
- H. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements.
- I. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements.
- J. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- K. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or after product is installed in its final location, for compliance with requirements.
- L. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.
- M. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements in Division 1 Section "Closeout Procedures."
- N. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.

## 2.3 REQUESTS FOR INFORMATION

- A. Engineer reserves the right to reject, unprocessed, any RFI that the Engineer, at its sole discretion, deems already answered in the Contract Documents.

### ***PART THREE - EXECUTION***

#### **3.1 CONTRACTOR'S REVIEW**

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

END OF SECTION

SECTION 01 45 00

QUALITY CONTROL

### ***PART ONE - GENERAL***

#### **1.1 RELATED DOCUMENTS**

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

#### **1.2 SUMMARY**

- A. This Section specifies administrative and procedural requirements for quality control services.
- B. Quality control services include inspections, tests and related actions including reports, performed by independent agencies, governing authorities, and the Contractor. They do not include Contract enforcement activities performed by Engineer.
- C. Inspection and testing services are required to verify compliance with requirements specified or indicated. These services do not relieve the Contractor of responsibility for compliance with Contract Document requirements.
- D. Related Sections: Following Sections contain requirements that relate to this Section:

1. Division 1 Section "Cutting and Patching" specifies requirements for repair and restoration of construction disturbed by inspection and testing activities.
2. Division 1 Section "Submittal Procedures" specifies requirements for development of a schedule of required tests and inspections.
3. Division 1 Section "Structural Testing Laboratory Services" specifies material testing and inspection requirements.

### 1.3 RESPONSIBILITIES

#### A. Contractor Responsibilities:

1. Retesting: Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
  - a Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.
2. Associated Services: Cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
  - a. Provide access to the Work.
  - b. Furnish incidental labor and facilities necessary to facilitate inspections and tests.
  - c. Take adequate quantities of representative samples of materials that require testing or assist the agency in taking samples.
  - d. Provide facilities for storage and curing of test samples.
  - e. Deliver samples to testing laboratories.
  - f. Provide the agency with a preliminary design mix proposed for use for material mixes that require control by the testing agency.
  - g. Provide security and protection of samples and test equipment at the Project Site.

- #### B. Owner Responsibilities: Owner will provide inspections, tests and similar quality control services specified to be performed by independent agencies and not by the Contractor, except where they are specifically indicated as the Contractor's responsibility or are provided by another identified entity. Costs for these services are not included in the Contract Sum.

1. Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.
- C. Coordination: Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.
1. Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

#### 1.4 SUBMITTALS

- A. Testing Agency shall submit a certified written report of each inspection, test or similar service, to Engineer, in duplicate, unless Contractor is responsible for the service. If Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.
1. Submit additional copies of each written report directly to the governing authority, when the authority so directs.
  2. Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
    - a. Date of issue.
    - b. Project title and number.
    - c. Name, address and telephone number of testing agency.
    - d. Dates and locations of samples and tests or inspections.
    - e. Names of individuals making the inspection or test.
    - f. Designation of the Work and test method.
    - g. Identification of product and Specification Section.
    - h. Complete inspection or test data.
    - i. Test results and interpretations of test results.
    - j. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
    - k. Name and signature of laboratory inspector.
    - l. Recommendations on retesting.

#### 1.5 QUALITY ASSURANCE

- A. Qualification for Testing Agencies: Engage testing agencies, including independent testing laboratories, which are prequalified as complying with "Recommended Requirements for Independent Laboratory Qualification" by the American Council of Independent Laboratories, and which specialize in the types of inspections and tests to be performed.

1. Each independent testing agency engaged on the Project shall be authorized by authorities having jurisdiction to operate in the State in which the Project is located.

**PART TWO - PRODUCTS (Not Applicable).**

**PART THREE – EXECUTION**

3.1 REPAIR AND PROTECTION

- A. General: Upon completion of inspection, testing, sample-taking and similar services, repair damaged construction and restore substrates and finishes to eliminate deficiencies, including deficiencies in visual qualities of exposed finishes. Comply with Contract Document requirements for "Cutting and Patching."
- B. Protect construction exposed by or for quality control service activities, and protect repaired construction.
- C. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION

SECTION 01 45 29

STRUCTURAL TESTING LABORATORY SERVICES

**PART ONE - GENERAL**

1.1 RELATED DOCUMENTS

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

1.2 STANDARDS

- A. The following Standards are listed in this specification:

ASTM A706	Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement
-----------	---

ASTM C31	Standard Practice for Making and Curing Concrete Test Specimens in the Field
----------	--

ASTM C109	Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)
-----------	--

ASTM E329                      Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

AWS D1.1                      Structural Welding Code - Steel

### 1.3 SCOPE OF WORK

- A.     The Owner's Testing Laboratory: An independent testing laboratory will sample and test materials as they are being installed for compliance with acceptance criteria as specified and report and interpret the results. The laboratory shall monitor and report on the installation of constructed work and shall perform tests on the completed construction as required to indicate Contractor's compliance with the various material specifications governing this work. The owner shall be responsible for paying the testing laboratory for these services.
- B.     The Contractor shall not engage the same testing laboratory for construction services as the Owner has for quality assurance testing, unless agreed to by the Owner.

### 1.4 SPECIAL INSPECTIONS

- A.     The Owner's Testing Laboratory or a separate agency shall serve as a Special Inspector to provide Special Inspection services for the items listed below. The scope of such services for each item shall be as defined in The International Building Code – 2003 or as defined in the City of Houston Building Code Amendments. These inspections are mandatory for conformance to the legal requirements of the building code and shall be in addition to the inspections and tests otherwise defined in this specification.
  - 1.     Inspection of Structural Steel and Welding Material
  - 2.     Welding of Structural Steel
  - 3.     Applied Fireproofing Materials
- B.     Qualifications of Special Inspector: The special inspector shall be a qualified person who shall demonstrate competence, to the satisfaction of the Building Official, for inspection of the particular type of construction or operation being inspected. The Special Inspector shall meet the legal qualifications of The International Building Code – 2003 or as defined in the City of Houston Building Code Amendments.
- C.     Duties and Responsibilities of the Special Inspector:
  - 1.     The special inspector shall observe the work assigned to ascertain, to the best of his/her knowledge, that it is in conformance with the approved design drawings and specifications.

2. The special inspector shall furnish inspection reports to the Building Official, the Engineer, and the Owner. All discrepancies shall be brought to the immediate attention of the Engineer, Contractor, and Owner. A report that the corrected work has been inspected shall be sent to the Building Official, the Engineer, and the Owner.
3. The special inspector shall submit a final signed report stating whether the work requiring special inspection was, to the best of the inspector's knowledge, in conformance to the approved plans and specifications and the applicable workmanship provisions of the building code.

#### 1.5 QUALIFICATIONS OF TESTING LABORATORY

- A. The Testing Laboratory shall meet the basic requirements of ASTM E329 and shall submit to the Owner and Engineer evidence of current accreditation from the American Association for Laboratory Accreditation, the AASHTO Accreditation Program or the "NIST" National Voluntary Laboratory Accreditation Program.
- B. The Testing Laboratory shall be an Approved Agency by the Building Official of the City of Houston to perform Special Inspections and other tests and inspections as outlined in The International Building Code – 2003 or as defined in the City of Houston Building Code Amendments..
- C. Tests and inspections shall be conducted in accordance with specified requirements, and if not specified, in accordance with the applicable standards of the American Society for Testing and Materials or other recognized and accepted authorities in the field.
- D. Qualifications of Welding Inspectors
  1. Inspectors performing visual weld inspection shall meet the requirements of AWS D1.1 Section 6.1.4. Welding inspection shall be supervised and the inspection reports signed by an inspector with current certification as an AWS Certified Welding Inspector (CWI)

#### 1.6 AUTHORITIES AND DUTIES OF THE LABORATORY

- A. Cooperation with Design Team: The Laboratory shall cooperate with the Engineer and Contractor and provide qualified personnel promptly on notice.
- B. The Laboratory shall perform the required inspections, sampling, and testing of materials as specified under each section and observe methods of construction for compliance with the requirements of the Contract Documents and the applicable building code.
- C. Notification of Deficiencies in the Work: The Laboratory shall notify the Engineer and Contractor within 24 hours of discovery by telephone or e-mail, and then in writing of observed irregularities and deficiencies of the

work and other conditions not in compliance with the requirements of the Contract Documents.

D. Reports:

1. Information on Reports: The Laboratory shall submit copies of reports of inspections and tests promptly and directly to the parties named below. The reports shall contain at least the following information:

- a. Project Name
- b. Date report issued
- c. Testing Laboratory name and address
- d. Name and signature of inspector
- e. Date of inspection and sampling
- f. Date of test
- g. Identification of product and Specification section
- h. Location in the project
- i. Identification of inspection or test
- j. Record of weather conditions and temperature (if applicable)
- k. Results of test regarding compliance with Contract Documents

2. Copies: The Laboratory shall send signed copies of test and inspection reports to the following parties:

- a. 1 copy to the Owner or his representative
- b. 1 copy to the General Contractor
- c. 1 copy to the Engineer of responsibility

3. Certification: Upon completion of the job, the Laboratory shall furnish to the Owner and Engineer of Record, a statement signed by a licensed professional engineer that, to the best of their knowledge, required tests and inspections were made in accordance with the requirements of the Contract Documents.

E. Accounting: The Testing Laboratory shall be responsible for separating and billing costs attributed to the Owner and costs attributed to the Contractor.

F. Monitoring Product and Material Certifications: The Testing Laboratory shall be responsible for monitoring the submittals of product and material certifications from manufacturers and suppliers as specified in the Specifications and shall report to the Owner and Engineer when those submittals are not made in a timely manner.

G. Limitations of Authority: The Testing Laboratory is not authorized to revoke, alter, relax, enlarge upon, or release any requirements of the Specifications or to approve or accept any portion of the work or to perform any duties of the General Contractor and his Subcontractors.

## 1.7 CONTRACTOR'S RESPONSIBILITY

- A. Cooperation with Design Team: The Contractor shall cooperate with laboratory personnel, provide access to the work, and to manufacturer's operations.
- B. Furnishing Samples and Certificates: The Contractor shall provide to the laboratory certificates and representative samples of materials proposed for use in the work in quantities sufficient for accurate testing as specified.
- C. Furnishing Casual Labor, Equipment and Facilities: The Contractor shall furnish casual labor, equipment, and facilities as required for sampling and testing by the laboratory and otherwise facilitate the required inspections and tests.
- D. Advance Notice: The Contractor shall be responsible for notifying the Testing Laboratory sufficiently in advance of operations to allow for assignment of personnel and scheduling of tests. Failure to sufficiently notify may result in additional costs incurred by the Testing Laboratory that may be back-charged to the Contractor by the Owner.
- E. Payment for Substitution Testing: The Contractor shall arrange for and pay for any additional samples and tests above those required by the Contract Documents as requested by the Contractor for his convenience in performing the work.
- F. Payment for Retesting: The Contractor shall be liable to the Owner for the cost for any additional inspections, sampling, testing, and retesting done by the Owner's Testing Laboratory as required when initial tests indicate work does not comply with the requirements of the Contract Documents.
- G. Payment by Contractor: The Contractor shall furnish and pay for the following items:
  - 1. Concrete coring, tests of below strength concrete, and load tests, if ordered by the Owner or Engineer.
  - 2. Certification of welders and preparation of Welding Procedure Specifications.
  - 3. Tests, samples, and mock-ups of substitute material where the substitution is requested by the Contractor and the tests are necessary in the opinion of the Owner or Engineer to establish equality with specified items.
  - 4. Any other tests when such costs are required by the Contract Documents to be paid by the Contractor.
- H. Notification of Source Change: The Contractor shall be responsible for notifying the Owner, Engineer, and Owner's Testing Laboratory when the source of any material is changed after the original tests or inspections have been made.

- I. Tests for Suspected Deficient Work: If in the opinion of the Owner or Engineer any of the work of the Contractor is not satisfactory, the Contractor shall furnish and pay for all tests that the Owner or Engineer deem advisable to determine its proper construction. The Owner shall pay all costs if the tests prove the questioned work to be satisfactory.

#### 1.8 PAYMENT OF TESTING LABORATORY

- A. The Owner will pay for the initial Laboratory services for testing of materials for compliance with the requirements of the Contract Documents. The Contractor will be liable to the Owner for the cost for testing and retesting of materials that do not comply with the requirements of the Contract Documents and shall furnish and pay for the testing and inspection of other items as specified in these Specifications.

### ***PART TWO - PRODUCTS (Not Used)***

### ***PART THREE - EXECUTION***

#### 3.1 SCOPE OF WORK

- A. The work to be performed by the Testing Laboratory shall be as specified in this Section of the Specification and as determined in meetings with the Owner and Engineer.

#### 3.2 CONCRETE MATERIALS AND POURED IN PLACE CONCRETE

- A. Refer to Section "Concrete Repair Materials" for testing requirements.

#### 3.3 POST-TENSIONED CONCRETE

The extent of Testing Laboratory services required for post-tensioned concrete structures shall include the services specified for concrete materials and poured in place concrete and reinforcing steel for concrete plus the additional services specified under this section.

- A. Review of Contract Documents and Submittals:
  1. The Testing Laboratory inspector shall review and become familiar with the Repair Documents, tendon repair shop drawings, and specifications in so far as they relate to post tensioning materials, installation, and stressing.
  2. The Owner's Testing Laboratory shall review the mill certificates for post-tensioning steel for consistency with the Repair Documents and with recognized engineering practice.
- B. Field Inspection Requirements: The duties and responsibilities of the inspector for the Owner's Testing Laboratory shall be as follows:

1. Check that post-tensioned slab is completely shored before de-tensioning operations.
  2. Ensure that de-tensioning operations are performed in accordance with the Repair Documents and tendon repair shop drawings.
  3. Check the general layout, size, and profile of post tensioning steel for conformance to the tendon repair shop drawings of the Prestress Supplier. Also check for the proper size, grade, number and proper placement of mild reinforcing steel in the tendon repair areas.
  4. Inspect 100% of hardware (couplers, new anchors, lock-off devices, etc.) required for tendon repairs and re-stressing for proper size, type and placement.
  5. Inspect for any mild steel reinforcing bars or spirals required by the Prestress Supplier near stressing anchors.
  6. Perform inspection during concrete patch repairs to observe and report any damage or misalignment of post tensioning steel and embedded anchorages and couplers.
- C. Inspection during Stressing Operation: The Owner's Testing Laboratory shall be continuously present during the stressing operations and shall have the following responsibilities and duties.
1. Review current calibration data on the proposed stressing equipment.
  2. Ascertain that the compressive strength of repair mortar meets the minimum required strength prior to stressing by evaluating the results of specified tests.
  3. Check the stressing sequence, and verify the required post tensioning forces by observing and inspecting the stressing operation and recording the following information:
    - a. Garage, floor, and tendon identification numbers.
    - b. Actual measured elongation for each jacking point, and totals for each tendon compared with calculated elongation submitted by Contractor.
    - c. Range of allowable elongations for jacking force or a measure of the deviation of the measured elongations from the calculated elongations. Deviations that do not comply with the specified tolerances shall be noted for the Engineer to review.
    - d. Stressing ram number, initial and final gauge load reading during stressing for each tendon.
    - e. Required and actual repaired mortar strength at time of jacking.
    - f. Obvious irregularities or stress loss during anchoring procedures.



1. Approve Welding Procedure Specifications submitted by the Contractor. Approve any changes submitted by the Contractor to any WPS that has already been approved. Obtain the Welding Procedure Qualification Record (WPQR) for each successful WPS qualification.
2. Verify welder qualifications either by certification and/or by retesting. Obtain welder certificates.
3. Visually inspect 100 % of welds for proper size, length, location, and weld quality in accordance with AWS D1.1 requirements. Unless specifically noted otherwise, all welding shall be considered statically loaded nontubular connections.

### 3.5 APPLIED FIREPROOFING

- A. The required field tests of sprayed-on fireproofing are as follows:
1. ASTM E605 - Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
  2. ASTM E736 - Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members

### 3.6 FIBER REINFORCED POLYMERS (FRP)

- A. The extent of Testing Laboratory services required for FRP work shall include:
1. Check the materials to ensure that they conform to the specifications.
  2. Review the storage facility and temperature at which the material is stored.
  3. Review the surface preparation to ensure that the surface is clean as required in the specifications.
  4. Review mixing and application procedures of all epoxy materials.
  5. Inspect the work in progress to assure that the work is being done in accordance with established procedures, manufacturer's printed directions, and these specifications.
  6. Take at least 3 samples of 12" x 12" cured FRP materials on a random basis. Excise four to five coupon of ¾" x 9" from each 12" x 12" sample and test coupons in accordance with ASTM D 3039. Testing shall provide average values based on nominal layer thickness of the following:
    - a. Ultimate tensile strength
    - b. Tensile modulus

c. Percent elongation

Acceptable minimum values for the above items are the reduced typical test values used for the design of the composite system. Any values below these design values are considered a failure, and shall require remedial work.

7. Take at least 3 FRP rod samples for each 500 linear feet for FRP rod and test in accordance with ASTM D 3916. Testing shall provide average values based on nominal cross-sectional area of the following:

- a. Tensile strength
- b. Tensile modulus of elasticity
- c. Ultimate strain

Acceptable minimum values for the above items are the reduced typical test values used for the design of the composite system. Any values below these design values are considered a failure, and shall require remedial work.

- 8. Test all FRP applied areas for voids, bubbles and delaminations. Repair all voids, bubbles and delaminations as recommended by the manufacturer and approved by the Engineer of Record.
- 9. Conduct direct pull-off test on FRP applied to concrete members to verify the tensile bond between the FRP and the existing concrete substrate. Inspect the failure surface of the core specimen. Failure at the bond line at tensile stresses below 200 psi is unacceptable.
- 10. Perform a minimum of one pull-off test per day for each type of concrete member upgraded with FRP. The test shall be done prior to application of topcoat on the FRP.
- 11. Contractor shall repair the test areas of the FRP upgraded work to the satisfaction of the manufacturer and the Engineer of Record.

### 3.7 TRAFFIC COATINGS

- A. The extent of Testing Laboratory services required for traffic coating work shall include:

- 1. Samples of material delivered to Project site shall be taken, identified, sealed, and certified in presence of Contractor.
- 2. Testing agency shall perform tests for characteristics specified, using applicable referenced testing procedures or, if not referenced, using tests cited in manufacturer's product data.
- 3. Testing agency shall verify thickness of coatings during traffic coating application.

4. If test results show traffic coating materials do not comply with requirements, remove noncomplying materials, prepare surfaces, and reapply traffic coatings.
5. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

END OF SECTION

SECTION 01 73 29

CUTTING AND PATCHING

***PART ONE - GENERAL***

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  1. Divisions 2 through 16 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least 10 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.

2. Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. Engineer's Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

#### 1.5 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch operating elements and related components in a manner that results in reducing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety.
- C. Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Engineer's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical

and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

## 1.6 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

## ***PART TWO - PRODUCTS***

### 2.1 MATERIALS

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

## ***PART THREE - EXECUTION***

### 3.1 EXAMINATION

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

### 3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

- D. Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to [minimize] [avoid] interruption of services to occupied areas.

### 3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 1. Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.
- A. Cutting: Cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
  - 2. Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.
  - 3. Concrete: Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  - 4. Excavating and Backfilling: Comply with requirements in applicable Division 2 Sections where required by cutting and patching operations.
  - 5. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.
  - 6. Proceed with patching after construction operations requiring cutting are complete.
- B. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - a Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
4. Ceilings: Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

END OF SECTION

SECTION 01 74 23

FINAL CLEANING

## ***PART ONE - GENERAL***

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
  1. Special cleaning requirements for specific elements of Work are included in appropriate Sections of Divisions 2 through 16.
- B. General Project closeout requirements are included in Section "Closeout Procedures."
- C. Environmental Requirements: Conduct cleaning and waste disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes such as mineral spirits, oil or paint thinner in storm or sanitary drains.
2. Burning or burying of debris, rubbish or other waste material on the premises will not be permitted.

### ***PART THREE - PRODUCTS***

#### **2.1 MATERIALS**

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

### ***PART THREE - EXECUTION***

#### **3.1 FINAL CLEANING**

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
  1. Clean Project site, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
  2. Remove tools, construction equipment, machinery and surplus material from the site.
  3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
  4. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics and similar spaces.
  5. Broom clean concrete floors in unoccupied spaces.
  6. Remove labels that are not permanent labels.

7. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that can not be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical name plates.
  - 8 Wipe surfaces of mechanical and electrical equipment, elevator equipment and similar equipment. Remove excess lubrication, paint and mortar droppings and other foreign substances.
  - 9 Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
  - 10 Replace air disposable filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills. Clean ducts, blowers, and coils if units were operated without filters during construction.
  - 11 Clean light fixtures, lamps, globes and reflectors to function with full efficiency. Replace burned out bulbs, and defective and noisy starters in fluorescent and mercury vapor fixtures.
  - 12 Leave Project clean and ready for occupancy.
- B. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction period.
- C. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.
1. Where extra materials of value remain after completion of associated construction have become Owner's property, dispose of these materials as directed.

END OF SECTION

SECTION 01 77 00

CLOSEOUT PROCEDURES

***PART ONE - GENERAL***

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for project closeout, including but not limited to:
  - 1. Inspection procedures.
  - 2. Submittal of warranties.
  - 3. Final cleaning.
- B. Closeout requirements for specific construction activities are included in appropriate Sections in Divisions 2 through 16.

### 1.3 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for certification of Substantial Completion, complete following. List exceptions in request.
  - 1. In Application for Payment that coincides with, or first follows, date Substantial Completion is claimed, show 100% completion for portion of Work claimed as substantially complete. Include supporting documentation for completion as indicated in these Contract Documents and statement showing an accounting of changes to Contract Sum.
    - a. If 100% completion cannot be shown, include list of incomplete items, value of incomplete construction, and reasons Work is not complete.
  - 2. Advise Owner of pending insurance change-over requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
  - 4. Obtain and submit releases enabling Owner unrestricted use of Work and access to services and utilities; include occupancy permits, operating certificates and similar releases.
  - 5. Submit record drawings, maintenance manuals, final project photographs, damage or settlement survey, property survey, and similar final record information.
  - 6. Deliver tools, spare parts, extra stock, and similar items.
  - 7. Make final change-over of permanent locks and transmit keys to Owner. Advise Owner's personnel of change-over in security provisions.
  - 8. Complete start-up testing of systems, and instruction of Owner's operating and maintenance personnel. Discontinue or change over and remove temporary facilities from site, along with construction tools, mock-ups, and similar elements.

- B. Inspection Procedures: On receipt of request for inspection, Engineer will either proceed with inspection or advise Contractor of unfilled requirements. Engineer will prepare Certificate of Substantial Completion following inspection, or advise Contractor of construction that must be completed or corrected before certificate will be issued.
1. Engineer will repeat inspection when requested and assured that Work has been substantially completed.
  2. Engineer will provide one repeat inspection under its contract with Owner. Subsequent inspections shall be at Contractor's expense.
  3. Results of completed inspection will form basis of requirements for final acceptance.

#### 1.4 FINAL ACCEPTANCE

- A. Preliminary Procedures: Before requesting final inspection for certification of final acceptance and final payment, complete the following. List exceptions in request.
1. Submit final payment request with releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
  2. Submit an updated final statement, accounting for final additional changes to Contract Sum.
  3. Submit certified copy of Engineer's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and list has been endorsed and dated by Engineer.
  4. Submit final meter readings for utilities, measured record of stored fuel, and similar data as of date of Substantial Completion, or when Owner took possession of and responsibility for corresponding elements of Work.
  5. Submit consent of surety to final payment.
  6. Submit final liquidated damages settlement statement.
  7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.

#### ***PART TWO - PRODUCTS (Not Applicable).***

#### ***PART THREE - EXECUTION***

### 3.1 CLOSEOUT PROCEDURES

- A. Operating and Maintenance Instructions: Arrange for each installer of equipment that requires regular maintenance to meet with Owner's personnel to provide instruction in proper operation and maintenance. If installers are not experienced in procedures, provide instruction by manufacturer's representatives.

END OF SECTION

SECTION 01 78 36

PRODUCT WARRANTIES

## ***PART ONE - GENERAL***

### 1.1 RELATED DOCUMENTS

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

### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for warranties required by Contract Documents, including manufacturers' standard warranties on products and special warranties.
  - 1. Refer to General Conditions for terms of Contractor's period for correction of Work.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
  - 1. Division 1 Section "Submittal Procedures" specifies procedures for submitting warranties.
  - 2. Division 1 Section "Closeout Procedures" specifies contract closeout procedures.
  - 3. Divisions 2 through 7 Sections for specific requirements for warranties on products and installations specified to be warranted.
  - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in Contract Documents.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of warranty on Work that incorporates products. Manufacturer's disclaimers and limitations on

product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

### 1.3 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by warranty has failed and been corrected by replacement or rebuilding, reinstate warranty by written endorsement. Reinstated warranty shall be equal to original warranty with equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by warranty has failed replace or rebuild Work to an acceptable condition complying with requirements of Contract Documents. Contractor is responsible for cost of replacing or rebuilding defective Work regardless of whether Owner has benefited from use of Work through portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to Owner are in addition to implied warranties, and shall not limit duties, obligations, rights and remedies otherwise available under law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies.
  - 1. Rejection of Warranties: Owner reserves right to reject warranties and to limit selection to products with warranties not in conflict with requirements of Contract Documents.
- E. Where Contract Documents require a special warranty, or similar commitment on Work or part of Work, Owner reserves the right to refuse to accept Work, until Contractor presents evidence that entities required to countersign such commitments are willing to do so.

### 1.4 SUBMITTALS

- A. Submit written warranties to Engineer prior to date certified for Substantial Completion. If Engineer's Certificate of Substantial Completion designates commencement date for warranties other than date of Substantial Completion for Work, or designated portion of Work, submit written warranties upon request of Engineer.
- B. When designated portion of Work is completed and occupied or used by Owner, by separate agreement with Contractor during construction period, submit properly executed warranties to Engineer within 15 days of completion of that designated portion of Work.

1. When Contract Documents require Contractor, or Contractor and subcontractor, supplier or manufacturer to execute a special warranty, prepare written document that contains appropriate terms and identification, ready for execution by required parties. Submit draft to Owner through Engineer for approval prior to final execution.
- C. Prepare written document for special warranty, ready for execution by Contractor, or by Contractor and subcontractor, supplier or manufacturer. Submit draft to Owner through Engineer for approval prior to final execution.
1. Refer to Divisions 2 through 7 Sections for specific content requirements and particular requirements for submittal of special warranties
- D. Bind warranties and bonds in heavy-duty, commercial quality, durable 3-ring vinyl covered loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8.5 in. by 11in. paper.
1. Provide heavy paper dividers with celluloid covered tabs for each separate warranty. Mark tab to identify product or installation. Provide typed description of product or installation, including name of product, and name, address, and telephone number of Installer.
  2. Identify each binder on front and spine with typed or printed title "WARRANTIES," Project title or name, and name of Contractor.
  3. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

END OF SECTION

SECTION 03 01 30.70

SURFACE PREPARATION FOR PATCHING

***PART ONE - GENERAL***

1.1 SUMMARY

- A. This Section includes the provisions of all labor, materials, supervision and incidentals required to locate and remove all delaminated and unsound concrete, including preparation of cavities created by removal to receive patching material and preparation of existing surface spalls to receive patching material.
- B. Related Sections include the following:
  1. Division 3 Section "Concrete Repair Materials."

- C. Contractor shall fully acquaint himself with the existing job site conditions and discuss the accessibility of the work areas with the Owner.
- D. Provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- E. Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the facility. This work shall be done in consultation with the Owner.

## 1.2 REFERENCES

### A. Applicable Standards:

- 1. American Concrete Institute (ACI), latest version:
  - ACI 301      Specifications for Structural Concrete
  - ACI 546.1R    Guide for Repair of Concrete Bridge Structures
  - ACI 546R      Concrete Repair Guide

## ***PART TWO - PRODUCTS***

### 2.1 PRODUCTS AND MANUFACTURERS

#### A. Epoxy Coating for existing exposed non-prestressed steel reinforcement:

- 1. BASF: Emaco P24
- 2. Sika Chemical Corporation: Armatec 110
- 3. Euclid Chemical: Duralprep A.C.

Substitutions may be considered provided complete technical information and job references are furnished to the Owner/Engineer and approved prior to commencement of work. Changes in products required to suit temperature and environmental conditions at the time of material application shall be specified as separate line items by the Contractor showing credit or additions to the price for the various tasks.

In using the above products, follow strictly the manufacturer's specifications and directions for mixing and application. Also heed all label warnings by manufacturer. Make application in accordance with applicable safety laws.

## ***PART THREE - EXECUTION***

### 3.1 INSPECTION

#### A. Horizontal Surfaces

- 1. Contractor shall sound all designated floor areas for delaminations.

- B. Vertical and Overhead Surfaces
  - 1. Contractor shall sound only vertical and overhead surfaces in designated areas that show evidence of cracking and/or staining. Cracks, usually horizontal in orientation along beam faces, and vertical in orientation near column corners are indicators of delaminated concrete.
- C. Delaminated areas: Once located by Contractor, Contractor shall further sound and mark them to define limits.
- D. Spalls: Contractor shall locate spalls by visual inspection, and mark boundaries.
- E. Engineer may mark additional unsound concrete for removal.
- F. Areas to be removed shall be rectangular to provide adequate appearance.
- G. Contractor shall locate and determine the depth of all embedded reinforcement, electrical conduit, post-tensioned tendons, in repair area and mark these locations for reference during concrete removal. Do not cut any embeds unless approved by Engineer.

### 3.2 REPAIR PREPARATION

- A. Contractor shall review all marked removal and preparation areas and request clarification by Engineer of shoring requirements in questionable areas. Shores shall be in place prior to concrete removal and cavity preparation in any area requiring shores.
- B. All delaminated, spalled and unsound concrete shall be removed from within marked boundary to minimum depth of  $\frac{3}{4}$ " using 15 to 30 lb air hammers equipped with chisel point bits. When directed by Engineer, chipping hammers less than 15 lb shall be used to minimize damage to sound concrete. If delaminations exist beyond minimum removal depth, chipping shall continue until all unsound and delaminated concrete has been removed from cavity.
- C. Where embedded reinforcement, anchorages, or electrical conduit is exposed by concrete removal, proceed with caution to avoid damaging it during removal of unsound concrete. If bond between exposed embedded reinforcement/anchorages and adjacent concrete is impaired by Contractor's removal operation, Contractor shall perform additional removal around and beyond perimeter of reinforcement for minimum of  $\frac{3}{4}$ " along entire length affected at no cost to owner.
- D. Necessary approvals shall be obtained by the Contractor from authorizing governmental or other agencies prior to abrasive-blasting. Abrasive-blasting operations shall comply with the requirements of OSHA and NIOSH (National Institute for Occupational Safety and Health) Standard PB-246-697.

- E. If rust is present on embedded reinforcement where it enters sound concrete, additional removal of concrete along and beneath reinforcement will be required. Additional removal shall continue until non-rusted reinforcement is exposed, or may be terminated per Engineer's instructions.
- F. Removal of concrete for repair requires saw cutting  $\frac{3}{4}$ " into floor slab of the perimeter of the removal, unless a more stringent criteria applies. For vertical and overhead surfaces marked areas may be saw-cut, ground, or chipped to depth of  $\frac{1}{2}$ " to existing concrete, measured from original surface.
- G. Edges of patch areas shall be dressed perpendicular to member face to eliminate feather edges. All edges shall be straight and patch areas square or rectangular-shaped.
- H. Contractor shall exercise extra caution during saw cutting to avoid damaging existing reinforcement particularly post-tensioned tendons, sheathing, electrical conduit and any other embedded items near surface of concrete. Any damage to existing embedded items shall be repaired by Contractor with Engineer's approved methods at no additional cost to Owner.

### 3.3 INSPECTION OF REPAIR PREPARATION

- A. After removals are complete, but prior to final cleaning, cavity and exposed reinforcement shall be inspected by Contractor and verified by Engineer for compliance with requirements of this Section.
- B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer of all defective and damaged reinforcement or conduits. Replacement of damaged or defective reinforcement/conduits shall be performed in accordance to the requirements of this Section.

### 3.4 CLEANING OF REINFORCEMENT

- A. All exposed reinforcing steel shall be cleaned and free of rust and other contaminants. Cleaning shall be accomplished by abrasive methods. Cleaning shall be completed immediately before patch placement to insure that base metal is not exposed to elements and further rusting for extended periods of time. Use powered wire brushes in locations where reinforcing steel cannot be cleaned by abrasive-blasting or water-blasting.
- B. All exposed reinforcing steel shall be coated with a corrosion inhibiting product specified in the Section "Products" in this specification prior to mortar application. Protect prepared surfaces from damage prior to and during patch placement.

### 3.5 REINFORCEMENT IN REPAIR AREAS

- A. All embedded reinforcement exposed during surface preparation that has lost more than 10% of original cross-sectional area due to corrosion shall be considered defective. Defective reinforcement shall be supplemented in accordance to Engineer's instructions and shall be paid for by Owner.
- B. Damaged reinforcement caused during removals made by Contractor shall be supplemented in accordance to Engineer's instructions and shall be paid for by Contractor.
- C. Supplement defective or damaged embedded reinforcement of equal diameter with a Class B splice in accordance to ACI-318 beyond damaged portion of reinforcement. Secure new reinforcement to existing reinforcement with approved anchors. Supplemental steel shall be A615 Grade 60 steel except where more stringent requirements apply in drawings and/or details.
- D. Loose reinforcement exposed during surface preparation shall be securely anchored prior to patch placement. Loose reinforcement shall be adequately secured with wire ties to bonded reinforcement or with drilled-in anchors. Drilled-in anchors shall be ITW Ramset/Red head TW-1400 anchors or approved equal. Engineer will determine adequacy of wire ties and anchors. Securing loose reinforcement is incidental to surface preparation.
- E. Minimum of 1 1/2" concrete cover shall be provided over all new/existing reinforcement except where more stringent requirements apply in drawings and/or details.

### 3.6 PREPARATION OF CAVITY FOR PATCH PLACEMENT

- A. Cavities will be examined prior to commencement of patching operations. Sounding surface shall be part of examination. Delaminations noted during sounding shall be removed as specified in this Section.
- B. All debris shall be removed from site prior to commencement of patching.

END OF SECTION

SECTION 03 01 30.71

CONCRETE REPAIR MATERIALS

### ***PART ONE - 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 includes the provisions of all labor, materials, supervision and incidentals required to prepare deteriorated or damaged concrete surfaces and install patching materials to restore original surface condition and integrity.
- B. Related Sections include the following:
  - 1. Division 3 Section "Surface Preparation for Patching."
- C. Contractor shall fully acquaint himself with the existing job site conditions and discuss the accessibility of the work areas with the Owner.
- D. Contractor shall ensure that there is adequate ventilation in areas where repair work is being performed and that no work results in nauseating, annoying or toxic fumes and odors from entering occupied areas. Provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- E. Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the facility. This work shall be done in consultation with the Owner.

### 1.3 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 1 and as specified in this Section.
- B. At the preconstruction meeting, contractor shall submit procedures to protect fresh patches from weather and traffic (if applicable).

### 1.4 QUALITY ASSURANCE

- A. Work shall conform to requirements of the American Concrete Institute (ACI) as applicable except where more stringent requirements are shown on Drawings or specified in this Section.
- B. Manufacturer's Qualifications: Companies furnishing the repair materials shall have a proven track record of at least five years. Furthermore, they shall have in existence a program of training, certifying, and supporting a nationally organized program of approved contractors. Evidence of this shall be made available to the Engineer/Owner upon request.
- C. Contractor's Qualifications: Contractor performing the work shall be an approved contractor by the manufacturer furnishing the repair materials, and shall have no less than five years experience in the various types of polymer related work required in this project. Upon request by the Engineer, a notarized certification from the manufacturer attesting to the training shall be submitted to the Engineer/Owner.

### 1.5 REFERENCES

- A. Applicable Standards:

1. American Concrete Institute (ACI), latest version:
  - ACI 301R Specifications for Structural Concrete
  - ACI 305R Hot Weather Concreting
  - ACI 306R Cold Weather Concreting
  - ACI 308R Guide to Curing Concrete
  - ACI 318R Building Code Requirements for Structural Concrete
  - ACI 548.1R Guide for Use of Polymers in Concrete
2. American Society for Testing and Materials (ASTM):
  - ASTM C109 Test Method for Compressive Strength of Hydraulic Cement Mortars

## ***PART TWO - PRODUCTS***

### **2.1 GENERAL REQUIREMENTS FOR POLYMER MODIFIED CEMENTITIOUS MORTARS**

- A. Mortar used for bonding, patching, and resurfacing in exposed or exterior environmental conditions with large cyclic temperature changes shall have the following properties:
  1. Mortar shall be non-sagging.
  2. Acceptable materials shall have minimum 3-day compressive strength of 3,000 psi, and 5,000 psi at 28 days as certified by manufacturer.
  3. Coefficient of thermal expansion shall be comparable with that of concrete ( $5.5 \times 10^{-6}$  in/in/°F).
  4. Sand used in preparing mortar shall be graded oven dry quartzite furnished in bags.
  5. The mortar patch material shall match the existing texture and color of existing exposed/cured concrete without giving a blotchy appearance. A test patch shall be applied for approval prior to final acceptance of the mortar. Size of test patch shall be approximately equal to the size of the average mortar patch to be used on the project.

### **2.2 PRODUCTS AND MANUFACTURERS**

- A. Acceptable materials for this work are:

#### **HORIZONTAL REPAIRS (Task Items 2.3):**

1. EMACO R310 CI by BASF
2. SikaTop 122 Plus by Sika

3. SikaRepair 222 with Latex R by Sika
4. Concrete-Top Supreme by Euclid Chemical Company

OVERHEAD/VERTICAL REPAIRS (Task Items 2.1, 3.2, 3.6, 3.7, 4.1, 4.2):

1. Gel Patch by BASF
  2. EMACO R 300 CI by BASF3. SikaTop 123 Plus by Sika
  4. SikaRepair 223 with Latex R by Sika
  5. Verticoat by Euclid Chemical Company
- B. High early strength products (Task Item 2.3, 2.4, 9.1, 9.4):
1. EMACO T415 OR EMACO T430 by BASF
  2. SikaQuick 1000 or SikaQuick 2500 by Sika
  3. Versaspeed or Versaspeed LS by Euclid

Substitutions may be considered provided complete technical information and job references are furnished to the Owner/Engineer and approved prior to commencement of work.

Changes in products required to suit temperature and environmental conditions at the time of material application shall be specified as separate line items by the Contractor showing credit or additions to the price for the various tasks.

In using the above products, follow strictly the manufacturer's specifications and directions for mixing and application. Also read all label warnings by manufacturer. Make application in accordance with applicable safety laws.

### ***PART THREE - EXECUTION***

#### **3.1 POLYMER MODIFIED AND NON-POLYMER MODIFIED CEMENTITIOUS MORTAR PATCH**

- A. Applicator's Qualifications
1. Mortar repair work shall only be performed by contractors who have successfully used this process on at least three similar structural repairs of equal scope which have performed successfully for a minimum period of five years.
  2. Only adequately trained and experienced personnel shall be used on the job.
- B. Surface Preparation

1. Concrete surface to which the mortar is to be applied shall be exposed parent concrete free of loose and unsound materials. Preparation of cavity to receive new mortar shall be in accordance to Section "Surface Preparation for Patching" and manufacturer's instructions.
- C. Concrete Surface Inspection: Ensure that the surface and ambient temperature is at least 45°F and rising at the time of application.
- D. Bonding Grout
1. Apply bonding grout in strict accordance with manufacturer's recommendations.
  2. If bonding grout dries, cavity shall not be patched until it has been re-cleaned and prepared as indicated in Section "Surface Preparation for Patching." Grout shall not be applied to more cavities than can be patched within 15 min. by available manpower.
  3. Patching materials shall be placed immediately following grout application in strict accordance with manufacturer's instructions.
- E. Mortar Application
1. Condition polymer mortar material to 65°F-80°F unless otherwise recommended by the manufacturer. Materials beyond this range of temperature shall not be used.
  2. Mix the two components in a clean container free of contaminants as recommended by the manufacturer.
  3. Thoroughly blend components and aggregates with Jiffy mixers (made by The Jiffy Mixer Co., Irvine, California) to a uniform and homogenous mixture. Small batches of one quart or less may be mixed by spatulas, palette knives or similar devices.
  4. Mixing should be accomplished within three minutes when using Jiffy mixer or five minutes when mixed by hand.
  5. Apply mortar by means suitable for the consistency of the mortar mix.
  6. Use appropriate forms as required for retaining mortar if mixed to a flowable consistency.
  7. Consolidate the mortar thoroughly to remove entrapped air.
  8. Supplemental wire mesh shall be required for delamination and spall repairs greater than 2" in depth. Fresh bonding grout is required between successive lifts of patching material.

9. Finish surface of mortar to match the texture and contours of existing concrete.

F. Curing

1. Immediately after finishing, keep patch material continually moist for at least 24 hrs. Continue curing for first 7 days after patch placement. During initial and final curing periods maintain patch material above 50 °F.
2. Prevent rapid drying at end of curing period.
3. Provide additional curing as required by manufacturer's recommendations.

G. Cleanup

1. Protect surfaces surrounding the work areas against spillage.
2. Material spillage shall be cleaned before they set and become difficult to remove.
3. Cleanup all portions of the existing structure that are soiled or stained in the process of mortar repair work.

### 3.2 FIELD QUALITY CONTROL

A. Testing Agency:

1. Independent testing laboratory employed by Owner and acceptable to Engineer.
2. Sampling and testing of mortar shall be performed by ACI certified Concrete Field Technicians Grade I. Certification shall be no more than three years old.
3. Testing Agency is responsible for conducting, monitoring, and reporting results of all tests required under this Section. Testing Agency has authority to reject mortar not meeting Specifications.
4. Concrete Compressive Strength (Mold test cubes per ASTM C-109):
  - a. Take minimum of 6 cubes (2"x2") for each 10 ft<sup>3</sup> or fraction of each repair mortar placed in any one day.
  - b. Additional cubes shall be taken as directed by Engineer.
  - c. Cover and protect molds from contact with water for the first 24-hrs. after molding.
  - d. Follow ACI Specifications for storage and handling of specimens.
  - e. Test 3 cubes at 7 days.
  - f. Test 3 cubes at 28 days.

### 3.3 ACCEPTANCE OF REPAIRS

- A. Acceptance of completed concrete repair will be in accordance to ACI 301.
- B. Patched areas shall be sounded by Engineer and Contractor after curing for 72 hours. Contractor shall repair all hollowness detected by removing and replacing patch or affected area at no cost to Owner.
- C. If shrinkage cracks appear in patch area after the initial curing period is concluded, the patch in question shall be considered unacceptable, and it shall be removed and replaced by Contractor at no cost to Owner.

END OF SECTION

SECTION 03 01 30.72

### FIBER REINFORCED POLYMER (FRP) REINFORCEMENT

#### **PART ONE - GENERAL**

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provision of contract, including General and Supplementary Conditions and Division – 1 Specification Sections, apply to the work of this section.

#### 1.2 STANDARDS

- A. The following standards are referenced in this specification:

ASTM D 696	Test Method for Coefficient of Linear Thermal Expansion of Plastics between -30°C and 30°C.
ASTM D 2240	Test Method for Rubber Hardness – Durometer Hardness.
ASTM D 2583	Test Method for Indentation Hardness of Rigid Body Plastics by Means of a Barcol Impresser.
ASTM D 3039	Test Method for Tensile Properties of Fiber Resin Composites.
ASTM D 3165	Test Method for Strength Properties of Adhesives in Shear by Tension Loading of Single Lap Joint Laminated Assemblies.
ASTM D 3418	Test Method for Transition Temperatures of Polymers by Thermal Analysis (DTA or DSC).
ASTM D 3528	Test Method for Strength Properties of Double Lap Shear Adhesive Joints by Tension Loading.

ASTM D 3916	Standard Test Method for Tensile Properties of Pultruded Glass-Fiber Reinforced Polymer Rod
ASTM D 4065	Practice for Determining and Reporting Dynamic Mechanical Properties of Plastics.
ASTM D4263	Indicating Moisture in Concrete by the Plastic Sheet Method.
ASTM D 4541	Test Method for Pull off Strength of Coatings Using Portable Adhesion Tester.
ASTM E 84	Test Method for Surface Burning Characteristics of Building Materials.
ASTM E 119	Standard Test Methods for Fire Tests of Building Construction and Materials.

### 1.3 DESCRIPTION OF WORK

- A. The Work of this Section shall include furnishing all labor, materials, equipments, and supervision to prepare the surface of the structural concrete members and to install the FRP Reinforcement as indicated on the Drawings and this specification.
- B. Contractor shall fully acquaint himself with the existing jobsite conditions and discuss the accessibility of the work areas with the Owner.
- C. Contractor shall ensure that there is adequate ventilation in areas where the FRP repair work is being performed and that no work results in nauseating, annoying or toxic fumes and odors from entering occupied areas. Contractor shall discuss air quality impacts and site-specific limitations with the Owner prior to bidding and construction.
- D. Contractor shall provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- E. Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the parking garage. This work shall be done in consultation with the Owner.
- F. Epoxy Related Work is specified in Section 03 63 00.
- G. The type, thickness, number of layers of material and the extent to which the material will be installed to augment the capacity of the existing concrete elements are indicated on the drawings.

### 1.4 QUALIFICATIONS

- A. FRP Manufacturer's Qualifications:

1. Companies furnishing the FRP and related materials shall have a proven track record of supplying similar material for at least five years. Furthermore, they shall have in existence a program of training, certifying and supporting a nationally organized program of approved contractors. Evidence of this shall be provided at the time when the Contractor bids on the project.
2. Manufacturer shall provide test data to the Engineer to demonstrate that the FRP system proposed on the project will have the required properties for upgrading the structure and be durable for the lifetime of the structure, which shall be 50 years unless a higher lifetime is specified on the drawings. Durability shall take into account environmental conditions that include temperature, humidity and chemical exposure.
3. Evidence of fatigue strength shall also be provided where the proposed FRP system will be subjected to fatigue loading. Locations where fatigue loads are present are indicated on the drawings.
4. Manufacturer shall provide evidence of at least twenty successful installations of a type that is similar to the proposed project along with the proposal to do the work.

B. FRP Contractor's Qualifications:

1. Contractor performing the work shall be an approved contractor of the manufacturer furnishing the FRP and related materials, and shall have no less than five years experience in the various types of FRP work required in this project. A notarized certification from the manufacturer attesting to the training shall be submitted to the Engineer/Architect along with the proposal to do the work.
2. The FRP Contractor shall provide evidence to the Engineer that he has completed at least ten (10) installations similar to this project along with his proposal to do the work. The list shall include the name of owner for which the work was done, name of the Engineer of Record, description of the work performed and the date the work was executed. The list shall also include the name and telephone number of the contact person with the Owner or Engineer of Record who is familiar with the work described.
3. The project superintendent assigned by the FRP Contractor to the project shall have a minimum of two years experience in supervising FRP related projects. Evidence of such experience will be submitted to the Engineer prior to commencement of FRP reinforcement work.

1.5 QUALITY ASSURANCE

The Contractor is responsible for quality control and quality assurance, including workmanship and materials furnished by his subcontractors and suppliers.

- A. Specifications, Standards and Guidelines: Comply with provisions of the following, except where more stringent requirements are shown or specified.
1. ACI 440.2 R-08, Guide for the Design and Construction of Externally Bonded FRP Systems for Strengthening Concrete Structures.
  2. ACI 440.3R-04, Guide Tests Methods for Fiber Reinforced Polymer (FRPs) for Reinforcing or Strengthening Concrete Structures.
  3. ACI 503 R, Pull-off test to determine FRP adhesion to concrete substrate.
  4. ACI 546 R, Concrete Repair Guide
  5. ICRI 03733, Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion.

B. Document Conflict and Precedence:

In case of conflict among documents, including structural drawings and specifications, notify the Engineer prior to submitting proposal. In case of conflict between and/or among the structural drawings and specifications, the strictest interpretation shall govern, unless specified otherwise in writing by the Engineer.

C. Inspection and Testing of the Work

Materials and installed work will require testing and retesting as necessary, as directed by the Engineer, at any time during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at the Owner's expense, including retesting of rejected materials and installed work, shall be done at the Contractor's expense. Scope of testing shall be as stated in this specification. Inspection or testing by the Owner does not relieve the Contractor of his responsibility to perform the Work in accordance with the Contract Document

## 1.6 PRE-INSTALLATION CONFERENCE

- A. At least 7 calendar days prior to start of FRP work, the Contractor shall conduct a meeting to:
1. Review the proposed surface preparation, installation procedures and materials to be used in the project.
  2. Review requirements for submittals, status of other work around the FRP work area, work that requires coordination with FRP work and availability of materials.

3. Establish work progress schedule and procedures for materials inspection, testing and certifications.
- B. The contractor shall send a pre-installation conference agenda to all attendees at least 7 calendar days prior to the scheduled date of conference.
  - C. The Contractor shall require responsible representatives of every party who is concerned with the FRP work to attend the conference, including but not limited to:
    1. General Contractor's Project Manager.
    2. General Contractor's Superintendent.
    3. FRP Contractor's Project Manager.
    4. FRP Contractor's Superintendent.
    5. Owner's Representative.
    6. Engineer's Representative.
  - D. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed by him to all concerned parties within 5 days of the meeting.
  - E. It is mandatory for the Engineer's and FRP contractor's representative to be present in this pre-installation conference.

#### 1.7 SUBMITTALS

- A. Product Data:
  1. Submit manufacturer's product data with application and installation instructions showing compliance with all project requirements for proprietary materials and items. Include physical and chemical characteristics, limitations, surface preparation, cure times and maintenance instructions.
  2. Submit certifications by the manufacturer that all materials comply with all the requirements and standards of the appropriate ASTM and other national agencies.
  3. Submit durability test data for the proposed FRP system for the environmental condition of the structural element being repaired.
  4. Submit structural test reports of the proposed FRP system pertinent to the proposed application.
  5. Submit Manufacturer's Material Safety Data Sheets (MSDS) for all materials to be used.

6. Submit samples of each FRP material to be used in the project with labels that indicate the source and the name of the product.
7. For all epoxy materials, submit for record when such materials were purchased along with information that indicates that the materials proposed on this project are within the shelf life of the materials used.
8. Submit detailed shop drawings for each installation of the FRP system. Shop drawings shall include details on the type, thickness or diameter for NSM CFRP bars, orientation and number of layers of the FRP material used, along with the length and width over which the FRP is to be applied on the member being upgraded. Provide lap and splice details as well as joint and end details. Indicate on drawings what kind of surface preparation will be required for the installation of the FRP materials.
9. Submit a complete quality control program to be followed by the contractor that conforms to the requirements stated in the contract drawings and the project specifications.
10. Submit a sample of the daily log or inspection form that will be used by the Contractor for FRP work.

## ***PART TWO - PRODUCTS***

### **2.1 PRODUCTS AND MANUFACTURERS OF FRP SYSTEMS**

Subject to compliance with this specification, the Contractor shall use the FRP systems and manufacturer indicated below. Material and manufacturer substitution requests shall be submitted to Engineer of Record for approval, and shall conform to all of the requirements stated in this specification. Substitution request shall have equal material properties and performance as those FRP systems indicated below.

#### **A. Sika Corporation**

201 Polito Avenue  
Lyndhurst, New Jersey 07071  
Phone: 800-933-7452  
Web Address: [www.sikausa.com](http://www.sikausa.com)

1. Slab Top Reinforcement: Sika CarboDur Rods. Pultruded high strength carbon fiber reinforced polymer (CFRP) rods are to be used on Near Surface Mounted (NSM) applications per Construction Drawings. The CFRP rod is installed in shallow groves cut into the existing member and bonded to the substrate with an epoxy resin.
2. Slab Bottom Reinforcement: SikaWrap Hex 103C Fiber with Sikadur Hex 300 Epoxy composite laminate. High strength

carbon fiber reinforced polymer laminates are bonded to the surface of the structural member.

3. Epoxy Repair Mortar (small surface irregularities): Sikadur 30 or Sikadur 31
4. Topcoat (2 coats): Sikaguard 550W Elastocolor

## 2.2 CONSTITUENT MATERIALS IN FRP RELATED WORK

- A. Epoxy: Epoxies selected for FRP work shall be compatible with the system selected. These shall provide the required bond to the concrete substrate and also provide adhesion to the reinforcing fibers. Only those epoxies that have been used in the FRP laminate system work for which the manufacturer has test data shall be used.
  1. Refer to section on Epoxy Related Work in the Project Manual for other epoxy requirements.
  2. All epoxies used shall be resistant to environmental effects, including but not limited to moisture, salt water, temperature extremes and chemicals normally associated with exposed concrete.
- B. Putty Fillers: Putty used shall be compatible with the epoxy primer and the FRP laminate.
- C. Repair Mortars: Repair mortars shall be either epoxy or polymer modified cementitious mortars. Mortars selected shall be compatible with the FRP system selected for the project.
- D. Epoxy Injection of Cracks: Refer to section on Epoxy Related Work in the Project Manual for epoxy injection of cracks.
- E. Protective Coating of FRP Laminate: Protective coating shall be polymer or acrylic based, shall be resistant to ultra violet (UV) rays and shall be compatible with the FRP laminate. Provide test data confirming UV resistance. Provide coating after the adhesive or saturating epoxy material of the FRP system has cured. Color shall be selected by the Engineer.
- F. Fire Protection: The floor framing members upgraded by FRP laminate shall have a minimum of 2 hours rating, and the columns shall have a 3 hour rating in conformance to ASTM E-119. Provide UL certification for tests conducted specifically for FRP laminates regarding conformance to the specified fire rating requirements.

## 2.3 DISSIMILAR MATERIALS

- A. Verify compatibility of FRP materials used with base material. Provide protection against galvanic action whether shown on the drawings or not.
- B. Provide protection by means of non-reactive GFRP wrap on carbon steel that is scheduled to receive CFRP.

## **PART THREE - EXECUTION**

### **3.1 GENERAL**

- A. Verify geometry and dimensions of the various structural elements scheduled to receive the FRP laminate prior to commencement of work. Notify Engineer of Record of any discrepancies from the drawings.
- B. Assess quality of concrete substrate prior to commencing work.
- C. The installation of the FRP laminate shall fully comply with the requirements of the manufacturer. If the manufacturers' requirements are more restrictive than the drawings and specifications, the manufactures requirements will control. In the event of a conflict between the drawings and specifications and the manufacturer's requirements, the Engineer must be consulted for approval proceeding with the work.
- D. Environmental Conditions:
  - 1. Ambient Temperature: FRP laminate shall not be applied when the ambient temperature is below 40°F. An auxiliary heat source shall be used to raise the ambient and surface temperature to the desired level. Only clean heat source like propane or electric heaters shall be used. Such heat source shall not contaminate the uncured FRP system or the bond surface by the carbonation of the concrete substrate. FRP laminate shall not be applied when the ambient temperature is above 130°F.
  - 2. Moisture: FRP laminate shall not be applied to damp or wet surfaces. Monitor the weather conditions. For FRP work in exterior exposed environment, do not commence work when rainfall, sleet or snow is expected. In non-conditioned spaces, do not commence work when high humidity conditions are anticipated.
- E. Vapor Transmission: Test for vapor transmission prior to installation of the FRP system in accordance with ASTM D4263. FRP laminate shall not be installed in situations where the extent of vapor transmission rate can impair the bond between the FRP system and the substrate.
- F. Surface Preparation:
  - 1. Unless otherwise specified, all concrete surface preparation shall be in accordance with the recommendations of ACI 546 R and ICRI 03730.
  - 2. External concrete corners shall be rounded to at least a ½ inch radius. Internal corners shall be smoothed by troweling epoxy or polymer mortar into the corners.
  - 3. All laitance, dust, oil, curing compounds, existing coatings, and any other contaminants that can impair bond of the FRP system with concrete shall be removed.

4. Fill all bug holes and small voids with putty or epoxy or polymer mortar.
5. Surface irregularities shall be limited to 0.04 inches. Surface irregularities greater than 1 inch shall be repaired using epoxy or polymer mortar. Grind protrusions to conform to the required profile as specified above.
6. The flatness of the concrete substrate shall meet the requirements by the product manufacturer.
7. For Near Surface Mounted installations, saw cut grooves on the concrete surface. Consult with the product manufacturer for groove dimensions. Locate all existing post-tensioning tendons in slabs in the areas to be saw cut as indicated in the drawings or as determined by the Engineer. Use reliable non-destructive techniques, such as Ground Penetrating Radar scan survey to locate the tendons and mark them on site. Do not damage tendons during installation.
8. All concrete surfaces and saw cut grooves shall be air blasted and vacuumed clean to a dust free condition. Protect surface from recontamination when there is a time lag between cleaning the surface and RFP application.

G. Concrete Repair:

1. Cracks: Cracks shall be epoxy injected where indicated on the drawings. Refer to Section 03 63 00 for detailed epoxy injection requirements.
2. Spalls: All spalls, broken pieces and delaminated areas of concrete shall be completely removed and repaired whether shown in the drawings or not. Repair shall be in accordance to the requirements specified in Section 03 01 30.71. The bond strength of the repair material to the existing concrete shall be verified with pull testing conducted in conformance with ASTM D 4541. Minimum direct pull-off strength is 200 psi.
3. Corroded Reinforcement: All corroded reinforcement shall be either removed or cleaned and repaired as directed by the Engineer of Record. Refer to Section 03 01 30.70 for corrosion protection of reinforcing steel.

H. Mixing Primer and Saturant:

1. Mix components in accordance with manufacturer's printed recommendations.
2. Condition epoxy materials at a temperature between 65° and 80°F, unless otherwise recommended by the manufacturer. Epoxies beyond this range of temperature shall not be used.
3. Do not dilute epoxy materials with solvents.

4. Mixed epoxies that exceed the pot life specified by the manufacturer shall be discarded and not used on the project.
- I. Primer Application:
1. Apply primer in accordance with the manufacturer's printed directions.
  2. Primer may be applied by roller or brush. Apply second coat after first coat has penetrated into concrete.
  3. The primer shall be allowed to cure in accordance with the manufacturer's installation direction before applying the FRP laminate. If the time allowed is exceeded, the primed surface shall be thoroughly cleaned and re-primed.
- J. FRP Reinforcement Application
1. Apply FRP reinforcement in accordance with the manufacturer's printed directions.
  2. For near surface mounted applications, the saw cut groove is partially filled with epoxy adhesive material, the FRP rod is placed into the groove ensuring full coverage of the adhesive around the rod, and the remaining space in the groove is filled with adhesive. Refer to manufacturer's product data sheet for detailed installation instructions.
  3. The reinforcing fibers shall be placed with sufficient saturating epoxy to achieve full saturation of the fibers. The resin to fabric ratio shall be verified by the epoxy usage and documented on the daily project logs.
  4. Apply the fabric to the concrete with no delay. Orient the fibers as indicated on the drawings.
  5. Remove any trapped air in the fabric with the ribbed roller or squeeze before the epoxy sets.
  6. Unless indicated otherwise on the drawings, all FRP laminates shall be lapped 6 inches in the longitudinal direction. No lapping is required of the sheets parallel to the direction of fiber orientation for unidirectional sheets.
  7. In case additional layers of FRP laminates are required, the process described above is repeated.
  8. Apply a final coat of thickened epoxy after all the layers are applied. Detail all fabric edges, including butt spliced, termination points and jacket edges with epoxy.
  9. In case of outdoor application, protect the work from rain, snow, sleet, sand dust and other environmental conditions that will reduce the effectiveness of the FRP work.

- K. Protective Topcoat: Unless specified otherwise, provide a protective topcoat on all FRP laminates. When not specified, color of topcoat shall match color of existing concrete structure. The topcoat shall be provided between 24 and 72 hours after final application of epoxy. If work is delayed beyond 72 hours, the surface of FRP shall be roughened by sanding or brush blasting. Care shall be taken in this procedure so that the fibers are not damaged. Remove all dust and residue prior to application of topcoat.
- L. Curing: In order to achieve full strength, curing shall extend for a period of two weeks at an average ambient temperature of 68°F. The repaired structural element shall not be subject to the design loading during its curing period.

### 3.2 TESTING

- A. Refer to Section "Structural Testing Laboratory Services" for requirements.

END OF SECTION

SECTION 03 38 00

POST-TENSIONED CONCRETE

## ***PART ONE - 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.
- B. Related work in other Sections related to Post-tensioned Concrete include:
  - 1. Section 01 45 29 - Structural Testing Laboratory Services.
  - 2. Section 03 01 30.71 - Concrete Repair Materials.

### 1.2 SCOPE OF WORK

- A. The post-tensioning supplier and installer shall furnish all labor, materials, services and equipment required to repair the post-tensioned structural system. The work shall include the following items:
  - 1. Furnishing all post-tensioning materials including prestressing steel, anchorages, wedges, pocket formers, couplers, center-pull tension couplers, button-head to monostrand splice couplers,

plates, support bars, chairs, tendon enclosures, and bursting reinforcement.

2. Placing of all items listed above.
3. Performing all post-tensioning operations including stressing, anchoring, trimming, and grouting pockets.
4. Cooperating with the Owner's Testing Laboratory and Engineer of Record in their function of recording and reporting tendon elongation and tension applied to the prestressing steel.
5. Prepare shop drawings and field placing drawings that complies with the specified repair details as shown on the structural drawings.

B. Tendons shall be unbonded as shown on the drawings.

### 1.3 REFERENCE STANDARDS AND CODES

A. ACI 117 - Specifications for Tolerances for Concrete Construction and Materials

1. ACI 318-08 - Building Code Requirements for Structural Concrete and Commentary.
2. ASTM E328 – Standard Test Methods for Stress Relaxation Tests for Materials and Structures.
3. PTI (Post Tensioning Institute) – Post Tensioning Manual, 6<sup>th</sup> Edition (2006).
4. PTI (Post Tensioning Institute) - "Specification for Unbonded Single Strand Tendons".
5. PTI (Post Tensioning Institute) - "Field Procedure Manual for Unbonded Single Strand Tendons".

B. Local Building Code.

### 1.4 ADMINISTRATIVE REQUIREMENTS

A. Section 01 31 00 Project Management and Coordination.

B. Coordination:

1. Coordinate with other repair work having a direct impact on work of this section.

C. Pre-installation Meetings:

1. Convene one (1) week before starting of this section.

2. Discuss button-head tendon splice locations, hardware locations and safety precautions regarding tensioning of button-head to new monostrand tendons.

#### 1.5 SUBMITTALS FOR REVIEW

- A. Section 01 33 00: Submittal Procedures.
- B. Tendon Repair Shop Drawings/Field-Placing Drawings: Submit for review and approval. Drawings shall include, but not be limited, to the following:
  1. Indicate layout, tendon sizes, supports and locations, tendon supports, location of tendon splices, accessories, clearances required for jack, and pressure plate stresses.
  2. Describe tensioning procedure, stressing location, type of jack, pressure monitoring device, anchorage set, tendon elongation, and tendon cut-off procedures.
  3. Details of anchorages, the positive connection between the anchorage and sheathing, pocket formers, couplers, and other related hardware.
  4. Type and thickness of post-tensioning sheathing.
  5. Type and chemical analysis of post-tensioning grease.
  6. Type, material and thickness of post-tensioning sheathing repair tape.
  7. Sequence of tendon repair, installation of new strand, anchors, couplers, and other hardware; cleaning and greasing of existing sheathing; concrete patching; and stressing sequences. Show required slab openings and related tendon repair details.
- C. Manufacturer's Data: Submit for review and approval.
  1. Sample hardware, including but not limited to: Button head to monostrand coupler, coated strand, tendon couplers, wedges, and other sub-assemblies required for complete installation including all accessories required to complete the system.
  2. Post-tensioning system brochures.
  3. Complete post-tensioning procedure, including but not limited to: Stressing system, method of determining anchor force, method of determining tendon slack, and method of cutting off excess strand after anchorage.
  4. Mill Certificates: Submit certified mill reports of post-tensioning steel immediately upon shipment indicating compliance with

specified requirements for all material that is to be delivered to the project.

5. Equipment Calibration: Submit certification of the calibration of all ram and gauge sets to the Engineer as specified herein.
  6. Manufacturer's Certificate: Certify that tendon strength characteristics meet or exceed specified requirements.
- D. Stressing Records: The contractor shall provide the appropriate cooperation and access to the Owner's Testing Laboratory to allow them to measure, record, and clearly report the information indicated below. In the absence of a Testing Laboratory representative, the post-tensioning installer shall measure, record, report and submit the information described below. Submit records to the Engineer for approval within 24 hours after stressing.
- (1) Floor and tendon identification numbers.
  - (2) Calculated elongation and actual measured elongation for each jacking point, and totals for each tendon.
  - (3) Stressing ram number, date of calibration, calibration chart, initial and final gauge load reading during stressing for each tendon.
  - (4) Date of stressing operation and signature of the Contractor's stressing personnel and inspector witnessing the operation.
  - (5) Range of allowable elongations for jacking force or a measure of the deviation of the measured elongations from the calculated elongations. Deviations that do not comply with the specified tolerances shall be noted for the Engineer to review.
  - (6) Obvious irregularities or stress loss during anchoring procedures.
  - (7) Required and actual concrete strength at time of jacking.

## 1.6 CLOSEOUT SUBMITTALS

- A. Record Documentation: The Contractor shall provide record drawings to the Owner, in care of the Engineer, of tendon repairs performed including any approved changes from the contract documents. Form of record drawings may be legible marked-up prints of contract drawings, or separate drawings of same scale. Record drawings shall include actual locations of new tendons, new sheathing, tendon splices, and new anchorages; stressing sequence and tension loads established; and elongation of tendon.

## 1.7 QUALITY ASSURANCE

- A. Perform Work in accordance with ACI 318 and PTI Manual.

- B. **Qualifications:** The supply and installation of post-tensioning shall be executed by organizations that have successfully performed major work of a nature similar to that involved in this project for a minimum of five (5) years and have successfully completed a minimum of five (5) similar projects in own name, unless this requirement is waived by the Engineer prior to Contract award. The Contractor shall submit supporting evidence acceptable to the Engineer that this qualification has been met. Post-tensioning shall be performed using methods and related equipment that are in conformance with generally accepted systems of post-tensioning. Experienced individuals shall control and supervise all operations.
- C. **Material Quality Assurance:** The post-tensioning material shall be fabricated by a plant that is fully PTI-certified at the time of bidding, and that shall maintain this certification throughout the duration of this project as described in the Post-Tensioning Institute's "Manual for Certification of Plants Producing Unbonded Single Strand Tendons."
- D. **Installer Quality Assurance:** All installers of unbonded post-tensioned tendons shall be certified under the Post-Tensioning Institute's "Post-tensioning Certification Program of Field Personnel for Unbonded Post-tensioning Installers".
- E. **Inspection and Testing:** Inspection and testing shall be provided in accordance with the Structural Testing Laboratory Services specification.
- F. **Field Quality Control:**
1. The Contractor shall maintain a consistent and good standard of workmanship. Check bulkheads, position of tendon couplers, anchorages, tendon charring and tying, location, size and placement of reinforcement, and tendon quantity.
  2. Prior to pouring concrete repair materials, an inspection of the tendons and mild reinforcing steel shall be made by the Engineer, or Independent Testing Agency.
  3. Inspection of stressing operations shall also be performed as directed by the Engineer.
  4. The Contractor shall cooperate with the Owner's Testing Laboratory and/or Engineer in their efforts to record tendon elongations. The Contractor shall keep a copy of the stressing records with the shop drawings.
  5. Submit certificates of all ram and gauge calibrations used on the project to the Engineer. Use of non-calibrated ram and gauge sets are not allowed on this project. If requested by the Engineer or Owner, the Contractor shall have the ram and gauge sets calibrated by an Independent Testing Agency, the cost of which shall be borne by the Contractor.
  6. Satisfactorily protect all prestressing steel from all moisture and rust or other physical damage prior to placement and keep steel

free from deleterious substances, such as chlorides, fluorides, sulfites and nitrates. Provide protection for exposed prestressing steel beyond ends of members to prevent deterioration by rust or corrosion.

7. Do not store post-tensioning strand in such a manner that it is in direct contact with soil or fresh concrete or exposed to rain, snow, de-icing salts or other corrosive elements. Protect plastic materials planned to be stored for more than one month from exposure to sunlight.
8. Damage to tendon sheathing in excess of 2% of its length shall be grounds for rejection of sheathing.
9. Contractor shall inspect tendon sheathing for damage and to verify watertight seal between sheathing and anchor. Repair all damaged sheathing.

## ***PART TWO - PRODUCTS***

### **2.1 POST-TENSIONING STEEL**

- A. Strand: Prestressing steel shall use strand conforming to ASTM A416, Low-Relaxation Type, and shall have a minimum guaranteed ultimate tensile strength of 270,000 psi based on the nominal area of the strand. The strand shall additionally conform to the "Specification for Unbonded Single Strand Tendons". The strand shall be free of dirt, corrosion or injurious marks, scratches, seams, and sharp kinks. Oil-tempered strand is prohibited. Certified mill reports giving name of drawing mill shall be submitted.
- B. Identification: All prestressing steel within every group or in the same member shall be of the same heat where practical. All tendons shall be assigned a proper heat and coil number and so identified on fabrication lists that are to be sent to the field with each shipment. Identify tendons in accordance with placing drawings. Unidentified steel shall not be allowed unless approved by the Engineer and tested.
- C. Sheathing: All post-tensioning tendons shall be coated and sheathed with an approved slippage sheathing designed to prevent the intrusion of cement paste and the loss of the P-T coating material and be watertight and impermeable to water vapor over the entire length. The sheathing shall be continuously extruded polyethylene or polypropylene with a minimum density of 0.034 lb./in., a minimum thickness of 50 mils, and an inside diameter at least .03 inches greater than the maximum diameter of the strand. The sheathing shall not rupture due to normal temperature changes, coiling and field handling. The sheathing material shall be chemically stable, without embrittlement or softening over the anticipated exposure temperature range and service life of the structure. It shall be non-reactive with concrete, prestressing steel, reinforcing steel, and corrosion preventive P-T coating. Heat-sealed or plastic-wrapped sheathing is not acceptable.

D. Coating: The PT coating shall lubricate the tendon and permanently protect the prestressing steel against corrosion. It shall resist flow caused by gravity within the anticipated temperature range of exposure and provide non-brittle coating at the lowest anticipated temperature of exposure. It shall be chemically stable and non-reactive with prestressing steel, reinforcing steel, sheathing material, and concrete. Acceptable tendon coating shall be lithium-based, contain corrosion inhibitors, wetting agents, and less than fifty parts per million of chlorides, sulphides or nitrates. The coating shall be applied under pressure to ensure the filling of the interstices between the individual wires of the strand. There shall be no voids or pockets between the sheathing and the coated strand for water or air to collect. The minimum amount of coating on the prestressing strand shall be 2.2 pounds of material per 100 feet of strand for a 7/16 inch diameter strand, 2.5 pounds of material per 100 feet of strand for a 0.5 inch diameter strand, and 3.0 pounds per 100 feet for a 0.6 inch diameter strand. The P-T coating shall satisfy the requirements of table 1 of the "Specification for Unbonded Single-Strand Tendons and Commentary".

1. Acceptable coatings:

- (1) Vinoco Strand Grease (EP"O")
- (2) "Shell PT Grease", Shell Oil Company, West Orange, NJ.
- (3) "Visconorust PT 1000", Viscosity Oil Division of Tenneco, Chicago, IL.
- (4) "Visconorust PT 1001", Viscosity Oil Division of Tenneco, Chicago, IL.
- (5) "Mobil Greaserex K218", Mobil Oil Company, Houston, TX
- (6) "Unocal PT1 Cable grease", Unocal Corporation, Schaumburg, IL.

E. Repair tape: The tape used to repair damaged sections of sheathing or to wrap exposed strand shall be a minimum of 2 inches wide and shall be of a color that contrasts with the sheathing. The tape shall be self-adhesive and moisture-proof and shall be non-reactive with the sheathing, P-T coating, prestressing steel, or concrete.

1. Acceptable products:

- (1) Tape: "3M Tape No. 226", 3M, St. Paul, MN
- (2) Denso LT Tape, Denso North America.

F. Corrosion protection of PT hardware: Protect PT hardware (i.e. center-pull stressing splices, button-head wire to monostrand couplers, etc.) with heat-shrink sleeves (one or two pieces). The installed system shall provide a tight fitting protective layer around the PT hardware.

## 2.2 ANCHORAGES AND COUPLERS

### A. Performance and Specification:

1. Anchoring hardware, center-pull tendon coupler and button-head to monostrand coupler shall be steel and shall meet the minimum requirements set forth in ACI 318, except as modified herein. The anchorage shall be capable of developing at least 95% of the minimum specified ultimate strength of the prestressing steel without exceeding anticipated set, and shall be capable of passing the static and dynamic tests as outlined in the PTI Post-Tensioning Manual. All anchorages, couplers, and miscellaneous hardware shall be the standard products as manufactured by the Post-Tensioning Supplier, unless certified test reports are submitted proving acceptable deviation, and shall be evaluated by the International Conference of Building Officials, or other agencies of equal stature, and the Engineer.
2. Anchors and couplers used shall include design features permitting a positive mechanical and watertight connection of the sheathing to the anchorage, and watertight closing of the wedge cavity, for stressing and non-stressing (fixed) anchorages. Friction connections between anchor and the sheathing shall not be allowed.
3. All anchorages shall have the demonstrated ability to remain watertight when subjected to a hydrostatic pressure of 1.25 psi over a period of 24 hours.
4. Sleeves used to connect the sheathing to the anchorage shall meet the same requirements as the sheathing for durability during fabrication, transportation, handling, storage, and installation and have a minimum thickness of 0.051 inches. The overlap between the end of the extruded sheathing and the end of the sleeve and seal shall be a minimum of 4 inches. The sleeve shall be translucent or have another method to verify both that the PT coating material is free of voids and the proper overlap with the sheathing.

B. Size: Anchorages and distribution (bearing) plates shall be sized according to ACI 318 unless certified test reports are submitted proving acceptable deviation.

C. Seating loss: Maximum allowable anchor slip or seating loss shall be 1/4 inch.

## 2.3 CONCRETE REPAIR MATERIALS

- A. The concrete repair material shall have a minimum 28-day compressive strength not less than 3,750 psi at transfer of prestress force unless otherwise specified on the Contract Drawings. Components or admixtures with chloride, fluoride, sulphite or nitrate ions or any other substance deleterious to prestressing steel shall not be used.

## 2.4 TENDON SUPPORT SYSTEM

- A. Slab Tendons: Support points shall consist of a bar support or positive attachment to existing slab reinforcement. Bar supports shall be plastic, plastic tipped, epoxy coated or stainless steel.

## 2.5 PRE-CONSTRUCTION CONFERENCE

- A. At least 15 days prior to post-tensioned concrete construction, the Contractor shall hold a meeting to review the procedures for performing safe and proper post-tensioned concrete repairs. Also review requirements for submittals, status of coordinating work and availability of materials, and provide safety plan for stressing operations. Establish work progress schedule and procedures for materials inspection, testing and certifications. If required by Owner, provide phasing plan for PT slab repairs.

- B. The Contractor shall require responsible representatives of every party who is concerned with the post-tensioned concrete work to attend the conference, including but not limited to the following:

- Contractor's Superintendent
  - Laboratory responsible for field quality control
  - Post-Tensioning Installer
  - Owner's Representative
  - Engineer-of-Record

- C. Minutes of the meeting shall be recorded, typed and printed by the Contractor and distributed to all parties concerned within 5 days of the meeting. One copy of the minutes shall be transmitted to the following for information purposes:

- Owner's Representative
  - Engineer-of-Record

- D. The Contractor shall coordinate the scheduled date of the conference with the Engineer.

## ***PART THREE - EXECUTION***

### 3.1 PREPARATION FOR POST-TENSIONED SLAB REPAIRS

- A. Initial Survey: Locate all existing post-tensioning tendons in slabs in the areas to be repaired as indicated in the drawings or as determined by the Engineer. Use reliable non-destructive techniques, such as Ground Penetrating Radar scan survey to locate the tendons and mark them on site. Use permanent markers or similar (markings shall last throughout the entire construction). Refer to Section "Required information for Engineer's evaluation of ground penetrating radar (GPR) results" for additional information.

- B. Shoring: Do not start de-tensioning (if required) of post-tensioned members until after post-tensioned slab has been shored as determined by the Engineer. Shoring requirements are dependent on number of tendons being replaced, areas of slab affected, size and location of slab openings for repairs, etc., and will be determined by Engineer on a case by case basis. Contractor shall submit shoring drawings. Shoring drawings shall be signed and sealed by an Engineer licened in the State of Texas.
- C. Concrete Removal: Perform slab openings at identified areas with tendon damage and at areas where new PT strand, couplers, and anchors are to be installed. Contractor shall not damage tendons and mild reinforcement during concrete removal. Concrete shall be removed by using lightweight pneumatic or electric impact breakers, or by electric hammers with auto-shut-off capability of power interruption when contacting grounded metal. Contractor shall exercise extreme caution when removing concrete near PT anchorages to prevent failure or blowout of the anchor. Concrete bearing against an anchor (V-shaped region in front of an anchor) shall not be removed.
- D. De-tensioning (if required): Provide protection at both ends of PT slab tendons being de-tensioned to guard against popping out of end anchorages. The release of the tendon force shall be controlled and slow and may require the use of appropriate clamping or tendon locking hardware. De-tension tendons by heating the strands with a torch over a 18 inch length minimum. Do not de-tension the strands by saw-cutting. Minimize damage to existing sheathing as much as possible.
- E. Safety: The contractor shall take all necessary precautions to prevent workers and public access to areas where post-tensioned slabs are being de-tensioned. Contractor shall request Owner to close public access to those areas located along the full length of tendons being de-tensioned at the floors above and below before de-tensioning any strand. The contractor shall ensure that de-tensioning operations are performed safely.

### 3.2 POST-TENSIONING STEEL PLACEMENT

- A. Profile: Restored post-tensioning tendons shall conform to the existing as-built profile and shall have a parabolic drape. Generally, low points of the tendons are at mid-span and high points are at column supports. Place the tendons normal to anchorage plates.
- B. Interference: Where interference between existing slab reinforcement and new PT hardware occurs, contact the Engineer before attempting to cut reinforcement.
- C. Tolerances: Firmly support tendons and anchorages to prevent displacement during subsequent operations. In no case shall tendons violate the absolute minimum cover stated in ACI 117. Horizontal sweeps shall have minimum radius of 25 feet and shall not exceed a maximum

slope of 1:6. Twisting or entwining of individual tendons within a bundle is not permitted.

- D. Supports: Provide a sufficient number of horizontal and vertical positioning supports to firmly support tendons to prevent displacement during stressing operations. Show all support devices on the shop drawings.
- E. Welding: Welding of cross bars or any welding in the vicinity of the tendons is not allowed. Do not use post-tensioning tendons as an electrical ground for welding operations.
- F. Sheathing
  - 1. The sheathing (new and existing) shall be continuous and fully protect repaired tendons at splice locations and locations with new anchorages.
  - 2. After tendon repairs and prior to concrete placement, inspect the sheathing on each tendon for the entire exposed length to detect possible damage. Repair any detected tears or abrasions by procedures conforming to the "Field Procedures Manual for Unbonded Single Strand Tendons" by PTI. Refer to typical details for repair of tendon sheathing. The repair of sheathing shall prevent intrusion of cement paste or loss of coating. The repair of sheathing shall also be watertight and approved by the Engineer.
- G. Encapsulation: Complete the encapsulation of the post-tensioning system the same day as the tendons are installed.

### 3.3 CONCRETE REPAIR MATERIAL PLACEMENT

- A. Placement: Place the concrete repair material in conformance with the requirements of the Specifications. Do not place the concrete repair material until the Engineer or Independent Testing Laboratory has inspected the placement of the mild steel reinforcement and tendons. Place the concrete in such a manner as to ensure that alignment of post-tensioning tendons remains unchanged. Make special provisions to ensure proper vibration of the concrete around the anchorage plates. Monitor the tendon positioning during the concrete placement.

### 3.4 STRESSING

- A. Methods: Perform post-tensioning by methods and related equipment that are in conformance with generally accepted systems of post-tensioning. Stressing of repaired tendons is typically performed with a center-pull stressing coupler, or at an existing live PT anchor as shown in Construction Drawings. Variations of such generally accepted methods and equipment will be permitted with Engineer approval, provided equal results can be obtained.
- B. Concrete Repair Material Strength: Do not begin the post-tensioning operations until tests or readings have indicated that the concrete repair material in the members has attained a compressive strength that is adequate for the requirements of the anchorages but not less than 3,750 psi unless otherwise specified on the Contract Drawings. If an approved rapid mortar is used, it is acceptable to use data provided by

manufacturer to determine age when mortar has achieved the required strength, but this age shall not be less than 24 hours.

- C. Equipment: Stress all tendons by means of hydraulic rams, equipped with accurate reading hydraulic pressure gauges that have been individually calibrated with a particular ram to permit the stress in the prestressing steel to be computed at any time. A certified calibration curve shall accompany each ram and gauge set. Immediately recalibrate the ram and gauge set if inconsistencies between the measured elongation and the gauge reading occur.
- D. Forces: Anchor the prestressing steel at an initial or anchor force that will result in the ultimate retention of the working or effective force shown on the plans. Jacking forces shall be those indicated on the shop drawings. The Field Inspector shall verify the wobble and curvature friction coefficients during the stressing operation and shall report to the Engineer deviations greater than 10% from the values assumed in the elongation calculations. Required adjustments to the stressing operation may be recommended by the Engineer.
- E. Elongations: Keep records of all tendon elongations as previously described in this Section. Agreement within 10% between the gauge reading and the measured elongation and between the measured and the calculated elongation after stressing will be considered satisfactory. Deviations greater than 10% will be reported to the Engineer prior to completing stressing operation. No tensioning will be permitted until it is demonstrated that the prestressing steel is reasonably free and unbonded in the enclosure. Evidence that the steel is unbonded will be considered satisfactory if inward movement of steel is observed at one end of the tendon when a nominal pull is applied to the steel at the other end. The Engineer may order a force/elongation check at any time. Do not cut off tendons until elongation records have been reviewed and approved in writing by the Engineer.
- F. Safety: Precautions shall be taken to prevent workers from standing directly behind, above or in front of the stressing rams. Contractor shall barricade all areas of the parking garage in the vicinity of tendons before stressing any strand. The contractor shall ensure that stressing operations are performed safely.

### 3.5 REQUIRED INFORMATION FOR ENGINEER'S EVALUATION OF GROUND PENETRATING RADAR (GPR) RESULTS

- A. The following information shall be included in the GPR scan survey report done to locate PT tendons before repairing post-tensioned members:
  - 1. Name of project, date and physical address of the project
  - 2. Name of the Client
  - 3. Objective of the project (purpose of scan)

4. Plan sheets depicting a global coordinate location system (X,Y) for the general area to be demolished and local coordinate system (x,y) for individual scanned areas including referenced points and the starting point (0,0)
5. Proper identification of building elements (slab, rebar, post-tensioned tendons, conduit, etc.) including the depth from the surface. The GPR scan shall clearly identify PT tendons and distinguish them from mild reinforcement.
6. In the field, on the surface of the members to be repaired, provide a schematic layout/marketing of the GPR results with dimensions (slab locations, PT tendon locations, rebar locations, etc.). In repair areas, mark the locations of PT tendons, PT anchors, and mild reinforcement. Locations of electrical conduits shall be identified and marked.

### 3.6 INSTALLATION SUPERVISION

- A. The duties of the post-tensioning installer's supervisor shall include:
  1. Ensure that de-tensioning operations are performed in accordance with the drawings and specifications if required.
  2. Check placement of tendon and repair hardware (couplers, new anchors, etc.) before and during pouring of concrete repair material. Be present during pours and check for tendons being moved out of position.
  3. Mark tendons prior to stressing and verify with the Owner's Testing Laboratory that all initial marks are accurate.
  4. Observe that tendon elongation measurements are made and recorded by Testing Laboratory or, in the absence of a Testing Laboratory representative, measure, record and report tendon elongations after stressing and submit copy of original to Engineer.
  5. Compare results of actual tendon elongations with hydraulic ram gage reading and with calculated elongation.
  6. Require checking of tendon force and/or elongation if requested by the Engineer.
  7. Do not allow cutting off of tendons without the Engineer's written approval.

END OF SECTION

SECTION 03 63 00

## EPOXY RELATED WORK

### ***PART ONE - GENERAL***

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SCOPE OF WORK

- A. The following epoxy related work is shown on the drawings and in this project manual:
  - 1. Crack locations and approximate lengths of cracks for epoxy injection work.
  - 2. These drawings are for the Contractor's guidance only, and are to be considered as a minimum for pricing. Contractor shall not do any additional work beyond what is shown in the drawings without prior written approval of the Engineer.
- B. The Contractor shall fully acquaint himself with the existing job site conditions and discuss the accessibility of the work areas with the Owner.
- C. The Contractor shall ensure that there is adequate ventilation in areas where epoxy repair work is being performed and that no work results in nauseating, annoying or toxic fumes and odors from entering occupied areas. Provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- D. The Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the parking garage. This work shall be done in consultation with the Owner.

#### 1.3 QUALITY ASSURANCE

- A. Applicable Standards
  - 1. American Society for Testing and Materials (ASTM)
    - C881-99 Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete
  - 2. American Concrete Institute (ACI)
    - ACI 503 R-93 Use of Epoxy Compounds with Concrete
    - ACI 503.1-92 Standard Specification for Bonding, Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete

with a Multi-Component Epoxy Adhesive

ACI 503.2-92 Standard Specification for Bonding Plastic Concrete to Hardened Concrete with a Multi-Component Epoxy Adhesive

ACI 503.3-92 Standard Specification for Producing a Skid-Resistant Surface on Concrete by the Use of Multi-Component Epoxy System

ACI 503.4-92 Standard Specification for Repairing Concrete with Epoxy Mortars

ACI 548.1R-97 Guide For Use of Polymers in Concrete

- B. **Manufacturer's Qualifications:** Companies furnishing the epoxy materials shall have a proven track record of at least five years. Furthermore, they shall have in existence a program of training, certifying and supporting a nationally organized program of approved contractors. Evidence of this shall be made available to the Engineer upon request.
- C. **Contractor's Qualifications:** Contractor performing the work shall be an approved contractor by the manufacturer furnishing the epoxy materials, and shall have no less than five years experience in the various types of epoxy related work required in this project. A notarized certification from the manufacturer attesting to the training shall be submitted to the Engineer along with the proposal to do the work.
- D. **Injection Equipment Requirements:** Injection equipment used by the Contractor shall be from a manufacturer who has been producing such equipment for a minimum of five years. Such equipment shall have a record of satisfactorily proportioning, mixing, and dispensing of the injection resin being used.

## ***PART TWO - PRODUCTS***

### **2.1 GENERAL REQUIREMENTS FOR EPOXY MATERIALS**

- A. All epoxy material shall be new and manufactured within the shelf life limitations set forth by the manufacturer.
- B. Epoxy shall be a two-part epoxy adhesive material, and shall be of epichlorohydrin/amine type. Polysulphide epoxies are not acceptable.
- C. Epoxy used shall be insensitive to the presence of water and moisture, and shall be capable of application and of strength development even when applied to damp surfaces having a temperature of 40° or above.
- D. Epoxy used shall develop a minimum strength of 2000 psi in tension and 4000 psi in compression at the end of seven days.

- E. Epoxies used shall not deteriorate under approximately 200 freeze thaw cycles.
- F. Epoxies used shall be 100% solids without solvents.
- G. Bonding and strength characteristics of epoxies shall be stable when exposed to ultraviolet rays.
- H. The viscosity of the epoxy used for injection work shall be low enough (about 300 cps at 77°F) to completely fill hairline cracks as small as 10 mils.

## 2.2 PRODUCTS AND MANUFACTURERS

- A. Epoxy Injection Work
  - 1. Master Builders Technologies: Concreive 1380.
  - 2. E-Poxy Industries: Eva-Pox Injection Resin No. 4.
  - 3. Rescon Technology Corp.: Product R303, Concrete Injection Resin.
  - 4. Sika Chemical Corporation: Sikadur Hi-Mod LV or Sikadur 52 Injection Resin.
  - 5. Thermal-Chem, Inc.: Thermal-Chem Injection Resin, Product No. 2.

Substitutions may be considered provided complete technical information and job references are furnished to the Engineer and approved prior to commencement of work.

Changes in products required to suit temperature and environmental conditions at the time of material application shall be specified as separate line items by the Contractor showing credit or additions to the price for the various tasks.

In using the above products, follow strictly the manufacturer's specifications and directions for mixing and application. Also heed all label warnings by manufacturer. Make application in accordance with applicable safety laws.

## 2.3 ABRASIVE MATERIAL FOR ABRASIVE BLASTING

- A. Coal slag shall be used as the blast abrasive in abrasive blasting operations.

## 2.4 CORROSION INHIBITING PAINT

- A. Z.R.C. Cold Galvanizing Compound manufactured by ZRC Chemical Products Company, Quincy, Massachusetts.

Substitutions may be considered provided complete technical information and job references are furnished to and approved by the Engineer prior to commencement of work.

### ***PART THREE - EXECUTION***

#### **3.1 EPOXY INJECTION**

##### **A. Applicator's Qualifications**

1. Epoxy injection work shall only be performed by contractors who have successfully used this process on at least five similar structural repairs of 1000 linear feet or longer, and which have performed successfully for a minimum period of five years.
2. Only adequately trained epoxy injection applicators shall be used on the job. Furnish certificate of training prior to commencing work.

##### **B. Preparation**

1. Before proceeding, the space in the vicinity of the crack location receiving epoxy shall be swept and be in a generally clean condition to permit proper bonding of surface seal.
2. Cracks may be dry or damp, but free of standing water and frost.
3. Entry points shall be established judiciously at a distance along the seal so that epoxy penetrates the crack completely. Spacing of entry points, however, shall be no greater than the thickness of the concrete at that location. Tighter joints will require closer spacing of entry ports.
4. Adequate surface seal shall be applied to the face of the crack between the entry points. Use masking tape at the pre-established entry points to prevent the surface sealer from sealing the entry points. Alternatively, drill and port method may be used to establish entry points. Use only rotary-percussion type drills for drilling holes. Drills shall be fitted with bits having single tooth that produce large cuttings, and hollow stem drill rods that permit simultaneous blowing of compressed air providing immediate expulsion of the cuttings from the hole. Ensure that the drilling operation does not contaminate the cracks.
5. For through cracks, surface seal shall be applied to both faces. Provide entry ports on both faces staggered with each other when the cracked concrete element is greater than 8" thick. Injection of cracks from both faces shall also be necessary when the cracks are contaminated in concrete elements equal to or less than 8" thick.

6. Pre-sealing between ports may be done using a material meeting the requirements of these specifications.
7. Allow adequate time for the surface seal material to cure before proceeding with the injection.

C. Equipment for Injection

1. Pumps used for injection shall be a positive displacement type with interlock to provide positive ratio control in proper proportions. The pumps used shall be electrically or air powered, portable and shall provide an in-line mixing and metering system for the two-component epoxy. The pressure hoses and injection nozzle shall be of such a design as to allow proper mixing of the two components of the epoxy. Dwell time in mixing head shall not exceed ten seconds.
2. The injection equipment shall have automatic pressure control, and shall be capable of injection pressures up to 300 psi to ensure complete penetration of cracks. Equipment used shall also have the capability of presetting the pressures, and shall be equipped with manual pressure control override.
3. The presence of a stand-by injection unit shall be required.

D. Crack Cleaning

1. All cracks shall be cleaned and flushed with water, and checked for port-to-port transmission.
2. All cracks shall be cleaned and flushed with water, checked for port-to-port transmission. Cracks which are contaminated with algae shall be flushed with chlorinated water mixed with copper sulphate.
3. Blow the water out of the cracks using compressed air, and allow adequate time for drying before injecting with epoxy.
4. If in the process of water flushing the cracks, the Contractor notices rust particles being flushed out with the water, or if the water has rust stains, the Engineer shall be notified prior to doing any epoxy injection work. The Engineer will then evaluate the extent of corrosion in the embedded reinforcement, and make necessary adjustments in the repair procedure. The Engineer/Owner reserves the right to either issue a change order for any additional work involved or to delete those portions of the work which show evidence of corrosion of the reinforcing steel. When work is deleted, the Contractor shall give a credit to the Owner on the basis of unit prices quoted for the project.
5. When temperature is near the freezing point of water, ensure that the crack is free of ice before doing the injection work.

E. Epoxy Injection

1. Condition epoxy materials at temperature between 65°F-80°F unless otherwise recommended by the manufacturer. Epoxies beyond this range of temperature shall not be used. Do not store epoxy (even for a short period) in direct sunlight.
2. Epoxy adhesive shall be injected into the crack at the first lower entry port with sufficient pressure to advance the epoxy to the next adjacent port. The original port shall be sealed and entry shifted to the port in which the epoxy appears. This manner of port-to-port injection shall be continued until each joint has been injected for the entire length.
3. If port-to-port travel of epoxy is not achieved, the crack shall be identified, and the Engineer notified.
4. Samples of mixed material shall be injected into a paper cup every 60 minutes to test ratio mix. These samples shall be dated and numbered and left at the sampling location until reviewed by the testing laboratory.
5. Solvents shall not be used to thin epoxy introduced into the cracks.

F. Finishing

1. Allow epoxy adhesive in the cracks to cure before removing the surface seal. Ensure that there is no drainage of epoxy from the cracks due to premature removal of surface seal.
2. The surface of the crack herein treated shall be finished flush with the adjacent concrete surfaces and shall show no indentations or evidence of port fittings.
3. All work shall be performed and conducted in a neat, orderly manner. Clean-up whatever portions of the existing structure that get soiled or stained in the process of epoxy injection work.

END OF SECTION

SECTION 07 18 00

TRAFFIC COATINGS

**PART ONE - 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 includes traffic coatings for the following applications
  - 1. Application around interior columns for vehicular traffic.
- B. Contractor shall fully acquaint himself with the existing job site conditions and discuss the accessibility of the work areas with the Owner.
- C. Provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- D. Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the facility. This work shall be done in consultation with the Owner.

## 1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. Shop Drawings: Show extent of each traffic coating. Include details for treating substrate joints and cracks, flashings, deck penetrations, termination conditions, and other defects on concrete surface. Include layout of traffic striping and markings.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors, textures, and patterns available for each type of product indicated.
- D. Samples for Verification: For each type of traffic coating required, prepared on rigid backing and of same thickness and material indicated for the Work.
  - 1. Provide one 1-ft by 1-ft stepped samples on backing large enough to illustrate build-up of traffic coatings for each duty grade to be applied.
- E. Material Test Reports: From a qualified independent testing agency indicating and interpreting test results for compliance of traffic coatings with requirements, based on comprehensive testing of current product formulations within the last three years including the following information:
  - 1. Static coefficient of friction shall meet minimum requirements of American with Disabilities Act (ADA).
  - 2. Flash point of each component 200 °F. maximum.
  - 3. Written certification from traffic coating manufacturer confirming compatibility with existing underlying coatings and/or substrate.

- F. Material Certificates: Signed by manufacturer certifying that traffic coatings comply with requirements, based on comprehensive testing of current product formulations within the last three years.
- G. Maintenance Data: To include in maintenance manuals specified in Division 1. Identify substrates and types of traffic coatings applied. Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.
- H. Certification that products and installation comply with applicable EPA, OSHA, and VOC requirements regarding health and safety hazards.
- I. Signed statement from this Section applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.
- J. Submit three copies of System Maintenance Manual.

#### 1.4 QUALITY ASSURANCE

- A. Installer (Applicator) Qualifications: An experienced applicator who has specialized in installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
  - 1. Certification: Written approval or license of applicator by traffic coating manufacturer. Show evidence of minimum 10 projects completed by applicator over previous 5 years using submitted system.
- B. Source Limitations: As follows:
  - 1. Use traffic coatings of a single manufacturer.
  - 2. Obtain primary traffic coating materials, including primers, from traffic coating manufacturer. Obtain secondary materials including aggregates, sheet flashings, joint sealants, and substrate repair materials of type and from source recommended by traffic coating manufacturer.
- C. Fire-Test-Response Characteristics: For traffic coatings as follows:
  - 1. Fire-response testing was performed by UL, ITS, or another independent testing and inspecting agency that is acceptable to authorities having jurisdiction and that performs testing and follow-up services.
  - 2. Provide materials identical to those of traffic coatings tested according to ASTM E 108 for deck type and slopes indicated and that comply with requirements for roof-covering Class indicated.
- D. Mockups: Engineer will select one representative surface for each traffic coating and each substrate to receive traffic coatings. Apply each coating to at least 100 sq. ft of each substrate to demonstrate surface

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

1. Remove and reapply mockups until they are approved by Engineer.
  2. Keep approved mockups undisturbed during construction as a standard for judging completed traffic coatings. Undamaged mockups may be incorporated into the Work.
- E. Pre-installation Conference: Conduct conference at Project site to discuss traffic topping installation requirements.
1. Before installing traffic coatings, meet with representatives of authorities having jurisdiction, manufacturer's technical representative, Owner, Engineer, consultants, independent testing agency, and other concerned entities. Review requirements for traffic coatings. Notify participants at least seven days before conference.
  2. Testing Agency employ wet mil gauge to periodically monitor thickness during application.
  3. Manufacturer: Provide qualified representative on site for duration of work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
1. Manufacturer's brand name.
  2. Type of material.
  3. Directions for storage.
  4. Date of manufacture and shelf life.
  5. Lot or batch number.
  6. Mixing and application instructions.
  7. Color.
- B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Apply traffic coatings within the range of ambient and substrate temperatures recommended in writing by manufacturer. Do not apply traffic coatings to damp or wet substrates,

when temperatures are below 40 deg F for a period of 24 hrs. when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F above dew point.

1. Do not apply traffic coatings in rain, fog, or mist, or when such weather conditions are imminent during the application and curing period. Apply only when frost-free conditions occur throughout the depth of the substrate.

## 1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty: Written warranty, signed by traffic coating manufacturer agreeing to repair or replace traffic coatings that do not comply with requirements or that deteriorate during the specified warranty period. Warranty does not include deterioration or failure of traffic coating due to unusual weather phenomena, failure of prepared and treated substrate, formation of new substrate cracks exceeding 1/16 inch in width, fire, vandalism, or abuse by maintenance equipment and truck traffic.
  1. Deterioration of traffic coatings includes, but is not limited to, the following:
    - a. Adhesive or cohesive failures.
    - b. Abrasion or tearing failures.
    - c. Surface crazing or spalling.
    - d. Intrusion of water, oils, gasoline, grease, or acids into deck substrate.
    - e. Abrasion or tear failure resulting from normal traffic use.
- C. Warranty Period: Five years from date of acceptance of work, jointly executed by Manufacturer and Applicator.
- D. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.
- E. Perform any repair under this guarantee at no cost to Owner.

## **PART TWO - PRODUCTS**

### 2.1 MATERIALS

- A. Physical Requirements: Provide traffic coatings complying with ASTM C 957.

- B. Material Compatibility: Provide primers; base, intermediate, and top coats; and miscellaneous materials that are compatible with one another and with substrate under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.

## 2.2 TRAFFIC COATING

- A. Acceptable traffic coating systems are listed below:
  - 1. Heavy Duty:
    - a. Iso-flex 750/760U-HL-HVT by Lyntal International, Inc.
    - b. Conipur II Deck System by BASF
    - c. Auto-Gard FC HD-52 by Neogard
  - b. Primer: Manufacturer's standard factory-formulated primer recommended for substrate and conditions indicated.

## ***PART THREE - EXECUTION***

### 3.1 EXAMINATION

- A.. Examine substrates, with Applicator present, for compliance with requirements and for other conditions affecting performance of traffic coatings. All high points, ridges, and other defects shall be corrected as acceptable to Engineer prior to installation of traffic coating system.
  - 1. For the record, prepare written report, endorsed by Applicator, listing conditions detrimental to performance.
  - 2. Verify compatibility with and suitability of substrates.
  - 3. Begin coating application only after minimum concrete curing and drying period recommended by traffic coating manufacturer has passed, after unsatisfactory conditions have been corrected, and after surfaces are dry.
  - 4. Verify that substrates are visibly dry and free of moisture. Test for moisture by method recommended in writing by manufacturer.
  - 5. Application of coating indicates acceptance of surfaces and conditions.

### 3.2 PREPARATION

- A. Clean and prepare substrates according to manufacturer's written recommendations to produce clean, dust-free, dry substrate for traffic coating application.
- B. Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.

- C. Concrete Substrates: Mechanically abrade concrete surfaces to a uniform CSP-4 profile according to ASTM D 4259. Do not acid etch.
  - 1. Remove grease, oil, paints, and other penetrating contaminants from concrete.
  - 2. Remove concrete fins, ridges, and other projections.
  - 3. Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form-release agents, and other incompatible materials that might affect coating adhesion by shotblasting.
  - 4. Remove remaining loose material to provide a sound surface, and clean surfaces according to ASTM D 4258.

### 3.3 TERMINATIONS AND PENETRATIONS

- A. Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves according to ASTM C 1127 and manufacturer's written recommendations.
- B. Provide sealant cants at penetrations and at reinforced and nonreinforced deck-to-wall butt joints.
- C. Terminate edges of deck-to-deck expansion joints with preparatory base-coat strip.
- D. Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates according to manufacturer's written recommendations.

### 3.4 JOINT AND CRACK TREATMENT

- A.. Prepare, treat, rout, and fill joints and all random cracks in substrates according to ASTM C 1127 and traffic coating manufacturer's written recommendations. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258. Crack preparation including installation of joint sealant material, where required, is incidental to traffic topping work.
  - 1. Comply with recommendations in ASTM C 1193 for joint-sealant installation.

### 3.5 TRAFFIC COATING APPLICATION

- A. Apply traffic coating material according to ASTM C 1127 and manufacturer's written recommendations.
  - 1. Start traffic coating application in presence of manufacturer's technical representative.
  - 2. Verify that wet film thickness of each component coat complies with requirements every 100 sq. ft.

3. Mask off surfaces to create a neat edge for traffic topping application.
  4. Do not apply traffic coatings to surfaces with existing epoxy floor coatings.
  5. Apply traffic coatings to prepared wall terminations and vertical surfaces to height indicated and omit aggregate on vertical surfaces.
  6. Installation shall include all of the following steps:
    - a. Surface preparation
    - b. Crack detail
    - c. Prime coat
    - d. Base coat
    - e. Aggregate coat
    - f. Aggregate
    - g. Top Coat
  7. Install a trial section of traffic coating system for each duty grade specified. Do not proceed with further installation until trial section is accepted in writing by Engineer. Remove and replace rejected trial sections with acceptable application.
  8. All adjacent vertical surfaces shall be coated with traffic topping minimum 4 inches above coated horizontal areas. Requirement includes, but is not limited to columns, walls, pipes, curbs, (full height of vertical faces of all curbs) and islands.
- B. Apply traffic paint for striping and other markings with mechanical equipment to produce uniform straight edges.

### 3.6 FIELD QUALITY CONTROL

- A. Refer to Section "Structural Testing Laboratory Services" for requirements.

### 3.7 CURING AND PROTECTING

- A. Cure traffic coatings according to manufacturer's written recommendations. Prevent contamination and damage during application and curing stages.
- B. Mask off adjoining surfaces not to receive traffic topping and mask off drains to prevent spillage and migration of liquid materials outside membrane area. Provide neat/straight lines at termination of traffic topping.
- C. Protect traffic coatings from damage and wear during remainder of construction period.

- D. All debris shall be removed from site prior to commencement of patching.

END OF SECTION

SECTION 07 81 00

APPLIED FIREPROOFING

***PART ONE - 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 STANDARDS

- A. The following Standards are listed in this specification:

ASTM D4541	Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers
ASTM E84	Standard Test Method for Surface Burning Characteristics of Building Materials
ASTM E119	Standard Test Methods for Fire Tests of Building Construction and Materials
ASTM E605	Standard Test Methods for Thickness and Density of Sprayed Fire-Resistive Material (SFRM) Applied to Structural Members
ASTM E736	Standard Test Method for Cohesion/Adhesion of Sprayed Fire-Resistive Materials Applied to Structural Members
NFPA 251	Standard Methods of Tests of Fire Resistance of Building Construction and Materials
UL 263	Standard for Fire Tests of Building Construction and Materials
UL 1709	Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel

1.3 DEFINITIONS

- A. Exposed Sprayed-on Fireproofing: Refers to applications where sprayed-on materials are applied to surfaces which are exposed to view when the work is completed.

1.4 SCOPE OF WORK

- A. The types of sprayed-on fireproofing included in this section are as follows:
1. Intumescent Mastic Fireproofing.

- B. The extent of sprayed-on fireproofing is indicated on the structural drawings. All steel shall have a 2-hr fire rating.

## 1.5 QUALITY ASSURANCE

- A. **Installer of Sprayed-On Fireproofing:** The installer of sprayed-on fireproofing shall be a firm licensed or otherwise approved by the manufacturer of fireproofing materials, including qualified factory training where recommended by the manufacturer. Obtain materials from a single manufacturer for each different product required.
- B. **Fire Endurance Ratings:** Provide products which have been tested in accordance with ASTM E 119, UL 263, ANSI A2.1, or NFPA 251 for fire resistance and rated by Underwriter's Laboratories (UL) or other industry recognized agency for the required resistances.
- C. **Fire Spread Ratings:** Provide products which have been tested and listed by UL for required surface burning characteristics (flame spread, fuel contributed, smoke developed) in accordance with ASTM E 84.

Except as otherwise indicated, provide completed installations including coatings rated at a maximum flame spread of 25.

- D. **Maximum Allowable Asbestos Content:** Where sprayed-on fireproofing is composed of lightweight mineral aggregates or mineral fibers, provide products which contain less than 0.25% by weight of asbestos of any type or mixture of types occurring naturally as impurities, as determined by polarized light microscopy test per Appendix A of 40 CFR 763, subpart F "Friable Asbestos-Containing Materials in Schools" issued by the Environmental Protective Agency.
- E. **Mock-Up:** After processing of initial submittals and before delivery and installation of fireproofing materials, prepare a sample installation of fireproofing work, approximately 10 sq.ft. in area; providing an example application on each different substrate, to produce the required rating, and reasonably representative of entire sprayed-on fireproofing work. When nominally cured, examine mock-up for general qualities and compliance with requirements, perform cohesion/adhesion tests of the fireproofing material in accordance with ASTM E 736 and ASTM D 4541, measure thickness and density of material in accordance with ASTM E 605, and review specified visual qualities (if any) with Engineer. Demonstrate durability of work to Engineer. Make minor adjustments in materials and installation procedures to comply with requirements. Mock-up work which remains in compliance with requirements and is in undamaged and acceptable condition may be retained as final work in place.
- F. **Preinstallation Conference:** Conduct conference at Project site to review methods and procedures related to fireproofing material including, but not limited to, the following:

1. Review products, exposure conditions, design ratings, restrained and unrestrained conditions, calculations, densities, thicknesses, bond strengths, and other performance requirements.
2. Review and finalize construction schedule and verify sequencing and coordination requirements.
3. Review surface conditions and preparations.
4. Review field quality-control testing procedures.

## 1.6 SUBMITTALS

- A. Product Data: Submit manufacturer's product specifications and installation instructions for each type of material and application method required. Extent of fireproofing material for each construction and fire-resistance rating, include the following:
  1. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
  2. Minimum thicknesses needed to achieve required fire-resistance ratings of structural components.
  3. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.
- B. Shop Drawings: Submit a design of the fireproofing of steel jacket showing required thickness to achieve specified fire rating.
- C. Laboratory Test Reports: Submit laboratory test reports on each required test of in place fireproofing including location and date of samples tested and interpretations of test data. Refer to Testing Laboratory section of the specifications. Include compatibility and adhesion test reports from manufacturer indicating the following.
  1. Materials have been tested for bond with coated substrates.
  2. Materials have been verified by fireproofing manufacturer to be compatible with substrate primers over coated substrates.
- D. Certificates:
  1. Submit the following certificates:
  2. Steel Primers:
    - a. Where paint primers are applied to steel in shop or field, submit a statement from primer manufacturers, certifying that primers are compatible with sprayed-on fireproofing and will not impair its performance under fire exposure for applications indicated, as proven by ASTM E 119 test.

- Include test and other data as evidence; distribute data to sprayed-on fireproofing manufacturer.
- b. Also submit acceptance of steel primers by sprayed-on fireproofing manufacturer based on data submitted by primer manufacturer.
3. Fireproofing Materials: Sprayed-on fireproofing manufacturers' certification that their products comply with specification requirements and are suitable for the use indicated.

## ***PART TWO - PRODUCTS***

### **2.1 FIREPROOFING MATERIALS**

- A. Intumescent Mastic Fireproofing: Factory-mixed formulation consisting of a modified vinyl-rich heavy-bodied mastic, solvent-based, with inorganic reinforcing fibers for spray application.

For exterior fireproofing applications provide manufacturer's formulation approved for such use.

Subject to compliance with requirements, products which may be incorporated in the work include, but are not limited to, the following:

"Albi Clad 800"; Albi Manufacturing Div., Stanchem Inc.  
"Interchar 212"; Isolatek International, Cafco Inc.

### **2.2 AUXILIARY FIREPROOFING MATERIALS**

- A. General: Provide auxiliary fireproofing materials which are compatible with sprayed-on fireproofing products and substrates, approved for use indicated by manufacturer of sprayed-on fireproofing, and which have been approved by UL or other acceptable testing and inspecting agency for use in fire-resistance rated designs indicated.
- B. Substrate Primers: Provide type which is compatible with condition of each substrate to be fireproofed, including shop primers applied by metal fabricators/erectors, and which is recommended by fireproofing materials manufacturers for (in each case) compatibility with bonding adhesives and fireproofing materials.
- C. Adhesive for Bonding Fireproofing: Type recommended by fireproofing manufacturer, and complying with selection requirements of applicable fire-endurance tests.

## ***PART THREE - EXECUTION***

### **3.1 INSPECTION AND PREPARATION**

- A. Initial Inspection: Installer must examine substrates and conditions under which fireproofing work is to be performed, and must notify Contractor in

writing of unsatisfactory conditions. Do not proceed with fireproofing work until unsatisfactory conditions have been corrected in a manner acceptable to Installer. A satisfactory substrate is defined as follows:

1. Substrate complies with requirements of the section in which the substrate and related work is specified and is free of oil, grease, rolling compounds, incompatible primers, loose mill scale, dirt or other foreign substances capable of impairing bond of fireproofing with substrate under conditions of normal use or fire exposure.
  2. Objects which will penetrate fireproofing, including clips, hangers, support sleeves and similar items have been securely attached to substrates.
  3. Substrates are not obstructed by ducts, piping, equipment and other suspended construction that could interfere with application of fireproofing.
- B. Substrate Cleaning: Clean substrates of substances which might be incompatible with or interfere with bond of fireproofing, including oil, dirt, scale, rust and noncompatible shop primer. Remove ill-timed work which might interfere with installation of fireproofing. For steel or other substrates suspected of being coated with oil, rolling compounds or other substances not readily identifiable but potentially capable of impairing bond, conduct tests recommended by fireproofing manufacturer to determine their presence and effect on adhesion of fireproofing.
- C. Substrate Priming: Prime substrates where recommended by fireproofing manufacturer, covering surfaces to receive direct-bonded application of fireproofing, except where acceptable shop primer (specified as work of another section) is in satisfactory condition to receive fireproofing, as determined by Installer.

Where sprayed-on fireproofing is indicated as exposed finish in occupied spaces, repair substrate imperfections to ensure acceptable visual effect in texture or finish. Remove minor projections of substrate materials and fill voids which might telegraph through as visual texture variations.

- D. Protection of Other Work: Cover other work which might be damaged by fall-out or overspray of fireproofing materials during spraying operations. Provide temporary enclosure as may be required to confine operations, protect the environment, and ensure adequate ambient conditions including temperature minimum of 40°F (4°C) and rising. Maintain substrate temperatures of at least 40°F (4°C) and rising. Provide temporary protection and heat to maintain this temperature for 24 hours before and 24 hours after application or as required by the manufacturer. Ventilate spray fireproofing by natural or forced air circulation as required until it dries thoroughly.

### 3.2 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to project site in original, unopened packages with manufacturers' labels identifying products legible and intact. Include on

labels names of products and manufacturers, date of manufacture and shelf life, where applicable. Also include UL labels for fire-resistance ratings applicable to project.

- B. Use materials with limited shelf life within period indicated. Remove from project site and discard any materials whose shelf life has expired.
- C. Store materials inside, under cover, above ground and in a manner to keep them dry until ready to use. Remove from project site and discard any materials that have been exposed to moisture or have otherwise deteriorated.

### 3.3 SEQUENCING AND COORDINATION

- A. Sequence and coordinate application of sprayed-on fireproofing with other related work specified in other sections to comply with the following requirements.
- B. Prevent deterioration of sprayed-fireproofing for interior applications due to exposure to unfavorable environmental conditions.
- C. Avoid unnecessary exposure of sprayed-on fireproofing to abrasion and other damage likely to occur during construction operations subsequent to its application.
- D. Ensure that sprayed-fireproofing is installed prior to installation of enclosing or concealing work, with sufficient time allowed for inspection, testing and correction of defective fireproofing.

### 3.4 INSTALLATION

- A. General Requirements:
  - 1. Comply with manufacturer's instructions for particular conditions of installation in each case. Consult with manufacturer's technical representative for conditions not covered by printed instructions.
  - 2. Coat substrate with bonding adhesive where direct bonding of fireproofing is indicated and where use of adhesive is required or recommended by manufacturer.
  - 3. Install fabric reinforcements where indicated.
  - 4. Install metal lath as required to comply with fire resistance ratings and recommendations of fireproofing manufacturer for conditions of exposure and intended use. Securely attach lath to substrate in position required for fire- resistance rating indicated and to support as well as to reinforce fireproofing, using anchorage devices of type recommended by fireproofing manufacturer. Attach lathing accessories where indicated or required.
  - 5. Provide thicknesses as indicated or as required for compliance with indicated fire-endurance ratings, whichever is greater in each

instance. Extend fireproofing full thickness over entire area of each substrate to be protected. Except as otherwise indicated or recommended by manufacturer, install body of fireproof covering material in a single course.

6. Provide sprayed-in-place installation of fireproofing materials to the greatest extent possible. Following spraying operation in each area, complete the coverage by troweled installation or other appropriate placement method recommended by manufacturer.
  7. Maintain ambient conditions during installation and for cure period following installation, as recommended by manufacturer. Provide ventilation and avoid excessive rate of drying. Protect from exposure to sun.
- B. Intumescent Mastic Fireproofing: Apply intumescent mastic fireproofing to comply with requirements indicated and to produce the following finish:
1. Spray texture with no further treatment, unless shown otherwise on the Engineer's Drawings.
  2. Provide even spray-textured finish by lightly rolling flat surfaces of fireproofed members to smooth out surface irregularities and seal in surface fibers, where specified on the Engineer's drawings.

### 3.5 FIELD QUALITY CONTROL

- A. Refer to Section "Structural Testing Laboratory Services" for requirements.

### 3.6 CLEANING, PATCHING, PROTECTION

- A. Cleaning: Immediately upon completion of spraying operations in each containable area of project, remove over-spray and fall-out of materials from surfaces of the work, and clean surfaces to remove evidence of soiling. Repair or replace damaged work to restore surfaces to acceptable condition.
- B. Patching: Repair or replace fireproofing found (by field tests) to be below compliance requirements. Add extra course of fireproofing material where feasible to achieve compliance; otherwise remove course and replace with newly installed complying work.

Coordinate installation of fireproofing with other work so as to minimize the need for other trades to cut into or remove installed fireproofing. As other trades successively complete installations of other work, patch fireproofing installations which have been cut away to facilitate such installations, so as to maintain complete coverages of full thickness on substrates to be protected with fireproofing. Trowel-applied fireproofing materials are acceptable for patching of work. Do not allow work requiring patchings to be covered over or otherwise concealed before patching is completed.

- C. Protection: Installer of sprayed-on fireproofing shall advise Contractor of protection requirements for fireproofing work, which will ensure that fireproofing will be substantially without damage or deterioration at time of substantial completion of project. Provide protection from reasonably predictable harmful exposures. Repair or replace work which has not been successfully protected.

END OF SECTION

SECTION 07 92 00

JOINT SEALANTS

### ***PART ONE - 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 SUBMITTALS

- A. Product Data: Submit manufacturer's technical data for each joint sealant product required, including instructions for joint preparation and joint sealant application.
- B. Certificates: Submit certificates from manufacturers of joint sealants attesting that their products comply with Specification requirements and are suitable for the use indicated.

#### 1.3 QUALITY ASSURANCE

- A. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required. Provide one year warranty on installation and materials.
- B. Review and approve joint details before construction.

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project Site in original unopened containers, or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time and mixing instructions for multicomponent materials.
- B. Store and handle materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

#### 1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
  - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturers.
  - 2. When joint substrates are wet due to rain, frost, condensation or other causes.
  - 3. Joint Width Conditions: Do not proceed with installation of joint sealants when joint widths are less than allowed by sealant manufacturer for application indicated.

## ***PART TWO - PRODUCTS***

### **2.1 MATERIALS, GENERAL**

- A. Compatibility: Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by testing and field experience.

### **2.2 SEALANT FOR HORIZONTAL (NON-COVE) JOINTS:**

- A. Products: Acceptable joint sealants:
  - 1. "Sonolastic SL-2" by Chemrex - BASF
  - 2. "Sikaflex-2c NS TG" by Sika
  - 3. "Iso-Flex 880 GB" by Lymtal International, Inc.
- B. Compounds used for sealants shall not stain concrete or masonry. Aluminum pigmented compounds not acceptable..
- C. The color of sealants shall match adjacent surfaces.

### **2.3 SEALANT FOR VERTICAL JOINTS AND COVE JOINTS:**

- A. Products: Acceptable joint sealants:
  - 1. "Sonolastic NP-2" by BASF
  - 2. "Sikaflex-2c NS" by Sika
  - 3. "Iso-Flex 881" by Lymtal International, Inc.
- B. Compound used for sealants shall not stain concrete or masonry. Aluminum pigmented compounds not acceptable.
- C. The color of sealants shall match adjacent surfaces.

## 2.4 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type which are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint-Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of material indicated below, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
- C. Either flexible, open cell polyurethane foam or non-gassing, closed-cell polyethylene foam, unless otherwise indicated, subject to approval of sealant manufacturer.
- D. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint. Provide self-adhesive taper where applicable.

## 2.5 MISCELLANEOUS MATERIALS

- A. Primer: Provide type recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate and field tests.
- B. Cleaners for Nonporous Surfaces: Provide non-staining, chemical cleaner of type acceptable to manufacturer of sealant and sealant backing materials which are not harmful to substrates and adjacent nonporous materials.
- C. Masking Tape: Provide non-staining, non-absorbent type compatible with joint sealants and to surfaces adjacent to joints.

## ***PART THREE - EXECUTION***

### 3.1 INSPECTION

- A. Require installer to inspect joints indicated to receive joint sealants for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealant performance. Obtain installer's written report listing any condition detrimental to performance of joint sealant work. Do not allow joint sealant work to proceed until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturers and the following requirements:

1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealant, including dust; paint, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; oil; grease; waterproofing; water repellants; water; surface dirt and frost.
  2. Clean concrete, substrate surfaces, by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  3. Remove laitance from concrete.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primers to areas of joint sealant bond. Do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALERS

- A. General: Comply with joint sealant manufacturers' printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.
  2. Do not leave gaps between ends of joint-fillers.
  3. Do not stretch, twist, puncture or tear joint-fillers.
  4. Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

5. Install bond breaker tape between sealants and joint-fillers, compression seals or back of joint where required to prevent third-side adhesion of sealant to back of joint.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants in concave joint configuration per ASTM C 962, unless otherwise indicated to form smooth, uniform beads of configuration indicated, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

#### 3.4 PROTECTION AND CLEANING

- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and reseal joints with new materials to produce sealant installations with repaired areas indistinguishable from original work.
- B. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by the manufacturer of the sealants and of the products used in the joints.

END OF SECTION

SECTION 07 95 00

EXPANSION JOINTS

### ***PART ONE - 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. Contractor shall fully acquaint himself with the existing job site conditions and discuss the accessibility of the work areas with the Owner.

- B. Provide barricades around the work area with appropriate signage to keep non-construction people from entering work area.
- C. Contractor shall provide all traffic cones or barriers to direct traffic during the repair of the facility. This work shall be done in consultation with the Owner.

### 1.3 SUBMITTALS

- A. Product Data: For each product indicated.
- B. An expansion joint system is detailed on Drawings. Shop drawings shall include temperature adjustment table with expansion joint opening calculated at 10°F increments. Shop drawing submittal shall show that proposed joint system is of similar gland configuration, capable of equal individual and combined movements in each direction when installed at designated temperature shown on drawings.
- C. Where installation temperature is other than specified temperature, submittal shall include calculations showing joint is capable of movement within design temperature range (supplied by Engineer) for “other” temperature, and that design and installation follow manufacturer’s recommendations. Design temperature range is -30° F to +130° F. Material samples.
- D. Installation plans and large scale details. Show all conditions including, but not limited to, splices, terminations, and change in section or alignment.
- E. Field samples of premolded joint sealant. Width, thickness and durometer hardness of sealant shall be checked by Testing Agency. Upward buckling caused by joint gap closure shall be limited to a maximum of ¼ inch per ADA Guidelines.
- F. Other information required to define joint placement or installation.
- G. ADA Certification: Prior to installation, submit written certification from manufacturer indicating that expansion joints conform to Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1-800-872-2253.
- H. Quality Assurance – Contractor setting expansion joint opening will require a temperature adjustment table to properly size joint gap at time of concrete pour or precast erection.
- I. Caution – The expansion joint movement capability and the actual joint gap movement may not coincide if Quality Assurance measure not followed.
- J. Submit test reports from accredited laboratory attesting to joint systems’ movement capability and ADA compliance.

K. Submit three copies of System Maintenance Manual.

#### 1.4 QUALITY ASSURANCE

- A. Manufacturer/Applicator: Review and approve all details before construction. Confirm in writing to Engineer.
- B. Applicator: Coordinate services with related Work including layout of joint system and approval of methods for providing joints.
- C. Applicator: Inspect site to insure proper joint configuration in field.
- D. Testing Agency at owner's expense shall check Shore A hardness in accordance with ASTM D2240 and ensure the limited upward buckling of ¼ inch or less.
- E. Manufacturer: Provide qualified representative for periodic inspection of Work.
- F. Expansion joint blockouts shall be floated and troweled before final cure to remove all air pockets, voids and spalls caused by form work.
- G. Expansion joint surface areas two feet on each side of joint gap shall be finish graded perpendicular to joint gap creating flush slab-to-slab transition. Elevations on each side shall be identical.
- H. Pre-installation Conference: Conduct conference at Project site to discuss expansion joint installation requirements.
  - 1. Manufacturer: Provide qualified representative on site for duration of work.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
  - 1. Manufacturer's brand name.
  - 2. Type of material.
  - 3. Directions for storage.
  - 4. Date of manufacture and shelf life.
  - 5. Lot or batch number.
  - 6. Mixing and application instructions.
  - 7. Color.

- B. Store materials in a clean, dry location protected from exposure to direct sunlight. In storage areas, maintain environmental conditions within range recommended in writing by manufacturer

## 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Install expansion joint systems within the range of ambient and substrate temperatures recommended in writing by manufacturer.

## 1.7 WARRANTY

- A. General Warranty: Special warranty specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

- 1. Special Warranty: Written warranty, signed by expansion joint manufacturer agreeing to repair or replace expansion joint systems that do not comply with requirements or that deteriorate during the specified warranty period.

- B. Warranty Period: Five years from date of acceptance of work, jointly executed by Manufacturer and Applicator.

- C. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.

- D. Perform any repair under this guarantee at no cost to Owner

- E. Vandalism and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

## ***PART TWO - PRODUCTS***

### 2.1 MATERIALS

- A. General:

- 1. Conform to Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1-800-872-2253.
  - 2. Surfaces accessible to pedestrian traffic: anti-slip construction.
  - 3. Material shall be applied in lengths no shorter than 20 ft, with no joints in the drive aisle.

- B. Elastomeric concrete edged, extruded rubber expansion joint sealant system. Acceptable systems (Task Item 6.5):
  - 1. Iso-Flex winged expansion joint, Type J by LymTal
  - 2. Wabo®Crete II Membrane 201 System–ME Series by Watson Bowman - BASF
  - 3. Thermaflex Membrane/Nosing System, Type TCR Series by Emseal
  
- C. Adhered extruded rubber expansion joint sealant system. Acceptable systems (Task Item 6.6):
  - 1. Iso-Flex Pressure Lok Expansion Joint System by LymTal
  - 2. Jeene® Structural Sealing Joint System FW Series by Watson Bowman - BASF
  
- D. Extruded Neoprene closed cell rubber expansion joint for vertical applications, stair towers, columns and perimeter floor-to-wall joints. Acceptable systems (Task Item 6.1):
  - 1. Iso-Flex Foamflux Joint Seal topped with Iso-Flex®888 QC Sealant by LymTal
  - 2. Wabo®InverSeal topped with Wabo®SiliconeSeal Two-Part Silicone by Watson Bowman – BASF
  
- E. Precompressed expansion joint for pedestrian and vertical applications. Acceptable systems (Task Item 6.2, 6.3):
  - 1. Iso-Flex Precom H-SL by LymTal
  - 2. Wabo HSeal by Watson Bowman - BASF
  - 3. DSM System by Emseal
  
- F. Field applied silicone sealant expansion joint system for joint gaps of 1.5 inches or less.
  - 1. Dow Corning FC parking structure sealant (fast cure) by Dow Corning
  - 2. Wabo®SiliconeSeal Two-Part Silicone by Watson Bowman – BASF

### ***PART THREE - EXECUTION***

#### **3.1 EXAMINATION**

- A. Inspect surfaces to receive Work and report immediately in writing to Engineer any deficiencies in surface which render it unsuitable for proper execution of Work.
- B. Coordinate and verify that related Work meets following requirements:
  - 1. Concrete surfaces are finished as acceptable for system to be installed.
  - 2. Curing compounds used on concrete surfaces are compatible with Work to be installed.
  - 3. Concrete surfaces have completed proper curing period for system selected.
  - 4. Joint Sealants are compatible with traffic toppings.
- C. Acid etching: Prohibited.
- D. All openings to occupied space shall be sealed to prevent cleaning materials, solvents and fumes from infiltration. All protective measures and/or ventilating systems required to prevent infiltration are incidental to this Work.

### 3.2 PREPARATION

- A. General Contractor: Correct unsatisfactory conditions in manner acceptable to installer before installing expansion joint system. All honeycombs and air voids in blockouts shall be patched as acceptable to Engineer prior to installation of Expansion Joint Sealant system.
- B. Coordinate expansion joint system with other related Work before installation of expansion joint.
- C. Check adhesion to substrates and recommend appropriate preparatory measures.
- D. Proceed with expansion joint system only after unsatisfactory conditions have been corrected in manner acceptable to installer and product manufacturer.
- E. Clean joints thoroughly in accordance with manufacturer's instructions to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion.
- F. Cease installation of expansion joints under adverse weather conditions, or when temperatures are outside manufacturer's recommended limitations for installation.
- G. Prepare for installation of extruded expansion joint systems in accordance with manufacturer's recommendations.

- H. Cease installation if expansion joint blockouts and/or openings exhibit cracked edges, voids or spalls. Repair with accepted material prior to installation of expansion joint.
- I. Check elevations on each side of expansion joint gap utilizing metal straight edge to ensure flush slab-to-slab transition. Present discrepancies to Engineer.
- J. Check anticipated or actual minimum and maximum joint openings with Engineer. Compare to manufacturer's movement specifications and make joint sizing recommendations.

### 3.3 INSTALLATION

- A. During months when historic mean daily temperature at Project is 20° F. or more colder than annual mean daily temperature, premolded sealant shall be installed on temporary basis to prevent hot weather buckling. Permanent installation shall be done in summer when Engineer directs.
- B. Install extruded expansion joint system in accordance with manufacturer's instructions.
- C. Areas adjacent to the joint must be masked with tape to assure clean joint lines.
- D. In-place testing: Prior to opening to traffic, test joint seal for leaks with maintained continuously wet for 12 hrs. Repair leaks revealed by examination of seal underside. Repeat test and repairs until all leaks stopped for full 12 hrs.

### 3.4 CLEANING

- A. Clean off excess material and material smears adjacent to joints as work progresses using methods and materials approved by manufacturers.

### 3.5 PROTECTION

- A. Protect the Expansion Joint System during construction. Heavy construction vehicles will not be permitted to cross the joint without specific and written permission by the Engineer. Subsequent damage to the expansion joint system shall be repaired at the contractor's expense.

END OF SECTION

### DRAWINGS

- A. The drawings are on pages 148 of 177 thru 167 of 177 and are shown at the following website:

**A PDF version of the Drawings can also be viewed at the following web Link**  
**<https://purchasing.houstontx.gov/buyer/BidDocumentManager.aspx?id=C23703>**

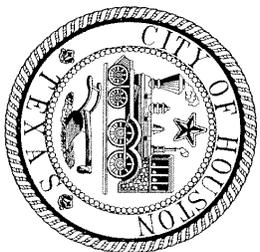
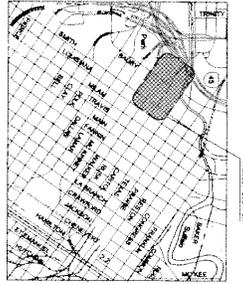
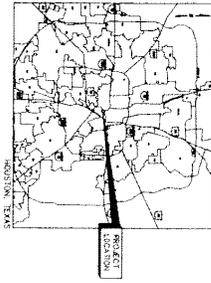
# CITY OF HOUSTON

## GENERAL SERVICES DEPARTMENT

### CONVENTION AND ENTERTAINMENT FACILITIES DEPARTMENT

THEATER DISTRICT PARKING -  
STRUCTURAL ASSESSMENT AND REPAIRS  
CIVIC CENTER, SMALL TRANQUILITY, AND LARGE TRANQUILITY GARAGES

**WBS No. B-000087-0002-4**  
DRAWINGS FOR BIDDING AND CONSTRUCTION



**MAYOR**  
ANNISE D. PARKER

**CONTROLLER**  
RONALD C. GREEN

DIRECTOR OF CONVENTION AND ENTERTAINMENT FACILITIES DEPARTMENT  
DANN R. ULLRICH

DIRECTOR OF GENERAL SERVICES DEPARTMENT  
ISSA Z. DADOUJSH, P.E.

**COUNCIL MEMBERS**

DISTRICT A	BRENDA STARBUCK	DISTRICT B	JAMES JOHNSON	DISTRICT C	ANNE CUTTERBACK	DISTRICT D	WANDA ADAMS	DISTRICT E	MIKE SULLIVAN	DISTRICT F	AL HOANG	DISTRICT G	OLIVER PERINACON	DISTRICT H	EDUARDO GONZALEZ	DISTRICT I	JAMES G. RODRIGUEZ	DISTRICT J	JOLANDA "JOT" JONES
------------	-----------------	------------	---------------	------------	-----------------	------------	-------------	------------	---------------	------------	----------	------------	------------------	------------	------------------	------------	--------------------	------------	---------------------

**COUNCIL MEMBERS AT-LARGE**

STEVEN C. COSTELLO POSITION 1	SUE LONGI POSITION 2
MELISSA NOMEIDA POSITION 3	C.O. "BOBO" BRADFORD POSITION 4
JOLANDA "JOT" JONES POSITION 5	

<b>WALTER P MOORE</b> <small>REGISTERED PROFESSIONAL ENGINEER - CIVIL                  NO. 11834 - EXPIRES 09/01/2018                  BOARD OF ENGINEERING EXAMINERS - STATE OF TEXAS</small>		
<b>CITY OF HOUSTON</b> GENERAL SERVICES DEPARTMENT		
DATE: _____ DRAWING NO.: _____ SHEET NO. 1 OF 20	PROJECT: _____ CONTRACT NO.: _____ DATE: _____	TITLE: _____ POSITION: _____ DEPARTMENT: _____

# GENERAL NOTES

1. GENERAL NOTES:
  - A. GENERAL NOTES: SEE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - B. MATERIALS: ALL MATERIALS SHALL BE OF THE QUALITY AND QUANTITY SPECIFIED IN THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - C. CONSTRUCTION: ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - D. UTILITIES: ALL UTILITIES SHALL BE PROTECTED AND MAINTAINED IN PLACE. ANY UTILITIES THAT ARE DAMAGED OR DESTROYED SHALL BE REPAIRED TO ORIGINAL OR BETTER CONDITION.
  - E. TRAFFIC CONTROL: ALL TRAFFIC CONTROL SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - F. ENVIRONMENTAL PROTECTION: ALL ENVIRONMENTAL PROTECTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - G. SAFETY: ALL SAFETY MEASURES SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - H. RECORD DRAWINGS: ALL RECORD DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL.
  - I. AS-BUILT DRAWINGS: ALL AS-BUILT DRAWINGS SHALL BE SUBMITTED TO THE ENGINEER FOR REVIEW AND APPROVAL.
  - J. MAINTENANCE: ALL MAINTENANCE SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - K. INSPECTION: ALL INSPECTION SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.
  - L. PAYMENT: ALL PAYMENT SHALL BE IN ACCORDANCE WITH THE SPECIFICATIONS AND SUPPLEMENTAL SPECIFICATIONS TO THE STANDARD SPECIFICATIONS FOR HIGHWAY CONSTRUCTION, LATEST EDITION, AND THE STANDARD SPECIFICATIONS FOR PUBLIC WORKS, LATEST EDITION.

ITEM NO.	DESCRIPTION	QUANTITY	UNIT	PRICE
1.1	CONCRETE PAVEMENT			
1.2	CONCRETE CURB			
1.3	CONCRETE SIDEWALK			
1.4	CONCRETE DRIVEWAY			
1.5	CONCRETE DRIVEWAY			
1.6	CONCRETE DRIVEWAY			
1.7	CONCRETE DRIVEWAY			
1.8	CONCRETE DRIVEWAY			
1.9	CONCRETE DRIVEWAY			
1.10	CONCRETE DRIVEWAY			
1.11	CONCRETE DRIVEWAY			
1.12	CONCRETE DRIVEWAY			
1.13	CONCRETE DRIVEWAY			
1.14	CONCRETE DRIVEWAY			
1.15	CONCRETE DRIVEWAY			

# 3

SHEET NUMBER	DESCRIPTION
1	GENERAL NOTES
2	GENERAL NOTES
3	PLAN - CIVIC CENTER GARAGE - GREEN LEVEL - TASK ITEM REPAIRS
4	PLAN - CIVIC CENTER GARAGE - GREEN LEVEL - TASK ITEM REPAIRS
5	PLAN - CIVIC CENTER GARAGE - ORANGE LEVEL - TASK ITEM REPAIRS
6	PLAN - CIVIC CENTER GARAGE - ORANGE LEVEL - TASK ITEM REPAIRS
7	PLAN - CIVIC CENTER GARAGE - PURPLE LEVEL - TASK ITEM REPAIRS
8	PLAN - CIVIC CENTER GARAGE - PURPLE LEVEL - TASK ITEM REPAIRS
9	PLAN - SMALL TRANQUILITY GARAGE - BLUE LEVEL - TASK ITEM REPAIRS
10	PLAN - SMALL TRANQUILITY GARAGE - BLUE LEVEL - TASK ITEM REPAIRS
11	PLAN - LARGE TRANQUILITY GARAGE - YELLOW LEVEL - TASK ITEM REPAIRS
12	PLAN - LARGE TRANQUILITY GARAGE - YELLOW LEVEL - TASK ITEM REPAIRS
13	PLAN - LARGE TRANQUILITY GARAGE - AQUA LEVEL - TASK ITEM REPAIRS
14	PLAN - LARGE TRANQUILITY GARAGE - PINK LEVEL - TASK ITEM REPAIRS
15	TASK ITEM REPAIR DETAILS
16	TASK ITEM REPAIR DETAILS
17	PT TENSION REPAIRS - PARTIAL PLANS AND REPAIR DETAILS
18	PT TENSION REPAIRS - PARTIAL PLANS AND REPAIR DETAILS
19	PT TENSION REPAIRS - PARTIAL PLANS AND REPAIR DETAILS
20	PT TENSION REPAIRS - PARTIAL PLANS AND REPAIR DETAILS

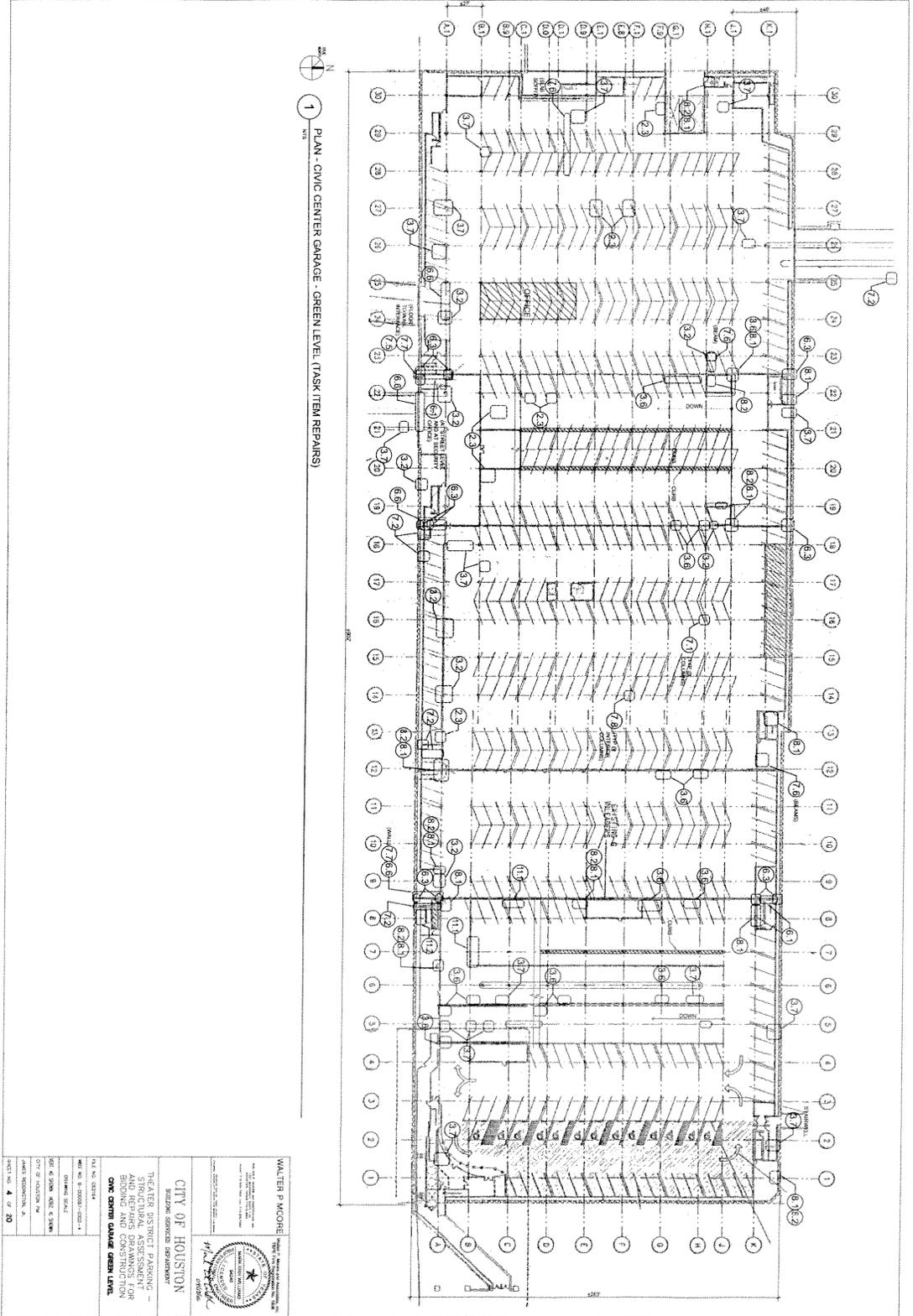
WALTER P MOORE  
 PROJECT MANAGER  
 10100 W. HIGHTWAY 290, SUITE 100  
 HOUSTON, TEXAS 77055  
 (713) 865-1234  
 FAX: (713) 865-1235  
 WWW.WPMOORE.COM

CITY OF HOUSTON  
 BUILDING SERVICES DEPARTMENT  
 1000 RICE AVENUE, SUITE 1000  
 HOUSTON, TEXAS 77005  
 (713) 865-1234  
 FAX: (713) 865-1235  
 WWW.CITYOFHOUSTON.COM

THEATER DISTRICT PARKING -  
 STRUCTURAL ASSESSMENT  
 AND REPAIRS  
 BIDDING AND CONSTRUCTION  
 GENERAL NOTES

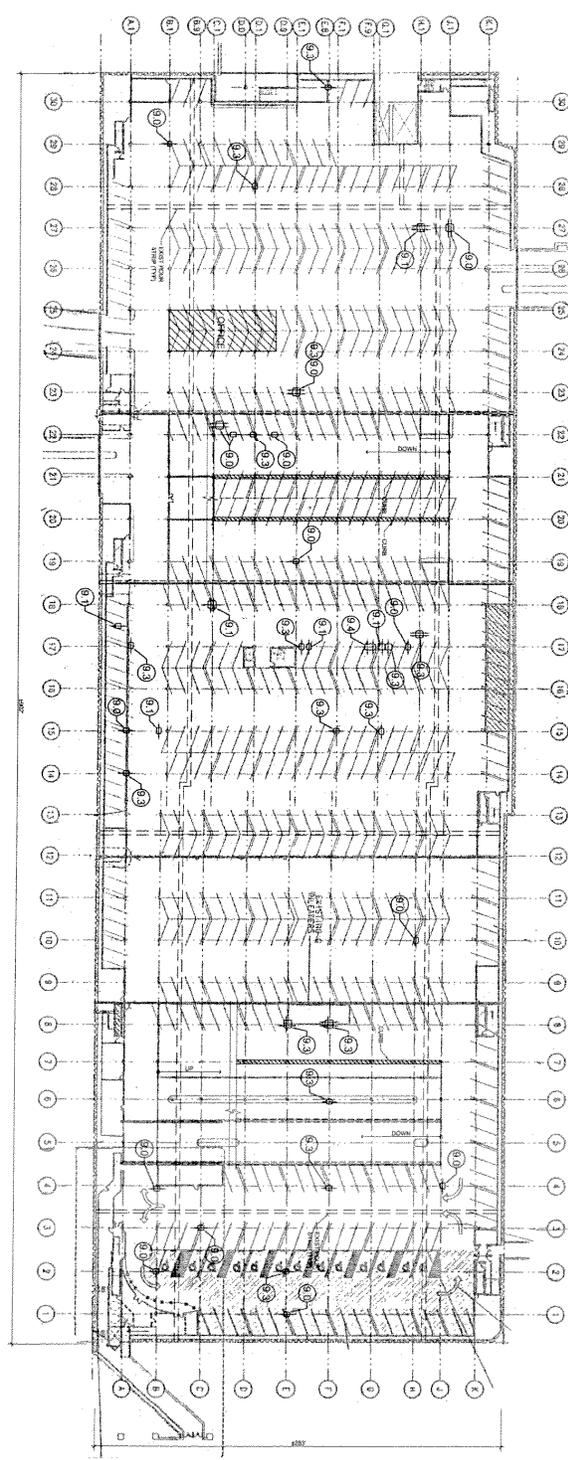
FILE NO. 10-100001-0001-A  
 SHEET NO. 2 OF 20





NOTE: INDICATED TENDON TERMINATION AND CONNECTIONS

1 PLAN - CIVIC CENTER GARAGE - GREEN LEVEL (PT TENDON REPAIR LOCATIONS)

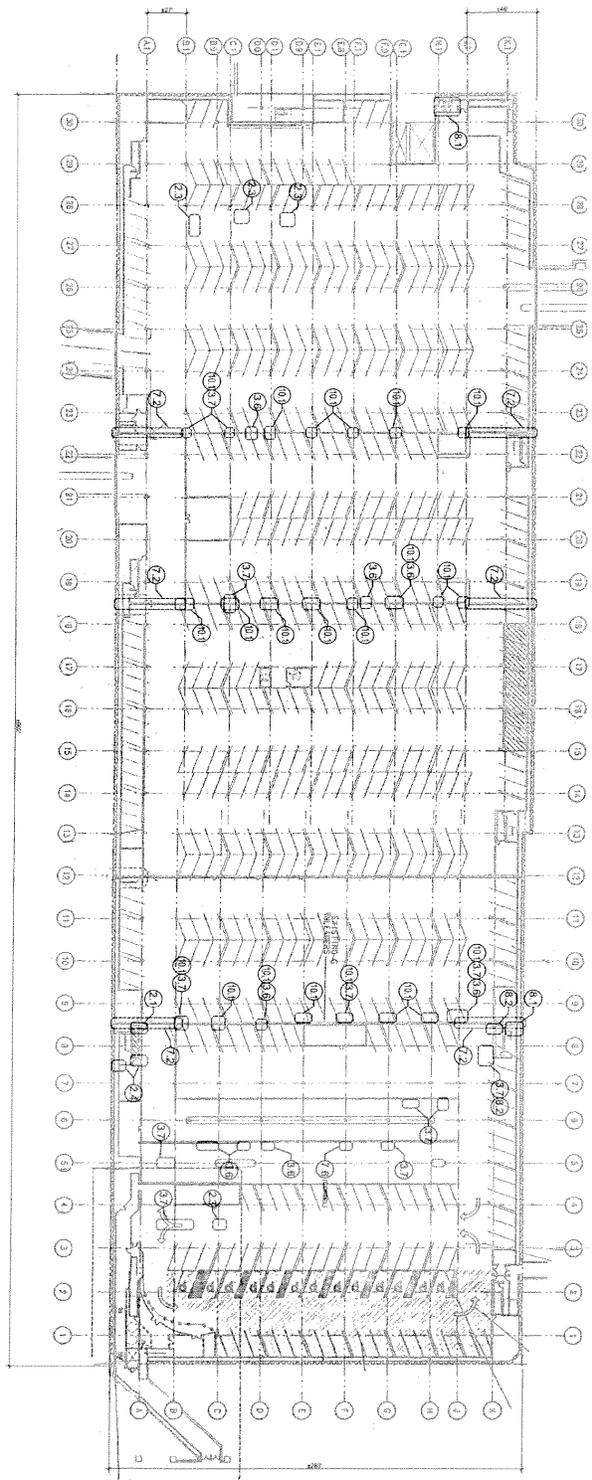


<p>WALTER P. MOORE, P.E. - Registered Professional Engineer, No. 10412</p> <p>1000 WEST 19TH STREET, SUITE 1000, HOUSTON, TEXAS 77008</p> <p>HOUSTON, TEXAS 77008</p> <p>HOUSTON, TEXAS 77008</p>	
<p>CITY OF HOUSTON</p> <p>BUILDING SERVICES DEPARTMENT</p> <p>THEATER DISTRICT PARKING - STRUCTURAL ASSESSMENT AND REPAIRS</p> <p>BIDDING AND CONSTRUCTION</p> <p>CIVIC CENTER GARAGE GREEN LEVEL</p>	
<p>DATE: 04/11/2017</p> <p>PROJECT NO.: 1601-001-001</p> <p>SCALE: AS SHOWN</p> <p>CITY OF HOUSTON, TX</p> <p>PROJECT NO. 6 OF 20</p>	





1  
PLAN - CIVIC CENTER GARAGE - PURPLE LEVEL (TASK ITEMS REPAIRS)



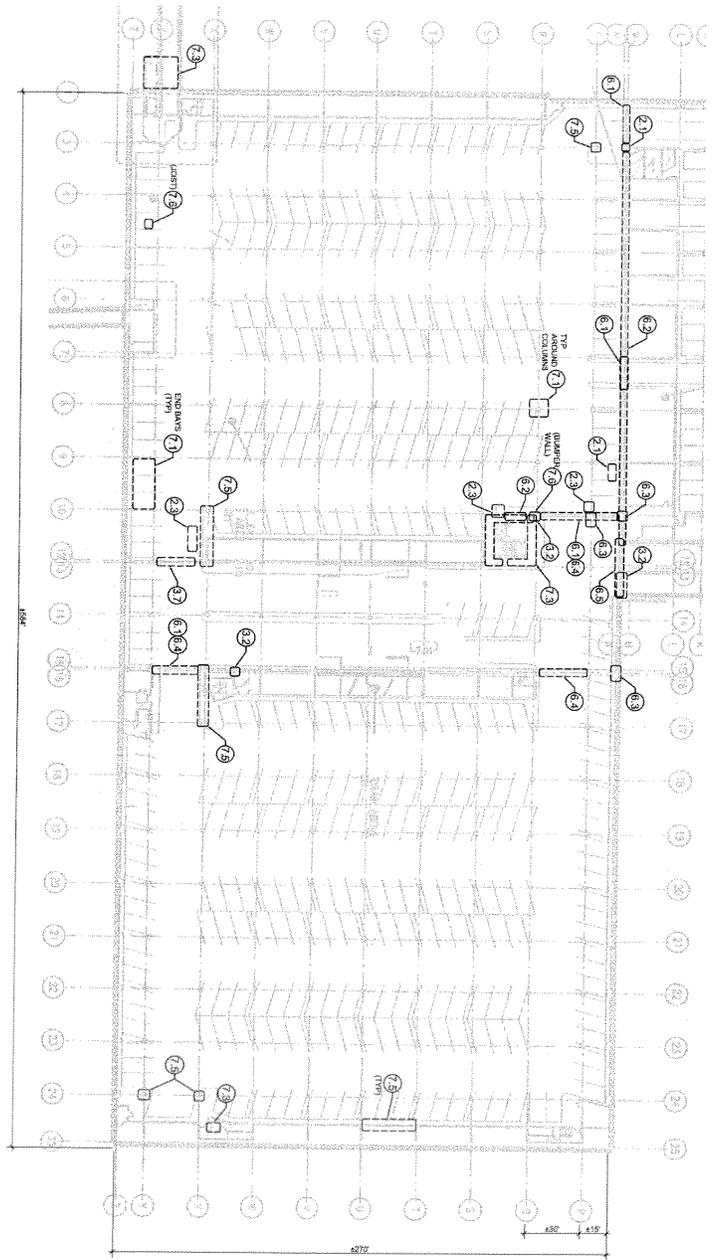
<p>WALTER P MOODIE                  REGISTERED PROFESSIONAL ENGINEER                  No. 10151 - State of Texas                  4400 West Loop South, Suite 200                  Houston, Texas 77056                  713-865-1111                  www.walterpmoodie.com</p>		<p>SEAL                  REGISTERED PROFESSIONAL ENGINEER                  No. 10151 - State of Texas                  4400 West Loop South, Suite 200                  Houston, Texas 77056                  713-865-1111                  www.walterpmoodie.com</p>	
<p><b>CITY OF HOUSTON</b>                  BEZALAN SERVICES DEPARTMENT</p>			
<p>THEATER DISTRICT PARKING -                  STRUCTURAL ASSESSMENT                  AND REPAIRS                  BIDDING AND CONSTRUCTION  <b>CIVIC CENTER GARAGE PURPLE LEVEL</b></p>			
<p>DATE OF DESIGN: 01/11/2011</p>			
<p>DESIGNED BY: WALTER P. MOODIE</p>			
<p>CHECKED BY: JAMES R. HARRIS</p>			
<p>DATE OF REVIEW: 01/11/2011</p>			
<p>SCALE: AS SHOWN</p>			
<p>PROJECT NO. 8 OF 20</p>			







1 PLAN - LARGE TRANQUILITY GARAGE - YELLOW LEVEL (TASK ITEM REPAIRS)



<p>WALTER P. MOORE Professional Engineer No. 12456 State of Texas Exp. 08/31/2011</p>	
<p>CITY OF HOUSTON ENGINEERING SERVICES DEPARTMENT</p>	
<p>THEATER DISTRICT PARKING - STRUCTURAL ASSESSMENT AND REPAIRS DRAWINGS FOR LARGE TRANQUILITY GARAGE YELLOW LEVEL</p>	
<p>FILE NO. 02011-00011-00011-00011</p>	<p>DATE: 08/08/2011</p>
<p>DRAWING SCALE:</p>	<p>CITY OF HOUSTON, TX</p>
<p>PROJECT NO. 12 OF 20</p>	<p>DATE: 08/08/2011</p>





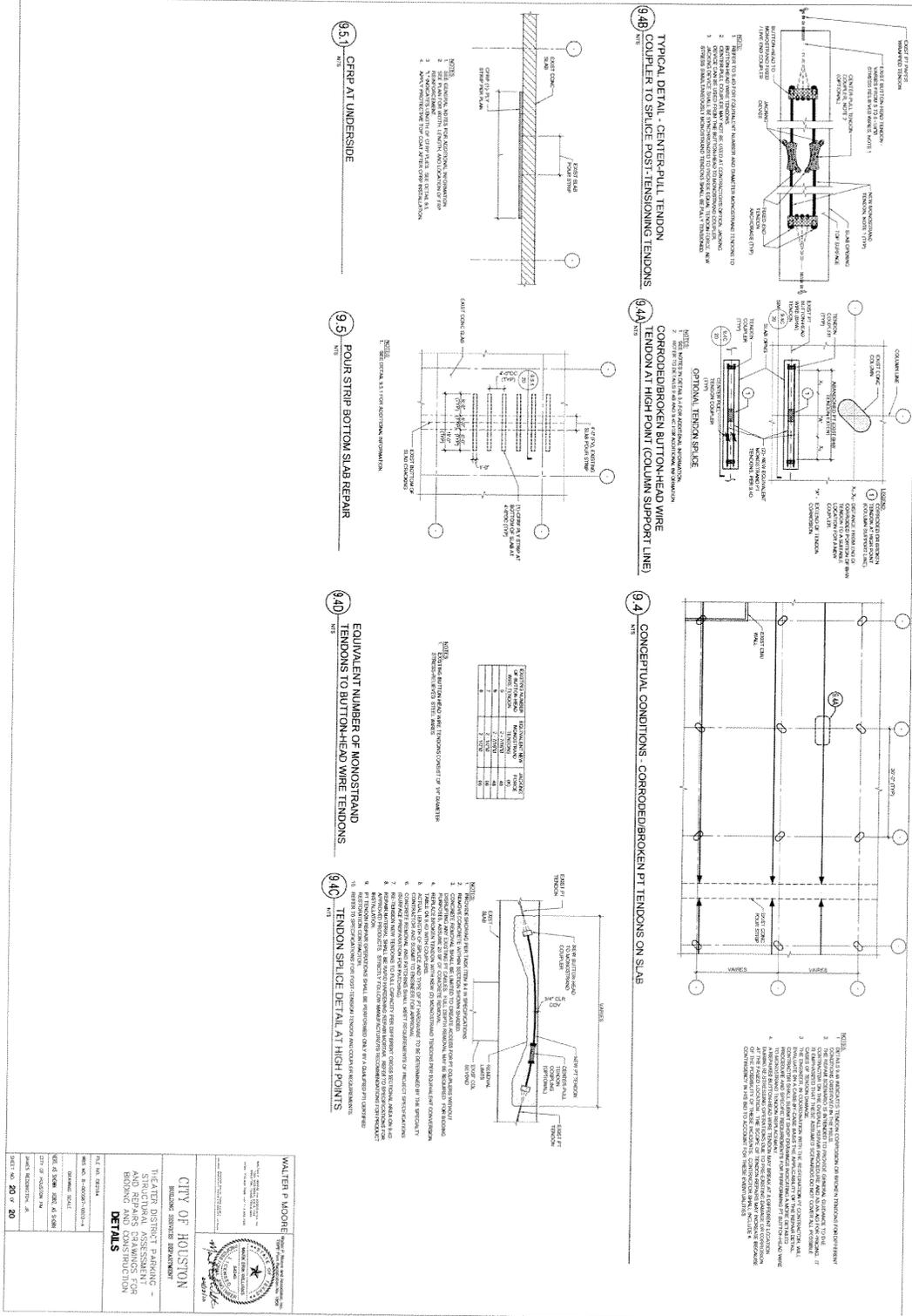












A PDF version of the Structural Drawings can also be viewed on the following web Link <https://purchasing.houstontx.gov/buyer/BidDocumentManager.aspx?id=C23703>

**SECTION C  
2010 BUILDING WAGE SCALE**

A PDF version of this Building Wage Scale can be viewed on the following web link  
<https://purchasing.houstontx.gov/buyer/BidDocumentManager.aspx?id=C23703>

**Document 00700  
GENERAL CONDITIONS**

A PDF version of the General Conditions can be viewed on the following web link:  
<https://purchasing.houstontx.gov/buyer/BidDocumentManager.aspx?id=C23703>

**Document 00800  
SUPPLEMENTARY CONDITIONS**

The following Paragraphs amend and supplement the 2005 edition of General Conditions. Unaltered portions of General Conditions remain in effect.

**ARTICLE 3 - THE CONTRACTOR**

3.5        *LABOR: Insert the following Paragraph 3.5.3.1.1.*

3.5.3.1.1 Contractor shall make good faith efforts to comply with the City ordinances regarding Minority and Women Business Enterprises (MWBE) and Persons with Disabilities Business Enterprises (PDBE) participation goals which are as follows:

- .1 the MWBE goal is 0 percent, and
- .2 the PDBE goal is 0 percent.

**3.28        CONTRACTOR DEBT**

**3.28.1    IF CONTRACTOR, AT ANY TIME DURING THE TERM OF THIS AGREEMENT, INCURS A DEBT, AS THE WORD IS DEFINED IN SECTION 15-122 OF THE HOUSTON CITY CODE OF ORDINANCES, IT SHALL IMMEDIATELY NOTIFY CITY CONTROLLER IN WRITING. IF CITY CONTROLLER BECOMES AWARE THAT CONTRACTOR HAS INCURRED A DEBT, IT SHALL IMMEDIATELY NOTIFY CONTRACTOR IN WRITING. IF CONTRACTOR DOES NOT PAY THE DEBT WITHIN 30 DAYS OF EITHER SUCH NOTIFICATION, CITY CONTROLLER MAY DEDUCT FUNDS IN AN AMOUNT EQUAL TO THE DEBT FROM ANY PAYMENTS OWED TO CONTRACTOR UNDER THIS AGREEMENT, AND CONTRACTOR WAIVES ANY RECOURSE THEREFORE.**

**ARTICLE 8 - TIME**

8.1        *PROGRESS AND COMPLETION: Delete Paragraph 8.1.6. and replace with the following 8.1.6.*

- 8.1.6.1 Contractor shall credit the City by Change Order for inspection services for overtime work or work performed on Sundays or Legal Holidays. The amount Contractor credits the City will be **\$50.00 per hour** per inspector for inspection services.

## **ARTICLE 9 - PAYMENTS AND COMPLETION**

- 9.1 *UNIT PRICE WORK: Delete Section 9.1 in its entirety and insert the following Section 9.1.*
- 9.1 References to Unit Prices in individual Specification sections are not applicable to the Contract. Include payment for portions of the Work required by these sections in the Stipulated Price for the Contract.
- 9.12 LIQUIDATED DAMAGES: Insert the following Paragraph 9.12.1.1.**
- 9.12.1.1 *The amount of liquidated damages provided in General Conditions Paragraph 9.12.1 payable by Contractor or Surety for each and every day of delay beyond Contract Time, are \$1,200.00 per day.***

## **ARTICLE 11 - INSURANCE AND BONDS**

- 11.2 *INSURANCE TO BE PROVIDED BY CONTRACTOR: Delete Paragraph 11.2.8. and replace with the following 11.2.8.*
- 11.2.1.4 Contractor shall provide Owners and Contractor's Protective Liability Insurance only if the contractor's bid price is equal to or greater than \$100,000.00.
- 11.2.8 *Endorsement of Primary Insurance:* Each policy except Workers' Compensation Insurance must contain an endorsement that the policy is primary insurance to any other insurance available to additional insured with respect to claims arising under the Contract.

**CITY OF HOUSTON -- BIDDER'S BOND**

(Must be in an amount at least 10% of the bid. If the bid is upon alternates this bond must be for at least 10% of the highest amount for which the bidder offers to do any or all the work bid upon.)

THE STATE OF TEXAS

§  
§

KNOW ALL MEN BY

THESE PRESENTS:

COUNTY OF HARRIS

§

THAT WE, \_\_\_\_\_ as principal and the other subscriber hereto as Surety, do hereby acknowledge ourselves to be held and firmly bound to the City of Houston, a municipal corporation in the sum of \$\_\_\_\_\_ Dollars (\$\_\_\_\_\_).

The condition of this obligation is that: ---

WHEREAS, the said principal is submitting to the City of Houston his or its bid for the doing for the City of Houston of certain work and construction of which the following is a brief description, to-wit: ---

**Bid No. S50-C23703**

**Theater District Parking Garage Repairs**

in accordance with the plans and specifications for such work upon which such bid is made, to which plans and specifications reference is made for a more full description of the work and construction referred to.

NOW, THEREFORE, if the said bidder is awarded the contract for such work, the said bidder will, within the time provided in the specifications, enter into a contract with the City therefore upon the form and to the purpose and intent provided in the specifications, will furnish insurance as required in the specifications and will furnish a good and sufficient construction surety bond executed by said bidder and one corporate surety organized under the laws of the State of Texas or authorized to do business in the State of Texas and having a fully paid up capital stock of not less than \$100,000.00 and duly licensed and qualified by the Board of Insurance Commissioners of the State of Texas, which bond shall be for an amount equal to 100 percent of the contract price and shall be conditioned in accordance with the requirements stated in the specifications upon which such bid is being submitted.

In the event said bidder is unable or fails to execute said contract for the work proposed to be done, is unable or fails to furnish insurance as specified or is unable or fails to furnish said construction bond in the amount and condition as aforesaid, the undersigned principal and surety shall be liable to said City of Houston for the full amount of this obligation which is here and now agreed upon and admitted as the amount of the damages which will be suffered by the City of Houston on account of the failure of such bidder to so comply with the terms of this bid.

Executed this \_\_\_\_\_ day of \_\_\_\_\_, A.D. 2008.

PRINCIPAL

By \_\_\_\_\_

By \_\_\_\_\_

\_\_\_\_\_  
Surety

**ONE-YEAR MAINTENANCE BOND**

**THAT WE,** \_\_\_\_\_, as Principal, hereinafter called Contractor, and the other subscriber hereto, \_\_\_\_\_, as Surety, do hereby acknowledge ourselves to be held and firmly bound to the City of Houston, a municipal corporation, in the sum of \$\_\_\_\_\_, for the payment of which sum well and truly to be made to the City of Houston and its successors, the said Contractor and Surety do bind themselves, their heirs, executors, administrators, successors, jointly and severally.

**THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT:**

**WHEREAS,** the Contractor has on or about this day executed a Contract in writing with the City of Houston for \_\_\_\_\_, \_\_\_\_\_, all of such work to be done as set out in full in said Contract documents therein referred to and adopted by the City Council, all of which are made a part of this instrument as fully and completely as if set out in full herein.

**NOW THEREFORE,** if the said Contractor shall comply with the provisions of Paragraph 11.5.1 of the General Conditions, and correct work not in accordance with the Contract documents discovered within the established one-year period, then this obligation shall become null and void, and shall be of no further force and effect; otherwise, the same is to remain in full force and effect.

Notices required or permitted hereunder shall be in writing and shall be deemed delivered when actually received or, if earlier, on the third day following deposit in a United States Postal Service post office or receptacle, with proper postage affixed (certified mail, return receipt requested), addressed to the respective other party at the address prescribed in the Contract documents, or at such other address as the receiving party may hereafter prescribe by written notice to the sending party.

**IN WITNESS THEREOF,** the said Contractor and Surety have signed and sealed this instrument on the respective dates written below their signatures and have attached current Power of Attorney.

ATTEST, SEAL: (if a corporation)

\_\_\_\_\_

WITNESS: (if not a corporation)

Name of Contractor

By: \_\_\_\_\_

Name:  
Title:

By: \_\_\_\_\_

Name:  
Title:  
Date:

ATTEST/SURETY WITNESS:

(SEAL)

\_\_\_\_\_  
Full Name of Surety

\_\_\_\_\_  
Address of Surety for Notice

\_\_\_\_\_

\_\_\_\_\_  
Telephone Number of Surety

By: \_\_\_\_\_

Name:  
Title:  
Date:

By: \_\_\_\_\_

Name:  
Title: Attorney-in-Fact  
Date:

**This Ordinance or Contract has been reviewed as to form by the undersigned legal assistant and have been found to meet established Legal Department criteria. The Legal Department has not reviewed the content of these documents.**

\_\_\_\_\_  
Legal Assistant

\_\_\_\_\_  
Date

## PERFORMANCE BOND

**THAT WE,** \_\_\_\_\_, as Principal, (the "Contractor"), and the other subscriber hereto, \_\_\_\_\_, as Surety, do hereby acknowledge ourselves to be held and firmly bound to the City of Houston (the "City"), a municipal corporation, in the penal sum of \$\_\_\_\_\_ for the payment of which sum, well and truly to be made to the City, its successors and assigns, Contractor and Surety do bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally.

### THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT:

**WHEREAS,** the Contractor has on or about this day executed a Contract in writing with the City for \_\_\_\_\_, \_\_\_\_\_, all of such work to be done as set out in full in said Contract documents therein referred to and adopted by the City Council, all of which are made a part of this instrument as fully and completely as if set out in full herein.

**NOW THEREFORE,** if the said Contractor shall faithfully and strictly perform the Contract in all its terms, provisions, and stipulations in accordance with its true meaning and effect, and in accordance with the Contract documents referred to therein and shall comply strictly with each and every provision of the Contract and with this Bond, then this obligation shall become null and void and shall have no further force and effect; otherwise the same is to remain in full force and effect. Should the Contractor fail to faithfully and strictly perform the Contract in all its terms, including but not limited to the indemnifications thereunder, the Surety shall be liable for all damages, losses, expenses and liabilities that the City may suffer in consequence thereof, as more fully set forth herein.

It is further understood and agreed that the Surety does hereby relieve the City or its representatives from the exercise of any diligence whatever in securing compliance on the part of the Contractor with the terms of the Contract, and the Surety agrees that it shall be bound to take notice of and shall be held to have knowledge of all acts or omissions of the Contractor in all matters pertaining to the Contract. The Surety understands and agrees that the provision in the Contract that the City will retain certain amounts due the Contractor until the expiration of 30 days from the acceptance of the Work is intended for the City's benefit, and the City will have the right to pay or withhold such retained amounts or any other amount owing under the Contract without changing or affecting the liability of the Surety hereon in any degree.

It is further expressly agreed by Surety that the City or its representatives are at liberty at any time, without notice to the Surety, to make any change in the Contract documents and in the Work to be done hereunder, as provided in the Contract, and in the terms and conditions thereof, or to make any change in, addition to, or deduction from the Work to be done hereunder; and that such changes, if made, shall not in any way vitiate the obligation in this Bond and undertaking or release the Surety there from.

It is further expressly agreed and understood that the Contractor and Surety will fully indemnify and save harmless the City from any liability, loss, cost, expense, or damage arising

out of Contractor's performance of the Contract.

If the City gives Surety notice of Contractor's default, Surety shall, within 45 days, take one of the following actions:

1. Arrange for Contractor, with consent of the City, to perform and complete the Contract; or
2. Take over and assume completion of the Contract itself, through its agents or through independent contractors, and become entitled to the payment of the balance of the Contract Price.

If the Surety fails to take either of the actions set out above, it shall be deemed to have waived its right to perform and complete the Contract and receive payment of the balance of the Contract Price and the City shall be entitled to enforce any remedies available at law, including but not limited to completing the Contract itself and recovering any cost in excess of the Original Contract Price from the Surety.

This Bond and all obligations created hereunder shall be performable in Harris County, Texas. This Bond is given in compliance with the provisions of Chapter 2253, Texas Government Code, as amended, which is incorporated herein by this reference.

Notices required or permitted hereunder shall be in writing and shall be deemed delivered when actually received or, if earlier, on the third day following deposit in a United States Postal Service post office or receptacle, with proper postage affixed (certified mail, return receipt requested), addressed to the respective other Party at the address prescribed in the Contract documents, or at such other address as the receiving party may hereafter prescribe by written notice to the sending party.

EXECUTED in multiple originals this \_\_\_\_\_ day of \_\_\_\_\_, 20\_\_\_\_\_.

ATTEST/SEAL: (if a corporation)

WITNESS: (if not corporation)

\_\_\_\_\_  
(Name of Principal)

\_\_\_\_\_  
(Address of Principal)

By: \_\_\_\_\_

Name:

Title:

Date:

By: \_\_\_\_\_

Name:

Title:

Date:

ATTEST/SEAL

SURETY WITNESS:

\_\_\_\_\_  
(Name of Surety)

\_\_\_\_\_  
(Address of Surety)

By: \_\_\_\_\_

Name:

Title:

Date:

By: \_\_\_\_\_

Name:

Title:

Date:

REVIEWED:

This Bond has been reviewed as to form by the undersigned Paralegal and has been found to meet established Legal Department criteria.

\_\_\_\_\_  
Date

\_\_\_\_\_  
Paralegal

**STATUTORY PAYMENT BOND**

**THAT WE,** \_\_\_\_\_, as Principal, hereinafter called Contractor and the other subscriber hereto, \_\_\_\_\_, as Surety, do hereby acknowledge ourselves to be held and firmly bound unto the City of Houston, a municipal corporation, in the sum of \$\_\_\_\_\_ for the payment of which sum, well and truly to be made to the City of Houston, and its successors, the said Contractor and Surety do bind themselves, their heirs, executors, administrators, successors, jointly and severally.

**THE CONDITIONS OF THIS OBLIGATION ARE SUCH THAT:**

**WHEREAS,** the Contractor has on or about this day executed a contract in writing with the City of Houston for \_\_\_\_\_, all of such work to be done as set out in full in said Contract documents therein referred to and adopted by the City Council, all of which are made a part of this instrument as fully and completely as if set out in full herein;

**NOW, THEREFORE,** if the said Contractor shall pay all claimants supplying labor and materials to him or a Subcontractor in the prosecution of the Work provided for in the Contract, then, this obligation shall be void; otherwise the same is to remain in full force and effect;

**PROVIDED HOWEVER,** that this Bond is executed pursuant to the provisions of Chapter 2253, Texas Government Code, as amended, and all liabilities on this Bond shall be determined in accordance with the provisions of said Article to the same extent as if it were copied at length herein.

**IN WITNESS THEREOF,** the said Contractor and Surety have signed and sealed this instrument on the respective dates written below their signatures and have attached current Power of Attorney.

ATTEST, SEAL: (if a corporation)  
WITNESS: (if not a corporation)

\_\_\_\_\_  
Name of Contractor

By: \_\_\_\_\_  
Name:  
Title:

By: \_\_\_\_\_  
Name:  
Title:  
Date:

ATTEST/SURETY WITNESS:  
(SEAL)

\_\_\_\_\_  
Full Name of Surety

\_\_\_\_\_  
Address of Surety for Notice

\_\_\_\_\_  
Telephone Number of Surety

By: \_\_\_\_\_  
Name:  
Title:  
Date:

By: \_\_\_\_\_  
Name:  
Title: Attorney-in-Fact  
Date:

**This Ordinance or Contract has been reviewed as to form by the undersigned legal assistant and have been found to meet established Legal Department criteria. The Legal Department has not reviewed the content of these documents.**

\_\_\_\_\_  
Legal Assistant

\_\_\_\_\_  
Date