

SPECIFICATIONS

NORTH PIER PARKING STRUCTURE REPAIRS PROJECT

JOB NO. 70610





Lauren Sablan, Acting City Engineer

(Seal)

**PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION
415 DIAMOND STREET, DOOR 2
REDONDO BEACH, CA 90277-0270
(310) 318-0661, FAX (310) 374-4828**

JULY 2024



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City of Redondo Beach

Notice to Contractors Inviting Bids

July 2024

NOTICE IS HEREBY GIVEN that sealed proposals for performing the following described work will be received at the office of the City Clerk of the City of Redondo Beach, 415 Diamond Street, Door 1, Redondo Beach, California, until **9:00 A.M. on October 16, 2024**. Thereafter said bids will be publicly opened and read in the City Clerk's office of said City.

North Pier Parking Structure Repairs Project, Job No. 70610

Work consists of both general building and seismic repairs of the North Pier Parking Structure in the City of Redondo Beach, California.

Project work shall include the following:

Project comprises of the restoration of selected areas of the floors, ceilings, beams, columns, rails, curbs for North Pier Parking Structure located at Redondo Beach, California as identified in the Drawings.

General building work consists of 2 supported levels and slab-on-grade and includes repair of select areas of the concrete slab, beams, columns, walls, epoxy injection, selected areas of guardrail replacement, traffic markings, etc. at locations within parking structure as shown in Drawings.

Seismic work consists of new shear walls supported by micro pile foundations. Cord and drag steel will be added to the existing topping slabs. The existing waffle shear wall on grid line Z between the village and pier level will be strengthened as well as double tee stems in the vicinity.

Work on basin level is to be prioritized with work on pier and village level bid as additive bid items. The seismic repairs shall be coordinated and performed concurrently with the general building repairs.

The estimated cost of the above described work is \$1,758,000 with potential additive items on the pier and village level. Bidders shall have an active **Class "A" or "B"** license from the Contractor's State License Board, a minimum of 5 years of applicable experience and 5 recently completed similar public works projects, at the time of submitting bid.

The project contract shall be completed and facility shall be made ready for service within **100** working days after the Notice to Proceed is issued.



In accordance with Labor Code Section 1770 et seq., this Project is a “public work,” and thus, the Contractor and any Subcontractors must pay wages in accordance with the determination of the Director of the Department of Industrial Relations (“DIR”) regarding the prevailing rate of per diem wages. Copies of those rates are on file with the Director of Public Works, and are available to any interested party upon request. Contractor shall post a copy of the DIR’s determination of the prevailing rate of per diem wages at each job site.

No contractor or subcontractor may be listed on a bid proposal for a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5 [with limited exceptions from this requirement for bid purposes only under Labor Code section 1771.1(a)].

No contractor or subcontractor may be awarded a contract for public work on a public works project unless registered with the Department of Industrial Relations pursuant to Labor Code section 1725.5.

This project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

Five percent of the payments due to the successful Contractor shall be withheld by City as retention for performance security, but the Contractor may substitute securities for said retention pursuant to Section 7.04 of the General Conditions.

If the Project includes the construction of a pipeline, sewer, sewage disposal system, boring and jacking pits, or similar trenches or open excavations, which are five feet or deeper, the bid shall contain, as part of the lump sum bid package, adequate sheeting, shoring, and bracing, or equivalent method, for the protection of life or limb, which shall conform to all applicable safety laws, rules, regulations and orders.

If the Bidder is awarded the contract, the contract shall be terminated and the bid bond forfeited if the Bidder fails to provide the applicable insurance certificates and bonds within the time set forth in Section 21 of the Instructions to Bidders.

Due to the current State and local Health Department Orders regarding reducing the spread of COVID-19, plans and specifications are only available from the City electronically. Paper copies are not available from the City. Bidders may either download contract documents



from the City's website or place a request for a CD to be sent by USPS first class mail. All such requests should be sent to planholders@redondo.org. There is no charge for the CD. Contract documents may also be obtained from the City's website:

(https://www.redondo.org/depts/public_works/engineering/cip_bid_opportunities/default.asp).

Those who only view and/or print the bid schedule or specifications from the City's website will not be added to the City's Plan Holder List for this project. To be included on the Plan Holder's List for this project, a prospective bidder must provide the firm's name, address, telephone number, fax number, a contact person, and a valid email address to the Engineering Division at planholders@redondo.org. It is not required to be on the Plan Holder's list, however any addenda will be sent via email only to those who are on the Plan Holder's List. Addenda will also be posted on the City website. Receipt of any Addendum must be acknowledged by the bidder on the form and included in its submitted Proposal.

Proposals (bids) to perform the work shall be made on the forms provided by the City Engineer and shall be submitted complete, including bid bond and list of subcontractors, in accordance with the Instructions to Bidders and other requirements of the bid document. In order to qualify to bid this project, bidders must obtain and properly execute a hardcopy of the contract documents. Each bidder wishing to submit a bid proposal shall print a hard copy of the City's bid proposal documents for submittal from the sent or downloaded electronic set. The City's bid proposal documents include the following forms: Proposal, Bidder's Proposal, Bid Bond, Bidder's Qualifications & References, Designation of Subcontractors, Contractor's Affidavit of Non-collusion, Pre-bid Site Inspection Certification, Workers' Compensation Certificate, and Receipt Acknowledgment of all addenda if any.

A mandatory pre-bid job walk will be held at the at the jobsite, 123 International Boardwalk, Redondo Beach, CA 90277 at 10a.m., on October 2, 2024.

Contact project manager, Lauren Sablan, at 310-318-0661, or by email at lauren.sablan@redondo.org for questions regarding this project.

CITY OF REDONDO BEACH, CALIFORNIA

Eleanor Manzano

City Clerk of the City of Redondo Beach



Instructions to Bidders

1. Registration of Contractors and Subcontractors

Before submitting bids, contractors shall be licensed in accordance with the provisions of Chapter 9, Division III, of the Business and Professions Code of the State of California and submit the number and classification of said licenses.

All contractors and subcontractors who bid or work on a public works project must register and pay an annual fee to the Department of Industrial Relations (DIR).

2. Questions Prior to Opening Bid

Questions regarding documents, discrepancies, omissions, or intent of specifications or drawings, shall be communicated to the City Engineer, in writing, at least ten (10) working days prior to opening of bids, to provide time for issuing and forwarding an addendum should the City consider an addendum necessary. The City will not be responsible for oral interpretation of the specifications and drawings.

3. Obtaining Drawings and Documents

The project drawings are available from the City Public Works Department, Engineering Services Division. In order to qualify to bid this project, bidders must obtain and properly execute a hardcopy of the contract documents.

Contract documents may be viewed and downloaded from the City's website, (https://www.redondo.org/depts/public_works/engineering/cip_bid_opportunities/default.asp). Those who only view and/or print the bid schedule or specifications from the City's website will not be added to the City's Plan Holder List for this project. To be included on the Plan Holder's List for this project, a prospective bidder must provide the firm's name, address, telephone number, fax number, a contact person, and a valid email address to the Engineering Division at planholders@redondo.org. It is not required to be on the Plan Holder's List. However, any pertinent information or any addenda will be sent via email only to those who are on the Plan Holder's List. This information will also be posted on the City website. Receipt of any Addendum must be acknowledged by the bidder on the form provided with the Addendum and must be included with the submitted Proposal.



Due to the current State and local Health Department Orders regarding reducing the spread of COVID-19, plans and specifications are only available electronically. Paper copies are not available from the City. You may either download them from the City's website as discussed above or place a request for a CD to be sent by USPS first class mail. Contract documents may also be obtained by FEDEX by providing recipient account information. All such request shall be sent to planholders@redondo.org. There is no charge for the CD. However, the requestor shall bear all responsibility of requesting the CD in time to submit a Proposal. The City will confirm shipment of the CD with the requestor but shall bear no responsibility for shipping delays.

4. Proposal Forms - Submittal

The proposal shall be made on the forms provided herein with the blank spaces properly filled in. The phraseology shall not be changed, and no additions shall be made to the items mentioned herein. Unauthorized conditions, limitations, or provisions attached to a proposal will render it informal and may cause its rejection. All forms requiring specific information shall be completed with all applicable information for a bid to be considered responsive. Special attention should be given to completing:

- A. Bidder's Qualifications and References;
- B. Designation of Subcontractors; and
- C. Bidder's Bond

Include all proposal forms. Enclose the proposal in a sealed envelope; type or print on the envelope "Proposal for" followed by the title and specification number and the date and time of bid opening as they appear on the cover of this Specification book, and the bidder's name and address. The envelope may be mailed, hand delivered, or delivered by courier or package delivery service.

Mailed proposals shall be addressed as follows:

City Clerk
City of Redondo Beach
P.O. Box 270
Redondo Beach, CA 90277

Proposals that are hand delivered or delivered by courier or package delivery service shall be presented to:



City Clerk
City of Redondo Beach
415 Diamond Street, Door 1
Redondo Beach, CA 90277

Proposals received after bid opening time as stated in this Specification book or at any place other than the office of the City Clerk will not be considered. Prior to the stated bid opening time, a bidder may withdraw his proposal without prejudice to himself by submitting a written request for its withdrawal to the City Clerk.

5. Proposal Form

The full name, business address, zip code, and business telephone number, with area code of the individual, partnership, joint venture, or corporation submitting the proposal shall be typewritten or legibly printed on the proposal. The bidder shall sign the proposal with his usual signature. An individual submitting a proposal or a partner signing for a partnership shall sign in the presence of a Notary Public and the notarial acknowledgment shall be attached to the proposal. A partner shall sign for a partnership and the names and addresses of all partners shall be given. An officer shall sign for a corporation, the corporate name shall be attested by the corporate seal, and the names and titles of all officers of the corporation shall be given. A signature other than a corporate officer's will be accepted if an authenticated power of attorney is attached.

6. Proposal Form - Prices

The bidder shall include in his bid price(s) any and all expense or costs that may be necessary to complete the project in accordance with the requirements of the contract. The bidder shall state for each item on the proposal form, in clearly legible figures, the unit price and item total or lump sum, as the case may be, for which he proposes to supply labor, materials, and equipment and to perform the work required by this Specification. Alteration of a price by erasure or interlineations must be explained or noted in the proposal over the signature of the bidder. In the case of a unit price item, the amount set forth, as the item total shall be the product of the estimated quantity times the unit price bid. In the event of a discrepancy between the unit price bid and the item total, the unit price shall prevail; however, if the unit price is ambiguous, unintelligible, or uncertain for any cause, or is omitted, or is the same amount as the



entry for the item total, then the item total shall prevail and shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price. In the event of a discrepancy between the unit price extension and the total amount bid or summaries of totals, the unit price extension total shall prevail.

7. Bidder's Bond

Each bidder shall submit with his proposal a bidder's bond for not less than 10% of the total amount of the bid, using the form entitled "Bidder's Bond" contained in this Specification, and properly executed and acknowledged by the bidder and by a corporate surety authorized to transact such business in the State of California. Such bond shall be accompanied by a power of attorney from the surety company authorizing the person executing the bond to sign on behalf of the company. If the bond is executed outside the State of California, all copies of the bond must be countersigned by a California representative of the surety. The signature of the person executing the bond shall be acknowledged by a notary public as the signature of the person designated in the power of attorney. The surety or sureties on the bond must be satisfactory to the City. The City will reject a surety bond obtained from any company not holding Certificate of Authority from the U.S. Secretary of the Treasury under the Act of Congress approved July 30, 1947, (6 U.S.C., Secs. 6-13) as acceptable sureties on federal bonds. Any alteration of said form of bidder's bond, or imperfection in the execution thereof, as herein required, will render it informal and may, at the option of the City, result in the rejection of the proposal under which the bidder's bond is submitted.

8. Declaration of Non-collusion

Each bidder shall execute and submit with the proposal the Declaration of Noncollusion. The bidder signing the Declaration of Noncollusion shall meet all requirements for signing the proposal form.

9. Bidder's Qualifications and References

The bidder must complete and submit with the proposal all information required, on both sides of the form, entitled "Bidder's Qualifications and References" and sign the form. If no information is to be filled in a blank space, then write "none".

10. Designation of Subcontractors



The bidder must complete and submit with the proposal the form entitled "Designation of Subcontractors" for all subcontracts in excess of one-half of one percent of the total bid. Subcontractors' names, license numbers and class, DIR registration numbers, and city of business shall be complete and legible. Clearly state that portion of the work to be done by each subcontractor listed, by trade and by estimated dollar amount. If this form is completed by hand in the proposal package, the Contractor shall also submit a typed listing of subcontractors, listing subcontractors' name, complete address, phone number, license, trade and estimated dollar amount within 24 hours of the bid opening.

11. Examination of Drawings, Specifications, and Site of Work

The bidder shall examine carefully the site of the work contemplated and the proposal, drawings, and specifications therefore. The submission of a bid will be conclusive evidence that the bidder has investigated and is satisfied as to the conditions to be encountered, as to the character, quality, and quantities of work to be performed and materials to be furnished, the difficulties to be encountered, and to the requirements of the proposal, drawings, specifications, and other contract documents. The bidder is required to ascertain the locations of the existing utility services, and other underground facilities, and to provide for carrying out his operations so as to cause the minimum possible inconvenience to the occupants of property along any streets affected. All work and costs involved in the safeguarding of the property of others shall be at the expense of the bidder to whom the contract may be awarded.

The bidder hereby certifies that he/she has examined the local conditions, has read each and every clause of the Specifications, and that he has included all costs necessary to complete the specified work in his bid prices, and the bidder agrees that if he is awarded the contract he will make no claim against the City based upon ignorance of local conditions or misunderstanding of any of the provisions of the contract. Should the conditions turn out otherwise than anticipated by him/her, the bidder agrees to assume all risks incident thereto.



12. Interpretation of Specifications

Should a bidder find discrepancies in, or omissions from, the specifications or plans, or should the bidder be in doubt as to their meaning, the bidder shall at once notify the City Engineer, requesting an interpretation or clarification. The person submitting such request will be responsible for its prompt delivery. Should the City Engineer find that the point in question is not clearly and fully set forth; the City Engineer may issue a written addendum which will be sent to all bidders of record. The City Engineer will not be responsible for any other explanation or interpretation of the plans or specifications, or for any oral instructions. If the bidder does not so notify the City Engineer, the bidder shall be conclusively deemed to have read, understood and agreed with all of the information and materials contained in the bid documents.

13. Experience

Bidders, if required, shall present satisfactory evidence that they have been regularly engaged in furnishing such material and equipment and constructing such work as they propose to furnish or construct and that they are fully prepared with necessary capital, equipment, and material to begin work promptly and to conduct it as required by this Specification.

14. Prices and Payments

Approximate quantities listed in the Notice to Contractors and quantities listed for unit price items on the bidding form, are rough estimates given for comparing bids, and no claim shall be made against the City for excess or deficiency therein, actual or relative. Payment at the prices agreed upon will be in full for the completed work and will cover materials, supplies, labor, tools, equipment, and all other expenditures incident to a satisfactory compliance with the contract, unless otherwise specifically provided.

15. Substitutions

To obtain approval during bid period to use unspecified products, bidders shall submit written requests at least ten (10) working days before the bid date and hour. Requests received after this time will not be considered. Requests shall clearly describe the product for which approval is asked, including all data necessary to demonstrate acceptability. If the product is acceptable, an addendum will be issued covering it.



16. Modifying Bid

Any bidder may modify his bid by written communication, provided such communication is received by the City Clerk's Office prior to the bid opening time. The written communication should not reveal the bid price but should state the addition or subtraction or other modification so that the final prices or terms will not be known by the City until the sealed bid is opened.

17. Bid Opening

All proposals will be opened and declared publicly at the time and place stated in the Notice to Contractors. Bidders, their representatives, and other interested parties are invited to be present. After the bid opening, proposals may be inspected at the Engineering Services Division, until 3:00 p.m. on the working day following the bid opening.

18. Mistakes in the Bid

A bidder shall be relieved of a bid due to mistakes only if the bidder can establish to the satisfaction of the City Engineer that all of the following circumstances exist:

- A. A mistake was made.
- B. He or she gave the public entity written notice within five working days, excluding Saturdays, Sundays, and City or state holidays, after the opening of the bids of the mistake, specifying in the notice in detail how the mistake occurred.
- C. The mistake made the bid materially different than he or she intended it to be.
- D. The mistake was made in filling out the bid and not due to error in judgment or to carelessness in inspecting the site of the work, or in reading the plans and specifications.

19. Award

The City reserves the right to reject any or all proposals and to waive technical defects, as the interest of the City may require. Award of contract or rejection of bid proposals will be made by the City within 90 calendar days following the bid opening.



20. Basis of Award

Contract will be awarded to the lowest responsible bidder meeting all requirements set forth in these specifications. The City will award the contract based on the lowest base bid, or the lowest base bid plus the first alternate, or the lowest base bid plus an orderly combination of the alternates, in the order said alternates were advertised.

21. Execution of Contract

Within ten (10) working days after being notified by City that he has been awarded the contract, Contractor shall deliver to the City Engineer the following documents:

1. Two (2) copies of the Agreement in the form included herein, properly executed by Contractor and, if the Contractor is a corporation, evidence of its corporate existence and that the persons signing the Agreement are authorized to do so.
2. Properly executed copies of the following:
 - (a) Faithful Performance Bond,
 - (b) Labor and Material Bond, and
 - (c) Maintenance Bond in accordance with the requirements set forth in Article 11 of the General Conditions and attached thereto.
3. Properly executed copies on the following City forms:
 - (a) The General Liability Endorsement and Waiver of Subrogation,
 - (b) The Automotive Liability Endorsement and Waiver of Subrogation, and
 - (c) Workers' Compensation Waiver of Subrogation.
4. Certificate of Insurance with 30-day notice in accordance with the requirements set forth in Article 11 of the General Conditions and attached thereto.

In any event that the tenth working day falls on Saturday, Sunday or a legal holiday for the State of California, the aforesaid documents shall be delivered by the following working day. After receipt of said documents within said time period or any extension thereof granted by the City Engineer, the City shall execute the Agreement and return one of said two copies to Contractor for his files.



22. General Prevailing Wage Rates

In accordance with Labor Code Section 1770 et seq., this Project is a “public work,” and thus, the Contractor and any Subcontractors must pay wages in accordance with the determination of the Director of the Department of Industrial Relations (“DIR”) regarding the prevailing rate of per diem wages. Copies of those rates are on file with the Public Works Director, and are available to any interested party upon request. Contractor shall post a copy of the DIR’s determination of the prevailing rate of per diem wages at each job site.

23. Failure to Execute Contract

If the bidder to whom the award is made fails to enter into the contract as herein provided and furnish the said bonds and insurance, this shall be just cause for the annulment of the award and the forfeiture of the Bidder's Bond, and an award may, in the discretion of the City Engineer, be made to the bidder whose proposal is the next most acceptable to the City in the opinion of the City Council, and such bidder shall fulfill every term, covenant and condition herein as if he/she were the party to whom the first award was made.

24. Bid Protest Procedures

Any bid protest must be in writing and received by the City’s Project Manager before 5:00 p.m. no later than five working days following bid opening (the “Bid Protest Deadline”) and must comply with the City’s Standard Bid Protest Procedures, which are posted on the City’s website at https://www.redondo.org/depts/public_works/engineering/cip_bid_opportunities/



Proposal

Date: _____, 20____

North Pier Parking Structure Repairs Project, Job No. 70610

TO THE CITY OF REDONDO BEACH, REDONDO BEACH, CALIFORNIA

Pursuant to the foregoing Notice to Contractors, the undersigned bidder herewith submits a proposal on the bidding form or forms attached hereto and made a part hereof, and binds himself on award by the City of Redondo Beach under this proposal to execute in accordance with such award a contract, of which this proposal and the said Notice to Contractors, Instructions to Bidders, Specifications, and drawings shall be a part, and to furnish the bond or bonds required by the Specifications. The attached Notice to Contractors, Instructions to Bidders, Specifications, and drawings are made a part of this proposal and all provisions thereof are hereby accepted.

The bidder acknowledges that the Instructions to Bidders provides, among other things, that the Contract shall be terminated and the bid bond forfeited if the contractor fails to provide the applicable insurance certificates and bonds within the time set forth in Section 21 of the Instructions to Bidders.

The bidder further agrees that, in case of his/her default in executing the required contract and the required bond or bonds, or furnishing the required insurance, the money payable under the bid bond accompanying his proposal shall be applied by the City towards payment of the damage to the City on account of such default, as provided in the specifications.



Firm _____

By _____

(Signature)

Name/Title _____

Address _____

Zip _____

Phone _____

FAX _____

(CORPORATE SEAL OR
NOTARIAL ACKNOWLEDGEMENTS
OF SIGNATURE - IF PARTNERSHIP
OR PROPRIETORSHIP)

Nature of firm (corporation, partnership, etc.)
and names of individual members of the firm,
or names and titles of officers of the
corporation.

Corporation organized under the laws of the

State of: _____



Bidder's Proposal

Name of Bidder: _____

The undersigned, having examined the proposed Contract Documents titled:

North Pier Parking Structure Repairs Project, Job No. 70610

and having visited the site and examined the conditions affecting the work, hereby proposes and agrees to furnish all labor, materials, equipment, and appliances, and to perform operations necessary to complete the work as required by said proposed Contract Documents as itemized below:

BASE BID:

BASE SCOPE OF WORK FOR <u>BASIN LEVEL TO PIER LEVEL</u> (REPAIR & MAINTENANCE)				
WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
PART I: GENERAL REQUIREMENTS/PRELIMINARY MATTERS				
1.0 GENERAL REQUIREMENTS				
1.1	Project Mobilization	L.S.	1	
1.2	Concrete Formwork	Incidental		
1.3	Concrete Shores and Reshores	Incidental		
1.4	Concrete Reinforcement	Incidental		
1.5	Temporary Signage	Incidental		
1.6	Overhead Protection/Temporary Signage/Traffic Control	Incidental		
PART II: CONCRETE FLOOR/CEILING SURFACES				
2.0 FLOOR SURFACE PREPARATION				
2.1	Floor Preparation - Traffic Topping	S.F.	7,500	
3.0 CONCRETE FLOOR REPAIR				
3.1	Floor Repair - Partial Depth/Shallow	S.F.	220	
3.3a	Tee Flange Repair - Full Depth	S.F.	3	



WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
3.3c	Tee joint Repair - Full Depth	S.F.	20	
3.4	Floor Repair - Curbs/Walks	L.F.	20	
PART III: STRUCTURAL CONCRETE FRAME REPAIRS				
5.0 CONCRETE BEAM AND JOIST REPAIR				
5.1	Beam Repair - Partial Depth/Shallow	S.F.	16	
5.3	Beam Repair - Full Depth 12"x15" Rail Section	L.F.	30	
6.0 CONCRETE COLUMN REPAIR				
6.1	Column Repair - Partial Depth/Shallow	S.F.	10	
7.0 CONCRETE WALL REPAIR				
7.1	Wall Repair - Partial Depth/Shallow	S.F.	10	
8.0 PRECAST TEE BEAM REPAIR				
8.4	Tee Flange Repair - Partial Depth	S.F.	71	
PART IV: CRACKS AND JOINTS				
11.0 CRACK AND JOINT REPAIR				
11.5	Epoxy Injection	L.F.	20	
16.0 TRAFFIC TOPPING				
16.5	Traffic Topping (Complete System)	S.F.	7,500	
PART VII: MECHANICAL/ELECTRICAL SYSTEMS				
25.0 MECHANICAL - DRAINAGE				
25.1	Mechanical Allowance	ALLOW	1	\$12,500
30.0 ELECTRICAL - LIGHTING				
30.1	Electrical Allowance	ALLOW	1	\$12,500



WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
PART IX: METAL WORK				
43.0 MISCELLANEOUS METALS				
43.2	Remove/Replace Rail	L.F.	30	
45.0 PAINTING				
45.1	Paint Traffic Markings	L.S.	1	
45.3	Paint Concrete Ceilings and Beams	L.S.	1	
45.7	Clean and Paint Bearing Angles	L.S.	1	
49.0 CATHODIC PROTECTION				
49.1	Cathodic Protection - Discrete Anodes	L.S.	1	
SUBTOTAL				

Description of Abbreviations: L.F. = Lineal Feet, EA = Each, Gal.= Gallon, S.F.= Square Feet, S.Y.= Square Yard, L.S. = Lump Sum, ALLOW = Allowance

BASE SCOPE OF WORK FOR BASIN LEVEL TO PIER LEVEL (SEISMIC STRUCTURAL REPAIR)

WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
PART I: BASE BID				
1.0				
1.1	Basin to Pier Level	L.S.	1	



ADDITIVE BID: Additional Repair & Maintenance and Seismic Structural Repairs work to the pier level to village level of the North Pier Parking Structure.

ADDITIVE SCOPE OF WORK FOR <u>PIER LEVEL TO VILLAGE LEVEL</u> (REPAIR & MAINTENANCE)				
WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
PART I: GENERAL REQUIREMENTS/PRELIMINARY MATTERS				
1.0 GENERAL REQUIREMENTS				
A1.1	Project Mobilization	L.S.	1	
A1.2	Concrete Formwork	Incidental		
A1.3	Concrete Shores and Reshores	Incidental		
A1.4	Concrete Reinforcement	Incidental		
A1.5	Temporary Signage	Incidental		
A1.6	Overhead Protection/Temporary Signage/Traffic Control	Incidental		
PART II: CONCRETE FLOOR/CEILING SURFACES				
2.0 FLOOR SURFACE PREPARATION				
A2.1	Floor Preparation - Traffic Topping	S.F.	7,500	
3.0 CONCRETE FLOOR REPAIR				
A3.1	Floor Repair - Partial Depth/Shallow	S.F.	220	
A3.3a	Tee Flange Repair - Full Depth	S.F.	277	
A3.3b	Tee Flange Repair – Full Depth at Joist	S.F.	90	
A3.3c	Tee joint Repair - Full Depth	S.F.	55	
A3.4	Floor Repair - Curbs/Walks	L.F.	20	
PART III: STRUCTURAL CONCRETE FRAME REPAIRS				
5.0 CONCRETE BEAM AND JOIST REPAIR				
A5.1	Beam Repair - Partial Depth/Shallow	S.F.	94	
A5.3	Beam Repair - Full Depth 12"x15" Rail Section	L.F.	30	
6.0 CONCRETE COLUMN REPAIR				
A6.1	Column Repair - Partial Depth/Shallow	S.F.	10	



WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
7.0 CONCRETE WALL REPAIR				
A7.1	Wall Repair - Partial Depth/Shallow	S.F.	10	
8.0 PRECAST TEE BEAM REPAIR				
A8.1	Tee Beam Repair - Partial Depth/Shallow	S.F.	25	
A8.4	Tee Flange Repair - Partial Depth	S.F.	169	
PART IV: CRACKS AND JOINTS				
11.0 CRACK AND JOINT REPAIR				
A11.5	Epoxy Injection	L.F.	20	
16.0 TRAFFIC TOPPING				
A16.5	Traffic Topping (Complete System)	S.F.	7,500	
PART VII: MECHANICAL/ELECTRICAL SYSTEMS				
25.0 MECHANICAL - DRAINAGE				
A25.1	Mechanical Allowance	ALLOW	1	\$12,500
30.0 ELECTRICAL - LIGHTING				
A30.1	Electrical Allowance	ALLOW	1	\$12,500
SUBTOTAL				

ADDITIVE SCOPE OF WORK FOR <u>PIER LEVEL TO VILLAGE LEVEL</u> (SEISMIC STRUCTURAL REPAIR)				
WORK ITEM	DESCRIPTION	UNITS	QUANTITY	UNIT PRICE
PART I: ADDITIVE BID				
A1.0				
A1.1	Pier to Village Level	L.S.	1	



Total Project Base Bid
North Pier Parking Structure Repairs Project, Job No. 70610

(Basin to Pier Level – Repair & Maintenance + Seismic Structural Repairs)
Base Bid Total in Words

(\$ _____)

(Basin to Pier Level – Repair & Maintenance + Seismic Structural Repairs)
Base Bid Total in Figures

Total Project Base Bid + Additive Items
North Pier Parking Structure Repairs Project, Job No. 70610

(Basin to Pier Level + Pier to Village Level – Repair & Maintenance + Seismic Structural Repairs)
Base + Additive Bid Total in Words

(\$ _____)

(Basin to Pier Level + Pier to Village Level – Repair & Maintenance + Seismic Structural Repairs)
Base + Additive Bid Total in Figures

The City reserves the right to request the unit price of some or all contract items.

Name of Bidder

Amount of Certified Check/Bidder's Bond

Address

Name of Bonding Company

The price shall include all State, Federal, and other taxes applicable to the project, and shall be a firm offer for a period of Ninety (90) days after the date of bid opening.



Bid Bond

Bond No.: _____

KNOW ALL PERSONS BY THESE PRESENTS that:

WHEREAS the City of Redondo Beach, California ("City"), has issued an invitation for bids for the work described as follows:

North Pier Parking Structure Repairs Project, Job No. 70610

WHEREAS _____

(Name and address of bidder)

("Principal"), desires to submit a bid to City or the work.

WHEREAS, bidders are required, under the terms of the Section 20170 of the California Public Contract Code, to furnish a form of bidder's security with their bid.

NOW, THEREFORE, we, the undersigned Principal, and _____

(Name and address of Surety)

("Surety") a duly admitted surety insurer under the laws of the State of California, as Surety, are held and firmly bound unto the City in the penal sum of _____ Dollars (\$_____), being not less than ten percent (10%) of the total bid price, including alternate, in lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the hereby bound Principal is awarded a contract for the work by the City and, within the time and in the manner required by the bidding specifications, enters into the written form of contract included with bidding specifications, furnishes the required bonds, one to guarantee faithful performance and the other to guarantee payment for labor and materials, and furnishes the required insurance coverage, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect.

In case suit is brought upon this bond, Surety further agrees to pay all court costs incurred by the City in the suit and reasonable attorneys' fees in an amount fixed by the court.



IN WITNESS WHEREOF, this instrument has been duly executed by Principal and Surety, on the date set forth below, the name of each corporate party being hereto affixed and these presents duly signed by its undersigned representative(s) pursuant to authority of its governing body.

Dated: _____

"Principal"
Company Name:

"Surety"
Company Name:

By: _____

Name: _____

Its: _____

By: _____

Name: _____

Its: _____

By: _____

Name: _____

Its: _____

By: _____

Name: _____

Its: _____

(Seal)

(Seal)

Note: This bond must be dated, all signatures must be notarized, and evidence of the authority of any person signing as attorney-in-fact must be attached.



Bidder's Qualifications and References

Name of Bidder _____

THE BIDDER SHALL COMPLETE THE FOLLOWING STATEMENTS:

1. The bidder has been engaged in the contracting business, under the present business name, for _____ years.

2. Experience in work of a nature similar to that covered in the Proposal extends over a period of _____ years.

3. The bidder, as a contractor, has never failed to satisfactorily complete a contract awarded to him, except as follows (Name any and all exceptions and reasons therefore):

4. Contractor's License Number, State of California _____ Class _____

5. Contractor's License Expiration Date _____

6. Department of Industrial Relations (DIR) Registration Number _____

7. The following contracts have been satisfactorily completed in the last three years for the persons, firm, or authority indicated; and to whom reference is made. (Name five contracts and include the total contract amount as well as the original bid amount for each contract.)



	YEAR	TYPE OF WORK	FINAL CONTRACT AMOUNT	ORIGINAL BID AMOUNT	LOCATION AND FOR WHOM PERFORMED
A					
B					
C					
D					
E					

8. The following persons may be contacted for information concerning the contract work listed above (list a reference for each contract named).

	NAME	TITLE	ADDRESS	TELEPHONE
A				
B				
C				
D				
E				

9. Reference is hereby made to the following bank or banks as to the financial responsibility of the bidder:

Bank _____ Branch _____

Bank _____ Branch _____

Bank _____ Branch _____



10. Reference is hereby made to the following surety company or companies as to the financial responsibility and general reliability of the bidder:

Surety Company _____ Phone _____

Surety Company _____ Phone _____

11. Following is a list of plant and equipment that is owned by the bidder and is definitely available for use on the proposed project:

QUANTITY	NAME, TYPE AND CAPACITY	CONDITION	LOCATION

(Attach additional sheets as necessary)

12. All of the above statements as to experience, financial qualifications, and available plant and equipment are submitted in conjunction with the proposal, as a part thereof, and the truthfulness and accuracy of the information is guaranteed by the bidder.

Signature of Bidder _____

Name/Title: _____



Designation of Subcontractors

NAME OF BIDDER _____

In compliance with the provisions of the Subletting and Subcontracting Fair Practices Act (Division 2, Part 1), Chapter 4 of the Public Contract Code of the State of California, and any amendments thereof), each bidder shall set forth below:

1. The name and location of the place of business of each subcontractor who will perform work or labor or render service to the Contractor in or about the construction of the work or improvement, or a subcontractor licensed in the State of California who, under subcontract to the Contractor, specially fabricates and installs a portion of the work or improvement according to detailed drawings contained in the plans and specifications, in an amount in excess of one-half of one percent of the Contractor's total bid.

2. The portion and estimated dollar amount of the work which will be done by each subcontractor. The Contractor shall list only one subcontractor for each portion as is defined by the Contractor in his bid.

Please type or legibly print (attach additional sheets as necessary).

Name of Subcontractor	City	Portion	Estimated \$ Amount
Name: License No.: License Class: DIR Registration No.:			
Name: License No.: License Class: DIR Registration No.:			
Name: License No.: License Class: DIR Registration No.:			
Name: License No.: License Class: DIR Registration No.:			
Name: License No.: License Class: DIR Registration No.:			
Name: License No.: License Class: DIR Registration No.:			



Circumvention by the Contractor of the requirement under Section 4104 of the Public Contract Code to list his subcontractors, by the device of listing another contractor who will in turn sublet portions constituting the majority of the work covered by this contract, shall be considered a violation of Division 2, Part 1, Chapter 4 of the Public Contract Code and shall subject the Contractor to the penalties set forth in Sections 4110 and 4111 of the Public Contract Code.

If the Contractor fails to specify a subcontractor or if the Contractor specifies more than one subcontractor for the same portion for work to be performed under the contract in excess of one-half of one percent of the Contractor's total bid, he agrees that he/she is fully qualified to perform that portion himself/herself, and that he/she shall perform that portion himself/herself. If after award of contract, the Contractor subcontracts, except as provided for in Sections 4107 or 4109 of the Public Contract Code, any such portion of the work, the Contractor shall be subject to the penalties named in Section 4111 of the Public Contract Code.

The Contractor shall not:

A. Substitute any person as subcontractor in place of the subcontractor listed in the original bid, except that the City may, except as otherwise provided in Section 4107.5 of the Public Contract Code, consent to the substitution of another person as subcontractor:

1. When the subcontractor listed in the bid, after having had a reasonable opportunity to do so, fails or refuses to execute a written contract, based upon the general terms, conditions, plans and specifications for the project involved or the terms of such contractor's written bid, is presented to him/her by the Contractor, or
2. When the listed subcontractor becomes bankrupt or insolvent, or
3. When the listed subcontractor fails or refuses to perform his/her subcontract, or
4. When the listed subcontractor fails or refuses to meet the bond requirements of the Contractor as set forth in Section 43108 of the Public Contract Code, or
5. When the Contractor demonstrates to the City, subject to the further provisions set forth in Section 4107.5 of the Public Contract Code, that the name of the subcontractor was listed as the result of an inadvertent clerical error, or



6. When the listed subcontractor is not licensed pursuant to the Contractors License Law, or

7. When the City determines that the work performed by the listed subcontractor is substantially unsatisfactory and not in substantial accordance with the plans and specifications, or that the subcontractor is substantially delaying or disrupting the progress of the work.

B. Permit any subcontract to be voluntarily assigned or transferred or allow it to be performed by anyone other than the original subcontractor listed in the original bid, without the consent of the City.

C. Other than in the performance of "change orders" causing changes or deviations from the original contract, sublet or subcontract any portion of the work in excess of one-half of one percent of the Contractor's total bid as to which his original bid did not designate a subcontractor.

Prior to approval of a Contractor's request for a subcontractor substitution, the City will give notice in writing to the listed subcontractor of the Contractor's request to substitute and of the reason for the request. The notice will be served by certified or registered mail to the last known address of the subcontractor. The listed subcontractor who has been so notified shall have five working days within which to transmit to the City written objections to the substitution. Failure to file these written objections shall constitute the listed subcontractor's consent to the substitution.

If written objections are filed, the City will give notice in writing of at least five working days to the listed subcontractor of a hearing by the City on the Contractor's request for substitution.

The Contractor, as a condition to asserting a claim of inadvertent clerical error in the listing of a subcontractor, shall within two working days after the time of the bid opening by the City, give written notice to the City and copies of such notice to both the subcontractor he claims to have listed in error and the intended subcontractor who had bid to the Contractor prior to the bid opening.

Subletting or subcontracting of any portion of the work in excess of one-half of one percent of the Contractor's total bid as to which no subcontractor was designated in the original



bid shall only be permitted in cases of public emergency or necessity, and then only after a finding reduced to writing as a public record of the City setting forth the facts constituting the emergency or necessity.

If the Contractor violates any of the provisions of Division 2, Part 1, Chapter 4 of the Public Contract Code or any amendments thereof, the Contractor violates his contract and the City may exercise the option, in its own discretion, of (1) canceling its contract, or (2) assessing the Contractor a penalty in an amount not more than ten percent of the amount of the subcontract involved, and this penalty shall be deposited in the fund out of which the prime contract is awarded. In any proceedings under Section 4110 of the Public Contract Code the Contractor shall be entitled to a public hearing and to five days notice of the time and place thereof.



Contractor's Affidavit of Non-collusion

STATE OF CALIFORNIA)
) SS
COUNTY OF LOS ANGELES)

_____ being first duly sworn, deposes and says:

1. That he/she is the _____ (Title of office if a corporation: "sole owner," "Partner," or other proper title) of _____, hereinafter called "Contractor", who has submitted to the City of Redondo Beach a proposal for the construction of the **North Pier Parking Structure Repairs Project, Job No. 70610**;

2. That said proposal is genuine; that the same is not sham; that all statements of fact therein are true;

3. That such proposal was not made in the interest or behalf of any person, partnership, company, association, organization, or corporation not named or disclosed.

4. That the Contractor did not, directly or indirectly induce, solicit or agree with anyone else to submit a false or sham bid, to refrain from bidding, or withdraw his/her bid, to raise or fix the bid price of the Contractor price or of anyone else, or to raise or fix any overhead profit, or cost element of the Contractor's price or the price of anyone else; and did not attempt to induce action prejudicial to the interest of the City of Redondo Beach, or of any other bidder, or anyone else interested in the proposed contract;

5. That the Contractor has not in any manner sought by collusion to secure for himself/herself an advantage over any other bidders or induce action prejudicial to the interests of the City of Redondo Beach or of any other bidder, or anyone else interested in the proposed contract;

6. That the Contractor has not accepted any bid from any subcontractor or material man through any bid depository, the bylaws, rules or regulations, of which prohibit or prevent



the Contractor from considering any bid from any subcontractor or material man, which is not processed through said bid depository, or which prevent any subcontractor or material man from bidding to any Contractor who does not use facilities of or accept bids from or through such bid depository;

7. That the Contractor has not been debarred from participation in any state or federal public works project.

8. That the Contractor did not, directly or indirectly, submit the Contractor's bid price or any breakdown thereof, or the contents thereof, or divulge information or data relative thereto to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, or to any individual or group of individuals, except to the City of Redondo Beach, or to any person or persons who have partnership or other financial interest with said Contractor in his business.

Dated this _____ day of _____ 20____

Contractor

Signature

Name/Title

SUBSCRIBED AND SWORN TO BEFORE ME

ON _____

Notary Public in and for the County of
Los Angeles, State of California

Place Notary Seal Above



Pre-Bid Site Inspection Certification

North Pier Parking Structure Repairs Project, Job No. 70610

The bidder hereby certifies that he or she and his or her Subcontractors have inspected the work site of the above project, and have fully acquainted themselves with all conditions and matters which might in any way affect the work, time of completion or the cost thereof. The bidder also certifies he or she has observed the designated Contractor Work Areas and access routes.

BIDDER:

Company Name: _____

Signature: _____

Name/Title: _____

Date: _____

BIDDER'S INSPECTORS:

Name: _____

Title: _____

Date of Inspection: _____

Name: _____

Title: _____

Date of Inspection: _____



Workers' Compensation Certificate

North Pier Parking Structure Repairs Project, Job No. 70610

The bidder hereby certifies that he or she is aware of the provisions of Section 3700 of the Labor Code which requires every employer to be insured against liability for workers' compensation or to undertake self-insurance in accordance with the provisions of that code, and will comply with such provisions before commencing the performance of any work on the above project.

BIDDER:

Company Name: _____

Signature: _____

Name/Title: _____

Date: _____



Reference Standards

The standards referred to, except as modified, shall have full force and effect as though printed in this Specification, and shall be the latest edition or revision thereof in effect on the bid opening date, unless a particular edition or issue is indicated. Copies of these standards are not available from the City. Abbreviations and terms, or pronouns in place of them, shall be interpreted as follows:

AASHTO:	American Associated of State Highway and Transportation Officials, Standard Specifications.
ACI:	American Concrete Institute, Standards
AISC:	American Institute of Steel Construction, Specification for the Design, Fabrications, and Erection of Structural Steel for Buildings, and the AISC Code of Standard Practice.
AMCA:	Air Moving and Conditioning Association, Standards.
ANSI:	American National Standards Institute
APA:	American Plywood Association
API:	American Petroleum Institute
APWA:	American Public Works Association, Standard Specifications for Public Works Construction
ASHRAE:	American Society of Heating, Refrigeration and Air Conditioning Engineers
ASME:	American Society of Mechanical Engineers
ASTM:	American Society for Testing and Materials, Standards
AWPA:	American Wood-Preservers' Association, Standards
AWS:	American Welding Society
AWWA:	American Water Works Association, Standards
CISPI:	Cast Iron Soil Pipe Institute, Standards
CMAA:	Crane Manufacturers' Association of America



CRSI:	Concrete Reinforcing Steel Institute, Standards
CSS:	CalTrans Standard Specifications, State of California, Department of Transportation.
DOSH:	Division of Occupational Safety and Health, State of California, Department of Industrial Relations
ICEA:	Insulated Cable Engineers Association
IEEE:	Institute of Electrical and Electronic Engineers
IESNA:	Illuminating Engineering Society of North America
MSS:	Manufacturers Standardization Society
NAAMM:	National Association of Architectural Metal Manufacturers
NACE:	National Association of Corrosion Engineers, Standards
NEC:	National Electric Code
NEMA:	National Electrical Manufacturers' Association, Standards
RIS:	Redwood Inspection Service, Standard Specifications
SDI:	Steel Door Institute
SMACNA:	Sheet Metal and Air Conditioning Contractors National Association
SSPC:	Steel Structures Painting Council, Specifications
CBC:	California Building Code of the California Building Standards Commission
UL:	Underwriters Laboratories
WCLIB:	West Coast Lumber Inspection Bureau, Standard Grading and Dressing Rules



General Conditions



Article 1

Preliminary Provisions

1.01 City's Representative.

The City Engineer (sometimes herein called "Engineer") shall be the representative of the City and, except as otherwise expressly provided herein, shall make all decisions and interpretations to be made by the City under the provisions of the contract documents.

1.02 Contractor's Representative.

The Contractor shall at all times be represented on the work in person or by a foreman or duly designated agent. Instructions and information given by the Engineer to the Contractor's foreman or agent on the work shall be considered as having been given to the Contractor.

1.03 Permits and Licenses.

A. The Contractor and all subcontractors shall purchase or hold current and valid City of Redondo Beach Businesses Licenses during the entire period of the contract. The Contractor shall obtain all permits required by other agencies of the State and County as well as the City of Redondo Beach. All permits and licenses shall be obtained by and at the expense of the Contractor and/or subcontractors. The Contractor shall enforce the permit requirements. Permit fees to the City of Redondo Beach shall be waived.

B. Where requirements of the permits differ from those of the drawings and specifications, the more stringent requirements shall apply.

C. The Contractor shall be responsible for payment of all assessments, fees, or charges levied or imposed by any governmental or quasi-governmental authority, or public or private utility, in connection with the work during the entire period of the contract.



1.04 Waiver.

Waiver by City of any breach of any term, covenant, or condition contained in the contract documents shall not be deemed to be a waiver of any subsequent breach of the same or any other term, covenant, or condition contained therein, whether of the same or a different character.

1.05 Data Furnished by the Contractor.

The Contractor shall furnish the Engineer reasonable facilities for obtaining such information as he may desire respecting the character of the materials and the progress and manner of the work, including all information necessary to determine its costs, such as the number of men employed, their pay, the time during which they worked on the various classes of construction, and other pertinent data.

1.06 Contract Drawings.

A. The drawings which form a part of this specification are bound in a separate volume.

B. The City will accept no responsibility for errors resulting from misinterpretation or scaling of the drawings.

1.07 Specifications and Drawings.

A. The Contractor shall keep on the job site a copy of all specifications, drawings, and change orders pertaining to the work and shall at all times give the Engineer access thereto. Anything mentioned in the specifications and not shown on the drawings, or shown on the drawings and not mentioned in the specifications shall be of like effect as though shown or mentioned in both. In case of difference between drawings and specifications, the specifications shall govern. City specifications shall govern over referenced standards. If neither is applicable, manufacturer's specifications and instructions shall apply. The Engineer will furnish from time to time such detail drawings, plans, profiles, and information as he may consider necessary for the Contractor's guidance, unless otherwise provided in the proposal, contract, or special requirements.

B. The Specifications for this project are the entire agreement between the Contractor and City, which consist of the aforesaid drawings, the Notice to Contractors, the Instructions to Bidders, the Proposal, Bidding Form, Bid Bond, the Bidder's



Qualifications and References, the Designation of Subcontractors, the Affidavit of Non-collusion, the Pre-bid Site Inspection Certification, the Worker's Compensation Certificate, the Reference Standards, the General Conditions, the Exhibits and the Special Conditions. If no Special Conditions are attached hereto, the Specifications are further deemed to incorporate by reference the latest edition of the Standard Specifications for Public Works Construction as an essential part of the contract documents. Copies of the "Green Book" are available for review at the City Engineer's office or for purchase at the following address: Building News, Inc., 10801 National Blvd., Suite 100, Los Angeles, CA 90064.

C. In the event of a conflict between the Agreement and the General Conditions, the former shall prevail.

D. All documents forming the complete contract are intended to integrate so that any condition or work called for in any one and not mentioned in another shall be executed as if mentioned in all documents and set forth in the drawings.

1.08 Lines, Grades, and Measurements.

A. All lines and grades will be established by the Contractor. The Contractors shall carefully preserve all survey stakes and reference points as far as possible. Should any stakes or points be removed or destroyed unnecessarily by any act of the Contractor or his employees, they must be reset at the Contractor's expense.

B. The Contractor shall inform the Engineer a reasonable length of time in advance of the times and places at which he intends to work in order that inspection may be provided, and that necessary measurements for records and payments may be made with minimum inconvenience.

C. No direct payment will be made for the cost to the Contractor of any of the work or delay occasioned by giving lines and grades, by making other necessary measurements, or by inspection.

1.09 Right of Way.

A. The site for the installation of equipment or the right of way for the works to be constructed under this contract will be provided by the City.

B. The City will provide the appropriate rights of way and property for pipelines and structures. Upon approval by the Engineer, the Contractor may, without cost, use portions of any of the City's rights of way or property which may be suitable for



working space and for storage of equipment and materials. The Contractor will be held responsible for any damage to structures, streets, and roads, and for any damage that may result from his use of City property.

C. In case areas additional to those available on the City's rights of way or property are required by the Contractor for his operations, he shall make arrangements with the property owners for the use of such additional areas at his own expense.

1.10 Assignment of Antitrust Cause of Action.

The Contractor assigns to the City all rights, title, and interest in and to all causes of action it may have under Section 4 of the Clayton Act (15 U.S.C. Sec. 15) or under the Cartwright Act (Chapter 2 (commencing with Section 16700) of Part 2 of Division 7 of the Business and Professions Code), in connection with the Project, such assignment to be effective upon final payment to the Contractor without further acknowledgment by the parties.

1.11 Signs.

Construction signs are not required for this project.



Article 2

Performance of Work

2.01 General.

Contractor will at its own cost and expense furnish all necessary materials, labor, transportation, and equipment for doing and performing said work and the materials used shall comply with the requirements of the contract documents. All work shall be performed and completed as required in the contract documents under the direction and supervision, and subject to the approval of the City Engineer, or his designated representative.

2.02 No Assignment.

Contractor shall not assign the contract or his interest therein in whole or in part without the prior written consent of the City Council, which may be withheld in the City's sole discretion.

2.03 Standard of Performance.

Contractor agrees that all services performed hereunder shall be provided in a manner commensurate with the highest professional standards and shall be performed by qualified and experienced personnel; that any work performed by him under the contract will be performed in the best manner; that any material furnished by him will be the best of its class; and that both work and materials will meet fully the requirements of these plans and specifications.

2.04 Defective Work.

The Contractor shall remove and rebuild at his own expense any part of the work that has been improperly executed, even though it has been included in the monthly estimates. If he refuses or neglects to replace such defective work, prior to acceptance of the work, it may be replaced by the City at the expense of the Contractor, plus 15% for overhead expenses, and his sureties shall be liable therefore. (See Section 2.14 for curing defects after acceptance of the work).



2.05 Communications Regarding the Work.

After award of the contract, all communications regarding the work covered by this Specification shall be addressed to the City Engineer and mailed to:

City of Redondo Beach
Public Works Department
Engineering Services Division
P.O. Box 270
Redondo Beach, California 90277-0270

Or hand delivered to:

City of Redondo Beach
Public Works Department
Engineering Services Division
415 Diamond Street, Door 2
Redondo Beach, California 90277

2.06 Independent Contractor.

The Contractor in the performance of the work hereunder will be acting in an independent capacity and not as an agent, employee, partner, or joint venture of the City.

2.07 Emergency Work.

A. During Working Hours: In case of an emergency which threatens loss or injury of property, and/or safety of life during working hours, the Contractor shall act, without previous instructions from the City, as the situation may warrant. He shall notify the Engineer of the emergency and the action taken immediately thereafter. Any compensation claimed by the Contractor, together with substantiating documents in regard to expense, shall be submitted to the Engineer within 15 calendar days after the emergency. Compensation, if allowed, will be paid for as extra work.

B. Outside of Working Hours: Whenever in the opinion of the City there shall arise, outside of the regular working hours on the contract work, an emergency involving utility services to the public or danger to public safety, the City's forces, agents or public utility operators will handle such emergency work. If such emergency arises out of or is the result of operations by the Contractor, the cost of the corrective measures will be billed to the Contractor and deducted from his payment as provided in the contract



documents. The performance of emergency work by City forces will not relieve the Contractor of any of his responsibilities, obligations, or liabilities under the contract.

2.08 Subcontractors.

A. Each subcontractor shall contain a reference to the contract between the City and the principal Contractor, and the terms of the contract and all parts thereof shall be made part of each subcontract insofar as applicable to the work covered thereby. Each subcontract shall provide for its annulment at the order of the Engineer, if, in his/her opinion, the subcontractor fails to comply with the requirements of the principal contract insofar as the same may be applicable to his work.

B. Nothing contained in this Specification shall be construed as creating any contractual relationship between any subcontractor and the City. The sections of this Specification are not intended to control the Contractor in dividing the work among subcontractors or to limit the work performed by any trade.

C. The Contractor shall be considered the employer of and as fully responsible to the City for the acts and omissions of subcontractors and of persons employed by them, as he is for the acts and omissions of persons directly employed by him.

D. The Contractor shall be responsible for the coordination of the trades, subcontractors, and material men engaged upon his work. It shall be his duty to see that all of his/her subcontractors commence their work at the proper time and carry it on with due diligence so that they do not delay or injure either the work or materials; and that all damage caused by them or their workmen is made good by them or by himself/herself at his/her expense.

E. The City will not undertake to settle differences between the Contractor and his subcontractors or between subcontractors.

F. The Contractor shall utilize the services of properly licensed specialty subcontractors, without additional expense to the City, on those parts of the work which are specified to be performed by specialty contractors.

2.09 Use of Facilities Prior to Completion of Contract.

A. Whenever in the opinion of the Engineer any work under the contract, or any portion thereof, is in a condition suitable for use by the City, the City may, after written notice and designation from the Engineer to the Contractor, use (which includes,



but is not limited to, taking over or placing into service) any portion or portions designated by the Engineer.

B. The use of any portion or portions by the City shall not be construed as, and will not constitute acceptance in any sense, of any portion of the work of the Contractor.

C. All necessary repairs, renewals, changes, or modifications in the work or any portion thereof so used, not due to ordinary wear and tear, but due to defective materials or workmanship, the operations of the Contractor, or any other cause, shall be made at the expense of the Contractor.

D. The use of any portion by the City shall not relieve the Contractor of any of his responsibilities or liabilities under the contract nor constitute a waiver by the City of any of the conditions thereof. Said use shall not cancel liquidated damages as of the first date of use, or any continuance thereof, nor impair, reduce, or change the amount of liquidated damages.

2.10 Cooperation with other Work Forces.

A. The City reserves the right to perform other work at or near the site at any time by the use of its own forces or other contractors.

B. Other contractors, other utilities and public agencies or their contractors, other City contractors, and City personnel may be working in the vicinity during the project construction period. There may be some interference between these activities and the work under this specification. The Contractor shall cooperate and coordinate his work with that of other work forces to assure timely contract completion.

2.11 Agreements with Property Owners.

Agreements with property owners for spoiling excavated material, storing materials, or other purpose related to the work shall be made in writing and a copy submitted to the Engineer for his information.

2.12 Protection of Property.

All public and private property, pavement or improvement shall be safely guarded from injury or loss in connection with this contract by the Contractor at all times. Should any facility, structure, or property be damaged during operations of the Contractor, he shall immediately notify the proper owners or authorities.



2.13 Contractor's Responsibilities for Losses or Liabilities.

A. Risk of Loss: Except as otherwise provided in the contract documents and except as to the cost of repair or restoration of damage to the work caused by an act of God as that term is defined in Section 7105(b) of the Public Contract Code of the State of California, the Contractor shall bear all losses resulting to him on account of the amount or character of the work, or from any unforeseen obstructions or difficulties which may be encountered, or from any encumbrances on the line of the work, or because the nature of the ground in or on which the work is done is different from what is assumed, or on account of the weather, or floods, or other causes.

B. Materials and Facilities: The Contractor shall be responsible for materials and facilities as hereinafter provided and in the event of his failure to carry out said responsibilities, the same may be carried out by the City at the expense of the Contractor:

1. The Contractor shall be responsible for any material furnished by him and for the care of all work until its completion and final acceptance, and he shall at his own expense replace damaged or lost material and repair damaged parts of the work.

2. The Contractor shall protect City facilities from damage resulting from his work. City facilities damaged by or as a result of the Contractor's work under this contract shall be repaired or replaced, as directed by the Engineer, at the Contractor's expense.

3. The Contractor shall remove from the vicinity of the completed work all buildings, rubbish, unused material, concrete forms, and other materials belonging to him or used under his direction during construction.

C. Laws and Regulations:

1. The Contractor shall keep himself fully informed of all laws, ordinances, and regulations in any manner affecting those engaged or employed on the work, or the materials used in the work, or in any way affecting the conduct of the work, and of all orders and decrees of bodies or tribunals having any jurisdiction or authority over the same. If any discrepancy or inconsistency should be discovered in this contract, or in the drawings or specifications herein referred to, in relation to any such law, ordinance, regulation, order, or decree, he shall forthwith report the same in writing to the Engineer.



2. He shall at all times himself observe and comply with, and shall cause all his agents and employees to observe and comply with all such applicable laws, ordinances, regulations, orders, and decrees in effect or which may become effective before completion of this contract.

3. Nothing in these drawings and/or specifications is to be construed to permit work not conforming to such laws, ordinances, and regulations. If the Contractor ascertains at any time that any requirement of this contract is at variance with such applicable law requirement, he shall promptly notify the Engineer.

4. If such applicable law requirement was not in effect on the date of submission of bids, any necessary adjustment of the contract price shall be made as provided in Article 5 of the General Conditions. If such applicable law requirement was in effect on said date of bid submission, no adjustment of contract price will be considered.

5. The Contractor, at his own expense, shall pay all taxes properly assessed against his equipment or property used or required in connection with the work.

2.14 Guarantee of Work.

A. The Contractor guarantees all materials and workmanship against defects for a period of one year, unless noted otherwise, from the date of final acceptance of all work performed under the contract. The date of final acceptance will be as stated on the Notice of Acceptance.

B. The Contractor assumes responsibility for a similar one-year guarantee, unless noted otherwise, for all work and materials provided or performed by subcontractors, manufacturers, or suppliers.

C. The Contractor hereby agrees that if, within a period of one year, unless noted otherwise, after final acceptance of the work done under the contract, any portion of the work installed, constructed, or performed by him/her fails to fulfill any of the requirements of the contract, he/she will, without delay and with the least practicable inconvenience and without further cost to the City, repair or replace defective or otherwise unsatisfactory work or materials. This agreement will not delay acceptance of the work or final payment.



D. Should the Contractor fail to act promptly in accordance with this requirement, or should the exigencies of the case require repairs or replacements to be made before the Contractor can be notified or can respond to notification, the City may at its option make the necessary repairs or replacements, or perform the necessary work, and the Contractor shall pay to the City the actual cost of such repairs plus 15 percent.

E. The Contractor shall be responsible for the full expense incidental to making good any and all of the above guarantees and agreements. The above guarantees and agreements are covenants, the performance of which shall be binding upon the Contractor and his sureties.

2.15 Cleaning and Environmental Controls.

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove waste materials, debris and rubbish from site and dispose off-site legally. Recycling is encouraged. The Contractor should investigate opportunities for recycling.

C. Spoil sites shall not be located where spoil shall be washed back into a street gutter, storm drain, runoff conveyance or ocean.

D. Water containing mud, silt, or other pollutants from activities, shall not be allowed to enter the ocean or placed in locations that may be subject to storm runoff.

E. Any equipment or vehicles driven and/or operated within or adjacent to a street gutter, storm drain, runoff conveyance or ocean shall be checked and maintained daily to prevent leaks of materials that if introduced to water could be deleterious to aquatic life.

F. No debris, soil, silt, sand, bark, slash, sawdust, rubbish, cement or concrete or washings thereof, oil or petroleum products or other organic or earthen material from any construction, or associated activity or whatever nature shall be allowed to enter into or placed where it may be washed by rainfall or runoff into waters of the State. When operations are completed, any excess materials or debris shall be removed from the work area.

G. The Contractor shall comply with all litter and pollution laws. All Contractors, subcontractors and employees shall also obey these laws and it shall be the responsibility of the Contractor to insure compliance.



Article 3

Preliminary Provisions

3.01 Commencement, Prosecution, and Completion of Work

A. Notice to Proceed: The Contractor is not authorized to perform any work under this specification until he has received from the City an official notification to commence work. The date on which the notification is received by the Contractor is herein referred to as the Notice to Proceed. The Contractor shall commence work within ten (10) calendar days after Notice to Proceed. A copy of the Notice to Proceed is included in these specifications. The notification to commence work will not be issued until the contract is properly executed, bonds are furnished and approved, and insurance has been submitted and approved.

B. Prosecution of the Work: Work shall be continued at all times with such force and equipment as will be sufficient to complete it within the specified time. The Contractor expressly proposes that he has taken into consideration and made allowances for all ordinary delays and hindrances to the work to be performed and that he will complete the work within the specified time.

C. Required Contract Completion: Facility shall be made ready for service within ninety (90) working days after the Notice to Proceed is issued. Work on Saturdays or after hours requires prior consent of the City Engineer and is subject to Cost of Overtime Construction Inspection. Work on Sundays or City holidays is generally not permitted.

3.02 City's Discretion to Extend Time

In the event the work required hereunder is not satisfactorily completed in all parts and in compliance with the Contract Documents, City shall have the sole right, in its discretion, to increase the number of working days or not, as may seem best to serve the interest of the City.

3.03 Delays and Extensions of Time for Contractor

A. The Contractor shall take reasonable precautions to foresee and prevent delays to the work. In the event of any delay to the work, the Contractor shall revise



his/her sequence of operations, to the extent possible under the terms of the contract, to offset the delay.

B. If any delay to the work is caused by circumstances within the Contractor's control, it is not excusable and not compensable, and the Contractor will not be entitled to any extension of time or to any other compensation for damages resulting directly or indirectly there from.

C. If any delay having a direct effect on the work is caused by circumstances beyond the control of the Contractor except for causes of delay specified in Paragraph 3.03-D., such delay may be excusable and may entitle the Contractor to an equivalent extension of time, but not to any other compensation. Excusable but not compensable causes include, but are not limited to, labor disputes, weather conditions unfavorable for prosecution of the work, and acts of God.

D. If any delay having a direct effect on the work is caused by failure of the City to provide information as specified, or necessary instructions for carrying on the work, or to provide the necessary right of way or site for installation, or failure of a utility to remove or relocate an existing facility such delay may be compensable and may entitle the Contractor to an equivalent extension of time; and may entitle the Contractor to compensation for damages resulting directly from any of the causes of delay specified in this paragraph.

E. The Contractor shall notify the Engineer in writing of any delay having a direct effect on the work and the causes thereof within 15 days from the beginning of such delay.

F. Any claim for an extension of time or for compensation for damages resulting from delay shall be made in writing to the Engineer not more than 30 days after the ending of such delay. The Contractor shall provide data showing the effect of the delay on the specified completion of the work, that they delay was beyond the control of the Contractor, and that the Contractor has revised his construction schedule, to the extent possible, to offset the delay. No extension of time or compensation for damages resulting from delay will be granted unless the delay affects the timely completion of all work under the contract or the timely completion of a portion of the work for which a time of completion is specified.

G. The Engineer will investigate the facts and ascertain the extent of the delay, and his findings thereon shall be final and conclusive, except in the case of gross



error. In the event of a gross error, the Engineer may reconsider his findings and thereafter his findings shall be final and conclusive.

H. Failure of the Contractor to give written notice of a delay, or to submit or document a claim for an extension of time or for damages resulting from delay in the manner and within the times stated above shall constitute a waiver of all claims thereto.

I. When a Contractor experiences two concurrent delays, one compensable and the other excusable, no compensation other than an extension of time will be allowed.

J. An extension of time must be approved by the Engineer to be effective, but an extension of time whether with or without consent of the sureties, shall not release the sureties from their obligations, which shall remain in full force until the discharge of the contract.

3.04 Climatic Conditions

A. The Engineer may suspend the work whenever weather conditions or conditions resulting from inclement weather are unfavorable for the prosecution of the work. The delay caused by such suspension may entitle the Contractor to an extension of time but not to any other compensation.

B. If the Contractor believes that work should be suspended under this Section 3.04, he may request such suspension. The delay caused by such suspension may entitle the Contractor to an extension of time but not to any other compensation.

C. No extension of time will be granted for suspension of work unless the suspension affects the timely completion of all work under the contract or the timely completion of a portion of the work for which a time of completion is specified. Determination that the suspension for inclement weather conditions or conditions resulting from inclement weather affects timely completion and entitles the Contractor to an extension of time shall be made and agreed to in writing by the Engineer and the Contractor on each day that work is suspended. In the event of failure to agree, the Contractor may protest under the provisions of Section 7.07.

D. If the work is suspended and an extension of time is granted under this Section 3.04 the Contractor will be entitled to a one day extension of time for each day that he is unable to work at least one-half of his current normal work day; and if the work is suspended at the regular starting time on any work day and the Contractor's workforce is dismissed as a result thereof, then he will be entitled to a one day extension of time



whether or not conditions change thereafter and the major portion of the day is suitable for work.

3.05 Safety Hazard

The Engineer may suspend operations if he determines that an imminent safety hazard exists.

3.06 Liquidated Damages

A. The deductions for liquidated damages shall be \$1000/day from date of required contract completion until actual contract completion date.

B. The above liquidated damages are necessary to ensure timely completion and to defray costs of additional construction inspection and contract administration. Timely completion is required to insure that the owner may occupy the building fully, all facilities operational and all construction activities completed in accordance with these specifications.

C. Should the Contractor fail to complete all or any portion of the work within the specified time therefore in Section 3.01, or within such extra time as may be allowed for delays by formal extensions granted by the City, deductions as set forth above will be made from the Contractor's earning for the time that the work remains incomplete after the time set for its completion.

D. It being impracticable or extremely difficult to fix the actual damage, the amount set forth above is hereby agreed upon as liquidated damages and will be deducted from any money due the Contractor under this contract. Should the amount of the damages exceed the amount due the Contractor, he and his sureties shall be liable for the excess.



Article 4

Construction Progress Schedules

4.01 Initial Schedule

A. Within 24 hours after the Notice to Proceed has been given, and prior to the start of any work, the Contractor shall submit to the City Engineer for approval six (6) copies of its proposed construction schedule with subschedules of related activity. If the Engineer notifies the Contractor that the schedule is unacceptable, the Contractor shall submit a revised schedule within 5 working days thereafter.

B. The construction schedule shall be in the form of bar charts with major activities of the project listed in chronological order showing the dates for beginning and completion of each activity.

C. The construction schedule shall also contain:

1. An economic component showing the cost of each activity, the anticipated monthly earnings and a cash flow diagram.

2. A products availability schedule, which shall show the availability dates for contractor furnished equipment affecting the progress of the work, indicate the required delivery dates for City furnished materials and equipment and indicate the required installation date for utility-furnished equipment.

4.02 Revised Schedules

A. After start of the work, the Contractor shall submit revised construction schedules not later than the 1st and 15th day of each month thereafter until completion of the contract.

B. The revised schedules should show any significant changes in activities since submission of the previous schedule with revised projections of progress and completion. It should also provide a narrative report of problem areas, anticipated delays and the impact on the schedule, corrective action recommended and its effect, and the effect of changes on schedules of other contractors involved with the work.



Article 5

Suspension or Termination of Contract

5.01 Suspension of Work-Default by Contractor

A. If the Contractor fails to begin the delivery of the material or to commence work as provided in the contract, or fails to make delivery of material promptly as ordered, or to maintain the rate of delivery of material or progress as ordered, or to maintain the rate of delivery of material or progress of the work in such a manner as in the opinion of the Engineer will ensure a full compliance with the contract within the time limit, or fails to timely pay subcontractors or suppliers, or if in the opinion of the Engineer the Contractor is not carrying out the provisions of the contract in their true intent and meaning, written notice will be served on him to provide within a specified time for a satisfactory compliance with the contract. If he neglects or refuses to comply with such notice, the City may suspend the operation of all or any part of the contract, or it may in its discretion after such notice perform any part of the work or purchase any or all of the material included in the contract or required for the completion thereof at the expense of the Contractor without suspending the contract.

B. Upon suspension of the contract, the Engineer, acting in behalf of the City, may in his discretion take possession of all or any part of the machinery, tools, appliances, materials, and supplies that have been delivered by or on account of the Contractor for use in connection therewith and the same may be used either directly by the City or by other parties for it in the completion of the work suspended; in which case the Contractor shall be credited with a reasonable rental therefor, to be determined by the Engineer; or the City may employ other machinery or materials, purchase the material contracted for in such manner as it may deem proper, or hire such force and buy machinery, tools, appliances, materials, and supplies at the Contractor's expense as may be necessary for the proper conduct and completion of the work. The Contractor shall not make any disposition of the plant, machinery, tools, appliances, supplies, or materials used on or in connection with the work, either by sale or conveyance, inconsistent with these provisions. The Contractor shall comply with any written order of the Engineer to re-commence the work.

5.02 Suspension of Work-Contract without Fault



The work may be suspended in whole or in part when determined by the City Engineer that such suspension is necessary in the best interest of the City, regardless of fault by the Contractor. In such event, the Contractor shall comply immediately with any written order of the Engineer suspending the work and shall comply with any written order of the Engineer re-commencing the work.

5.03 Decision of Engineer Final

The determination of the City Engineer to suspend the work under the provisions of either section 5.01 or 5.02 shall be final and binding upon both parties.

5.04 Remainder of Contract in Effect

Suspension of the contract, or any part thereof, shall operate only to terminate the right of the Contractor to proceed with the work covered by the contract or the suspended portion thereof. The provisions of the contract permitting the City to make changes and to make proper adjustment of accounts to cover any increase or decrease of cost on account of such changes and all other provisions of the contract except those giving the Contractor the right to proceed with work on the items covered by the suspension, shall be and remain in full force and effect after such suspension and until the contract shall have been completed and final payment or final adjustment or accounts made.

5.05 Allocation of Cost

A. Contractor at fault: When the work is suspended in whole or in part in accordance with the provisions of section 5.01 any cost to the City in excess of the contract price, arising from the suspension of the work, or from work performed or purchase made by the City, either before or after suspension, and required on account or failure of the Contractor to comply with his/her contract or the orders of the Engineer issued in pursuance thereof, will be charged to the Contractor and his/her sureties, who shall be liable therefor. If the net credits shall be in excess of the claims of the City against the Contractor, the balance will be paid to the Contractor or his legal representative.

B. Contractor without Fault:

1. Where the work is suspended in whole or in part in accordance with the provisions of section 5.02, the Contractor will be compensated for damages incurred due to delays for which the City is responsible if such delays



are unreasonable in the circumstances involved and were not within the contemplation of the parties when the contract was awarded to the Contractor. Such actual costs will be determined by the Engineer. The City will not be liable for, and in making this determination the Engineer will exclude, all damages which the Engineer determines the Contractor could have avoided by and reasonable means including, without limitation, the judicious handling of forces, equipment, or plant.

2. If the Contractor desires payment for such a delay it shall, within 30 days after the beginning of the delay, file with the City a written request and report as to the cause and extent of the delay. The request for payment or extension must be made at least 15 days before the specified completion date. Failure by the Contractor to file these items within the times specified will be considered grounds for refusal by the City to consider such request.

5.06 Termination of Contract-Default by Contractor

A. The City may terminate the Contractor's performance under the Contract and declare the Contractor in default for any breach of the Contract, which shall include, by way of example and not by limitation: (1) the Contractor fails to begin the delivery of the material or to commence work as provided in the contract; (2) the Contractor fails to make or maintain the rate of delivery of material or progress of work promptly as ordered or required under the contract, or to maintain the rate of delivery of material or progress of the work in such a manner as in the opinion of the Engineer will ensure full compliance with the contract within the time limit; (3) the Contractor fails to make prompt payment to subcontractors, materialmen, laborers or suppliers; (4) the Contractor fails to execute or prosecute the Work properly, or in the manner or location specified in the Contract, or fails to complete the Work entirely on or before any date established for partial or final completion, or fails to maintain a work program or schedule as to ensure the City's interest; (5) if there shall be filed by or against the Contractor in any court a petition in bankruptcy or insolvency or for reorganization or for the appointment of a receiver or trustee of all or a portion of the Contractor's property, and within thirty days therefrom the Contractor fails to secure a discharge thereof; (6) the Contractor makes an assignment for the benefit of creditors or petitions for or enters into an agreement or arrangement with its creditors; (7) the Contractor fails to perform the work in accordance with the contract documents (including without limitation, the failure to supply suitable materials and equipment, or sufficiently skilled workers and a sufficient number thereof,



to perform the work in accordance with the contract documents); (8) the Contractor disregards any applicable law, rule, regulation, order or directive; (9) if, in the reasonable opinion of the Engineer, the Contractor is not complying in good faith with any term or condition of the contract or any order from the City.

B. In the event of such termination, the Contractor will be paid the actual amount due based on unit prices or lump sums bid and the quantity of work completed at the time of cancellation, less damages caused to the City by acts of the Contractor causing the cancellation. The Contractor, in having tendered a Bid, shall be deemed to have waived any and all claims for damages because of cancellation of Contract for any such reason.

C. The procedures for declaring the Contractor in default are as follows. The City shall first serve written notice upon the Contractor, demanding full compliance with the Contract within 5 days after receipt of such notice. The surety on the faithful performance bond may be provided with a copy of such notice. If the Contractor does not comply with such notice within 5 days after receiving it, or if, after starting to comply, the Contractor fails to prosecute the work or otherwise comply with such notice promptly and in good faith, the City may declare Contractor in default, and such default shall be effective immediately upon Contractor's receipt of written notice of default from the City. A copy of such notice of default shall be provided to the surety.

D. In the event that Contractor is served with notice of default, the City may, immediately upon Contractor's receipt of such notice, exclude it from the premises and take possession of all material and equipment, and complete the Work by City forces, by letting the unfinished work to another Contractor, or by a combination of such methods. In any event, the cost of completing the work shall be charged against the Contractor and its Surety and may be deducted from any money due or becoming due from the City. If the sums under the Contract are insufficient for completion, the Contractor or Surety shall pay to the City within five (5) days after the completion all costs in excess of the Contract Price.

E. If the Surety assumes any part of the work, it shall take the Contractor's place in all respects for that part and shall be paid by the City for all work performed by it in accordance with the Contract. If the Surety assumes the entire Contract, all money due the Contractor at the time of its default shall be payable to the Surety as the work progresses, subject to the terms of the Contract.



F. The provisions of this section shall be in addition to all other rights and remedies available to the City under law.

5.07 Termination of Contract - Contractor without Fault

A. The City may terminate the Contract when conditions encountered during the work make it impossible or impracticable to proceed, or when the City is prevented from proceeding with the Contract by act of God, as defined in section 4151(b) of the State Government Code, by law, or by official action of a public authority.

B. When written notice by the Engineer to discontinue work is served upon the Contractor because the Contract has been terminated as provided in subsection A above; the Contractor shall comply immediately with the order of the Engineer.

C. The Contractor shall be paid for work performed to the time of termination at the unit prices named in the contract, or in the event no unit prices are named, a sum equal to that portion of the lump sum price which the work completed to the time of termination bears to the total work to be performed under the contract as determined by the Engineer. In no event will the City be liable to the Contractor for breach of contract, extra work, or damages because of said termination of contract.



Article 6

Changes

6.01 Changes Initiated by City

The City reserves the right to make such alterations, deviations, additions to or deletions from the plans drawings and specifications, including the right to increase or decrease the quantity of any item or portion of work or to omit any item or portion of the work, and to require such changes in the work as are determined by the City Engineer to be necessary or advisable for proper completion or construction of the whole work contemplated.

6.02 Changes at the Contractor's Request

If the Contractor, on account of conditions developing during the progress of the work, finds it impracticable to comply strictly with the plans and specifications and applies in writing for a modification of requirements or of methods of work, such change may be authorized by the Engineer, if not detrimental to the work and if without additional cost to the City.

6.03 Change Orders - Procedure

A. Engineer's Adjustment of Contract Terms: Changes will be set forth in a contract change order. If the work to be done or change to be made causes an increase or decrease in the Contractor's cost of performance of the contract, an equitable adjustment may be made as determined by the Engineer. The contract change order will specify the payment to be made or credit to be taken and adjustment of the contract time, if any. Payment in accordance with the terms and conditions set forth in a contract change order shall constitute full compensation for all work included therein or required thereby.

B. Contractor's Agreement: Contractor shall proceed with the ordered work, unless another starting date is specified. If the Contractor agrees with the terms and conditions of the contract change order, he shall indicate his acceptance by signing the original copy and returning it to the Engineer within 3 days. If the Contractor disagrees with the terms and conditions of such contract change order, he shall proceed with the ordered work and shall submit a written protest in accordance with "E. Protest Procedure."



C. Submittal of Contractor's Proposal of Changes: Prior to issuing an approved contract change order, the Engineer may request that the Contractor submit a proposal covering the changes. The request will include a description of the work or revised drawings or specifications reflecting changes proposed to be ordered. Within 3 days after receiving the request the Contractor shall submit his proposal to the Engineer, including any claim for extension of time and any and all compensation which may be necessary as a result of performing the changes. If the Engineer decides not to issue a contract change order after requesting a proposal from the Contractor, the Contractor will be notified of such decision in writing.

D. Issuance of Engineer's Order: The Engineer may, in writing, order the Contractor to proceed with the work prior to receipt of an approved contract change order therefor. In such case, the Engineer will as soon as practicable issue an approved contract change order for the work and the provisions "E. Protest Procedure" shall be fully applicable to such subsequently issued contract change order. The Contractor shall keep full and complete records of the cost of the ordered work until the method of compensation is determined and the approved change order is received, and shall permit the Engineer to have access to such records. An approved change order shall supersede any previously issued written order covering the same work.

E. Protest Procedure:

1. Should the Contractor disagree with any terms or conditions set forth in an approved change order which he has not executed, he shall submit a written protest to the Engineer within 3 days after the receipt of such approved contract change order. The protest shall state the points of disagreement, contract references, quantities, and costs involved. The Engineer shall consider and investigate such protest within a reasonable time and his decision thereon shall be conclusive and binding against both parties to the contract, except in the case of gross error. If a written protest is not submitted, adjustment of the contract time and payment will be made as set forth in the approved contract change order and shall constitute full compensation for all work included therein or required thereby. An unprotested approved change order will be considered as an executed contract change order.

2. When the protest concerning an approved contract change order relates to compensation, the Contractor shall keep full and complete records of the cost of such work and shall permit the Engineer to have such access thereto



as may be necessary to assist in the determination of the compensation payable for such work.

3. When the protest concerning an approved contract change order relates to the adjustment of contract time for the completion of the work, the time to be allowed therefor will be determined as provided in Section 3.03.

F. Extra Work:

1. Work not covered by any of the items of the bidding form for which there are bid prices or by any combination of such items, as determined by the Engineer, and work specifically designated as extra work in the drawings or specifications is extra work. The Contractor shall furnish the required labor, material, and equipment and shall perform such extra work upon receipt of a contract change order therefor. All labor, material, and equipment shall be subject to approval of the Engineer.

2. Extra work will be paid for by an adjustment of the contract price or on a force-account basis as provided in Section 7.06, or a combination of both, as determined by the Engineer. Extra work will not be paid for unless ordered in writing by the Engineer. The determination of the Engineer on all questions relating to extra work shall be conclusive and binding against both parties to the contract except in the case of gross error.



Article 7

Contract Payments and Claims

7.01 General

- A. Payment will be made at the price for each item listed on the bidding form as extra work as provided in the General Conditions.
- B. Initial progress payment will not be made prior to approval by the Engineer of the Schedule of Costs, the Construction Progress Schedule, and the Schedule of Submittals.
- C. No subsequent progress payment will be made prior to receipt by the Engineer of the monthly revision of the Construction Progress Schedule.

7.02 Schedule of Costs for Payments

- A. The Contractor shall submit to the Engineer, within ten (10) working days after Notice to Proceed, six (6) copies of a Schedule of Costs. The Schedule of Costs shall be a detailed breakdown of quantities and prices of work and materials required to perform and complete the contract.
- B. The total of the price breakdown shall agree with the lump-sum price bid. The price breakdown shall, as a minimum, show the cost of each item of the Construction Progress Schedule, Article 4. Any additional breakdown of the Schedule of Costs, by quantities and prices of work and materials, considered necessary by the Engineer will be as determined by the Engineer. The price breakdown shall not be unbalanced, shall be subject to adjustment between the Engineer and the Contractor, and will be used as a basis for progress payments.
- C. Acceptance of the Schedule of Costs by the Engineer shall not relieve the Contractor of the responsibility of performing all the work needed to complete the projects at the lump-sum price bid.

7.03 Progress Payments

- A. Determination by Engineer: The Engineer will make an approximate measurement of all approved materials delivered to the job site and work performed by the Contractor through the last working day of each calendar month for the purpose of making a progress payment. No payment will be made for the fabrication or production of materials off the job site, or for materials stored off the job site. The Engineer will



classify the work according to items listed on the Bidding Form and will estimate the value thereof and the basis of prices shown, or as extra work. The classification of the work performed and the value thereof will be based on the Schedule of Costs submitted by the Contractor.

B. Five Percent Retention: From the amount thus determined, five percent thereof will be deducted as retention by the City for performance security. The amount of all payments previously made to the Contractor and any amounts due to the City from the Contractor for supplies, materials, services, damages, or otherwise deductible under the terms of the contract will be deducted from the remainder. The remaining amount will be paid as a progress payment by the City to the Contractor thirty (30) days from the date that the undisputed invoice is received.

C. Additional Retention: In addition to the retention under Paragraph B above, the whole or part of any payment of the estimated amount due the Contractor may be withheld as an additional retention if such course be deemed necessary to protect the City from loss due to the Contractor's failure to protect any of the following: (1) meet his obligations; (2) expedite the work; (3) correct rejected work; (4) settle damages as provided; or (5) produce substantial evidence that no claims will or have been filed, and/or if it has been determined that unpaid balance may be insufficient to complete the work.

D. Effect of Progress Payment: All material and work covered by progress payments thereupon become the sole property of the City, but this provision shall not be construed as relieving the Contractor from sole responsibility for all materials and work upon which payments have been made or the restoration of any damaged work as a waiver of the City's right to require fulfillment of all of the contract terms.

E. Contractor Retention Escrow Accounts: Contractor may, at it's own expense, elect to have the said five percent retention paid to a qualified escrow agent, pursuant to Public Contracts Code § 22300, and any escrow agreement shall conform to the requirements of that section and be approved by the City. City approval process includes approval by the City Attorney, the City Council and the City Financial Services Department. Said City approval could take up to 120 calendar days.

7.04 Final Payment and Release of Claims

A. Notice of Acceptance and final payment: Upon completion of the work as determined by the Engineer, a Notice of Acceptance will be issued, and a Notice of Completion will be recorded with the County. The City will pay to the Contractor 35 days



after issuing the Notice of Acceptance, or as soon thereafter as practicable, the remaining amount due the Contractor, less all prior payments and advances whatsoever to or for the account of the Contractor for supplies, materials, services, damages, or otherwise deductible under the terms of the contract. All prior estimates and payments including those relating to extra work shall be subject to correction by this payment, which throughout this contract is called "final payment." A copy of the Notice of Acceptance is included in these specifications.

B. Release of Claims: Neither the final payment nor any part of the retained percentage shall become due until the Contractor shall have delivered to the City a complete release of all claims against the City arising under and by virtue of this contract and related to undisputed amounts, including claims of subcontractors and suppliers of either materials or labor. If disputed contract claims in stated amounts are unresolved 35 days after issuing the Notice of Acceptance, a progress payment of undisputed amounts and retained funds will be made by the City upon receipt of a release specifically excluding the disputed contract claims. Upon resolution of disputed claims, the Contractor shall execute a supplemental release and, upon delivery, the City will make final payment. A copy of the release form is included in these specifications.

C. Acceptance of final payment constitutes release: The acceptance of the final payment by the Contractor shall be and shall operate as a release to the City of all claims and of all liability to the Contractor for all things done or furnished in connection with the work and for every act and neglect of the City and others relating to or arising out of this work. No payments, however, final or otherwise, shall operate to release the Contractor or his sureties from any obligation under this contract or the bonds for payment and for faithful performance.

7.05 Force-Account Payment

A. Computation of Payment: When work is to be paid for on a force-account basis, the Contractor will be paid the costs of labor, materials, and equipment as provided in Paragraphs 7.05.B, 7.05.C and 7.05.D, except when agreement has been reached to pay in accordance with Paragraph 7.05.E. To the total of the costs computed as provided in Paragraphs 7.05.B, 7.05.C and 7.05.D, there will be added a markup of 20 percent to the cost of labor, 15 percent to the cost of materials, and 15 percent to the equipment rental. These markups shall constitute full compensation for profit and for all overhead costs which include superintendence, bond and insurance premiums, and all other items of expense not specifically designated as cost or equipment rental in



Paragraphs 7.05.B, 7.05.C and 7.05.D. The total payment made as provided above shall constitute full compensation for work performed on a force-account basis.

It is understood that labor, materials and equipment may be furnished by the Contractor or by a subcontractor or by others on behalf of the Contractor. When work paid for on a force-account basis is performed by forces other than the Contractor's organization, the Contractor shall reach agreement with such other forces as to the distribution of the payment made by the City for such work and no additional payment therefor will be made by the City.

B. Labor: The cost of labor used in performing the work, whether the employer is the Contractor, subcontractor, or other forces, will be the sum of the following:

1. Actual Wages. Actual wages paid to other workers, including foremen devoting their exclusive attention to the work in question. The actual wages shall include payments to, or on behalf of, workers for health and welfare, pension, vacation, and similar purposes.

2. Labor Surcharge. To the actual wages, as defined in Paragraph 7.05.B.1 above, will be added 27 percent which percentage shall constitute full compensation for all payments imposed by state and federal laws, and for all other payments made to, or on behalf of, the workers, other than actual wages as defined in Paragraph 7.05.B.1 above and the amount paid for travel and subsistence as specified in Paragraph 7.05.B.3 following.

3. Travel and Subsistence. The amount paid to the workers for travel and subsistence as defined in applicable collective bargaining agreements filed with the Department of Industrial Relations under the provisions of Section 1773.8 of the Labor Code.

C. Materials: Only materials incorporated in the work will be paid for, the cost of which will be the cost to the purchaser, whether Contractor, subcontractor, or other forces, from the supplier thereof, except as the following are applicable:

1. If a cash or trade discount by the actual supplier is offered or available to the purchaser, it shall be credited to the City notwithstanding the fact that such discount may not have been taken.

2. If materials are procured by the purchaser by any method which is not a direct purchase from a direct billing by the actual supplier to such



purchaser, the cost of such materials shall be deemed to be the price paid to the actual supplier as determined by the Engineer. No markup except for costs incurred in the handling of such materials will be permitted.

3. If the materials are obtained from a supply or source owned wholly or in part by the purchaser, payment therefor will not exceed the price paid by the purchaser for similar materials furnished from said source on contract items or the current wholesale price for such materials delivered on the job site, whichever price is lower.

4. If the cost of such materials is excessive, in the opinion of the Engineer, then the cost of such materials shall be deemed to be the lowest current wholesale price at which such materials are available in the quantities concerned delivered to the job site, less any discounts as provided in Paragraph 7.05.C.1 above.

5. If the Contractor does not furnish satisfactory evidence of the cost of such materials from the actual supplier thereof, the cost shall then be determined as provided in Paragraph 7.05.C.4 above. The City reserves the right to furnish such materials as it deems advisable, and the Contractor shall have no claims for costs and profit on such materials.

D. Equipment: The Contractor will be paid for the use of equipment at the rental rates established as provided in Paragraph 7.05.D.1 and 7.05.D.2 below, which rates shall include the cost of fuel, oil, lubrication, supplies, small tools, necessary attachments, repairs and maintenance of any kind, depreciation, storage, insurance, and all incidentals. Operators of rented equipment will be paid for as provided in Paragraph 7.05.B above. All rented equipment shall, as determined by the Engineer, be in good working condition for the purpose for which it is to be used. Unless otherwise specified, manufacturers' ratings shall be used to classify equipment for the determination of applicable rental rates.

1. Equipment on the work: For the use of any equipment normally required for the contract regardless of whether the equipment is already on the work or is to be delivered to the work and regardless of ownership and any rental or other agreement entered into by the Contractor for the use of such equipment, the Contractor will be paid as provided herein at the current local rental rates used by the State of California. (Copies of the Equipment Rental Rates used by the State will be furnished on request.) Individual pieces of equipment not listed



and having a replacement value of Two Hundred Dollars (\$200) or less shall be considered to be tools or small equipment and no payment will be made for their use on the work. The hourly rates for equipment not listed under the schedules of rental rates set forth by the State of California shall be those agreed upon by the Contractor and the Engineer prior to the use of the equipment, except that in no case shall the rental rates exceed those of established distributors or equipment rental agencies. In computing the hourly rental of equipment, less than 30 minutes shall be considered 1/2 hour, except that the minimum rental time to be paid per day shall be one hour. Rental time will not be allowed while equipment is inoperative due to breakdowns or non-working days. The rental time of equipment to be paid for shall be the time the equipment is in operation on the force-account work being performed. Loading and transporting costs will be allowed when the equipment is moved by means other than its own power, except that no payment will be made if the equipment is used at the site of the force-account work on other than the force-account work.

2. Equipment not on the work: For the use of equipment not required under the contract and moved in on the work and used exclusively for force-account work, the Contractor will be paid as provided herein and at the rates agreed upon by the Contractor and the Engineer, except that in no case shall the rental rates paid exceed those of established distributors or equipment rental agencies. The rental period shall begin at the time the equipment is unloaded at the site of the force-account work and shall terminate at the end of the day on which the order to discontinue the force-account work is given to the Contractor by the Engineer, except that the minimum total rental time to be paid for shall be not less than eight hours. Except as provided in the last sentence of this paragraph, the Contractor will be paid the cost of transporting the equipment to the work and its return to its original location, provided the original location of the equipment has been agreed to in advance by the Engineer, and provided further that such costs shall not exceed the applicable minimum Public Utility Commission's established rates for transporting the equipment. Should the equipment be transported by low bed trailers, hourly rates charged by established haulers will be paid. Also, the City will pay for loading and unloading costs. Should the Contractor desire the return of the equipment to a location other than its original location, the City will pay the cost of transportation in



accordance with the above provisions, provided such costs does not exceed the cost of moving the equipment to the work. Payment for transporting and loading and unloading the equipment as provided herein will not be made if the equipment is used on the work in any other way than upon the force-account work.

E. Work Performed by Special Forces or Other Special Services: When the Engineer and the Contractor, by agreement, determine that a special service or an item of force-account work cannot be performed by the forces of the Contractor or those of any of his subcontractors, such service or force-account work item may be performed by a specialist. Invoices of such services or item or force-account work on the basis of the current market prices thereof may be accepted without complete itemization of labor, material, and equipment rental costs when it is impracticable and not in accordance with the established practice of the special service industry to provide such complete itemization. In those instances wherein the Contractor is required to perform force-account work necessitating a fabrication or machining process in a fabrication or machine shop facility away from the job site, the charges for that portion of force-account work performed in such facility may, by agreement, be accepted as a specialist billing. To the specialist invoice price, less credit to the City for any cash or trade discount offered or available, whether or not such discount may have been taken, will be added 15 percent in lieu of the percentages provided in Paragraph 7.05.A above.

F. Reporting and Invoicing: All force-account work shall be reported daily upon Daily Cost of Extra Work Sheets furnished by the Engineer to the Contractor and signed by both parties, which daily reports shall thereafter be considered the true record of force-account work done. Complete detailed invoices covering the force-account work shall be submitted for payment no later than 15 days after the completion of the work. Those not so detailed will not be processed for payment until details are furnished. The charges for work performed by the Contractor, by a subcontractor, and by an employee of a subcontractor shall be reported separately. Substantiating invoices from suppliers, vendors, and subcontractors shall be included with the Contractor's invoices. The Contractor shall permit examination of accounts, bills, and vouchers relating to the force-account work, when requested by the Engineer.

7.06 Claims and Protests-Contract Requirements

A. Written Protest: If work demanded of the Contractor is considered by him to be outside the requirements of the contract, or if he considers any decision of the



Engineer to be unfair, he shall, upon such work being demanded or such decision being made, proceed without delay to perform the work or conform to the decision, and shall give written notice of protest to the Engineer within 48 hours. The written notice shall include the date and circumstances of the order or decision and his objections thereto. The Engineer will consider and investigate the protest and his/her decision thereon shall be final and conclusive, except in the case of gross error. In the event of a gross error, the Engineer may reconsider his/her findings and thereafter his/her findings shall be final and conclusive. Except for such protests as are made of record in the manner specified, the Contractor waives all grounds for protest to such orders or decisions of the Engineer.

B. Written Claim: No more than 30 days after submitting a protest in accordance with 7.07.A. above or 30 days after completing the protested work, if that is later, the Contractor shall submit to the Engineer his/her claim concerning the matter so noticed. The claim shall set forth clearly concerning the matter so noticed. The claim shall set forth clearly and in detail, for each item of additional compensation or time adjustment claimed, the reasons for the claim, the references to applicable provisions of the specifications, the nature and amount of cost or time involved, or both, the computations used in determining such cost or time, or both, and all other pertinent factual data. The Contractor shall furnish such clarification and further available information and data may be requested in writing by the Engineer within the time specified in such request. In addition, he/she shall maintain complete and accurate daily records of the costs of any portion of the work for which additional compensation is claimed, and shall give the Engineer access thereto or certified copies thereof as requested. Any order or decisions of the Engineer as to which the Contractor has submitted a protest shall be final and conclusive on the Contractor if he fails to submit or document a claim with respect thereto in the manner and within the times above stated, and such failure shall constitute a waiver of all claims in connection therewith, whether direct, indirect, or consequential in nature.

C. Written Decision: After reviewing the written claim submitted by the Contractor and any additional information furnished by the Contractor and after considering the facts of the matter, the Engineer will give the Contractor written notice of the Engineer's final determination regarding the claim.



Article 8

Materials

8.01 General

A. The Contractor shall furnish all materials needed to complete the work and installations required under the terms of this contract, except those materials specified to be furnished by the City.

B. The Contractor shall submit satisfactory evidence of compliance with the specifications of such materials to be furnished and used in the work as the Engineer may require. Materials incorporated in the work and not specifically covered in the specifications shall be the best of their kind. Unless otherwise specified, all materials and equipment incorporated in the work under the contract shall be new.

8.02 Quality and Workmanship

All materials must be of the specified quality and equal to approved samples, if samples have been required. All work shall be done and completed in a thorough, workmanlike manner, notwithstanding any omission from the specifications or the drawings, and it shall be the duty of the Contractor to call attention to apparent errors or omissions and request instructions before proceeding with the work. The Engineer may, by appropriate instructions, correct errors and supply omissions, which instructions shall be binding upon the Contractor as though contained in the original specifications or drawings. All work performed under this Specification will be inspected by the Engineer as provided in Paragraph 8.04. All work performed within City or County street or State of California freeway rights of way shall meet the requirements of the agency having jurisdiction. All materials furnished and all work done must be satisfactory to the Engineer. Work, material, or equipment not in accordance with this Specification, in the opinion of the Engineer shall be made to conform thereto. Unsatisfactory material and equipment will be rejected, and if so ordered by the Engineer, shall, at the Contractor's expense, be immediately removed from the vicinity of the work.

8.03 Trade Names and "Or Approved Equal" Provision

Whenever in the specifications or in the drawings the name or brand of a manufactured article is used it is intended to indicate a measure of quality and utility or a standard. Except in those instances where the product is designated to match others in



use on a particular improvement either completed or in the course of completion, the Contractor may substitute any other brand or manufacture of equal quality and utility on approval of the Engineer, provided the use of such brand or manufacture involves no additional cost to the City.

8.04 Approval of Materials

A. The Contractor shall furnish without additional cost to the City such quantities of construction materials as may be required by the Engineer for test purposes. He shall place at the Engineer's disposal all available facilities for and cooperate with him in the sampling and testing of all materials and workmanship. The Contractor shall prepay all shipping charges on samples. No samples are to be submitted with the bids unless otherwise specified.

B. Each sample submitted shall be labeled. A letter, in duplicate, submitting each shipment of samples shall be mailed to the Engineer by the Contractor. Both the labels on the sample and the letter of transmittal shall indicate the material represented, its place of origin, the names of the producer and the Contractor, the Specification number and title, and a reference to the applicable drawings and specification paragraphs.

C. Materials or equipment of which samples are required shall not be used on the work until approval has been given by the Engineer in writing. Approval of any sample shall be only for the characteristics of for the uses named in such approval and no other. No approval of a sample shall be taken in itself to change or modify any contract requirement.

D. Failure of any material to pass the specified tests will be sufficient cause for refusal to consider under this contract any further sample of the same brand or make of that material.

8.05 Ordering Materials

One copy of each of the Contractor's purchase orders for materials forming a portion of the work must be furnished to the Engineer, if requested. Each such purchase order shall contain a statement that the materials included in the order are subject to inspection by the City. Materials purchased locally will be inspected at the point of manufacture or supply, and materials supplied from points outside the Los Angeles area



will be inspected upon arrival at the job, except when other inspection requirements are provided for specific materials in other sections of this Specification.

8.06 Authority of the Engineer

On all questions concerning the acceptability of material or machinery, the classification of material, the execution of the work, and conflicting interests of contractors performing related work, the decision of the Engineer shall be final and binding on both parties, except in the case of gross error. The Engineer will make periodic observations of materials and completed work to observe their compliance with plans, specifications, and design and planning concepts, but he is not responsible for the superintendence of construction processes, site conditions, operations, equipment, personnel, or the maintenance of a safe place to work or any safety in, on, or about the site of work.

8.07 Inspection

A. All materials furnished and work done under this contract will be subject to rigid inspection. The Contractor shall furnish, without extra charge, the necessary test pieces and samples, including facilities and labor for obtaining them, as requested by the Engineer. The Engineer, or his authorized agent or agents, at all times shall have access to all parts of the shop and the works where such material under his inspection is being manufactured or the work performed. Work or material that does not conform to the specifications, although accepted through oversight, may be rejected at any stage of the work. Whenever the Contractor of installation or construction is permitted or directed to do night work or to vary the period during which work is carried on each day, he shall give the Engineer due notice, so that inspection may be provided. Such work shall be done under regulations to be furnished in writing by the Engineer.

B. No improvement shall be accepted by the City unless and until it is free of all liens and encumbrances, and free of all material defects and conditions which may create a hazard to the public health, safety, or welfare. In addition, all properties, rights-of-way, easements, and other interests to be dedicated to the City shall be, before acceptance thereof by the City, free and clear of all liens and encumbrances of any kind or character whatsoever and free of any and all material defects and conditions creating a hazard to public health or public safety.



8.08 Infringement of Patents

The Contractor shall hold and save the City, its officers, agents, servants, and employees harmless from and against all and every demand or demands, of any nature or kind, for or on account of the use of any patented invention, process, equipment, article, or appliance employed in the execution of the work or included in the material or supplies agreed to be furnished under the contract, and should the Contractor, his agents, servants, or employees, or any of them, be enjoined from furnishing or using any invention, process, equipment, article, material, supplies or appliance supplied or required to be supplied or used under this contract, the Contractor shall promptly substitute other inventions, processes, equipment, articles, materials, supplies, or appliances in lieu thereof, of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Engineer. Or in the event that the Engineer elects, in lieu of such substitution, to have, supplied, and to retain and use, any such invention, process, equipment, article, material, supplies, or appliances, as may by this contract be required to be supplied and used, in that event the Contractor shall at his expense pay such royalties and secure such valid licenses as may be requisite and necessary to enable the City, its officers, agents, servants, and employees, or any of them, to use such invention, process, equipment, article, material, supplies, or appliances without being disturbed or in any way interfered with by any proceeding in law or equity on account thereof. Should the Contractor neglect or refuse promptly to make the substitution herein before required, or to pay such royalties and secure such licenses as may be necessary and requisite for the purpose aforesaid, then in that event the Engineer shall have the right to make such substitution, or the City may pay such royalties and secure such licenses and charge the cost thereof against any money due the Contractor from the City, or recover the amount thereof from him and his surety, notwithstanding final payment under this contract may have been made.



Article 9

Submittals

9.01 General

A. The Contractor shall submit samples, drawings, and data for the Engineer's approval which demonstrate fully that the construction, and the materials and equipment to be furnished will comply with the provisions and intent of these plans and specifications.

B. Specific items to be covered by the submittals shall include, as a minimum, the following:

1. For structures, submit all shop, setting, equipment, miscellaneous iron and reinforcement drawings and schedules necessary.

2. For conduits, submit a detailed layout of the conduit with details of bends and fabricated specials and furnish any other details necessary. Show location of shop and field welds.

3. For equipment which requires electrical service, submit detailed information to show power supply requirements, wiring diagrams, control and protection schematics, shop test data, operation and maintenance procedures, outline drawings, and manufacturer's recommendation of the interface/interlock among the equipment.

4. For mechanical equipment submit all data pertinent to the installation and maintenance of the equipment including shop drawings, manufacturer's recommended installation procedure, detailed installation drawings, test data and curves, maintenance manuals, and other details necessary.

5. Samples.

6. Colors.

7. Substitutions.

8. Manuals.

9. As-built drawings.

C. Submit a schedule of submittals.

9.02 Product Handling



A. Submittals shall be accompanied by a letter of transmittal and shall be in strict accordance with the provisions of this section.

B. Submit priority of processing when appropriate.

9.03 Schedule of Submittals

Contractor shall provide the City with a schedule of submittals within ten (10) working days from the date of Notice of Award.

9.04 Shop Drawings

A. Scale required: Make all shop drawings accurately to a scale sufficiently large to show all pertinent features of the item and its method of connection to the work.

B. Type of prints required: Make all shop drawings prints in blue or black line on white background. Reproductions of City drawings are not acceptable.

C. Size of drawings required: The overall dimensions of each drawing submitted to the Engineer shall be equal to one of the City's standard sheet sizes as listed below:

Sheet Sizes

Height X Width

11" X 8 1/2"

11" X 17"

24" X 36"

The title block shall be located in the lower right hand corner of each drawing and shall be clear of all lifework, dimensions, details, and notes.

9.05 Colors

Unless the precise color and pattern are specified elsewhere, submit accurate color charts and pattern charts to the Engineer for his review and selection whenever a choice of color or pattern is available in a specified product. Label each chart naming the source, the proposed location of use on the project, and the project.

9.06 Manufacturers' Literature



Where contents of submitted literature from manufacturers includes data not pertinent to the submittal, clearly show which portions of the contents are being submitted for review.

9.07 Substitutions

A. Engineer's approval required:

1. The contract is based on the materials, equipment, and methods described in the Contract Documents. Any Contractor-proposed substitutions are subject to the Engineer's approval.

2. The Engineer will consider proposals for substitution of materials, equipment, and methods only when such proposals are accompanied by full and complete technical data, and all other information required by the Engineer to evaluate the proposed substitution.

B. Trade names and "or approved equal" provision: See Article 8.03.

9.08 Manuals

A. Format: When manuals are required to be submitted covering items included in this work, prepare such manuals in approximately 8-1/2" X 11" format in durable plastic binders and with at least the following:

1. Identification on, or readable through, the front cover stating general nature of the manual.

2. Neatly typewritten index near the front of the manual, furnishing immediate information as to location in the manual of all emergency data regarding the installation.

3. Complete instructions regarding operation and maintenance of all equipment involved.

4. Complete nomenclature of all replaceable parts, their part numbers, current cost, and name and address of nearest vendor of parts.

5. Copy of all guarantees and warranties issued.

6. Copy of drawings with all data concerning changes made during construction.

B. Extraneous data: Where contents of manuals include manufacturers' catalog pages, clearly indicate the precise items included in this installation and delete,



or otherwise clearly indicate, all manufacturers' data with which this installation is not concerned.

9.09 As-Built Drawings

A. When required to be submitted covering items included in this work, the Contractor shall deliver to the City one complete set of final As-Built reproducible drawings for City records before the contract will be accepted by the City.

B. The drawings shall be duplicates and at the same size and dimensional scale as the originals. They shall be on a polyester translucent base material with a minimum sheet thickness of .003 inch (.08mm).

C. The legibility and contrast of each drawing submitted to the City shall be such that every line, number, letter, and character is clearly readable in a full size blow back from a 35 mm microfilm negative of the drawing.

9.10 Submittals Quantities

A. Submit six (6) copies of all data and drawings unless specified otherwise.

B. Submit all samples, unless specified otherwise, in the quantity to be returned, plus two, which will be retained by the Engineer.

9.11 Identification of Submittals

Completely identify each submittal and resubmittal by showing at least the following information:

1. Name and address of submitter, plus name and telephone number of the individual who may be contacted for further information.

2. Name of project as it appears in this specification and specification number.

3. Drawing number and specification section number other than this section to which the submittal applies.

4. Whether this is an original submittal or resubmittal.

5. For samples, indicate the source of the sample.

9.12 Schedule of Submittals

A. Submit initial schedule of submittals within ten (10) days after Notice of Award.



B. Submit revised schedule of submittals within five (5) days after date of request from the Engineer.

C. Engineer will review schedule of submittals and will notify Contractor that schedule is acceptable or not acceptable within 5 days after receipt.

9.13 Coordination of Submittals

A. Prior to submittal for Engineer's review, use all means necessary to fully coordinate all material, including the following procedures:

1. Determine and verify all field dimensions and conditions, materials, catalog numbers, and similar data.
2. Coordinate as required with all trades and with all public agencies involved.
3. Secure all necessary approvals from public agencies and others and signify by stamp, or other means, that they have been secured.
4. Clearly indicate all deviations from the contract documents.

B. Unless otherwise specifically permitted by the Engineer, make all submittals in groups containing all associated items; the Engineer may reject partial submittals as not complying with the provisions of the contract documents.

9.14 Timing of Submittals

A. Make all submittals far enough in advance of scheduled dates of installation to provide all required time for reviews, for securing necessary approvals, for possible revision and resubmittal, and for placing orders and securing delivery.

B. In scheduling, allow at least ten (10) working days for the Engineer's review, plus the transit time to and from the City office.

C. Manuals shall be submitted prior to performing functional tests.

9.15 Approval by City

A. One copy of each submittal, except manuals, schedule of costs for progress payments, and as-built drawings will be returned to the Contractor marked "Approved," "Approved as Noted," or "Returned for Correction," Manuals, schedule of costs and as-built drawings will be returned for resubmittal if incomplete or unacceptable.



B. Submittals marked "Approved as Noted" need not be resubmitted, but the notes shall be followed.

C. If submittal is returned for correction, it will be marked to indicate what is unsatisfactory.

D. Resubmit revised drawings or data as indicated, in seven (7) copies.

E. Approval of each submittal by the Engineer will be general only and shall not be construed as:

1. Permitting any departures from the contract requirements.
2. Relieving the Contractor of the responsibility for any errors and omissions in details, dimensions, or of other nature that may exist.
3. Approving departures from additional details or instructions previously furnished by the Engineer.

9.16 Changes to Approved Submittals

A. Resubmittal is required for any proposed change to an approved submittal. Changes which require resubmittal include, but are not necessarily limited to, drawing revisions, changes in materials and equipment, installation procedures and test data. All resubmittals shall include an explanation of the necessity for the change.

B. Minor corrections to an approved submittal may be accomplished by submitting a "Corrected Copy."



Article 10

Safety

10.01 Protection of Persons and Property

Notwithstanding any other provision of these specifications, the Contractor shall be solely and completely responsible for conditions of the job site, including safety of all persons and property, during performance of the work. This requirement will apply continuously and will not be limited to normal working hours. Safety and sanitary provisions shall conform to applicable Federal, State, County, and local laws, regulations, ordinances, standards, and codes. Where any of these are in conflict, the more stringent requirement shall be followed.

10.02 Protection from Hazards

A. Trench Excavation Safety Plans: Attention is directed to the provisions of Section 6705 of the Labor Code. Excavation for any trench 5 feet or more in depth shall not begin until the Contractor has received approval from the Engineer of the Contractor's detailed plan for worker protection from the hazards of caving ground during the excavation of such trench. Such plan shall show the details of the design of shoring, bracing, sloping or other provisions to be made for worker protection during such excavation. No such plan shall allow the use of shoring, sloping or protective system less effective than that required by the Construction Safety Orders of the Division of Occupational Safety and Health, and if such plan varies from the shoring system standards established by the Construction Safety Orders, the plan shall be prepared and signed by an engineer who is registered as a Civil or Structural Engineer in the State of California.

B. Confined Spaces:

1. Tests for the presence of combustible or dangerous gases shall be made with an approved device immediately prior to a worker entering a confined space and at intervals frequent enough to ensure a safe atmosphere during the time a worker is in such a structure. A record of such tests shall be kept at the job site. Sources of ignition, including smoking, shall be prohibited in any confined space until after the atmosphere within the confined space has been tested and found safe. Note: Confined spaces for the purpose of this Article shall mean the interior of storm drains, sewers, vaults, utility pipelines,



manholes, reservoirs, and any other such structure which is similarly surrounded by confining surfaces so as to permit the accumulation of dangerous gases or vapors.

2. No employees shall be permitted to enter or remain within a confined space until such confined space is free of concentrations of harmful gases, and lack of oxygen, unless the employee is wearing suitable and approved respiratory equipment. Confined spaces that contain or that have last been used as container of toxic gases, light oils, hydrogen sulfide, corrosives, or poisonous substances, shall, in every case, be tested by means of approved devices or chemical analysis before being entered without wearing approved respiratory equipment. Reservoirs, vessels, or other confined spaces having openings or manholes in the side as well as in the top shall be entered from the side opening or manholes when practicable.

C. Material Safety Data Sheet: Attention is directed to the provisions of General Industry Safety Orders, Section 5194, Title 8, California Administrative Code. The Contractor shall submit to the Engineer a Material Safety Data Sheet (MSDS) for each hazardous substance proposed to be used, ten days prior to the delivery of such material to the job site or use of such material at a manufacturing plant where the Engineer is to perform an inspection. For materials which are to be tested in City laboratories, the MSDS shall be submitted with the sample(s). Hazardous substance is defined as any substance included in the list (Director's List) of hazardous substances prepared by the Director, California Department of Industrial Relations, pursuant to Labor Code Section 6382. Failure to submit an MSDS for any hazardous substance may result in actions as provided in Article 5, "SUSPENSION OR TERMINATION OF CONTRACT", of these General Conditions.

10.03 Differing Site Conditions

A. Attention is directed to Section 7104 of the Public Contract Code.

B. The Contractor shall promptly, and before such conditions are disturbed, notify the Engineer in writing of:

1. Material that the Contractor believes may be hazardous waste, as defined in Section 25117 of the Health and Safety Code that is required by law to be removed to a Class I, Class II, or Class III disposal site.



2. Subsurface or latent physical conditions at the site differing materially from those indicated in its contract.

3. Unknown physical conditions at their site, of an unusual nature, differing materially from those ordinarily encountered and generally recognized as inherent in work of the character provided for in this contract.

C. The Engineer will promptly investigate the conditions. If he finds that such conditions do materially differ, or do involve hazardous waste, and do cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work under this contract, an equitable adjustment will be made, as determined by the Engineer.

D. In the event of disagreement between the Contractor and the Engineer whether the conditions do materially differ or whether a hazardous waste is involved or whether the conditions cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the work, the Contractor shall not be excused from any completion date required by the contract, but shall proceed with all work to be performed under the contract.

E. The Contractor shall retain all rights provided by, and shall be subject to all requirements of, this contract which pertain to the resolution of disputes and protests.

10.04 Traffic Regulation

A. Temporary Safeguards: During the performance of the work the Contractor shall erect and maintain necessary temporary fences, bridges, railings, lights, signals, barriers, or other safeguards as shall be appropriate under the circumstance in his judgment for the prevention of accidents; and he shall take other precautions as necessary for public safety including, but not limited to, traffic control. Traffic control shall be conducted in accordance with the latest edition of the California Manual on Traffic Control Devices (CAMUTCD).

B. Submittals: Contractor shall submit at least 15 days prior to work a detailed traffic control plan, that is approved by all agencies having jurisdiction and that conforms to all requirements of these specifications.



C. Quality Assurance:

1. No changes or deviations from the approved detailed traffic control plan shall be made, except temporary changes in emergency situations, without prior approval of the Engineer and all agencies having jurisdiction.

2. Contractor shall immediately notify the Engineer and the agencies having jurisdiction of occurrences that necessitate modification of the approved traffic control plan.

10.05 Traffic Control Devices

Traffic signs, flashing lights, barricades and other traffic safety devices used to control traffic shall conform to the requirements of the California Manual on Traffic Control Devices (CAMUTCD).

A. Portable signals shall not be used unless permission is given in writing by the agency having jurisdiction.

B. Warning signs used for nighttime conditions shall be reflectorized or illuminated. "Reflectorized signs" shall have a reflectorized background and shall conform to the current State of California Department of Transportation specification for reflective sheeting on highway signs.

10.06 Execution

A. Roads subject to interference from the work covered by this contract shall be kept open, and the fences subject to interference shall be kept up by the Contractor until the work is finished. Except where public roads have been approved for closure, traffic shall be permitted to pass through designated traffic lanes with as little inconvenience and delay as possible.

B. Where alternating one-way traffic has been authorized, the maximum time that traffic will be delayed shall be posted at each end of the one-way traffic section. The maximum delay time shall be approved by the agency having jurisdiction.

C. Contractor shall install temporary traffic markings where required to direct the flow of traffic and shall maintain the traffic markings for the duration of need. Contractor shall remove the markings by abrasive blasting when no longer required.

D. Convenient access to driveways and buildings in the vicinity of work shall be maintained as much as possible. Temporary approaches to, and crossing of, intersecting traffic lanes shall be provided and kept in good condition.



E. When leaving a work area and entering a roadway carrying public traffic, the Contractor's equipment, whether empty or loaded, shall in all cases yield to public traffic.

10.07 Flagging

Contractor shall provide flaggers to control traffic where required by the approved traffic control plan.

A. Flaggers shall perform their duties and shall be provided with the necessary equipment in accordance with the current "Instructions to Flaggers" of the California Department of Transportation.

B. Flaggers shall be employed full time on traffic control and shall have no other duties.



Article 11

Indemnity, Insurance and Bonds

11.01 Indemnity Standard Specifications

The indemnity provisions shall be as follows.

11.01-1 Contractor's Duty

To the maximum extent permitted by law, Contractor hereby agrees, at its sole cost and expense, to defend with competent defense counsel approved by the City Attorney, protect, indemnify, and hold harmless the City, its elected and appointed officials, officers, employees, volunteers, attorneys, agents (including those City agents serving as independent contractors in the role of City representative), successors, and assigns (collectively "Indemnitees") from and against any and all claims (including, without limitation, claims for bodily injury, death or damage to property), demands, charges, obligations, damages, causes of action, proceedings, suits, losses, stop payment notices, judgments, fines, liens, penalties, liabilities, costs and expenses of every kind and nature whatsoever, in any manner arising out of, incident to, related to, in connection with or resulting from any act, failure to act, error or omission of Contractor or any of its officers, agents, attorneys, servants, employees, Subcontractors, material suppliers or any of their officers, agents, servants or employees, arising out of, incident to, related to, in connection with or resulting from any term, provision, image, plan, covenant, or condition in the Contract Documents, including without limitation, the payment of all consequential damages, attorneys' fees, experts' fees, and other related costs and expenses (individually, a "Claim," or collectively, "Claims"). Contractor shall promptly pay and satisfy any judgment, award or decree that may be rendered against Indemnitees in any such Claim. Contractor shall reimburse Indemnitees for any and all legal expenses and costs incurred by each of them in connection therewith or in enforcing the indemnity herein provided. Contractor's obligation to indemnify shall not be restricted to insurance proceeds, if any, received by Contractor or Indemnitees. This indemnity shall apply to all Claims regardless of whether any insurance policies are applicable or whether the Claim was caused in part or contributed to by an Indemnitees.

11.01-2 Civil Code Exception

Nothing in this Section 11.01 shall be construed to encompass Indemnitees' sole negligence or willful misconduct to the limited extent that the underlying Contract is subject to Civil Code Section 2782(a) or the City's active negligence to the limited extent that the underlying Contract Documents are subject to Civil Code Section 2782(b), provided such sole



negligence, willful misconduct or active negligence is determined by agreement between the parties or by the findings of a court of competent jurisdiction.

11.01-3 Nonwaiver of Rights

Indemnitees do not and shall not waive any rights that they may possess against Contractor because the acceptance by City, or the deposit with City, of any insurance policy or certificate required pursuant to these Contract Documents. This indemnity provision is effective regardless of any prior, concurrent, or subsequent active or passive negligence by Indemnitees and shall operate to fully indemnify Indemnitees against any such negligence.

11.01-4 Waiver of Right of Subrogation

Contractor, on behalf of itself and all parties claiming under or through it, hereby waives all rights of subrogation and contribution against the Indemnitees, while acting within the scope of their duties, from all Claims arising out of or incident to the activities or operations performed by or on behalf of the Contractor regardless of any prior, concurrent or subsequent active or passive negligence by Indemnitees.

11.01-5 Survival

The provisions of this Section 11.01 shall survive the term and termination of the Contract, are intended to be as broad and inclusive as is permitted by the law of the State, and are in addition to any other rights or remedies that Indemnitees may have under the law. Payment is not required as a condition precedent to an Indemnitee's right to recover under this indemnity provision, and an entry of judgment against a Contractor shall be conclusive in favor of the Indemnitee's right to recover under this indemnity provision.

11.02 Minimum Scope of Insurance

Contractor shall maintain minimum insurance coverage, at least as broad as following:

- A. Insurance Services Office Commercial General Liability coverage (occurrence form CG 0001).
- B. Insurance Services Office form number CA 0001 (Ed. 1/87) covering Automobile Liability, code 1 (any auto).
- C. Workers' Compensation insurance as required by the State of California and Employer's Liability Insurance. California Labor Code Sections 1860 and 3700 provide that every contractor will be required to secure the payment of compensation to



its employees. In accordance with the provisions of California Labor Code Section 1861, the Contractor hereby certifies as follows:

“I am aware of the provisions of Section 3700 of the Labor Code which require every employer to be insured against liability for workers’ compensation or to under take self-insurance in accordance with the provisions of that code, and I will comply with such provisions before commencing the performance of the work of this contract.”

11.03 Minimum Limits of Insurance

Contractor shall maintain minimum insurance limits no less than the following:

- A. General Liability: \$1,000,000 per occurrence for bodily injury, personal injury and property damage. The general aggregate limit shall apply separately to this project/location.
- B. Automobile Liability: \$1,000,000 per accident for bodily injury and property damage.
- C. Employer’s Liability: \$1,000,000 per accident for bodily injury or disease.

11.04 Deductibles and Self-Insured Retentions

Any deductibles or self-insured retentions must be declared to and approved by the City. At the option of the City, either: (1) the insurer shall reduce or eliminate such deductibles or self-insured retentions as respects the City, its officers, officials, employees and volunteers, or (2) the Contractor shall provide a financial guarantee satisfactory to the City guaranteeing payment of losses and related investigations, claim administration and defense expenses.

11.05 Other Insurance Provisions

The general liability and automobile liability policies are to contain, or be endorsed to contain, the following provisions:

- A. Additional Insured Endorsement:
 - 1. General Liability: The City, its officers, elected and appointed officials, employees, and volunteers are to be covered as insureds with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts or equipment furnished in connection with such work or operations. General liability coverage can be provided in the form of an endorsement to the contractor’s insurance, or as a separate owner’s policy.



2. Automobile Liability: The City, its officers, elected and appointed officials, employees, and volunteers are to be covered as insureds with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the Contractor.

B. For any claims related to this project, the Contractor's insurance coverage shall be primary insurance as respects the City, its officers, elected and appointed officials, employees, and volunteers. Any insurance or self-insurance maintained by the City, its officers, officials, employees, or volunteers shall be excess of the Contractor's insurance and shall not contribute with it.

C. Each insurance policy required by this clause shall be endorsed to state that coverage shall not be canceled by either party, except after thirty (30) days prior written notice by certified mail, return receipt requested, has been given to the City.

D. Each insurance policy shall be endorsed to state that the inclusion of more than one insured shall not operate to impair the rights of one insured against another insured, and the coverages afforded shall apply as though separate policies had been issued to each insured.

E. Each insurance policy shall be in effect prior to awarding the contract and each insurance policy or a successor policy shall be in effect for the duration of the project. The maintenance of proper insurance coverage is a material element of the contract and failure to maintain or renew coverage or to provide evidence of renewal may be treated by the City as a material breach of contract on the Contractor's part.

11.06 Acceptability of Insurers

Insurance is to be placed with insurers with a current A.M. Best's rating of no less than A:VII.

11.07 Verification of Coverage

Contractor shall furnish the City with original certificates and amendatory endorsements effecting coverage required by this clause. The endorsements should be on the City authorized forms provided with the contract specifications. Standard ISO forms which shall be subject to City approval and amended to conform to the City's requirements may be acceptable in lieu of City authorized forms. All certificates and endorsements are to be received and approved by the City before the contract is awarded. The City reserves the right to require complete, certified copies of all required



insurance policies, including endorsements effecting the coverage required by these specifications at any time.

11.08 Subcontractors

Contractor shall include all subcontractors as insured under its policies or shall furnish separate certificates and endorsements for each subcontractor. All coverages for subcontractors shall be subject to all of the requirements stated herein.

11.09 Risk Management

Contractor acknowledges that insurance underwriting standards and practices are subject to change, and the City reserves the right to make changes to these provisions in the reasonable discretion of its Risk Manager.

11.10 Endorsements and Certificate

A. Contractor shall have its insurance carrier(s) complete and execute the following documents, together with a copy of each insurance policy required under the contract, including all endorsements thereto, which shall be delivered to the City Engineer within ten (10) working days following issuance of the Resolution of Award of Public Works Project:

1. Form entitled: General Liability Endorsement, attached hereto as Exhibit A.
2. Form entitled: Automotive Liability Endorsement, attached hereto as Exhibit B.
3. Proof of Worker's Compensation Insurance (Employer's Liability), or if Contractor is self-insured for worker's compensation, a self-insuring certificate therefor from the State of California.
4. Form entitled: Waiver of Subrogation Clause and Contribution, attached hereto as Exhibit C, for all coverage and policies.
5. Form entitled: Certificate of Insurance, with 30 days' prior notice of cancellation required as to all coverage and policies.

B. The contract will not be executed by the City and the Notice to Proceed issued until the aforesaid insurance documents have been received and approved by the City. City's decision as to the acceptability of all insurance documents is final. No



substitution of the form of the documents or the endorsements or amendments thereto will be permitted without the prior written consent of City.

11.11 Bonds

A. Contractor shall furnish the following bonds:

1. A Faithful Performance Bond in an amount equal to One Hundred percent (100%) of the contract price on City form, attached hereto as Exhibit E.

2. A Payment Bond (Labor and Material) in an amount equal to One Hundred percent (100%) of the total contract price on City form, attached hereto as Exhibit F.

3. A Maintenance Bond in an amount equal to Ten percent (10%) of the total contract price on City form, attached hereto as Exhibit G.

B. All such bonds shall be accompanied by a power of attorney from the surety company authorizing the person executing the bond to sign on behalf of the company. If the bonds are executed outside the State of California, all copies of the bonds must be countersigned by a California representative of the surety. The signature of the person executing the bond shall be acknowledged by a notary public as the signature of the person designated in the power of attorney.

C. The surety or sureties on all bonds furnished must be satisfactory to the City. City will reject surety bonds obtained from any company which is not an admitted surety insurer under the laws of the State of California and which does not hold a Certificate of Authority from the U.S. Secretary of the Treasury under 31 U.S.C. §§ 9304-9306 as an acceptable surety on federal bonds. The surety must also be listed in the latest edition of U.S. Department of Treasury Circular 570, and the bonds provided must not exceed the surety's bonding limitations as set forth in Circular 570. Bonds shall be in multiples of \$1,000 only; provided, however, that the amount of the bond shall otherwise be fixed at the lowest sum that will fulfill all conditions herein set forth.

D. If during the continuance of the Contract any of the sureties, in the opinion of the City, are or become non-responsible or otherwise unacceptable to City, City may require other new or additional sureties, which the Contractor shall furnish to the satisfaction of City within ten days after notice, and in default thereof the contract may be suspended and the materials may be purchased or the work completed as provided in Article 5 herein.



E. No modifications or alterations made in the work to be performed under the contract or the time of performance shall operate to release any surety from liability on any bond or bonds required to be given herein. Notice of such events be waived by the surety.

F. The contract will not be executed by City nor the Notice to Proceed issued until the aforesaid bonds have been received and approved by City. City's decision as to the acceptability of all sureties and bonds is final. No substitution of the form of the documents will be permitted without the prior written consent of City.



Article 12

Labor Provisions

12.01 Working Hours

A. Work or activity of any kind shall be limited to the hours from 7:00 a.m. to 6:00 p.m. Monday through Friday. City Hall is closed every other Friday.

B. Work on Saturdays, Sundays, or City holidays requires prior consent of the City Engineer and is subject to Cost of Overtime Construction Inspection.

C. City holidays are:

New Year's Eve
New Year's Day
Martin Luther King, Jr. Day
Presidents' Day
Memorial Day (last Monday in May)
Independence Day
Labor Day
Veterans Day
Thanksgiving Day
Friday after Thanksgiving Day
Christmas Eve
Christmas Day

12.02 Cost of Overtime Construction Inspection

A. Overtime construction work performed at the option of, or for the convenience of, the Contractor will be inspected by the City at the expense of the Contractor. For any such overtime beyond the regular 8-hour day and for any time worked on Saturday, Sunday, alternating City Hall closed Fridays, or holidays the charges will be as shown in the following schedule:

<u>Class</u>	<u>Charge per Hour</u>
Civil Engineer	\$75.00
Associate Engineer	\$70.00
Assistant Engineer	\$60.00
Construction Inspector	\$50.00



Other equipment as identified in City Council Resolution, Fees for Public Works permits, inspections, reviews and services for sewer connection fees.

B. There will be no charges for the inspection of overtime work ordered by the City Engineer or required by the specifications.

12.03 Compliance with State Labor Code

A. Contractor acknowledges that this project is a “public work” as defined in Division 2, Part 7, Chapter 1 (commencing with Section 1720) of the California Labor Code (“Chapter 1”), and that this Agreement is subject to (1) Chapter 1, including without limitation Labor Code Section 1771 and (2) the rules and regulations established by the Director of Industrial Relations (“DIR”) implementing such statutes. Contractor shall perform all work on the project as a public work. Contractor shall comply with and be bound by all the terms, rules and regulations described in (1) and (2) as though set forth in full herein.

B. California law requires the inclusion of specific Labor Code provisions in certain contracts. The inclusion of such specific provisions below, whether or not required by California law, does not alter the meaning or scope of Section 12.03 A above.

C. Contractor acknowledges that eight (8) hours labor constitutes a legal day’s work. Contractor shall comply with and be bound by Labor Code Section 1810. Contractor shall comply with and be bound by the provisions of Labor Code Section 1813 concerning penalties for workers who work excess hours. The Contractor shall, as a penalty to the City, forfeit twenty-five dollars (\$25) for each worker employed in the performance of this Agreement by the Contractor or by any subcontractor for each calendar day during which such worker is required or permitted to work more than eight (8) hours in any one (1) calendar day and forty (40) hours in any one calendar week in violation of the provisions of Division 2, Part 7, Chapter 1, Article 3 of the Labor Code. Pursuant to Labor Code Section 1815, work performed by employees of Contractor in excess of 8 hours per day, and 40 hours during any one week shall be permitted upon public work upon compensation for all hours worked in excess of 8 hours per day at not less than 1 and 1/2 times the basic rate of pay.

D. For every subcontractor who will perform work on the project, Contractor shall be responsible for such subcontractor’s compliance with Chapter 1 and Labor Code



Sections 1860 and 3700, and Contractor shall include in the written contract between it and each subcontractor a copy of those statutory provisions and a requirement that each subcontractor shall comply with those statutory provisions. Contractor shall be required to take all actions necessary to enforce such contractual provisions and ensure subcontractor's compliance, including without limitation, conducting a periodic review of the certified payroll records of the subcontractor and upon becoming aware of the failure of the subcontractor to pay his or her workers the specified prevailing rate of wages (described in Section 12.04 below). Contractor shall diligently take corrective action to halt or rectify any failure.

E. Pursuant to Labor Code Section 1771.4, Contractor shall post job site notices, as prescribed by regulation.

F. Pursuant to Labor Code Section 1771.4(a)(1), project is subject to compliance monitoring and enforcement by the Department of Industrial Relations.

12.04 Wage Rates

A. State Prevailing Wages: The Contractor shall pay its workers on this City project, in accordance with the prevailing wage rate.

1. Pursuant to Labor Code Section 1773.2, copies of the prevailing rate of per diem wages for each craft, classification, or type of worker needed to perform the Agreement are on file at City Hall and will be made available to any interested party on request. Contractor acknowledges receipt of a copy of the DIR determination of such prevailing rate of per diem wages, and Contractor shall post such rates at each job site covered by this Agreement.

2. Contractor shall comply with and be bound by the provisions of Labor Code Sections 1774 and 1775 concerning the payment of prevailing rates of wages to workers and the penalties for failure to pay prevailing wages. The Contractor shall, as a penalty to the City, forfeit the maximum amount allowable by law for each calendar day, or portion thereof, for each worker paid less than the prevailing rates as determined by the DIR for the work or craft in which the worker is employed for any public work done pursuant to this Agreement by Contractor or by any subcontractor. The difference between the prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which such worker was paid less than the stipulated prevailing wage rate shall be paid to such worker by the Contractor.



3. The specified wage rates are minimum rates only and the City will not consider and shall not be liable for any claims for additional compensation made by the Contractor because of payment by him of any wage rate in excess of the general prevailing rates. All disputes in regard to the payment of wages in excess of those specified herein shall be adjusted by the Contractor at his own expense.

4. The holidays upon which such rates shall be paid shall be all holidays recognized in the collective bargaining agreement applicable to the particular craft, classification, or type of worker employed on the project.

5. Pursuant to Section 1773.8 of the Labor Code, travel and subsistence payments shall be made to each worker needed to execute the work, as such travel and subsistence payments are defined in the applicable collective bargaining agreements filed with the Director of Industrial Relations, State of California.

B. Federal Prevailing Wages: In the event this is a federally assisted construction contract, Contractor acknowledges that federal labor standards provisions, including prevailing wage requirements of the Davis-Bacon and Related Acts, will be enforced. Contractor understands that in the event of a conflict between the Federal General Wage Decision as established by the United States Department of Labor (available at www.access.gpo.gov/davisbacon/ca.html) and the State General Prevailing Wage Determination as established by the California Department of Industrial Relations (available at <http://www.dir.ca.gov/DLSR/PWD/index.htm>), the higher of the two will prevail. The City will not consider and shall not be liable for any claims for additional compensation made by the Contractor because of payment by him of any wage rate in excess of the federal wage rates. All disputes in regard to the payment of wages in excess of those specified herein shall be adjusted by the Contractor at its own expense.

C. Payroll Records: Contractor shall comply with and be bound by the provisions of Labor Code Section 1776, which requires Contractor and each subcontractor to (1) keep accurate payroll records and verify such records in writing under penalty of perjury, as specified in Section 1776, (2) certify and make such payroll records available for inspection as provided by Section 1776, and (3) inform the City of the location of the records, including the street address, city and county, and shall, within five working days, provide a notice of a change in location and address. The Contractor and every subcontractor shall keep an accurate record showing the name of and the actual hours worked each calendar day and each calendar week by each worker employed by him in connection with the work. Upon request by the City Engineer, the



Contractor shall provide a copy of the certified payroll records along with a statement of compliance.

12.05 Employment of Apprentices

A. Contractor shall comply with and be bound by the provisions of Labor Code Sections 1777.5, 1777.6 and 1777.7 and California Administrative Code title 8, section 200 et seq. concerning the employment of apprentices on public works projects. Contractor shall be responsible for compliance with these aforementioned Sections for all apprenticeable occupations. Prior to commencing work under this Agreement, Contractor shall provide City with a copy of the information submitted to any applicable apprenticeship program. Within sixty (60) days after concluding work pursuant to this Agreement, Contractor and each of its subcontractors shall submit to the City a verified statement of the journeyman and apprentice hours performed under this Agreement.

B. In the event the Contractor or any subcontractor willfully fails to comply with the aforesaid sections, such Contractor or subcontractor shall be subject to the penalties for noncompliance in Labor Code Section 1777.7.

12.06 Character of Workmen

The Contractor shall not allow its agents or employees, its subcontractors, or any agent or employee thereof, to trespass on premises or lands in the vicinity of the work. Only skilled foremen and workmen shall be employed on work requiring special qualifications, and when required by the City Engineer, the Contractor shall discharge any person who commits trespass or in the opinion of the City Engineer disorderly, dangerous, insubordinate, incompetent, or otherwise objectionable. Any employee being intoxicated or bringing or having intoxicating liquors on the work shall be discharged. Such discharge shall not be the basis of any claim for compensation of damages against the City or any of its officers.



Exhibits





GENERAL LIABILITY ENDORSEMENT
CITY OF REDONDO BEACH
415 DIAMOND STREET
REDONDO BEACH, CA 90277

POLICY INFORMATION

Insurance Company _____ Policy Number _____

Policy Term (From) _____ (To) _____ Endorsement Effective Date _____

Named Insured _____

Address of Named Insured _____

Limit of Liability any One Occurrence/Aggregate \$ _____ / _____

General Liability Aggregate Applies Separately to This Project/Location:

Yes _____ No _____

Deductible or Self-Insured Retention (None unless otherwise specified): _____

Coverage is equivalent to Commercial General Liability occurrence form CG 0001:

Yes _____ No _____

POLICY AMENDMENTS

1. WHO IS AN INSURED (Section II) is amended to include as an insured the City of Redondo Beach, its officers, elected and appointed officials, employees, and volunteers, but only with respect to liability arising out of work or operations performed by or on behalf of the Contractor including materials, parts or equipment furnished in connection with such work or operations.
2. This insurance shall be primary as respects the insured shown in the schedule above, or if excess, shall stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by the Insured scheduled above shall be in excess of this insurance and shall not be called upon to contribute with it.
3. The insurance afforded by this policy shall not be canceled except after thirty days prior written notice by certified mail return receipt requested has been given to the City.



INCIDENT AND CLAIM REPORTING PROCEDURE

Incidents and claims are to be reported to the insurer at:

(Name/Department)

(Company)

(Address)

(City/State/Zip)

(Phone)

SIGNATURE OF INSURER OR AUTHORIZED REPRESENTATIVE OF THE INSURER

I, _____ (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature - Authorized Representative / Title

Organization

Address/Telephone

Date





AUTOMOBILE LIABILITY ENDORSEMENT

CITY OF REDONDO BEACH

415 DIAMOND STREET
REDONDO BEACH, CA 90277

POLICY INFORMATION

Insurance Company _____ Policy Number _____

Policy Term (From) _____ (To) _____ Endorsement Effective Date _____

Named Insured _____

Address of Named Insured _____

Limit of Liability any One Occurrence/Aggregate \$ _____ / _____

Deductible or Self-Insured Retention (None unless otherwise specified): _____

Coverage is equivalent to Commercial Auto form CA 0001, Code 1 ("any auto") on endorsement CA 0025: Yes _____ No _____

POLICY AMENDMENTS

1. **WHO IS AN INSURED** (Section II) is amended to include as an insured the City of Redondo Beach, its officers, elected and appointed officials, employees, and volunteers, but only with respect to liability arising out of automobiles owned, leased, hired or borrowed by or on behalf of the Contractor.
2. This insurance shall be primary as respects the insured shown in the schedule above, or if excess, shall stand in an unbroken chain of coverage excess of the Named Insured's scheduled underlying primary coverage. In either event, any other insurance maintained by the Insured scheduled above shall be in excess of this insurance and shall not be called upon to contribute with it.
3. The insurance afforded by this policy shall not be canceled except after thirty days prior written notice by certified mail return receipt requested has been given to the City.



INCIDENT AND CLAIM REPORTING PROCEDURE

Incidents and claims are to be reported to the insurer at:

(Name/Department)

(Company)

(Address)

(City/State/Zip)

(Phone)

INCIDENT AND CLAIM REPORTING PROCEDURE

I, _____ (print/type name), warrant that I have authority to bind the below listed insurance company and by my signature hereon do so bind this company.

Signature - Authorized Representative / Title

Organization

Address/Telephone

Date





WAIVER OF SUBROGATION AND CONTRIBUTION

CITY OF REDONDO BEACH

415 DIAMOND STREET
REDONDO BEACH, CA 90277

The contractor and the insurer, jointly and severally, on behalf of themselves, and all parties claiming under or through them, hereby waive all rights of subrogation and contribution against the City of Redondo Beach and its officers, employees, elected officials, attorneys, members of boards and commissions, agents, and volunteers (hereinafter collectively referred to as "City"), while acting within the scope of their duties, from all claims, losses and liabilities arising out of or incident to the perils insured against in connection with the performance of the work under the designated contract by the contractor, its subcontractors, and the respective officers, agents and employees thereof, regardless of any prior, concurrent, or subsequent active or passive negligence by city.

Designated Contract: **North Pier Parking Structure Repairs Project, Job No. 70610**

Name of Contractor: _____

Name of Insurer: _____

Policy No(s): _____

CONTRACTOR

INSURER

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____



(Name, Address and Phone No. of Contractor)

Date: _____

City of Redondo Beach
415 Diamond Street
Redondo Beach, CA. 90277

Subject: North Pier Parking Structure Repairs Project, Job No. 70610

Dear Sir/Madam:

(Contractor's Name) hereby assumes sole responsibility for any and all deductibles on all its Policies, and shall cover any and all claims that might arise out of working by/for (Contractor's Name) on the above subject project, that said deductibles might not cover.

Authorized Representative

Name: _____

Title: _____



Performance Bond

Bond No.: _____

KNOW ALL PERSONS BY THESE PRESENTS that:

WHEREAS, the City of Redondo Beach, California ("City"), has awarded to

(Name and address of Contractor)

("Principal"), a contract ("Contract") for the work described as follows:

North Pier Parking Structure Repairs Project, Job No. 70610

WHEREAS, Principal is required under the terms of the Contract to furnish a bond for the faithful performance of the Contract.

NOW, THEREFORE, we, the undersigned Principal, and

(Name and address of Surety)

("Surety") a duly admitted surety insurer under the laws of the State of California, as Surety, are held and firmly bound unto the City in the penal sum of

_____ Dollars (\$_____), this amount being not less than one hundred percent (100%) of the total contract price, in lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the hereby bound Principal, its heirs, executors, administrators, successors or assigns, shall in all things stand to and abide by, and will and truly keep and perform all the undertakings, terms, covenants, conditions and agreements in the Contract and any alteration thereof made as therein provided, on the Principal's part to be kept and performed, all within the time and in the manner therein specified, and in all respects according to their true intent and meaning, and shall indemnify and hold harmless the City, its officers, agents, and others as therein provided, then this obligation shall become null and void; otherwise, it shall be and remain in full force and effect. In case suit is brought upon this bond, Surety further agrees to pay all court costs incurred by the City in the suit and reasonable attorneys' fees in an amount fixed by the court.



FURTHER, the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, addition or modification to the terms of the Contract, or of the work to be performed thereunder, or the specifications for the same, shall in any way affect its obligations under this bond, and it does hereby waive notice of any such change, extension of time, alteration, addition, or modification to the terms of the Contract or to the work or to the specifications thereunder.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original hereof, have been duly executed by Principal and Surety, on the date set forth below, the name of each corporate party being hereto affixed and these presents duly signed by its undersigned representative(s) pursuant to authority of its governing body.

Date: _____

"Principal"

"Surety"

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

(Seal)

(Seal)

CITY OF REDONDO BEACH

**APPROVED AS TO SURETY
AND PRINCIPAL AMOUNT**

APPROVED AS TO FORM

By: _____

By: _____

Risk Manager

City Attorney

Note: This bond must be executed in duplicate and dated. All signatures must be notarized, and evidence of the authority of any person signing as attorney-in-fact must be attached.



Payment Bond

(Labor and Material)

Bond No.: _____

KNOW ALL PERSONS BY THESE PRESENTS that:

WHEREAS, the City of Redondo Beach, California ("City"), has awarded to

(Name and address of Contractor)

("Principal"), a contract ("Contract") for the work described as follows:

North Pier Parking Structure Repairs Project, Job No. 70610

WHEREAS, Principal is required under the terms of the Contract and the California Civil Code secure the payment of claims of laborer, mechanics, materialmen, and other persons as provided by law

NOW, THEREFORE, we, the undersigned Principal, and

(Name and address of Surety)

("Surety") a duly admitted surety insurer under the laws of the State of California, as Surety, are held and firmly bound unto the City in the penal sum of _____ Dollars (\$ _____), this amount being not less than one hundred percent (100%) of the total contract price, in lawful money of the United States of America, for the payment of which sum well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if the hereby bound Principal, its heirs, executors, administrators, successors or assigns, or subcontractors shall fail to pay any of the persons named in Section 3181 of the California Civil Code, or any amounts due under the Unemployment Insurance Code with respect to work or labor performed under the Contract, or for any amounts required to be deducted, withheld, and paid over to the Employment Development Department from the wages of employees of the Principal and subcontractors pursuant to Section 13030 of the Unemployment Insurance Code, with respect to work or labor performed under the Contract, the Surety will pay for the same in an amount not exceeding the penal sum specified in this bond; otherwise, this obligation shall become null and void. This bond shall inure to the benefit of any of the persons named in Section 3181 of the California Civil Code so as to give a right of action to such persons or their assigns in any suit brought upon the bond. In case suit is brought upon this bond, Surety further agrees to pay all



court costs incurred by the City in the suit and reasonable attorneys' fees in an amount fixed by the court.

FURTHER, the Surety, for value received, hereby stipulates and agrees that no change, extension of time, alteration, addition or modification to the terms of the Contract, or of the work to be performed thereunder, or the specifications for the same, shall in any way affect its obligations under this bond, and it does hereby waive notice of any such change, extension of time, alteration, addition, or modification to the terms of the Contract or to the work or to the specifications thereunder.

IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original hereof, have been duly executed by Principal and Surety, on the date set forth below, the name of each corporate party being hereto affixed and these presents duly signed by its undersigned representative(s) pursuant to authority of its governing body.

Date: _____

"Principal"

"Surety"

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

(Seal)

(Seal)

CITY OF REDONDO BEACH

**APPROVED AS TO SURETY
AND PRINCIPAL AMOUNT**

APPROVED AS TO FORM

By: _____

By: _____

Risk Manager

City Attorney

Note: This bond must be executed in duplicate and dated. All signatures must be notarized, and evidence of the authority of any person signing as attorney-in-fact must be attached



Maintenance Bond

Bond No.: _____

KNOW ALL PERSONS BY THESE PRESENTS that:

WHEREAS, the City of Redondo Beach, California ("City"), has awarded to

(Name and address of Contractor)

("Principal"), a contract ("Contract") for the work described as follows:

North Pier Parking Structure Repairs Project, Job No. 70610

WHEREAS, the Principal is required to furnish a bond in connection with said contract guaranteeing the maintenance thereof.

NOW, THEREFORE, we, the undersigned Contractor and Surety, are held firmly bound unto the City in the penal sum of _____ Dollars (\$ _____), this amount being not less than ten percent (10%) of the total contract price, be paid to the City, its successors and assigns, for which payment will and truly to be made we bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents

THE CONDITION OF THIS OBLIGATION IS SUCH THAT, if bound Principal fails to make at its expense, in order to restore the work to full compliance with the requirements of the above-mentioned contract or any modifications or amendments thereto, any and all repairs and replacements made necessary by defects in materials or poor workmanship that become evident within one (1) year after the date of final payment to the Contractor, or if the Contractor fails to hold the City harmless from claims of any kind arising from damage due to said defects in materials or poor workmanship, then the Surety or sureties shall pay to the City and the City shall be entitled to retain and use the full amount of the Maintenance Bond set forth above, or any portion thereof sufficient to permit City or any contractors or subcontractors selected by the City to do the work in order to restore it to full compliance with the requirements of the contract or any modifications or amendments thereto, and sufficient to hold the City harmless from claims arising from defects in materials or poor workmanship; otherwise, the above obligations shall be void. If suit is brought to enforce the terms of this Maintenance Bond, the prevailing party shall be entitled to receive from the other party costs of suit, including reasonable attorneys' fees.



IN WITNESS WHEREOF, two (2) identical counterparts of this instrument, each of which shall for all purposes be deemed an original hereof, have been duly executed by Principal and Surety, on the date set forth below, the name of each corporate party being hereto affixed and these presents duly signed by its undersigned representative(s) pursuant to authority of its governing body.

Date: _____

"Principal"

"Surety"

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

By: _____

By: _____

Name: _____

Name: _____

Its: _____

Its: _____

(Seal)

(Seal)

CITY OF REDONDO BEACH

**APPROVED AS TO SURETY
AND PRINCIPAL AMOUNT**

APPROVED AS TO FORM

By: _____

By: _____

Risk Manager

City Attorney

Note: This bond must be executed in duplicate and dated. All signatures must be notarized, and evidence of the authority of any person signing as attorney-in-fact must be attached.





**CITY OF REDONDO BEACH
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION**

NOTICE OF AWARD OF PUBLIC WORKS CONTRACT

DATE: _____

(Name, Address and Phone No. of Contractor)

NOTICE IS HEREBY GIVEN that the aforesaid contractor is the successful bidder for the **North Pier Parking Structure Repairs Project, Job No. 70610**, as more particularly described in the plans and specifications therefore, and incorporated herein by reference, and is awarded the contract for the projects. Prior to signature of the Mayor to the contract, all applicable insurance certificates and bonds shall be provided to the City. **The aforesaid contractor acknowledges that the Contract shall be terminated and the bid bond forfeited if the contractor fails to provide the applicable insurance certificates and bonds within the time set forth in Section 21 of the Instructions to Bidders.**

CITY OF REDONDO BEACH

By: _____

Lauren Sablan, Acting City Engineer



AGREEMENT

North Pier Parking Structure Repairs Project, Job No. 70610

THIS AGREEMENT is made and entered into at Redondo Beach, California, this ____ day of ____, 20__ by and between the CITY OF REDONDO BEACH, a chartered municipal corporation ("City") and _____, a California Corporation ("Contractor").

THE PARTIES HERETO AGREE AS FOLLOWS:

1. CONTRACT DOCUMENTS

Contractor agrees to construct the **North Pier Parking Structure Repairs Project, Job No. 70610**, in accordance with the documents hereinafter described, which are by reference incorporated herein and made a part hereof, and are in the Office of the City Engineer:

- A.** Plans for the North Pier Parking Structure Repairs Project, Job No. 70610.
- B.** Specifications for the North Pier Parking Structure Repairs Project, Job No. 70610.
- C.** Notice to Contractors, including ascertaining of prevailing wage scale established by Resolution of the City Council of the City of Redondo Beach, which wage scale is on file and available for inspection by any party at the City Clerk's Office.
- D.** Instruction to Bidders.
- E.** Proposal for the construction of the North Pier Parking Structure Repairs Project, Job No. 70610, executed by the Contractor, date_____.
- F.** Addenda.



2. PAYMENT

In consideration thereof the City agrees to pay to the Contractor the sum of

_____ ,

payable as set forth in Article 7 of the General Conditions.

IN WITNESS WHEREOF, the parties have caused this Agreement to be executed the date and year first above written.

By: _____

Name/Title: _____

CITY OF REDONDO BEACH

By: _____
JAMES LIGHT, MAYOR

ATTEST:

Eleanor Manzano, City Clerk

Seal

APPROVED AS TO FORM:

Michael W. Webb, City Attorney





**CITY OF REDONDO BEACH
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION**

NOTICE TO PROCEED

DATE: _____

(Name, Address and Phone No. of Contractor)

NOTICE IS HEREBY GIVEN that the aforesaid contractor is hereby authorized to proceed with the **North Pier Parking Structure Repairs Project, Job No. 70610**, as more particularly described in the plans and specifications therefore, and incorporated herein by reference, starting _____.

Unless otherwise provided, the contract time shall commence on said _____, and work shall be diligently prosecuted to completion within the time provided in Article 3.

CITY OF REDONDO BEACH

By: _____

Lauren Sablan, Acting City Engineer



Contractor's Waiver and Affidavit

(Individual)

STATE OF CALIFORNIA)
) SS
COUNTY OF LOS ANGELES)

First being duly sworn, deposes and says:

That he/she, as general contractor on _____, entered into a written contract with the City of Redondo Beach, as owner, for the construction of the **North Pier Parking Structure Repairs Project, Job No. 70610**, in the City of Redondo Beach, County of Los Angeles, State of California.

That said improvement was fully completed on _____.

That all bills for labor and/or material furnished in connection with the construction of said buildings and work of improvements have been fully paid;

That said affiant further certifies and declares that he/she will testify or depose before any competent tribunal, officer, or person, in any case now pending or hereafter instituted, to the truth of the foregoing statements and each of them.

Contractor or Contractor's Authorized Agent

SUBSCRIBED AND SWORN TO BEFORE ME

ON _____

Notary Public in and for the County of
Los Angeles, State of California

Place Notary Seal Above





**CITY OF REDONDO BEACH
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION**

NOTICE OF ACCEPTANCE

DATE: _____

(Name, Address and Phone No. of Contractor)

NOTICE IS HEREBY GIVEN that the aforesaid contractor has satisfactorily completed the **North Pier Parking Structure Repairs Project, Job No. 70610**, in accordance with the project plans, specifications, and authorized changes, and that at its regular meeting held on _____, 20____, Redondo Beach City Council formally accepted said project as satisfactorily completed.

The release of retention will be 35 days from the date of the Notice of Acceptance.

CITY OF REDONDO BEACH

By: _____

Lauren Sablan, Acting City Engineer



RECORDING REQUESTED BY:

CITY OF REDONDO BEACH

WHEN RECORDED MAIL TO:

CITY OF REDONDO BEACH
PUBLIC WORKS DEPARTMENT -
ENGINEERING SERVICES DIVISION
415 DIAMOND STREET
REDONDO BEACH, CA 90277

SPACE ABOVE THIS LINE RESERVED FOR RECORDER'S USE

NOTICE OF COMPLETION



**CITY OF REDONDO BEACH
PUBLIC WORKS DEPARTMENT
ENGINEERING SERVICES DIVISION**

NOTICE IS HEREBY GIVEN:

1. The City of Redondo Beach is the Owner of that certain public improvement known as the North Pier Parking Structure Repairs Project, Job No. 70610.
2. Owner's address is: 415 Diamond Street, Redondo Beach, California 90277.
3. Work was completed on the said public improvement and was accepted by the City on _____.
4. The Contractor on said job was _____ of _____, California per contract dated _____. Kindly refer to _____ on all matters relating to said contract.
5. The property on which said work of improvement was completed is in the City of Redondo Beach, County of Los Angeles, State of California and is described as the North Pier Parking Structure Repairs Project, Job No. 70610 located at 123 International Boardwalk, Redondo Beach, CA 90277.

CITY OF REDONDO BEACH, CALIFORNIA

Dated

Lauren Sablan, Acting City Engineer

VERIFICATION

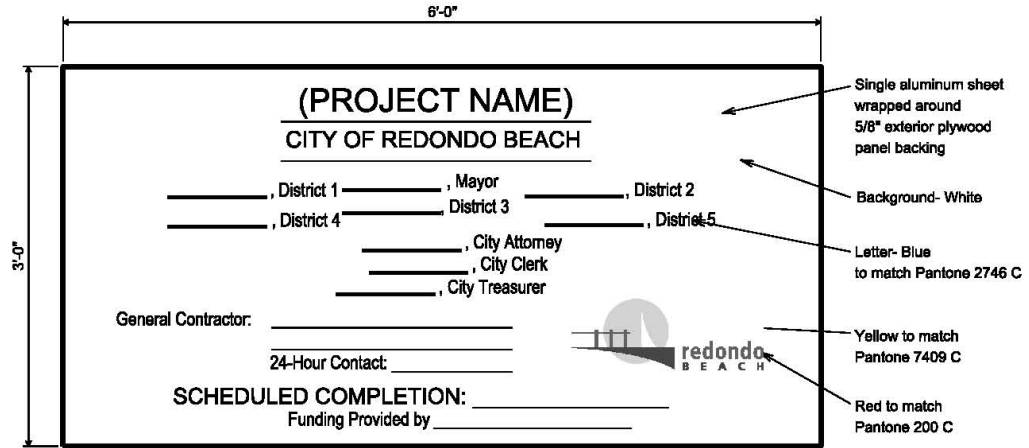
The undersigned says: I am the City Engineer of the City of Redondo Beach, California, the Declarant of the foregoing Notice of Completion, that said City being the owner of the aforesaid interest or estate in the property described in the foregoing notice; that I have read the same and know the contents thereof, and the same is true to my own knowledge. I declare under penalty of perjury that the foregoing is true and correct.

CITY OF REDONDO BEACH, CALIFORNIA

Dated

Lauren Sablan, Acting City Engineer

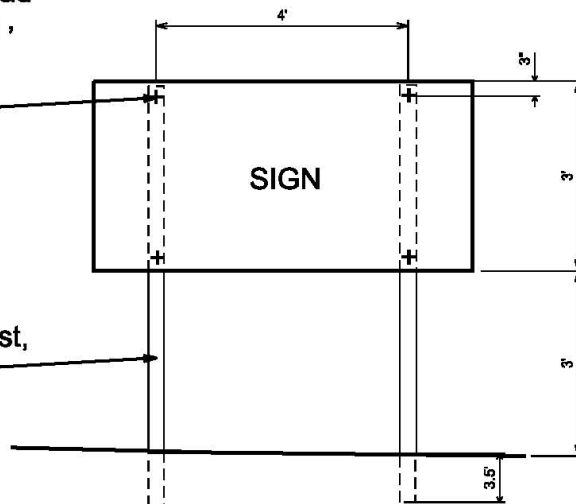




FRONT VIEW
N.T.S.

3/8" dia. hex head bolt w/ washers, nut and jam nut (Typ. of 4 per sign min.)

4 x 4 pressure treated wood post, 3.5' buried min.



FRONT ELEVATION
N.T.S.

CITY OF REDONDO BEACH CALIFORNIA DEPARTMENT OF PUBLIC WORKS ENGINEERING SERVICES DIVISION		
(PROJECT NAME) CONSTRUCTION SIGN		
DRAWN	CHECKED	SCALE
APPROVED BY: _____ CITY ENGINEER - R.O.E.		DATE: _____
PROJECT NO. _____	SHEET NO. _____ OF _____ SHEETS	DRAWING NO. _____



Technical Specifications





Technical Specifications

Redondo Beach

North Pier Parking Structure Maintenance Repairs, **JOB NO. 37-009397.02**

Prepared for: City of Redondo Beach

Date: November 30, 2023



WALKER
CONSULTANTS

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END OF SECTION 000110

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SECTION 011100 - SUMMARY OF WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 PROJECT DESCRIPTION

- A. Project comprises of the restoration of selected areas of the floors, ceilings, beams, columns, rails, curbs for North Pier Parking Structure located at Redondo Beach, California as identified in the Drawings.
- B. Work consists of 2 supported levels and slab-on-grade. Including the following:
1. Description of work - Restoration Repairs:
 - a. Work includes repair of select areas of the concrete slab, beams, columns, walls, epoxy injection, selected areas of guardrail replacement, traffic markings, etc.
 - b. Work will be performed at locations within parking structure as shown in Drawings.
 2. Description of work - Seismic Structural Repairs:
 - a. Work consists of adding new shear walls supported by micro pile foundations. Cord and drag steel will be added to the existing topping slabs. The existing waffle shear wall on grid line Z between the village and pier level will be strengthened as well as double tee stems in the vicinity.
 - b. The seismic structural repairs must be coordinated and performed concurrently with the general building repairs.
- C. Work required in these areas and estimated quantities are listed on Bid Form. Bid Quantities associated with Work Items listed on Drawings have been estimated and are subject to measurement as defined in Article "Measurements." Where additional Work Items are described, but not specifically located and/or shown on Drawings, Contractor shall be responsible for locating and marking areas to be repaired. Owner and/or Engineer/Architect reserves right to increase or decrease quantities up to 25% at same unit cost, as required by job conditions. Unit costs will be established in accordance with Supplementary Conditions, Article "Changes" for quantity variations exceeding 25%.
- D. Work Item specifications and details shall govern all repair operations. Locations where Work Items apply are shown on Drawings as symbols.
- E. 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 Work Item, Contractor shall locate, mark, and measure quantity of each item and report quantities to Engineer/Architect. If measured quantities exceed Engineer/Architect's estimate, Contractor shall obtain written authorization to proceed from Owner before executing Work required for that Work Item.
- C. Measurement of quantities for individual Work Items will be performed by Contractor and reviewed by Engineer/Architect. Coordinate measurements with inspection as required in Section "Project Management and Coordination."
- D. Cost of Work included in each Work Item for quantities as indicated in Contract Documents shall be included in Base Bid.
 - 1. Additions to or deductions from lump sum price for quantities of each Work Item added to or deducted from Work respectively shall be at unit prices indicated in Bid Form and shall constitute payment or deductions in full for all material, equipment, labor, supervision and incidentals necessary to complete Work.

1.4 WORK SEQUENCE

- A. Prior to commencement of Phased Work, meet with Engineer/Architect and Owner representatives to establish sequence and schedule of Work. Contractor shall give Owner notice of areas to be work in at least 7 working days in advance of actual Work.
- B. Contractor shall notify Owner's representative at least 7 days prior to all demolition-type operations and 24 hours prior to beginning any abrasive blasting operations.
- C. Contractor shall remove all broken concrete and debris from Work areas on daily basis and dispose of same at authorized dump sites. All debris shall be removed and effective permanent or temporary pavement markings in-place prior to begin Work in the subsequent phase Work area.
- D. Contractor shall remove dust and air transported sand/debris from remainder of facility at conclusion of operations in Work area.

1.5 CONTRACTOR USE OF PREMISES

- A. General: Limit use of premises to construction activities in areas indicated; allow for Owner occupancy and use by public.
 - 1. Confine operations to areas within Contract limits indicated. Portions of the site beyond areas in which construction operations are indicated are not to be disturbed.

2. 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.
- B. Contractor's use of premises shall not interfere with operation of same. Elevators shall not be used for transfer of materials or equipment.
- C. Contractor's debris removal path shall be over non-repaired services unless physical restraints prevent use of such path.
- D. Contractor shall confine its apparatus, materials, equipment, tool cribs, field offices and operations to areas designated by Owner and/or Engineer/Architect. Premises shall not be unreasonably encumbered with materials and equipment. Neat and orderly stockpiling and other operations shall be maintained, and debris shall be regularly removed from site. Contractor shall not load or permit any part of structure to be loaded with weight that will endanger structural integrity or safety of facility. Contractor shall limit axle loads to maximum 4000 lb per axle and gross weight of 8000 lb, or stockpiling of materials and equipment to 50 lb per sq ft. Contractor to note existing height restrictions within parking structure.
- E. Contractor Parking: Contractor's employees shall park within confines of work area or pay prevailing parking rates.
- F. On-Site Storage: Contractor shall not store materials or equipment at site of Work for more than one week prior to time that materials or equipment are incorporated into Work.

1.6 BARRICADES

- A. Provide positive barricading to separate Work areas from areas open to public parking and pedestrian traffic. Minimum acceptable separation: 8 ft. 0 in. high solid temporary barrier constructed of wood. Provide additional barriers as required to prevent damage to vehicles due to airborne debris. See "Temporary Facilities and Controls" for additional requirements.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

END OF SECTION 011100

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SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Engineer and paid for by Owner.
 - 1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Engineer will return incomplete applications without action.
 - 1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
 - 2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- D. Transmittal: Submit 3 signed and notarized original copies of each Application for Payment to Engineer by a method ensuring receipt within 24 hours. One copy shall include waivers of lien and similar attachments if required.
 - 1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- E. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application.

1. Submit partial waivers on each item for amount requested, before deduction for retainage, on each item.
 2. When an application shows completion of an item, submit final or full waivers.
 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
 4. Waiver Delays: Submit each Application for Payment with Contractor's waiver of mechanic's lien for construction period covered by the application.
 - a. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- F. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
 2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
 3. Updated final statement, accounting for final changes to the Contract Sum.
 4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
 5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
 6. Evidence that claims have been settled.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 012900

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SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including other Division 01 Specification Sections, 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 01 Section "Closeout Procedures" for coordinating Contract closeout.

1.3 COORDINATION

- A. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections that 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. Project closeout activities.

1.4 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.
- C. Progress Meetings: Conduct progress meetings at regular 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. 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.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 013100

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SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
 - 1. Contractor's Construction Schedule.
 - 2. Construction schedule updating reports.
 - 3. Daily construction reports.
 - 4. Material location reports.
 - 5. Field condition reports.
 - 6. Unusual event reports.
 - 7. Construction photographs.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
 - 2. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
 - 3. Division 01 Section "Photographic Documentation" for submitting construction photographs.
 - 4. Division 01 Section "Quality Control" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
 - 1. Critical activities are activities on the critical path that must start and finish on the planned early start and finish times.
 - 2. Predecessor activity is an activity that precedes another activity in the network.
 - 3. Successor activity is an activity that follows another activity in the network.

- B. Event: The starting or ending point of an activity.
- C. Milestone: A key or critical point in time for reference or measurement.
- D. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

1.4 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
 - 1. Working electronic copy of schedule file, where indicated.
 - 2. PDF file.
- B. Contractor's Construction Schedule: Initial schedule of size required to display entire schedule for entire construction period.
 - 1. Submit a working digital copy of schedule, using software indicated and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.
- C. Digital Photographs: Submit image files within two (2) days of taking photographs.
 - 1. Submit photos by emailing to Walker consultants. Include copy of key plan indicating each photograph's location and direction.
- D. Construction Schedule Updating Reports: Submit with Application for Payment
- E. Daily Construction Reports: Submit at bi-weekly intervals.
- F. Material Location Reports: Submit at **[weekly]** intervals.
- G. Unusual Event Reports: Submit at time of unusual event.

1.5 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, submittals schedule, progress reports, payment requests, and other required schedules and reports.
 - 1. Secure time commitments for performing critical elements of the Work from parties involved.
 - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

1.6 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for commencement of the Work to date of Final Completion.
 - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
 - 1. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
 - 2. Substantial Completion: Indicate completion in advance of date established for Substantial Completion and allow time for Engineer's administrative procedures necessary for certification of Substantial Completion.
 - 3. Punch List and Final Completion: Include not more than thirty (30) days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule and show how the sequence of the Work is affected.
 - 1. Phasing: Arrange list of activities on schedule by phase.
 - 2. Work under More Than One Contract: Include a separate activity for each contract.
 - 3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
 - 4. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 5. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
 - 6. Work Restrictions: Show the effect of the following items on the schedule:
 - a. Coordination with existing construction.
 - b. Limitations of continued occupancies.
 - c. Uninterruptible services.
 - d. Partial occupancy before Substantial Completion.
 - e. Use of premises restrictions.
 - f. Provisions for future construction.
 - g. Seasonal variations.
 - h. Environmental control.
 - 7. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
 - a. Subcontract awards.

- b. Submittals.
 - c. Purchases.
 - d. Mockups.
 - e. Fabrication.
 - f. Sample testing.
 - g. Deliveries.
 - h. Installation.
 - i. Tests and inspections.
 - j. Adjusting.
 - k. Curing.
 - l. Startup and placement into final use and operation.
- 8. Construction Areas: Identify each major area of construction for each major portion of the Work. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
 - a. Structural completion.
 - b. Temporary enclosure and space conditioning.
 - c. Permanent space enclosure.
 - d. Completion of mechanical installation.
 - e. Completion of electrical installation.
 - f. Substantial Completion.
- D. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule with each monthly payment application.
 - 1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
 - 2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
 - 3. As the Work progresses, indicate final completion percentage for each activity.
- E. Distribution: Distribute copies of approved schedule to Engineer, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
 - 1. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

1.7 GANTT-CHART SCHEDULE REQUIREMENTS

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's Construction Schedule within 15 days of date established for commencement of the Work.
 - 1. Base schedule on the startup construction schedule and additional information received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

1.8 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
 - 1. List of subcontractors at Project site.
 - 2. Approximate count of personnel at Project site.
 - 3. Equipment at Project site.
 - 4. Material deliveries.
 - 5. High and low temperatures and general weather conditions, including presence of rain.
 - 6. Testing and inspection.
 - 7. Accidents.
 - 8. Meetings and significant decisions.
 - 9. Unusual events.
 - 10. Stoppages, delays, shortages, and losses.
 - 11. Orders and requests of authorities having jurisdiction.
 - 12. Change Orders received and implemented.
 - 13. Change Directives received and implemented.
- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.
- C. Unusual Event Reports: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, responses by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.
 - 1. Submit unusual event reports directly to Owner within one (1) day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

- A. General: Take photographs with maximum depth of field and in focus.
 - 1. Maintain key plan with each set of construction photographs that identifies each photographic location.
- B. Periodic Construction Photographs: Take 50 photographs weekly coinciding with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

END OF SECTION 013200

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SECTION 013300 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Engineer's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Engineer's approval. Submittals may be rejected for not complying with requirements.
- C. File Transfer Protocol (FTP): Communications protocol that enables transfer of files to and from another computer over a network and that serves as the basis for standard Internet protocols. An FTP site is a portion of a network located outside of network firewalls within which internal and external users are able to access files.
- D. Portable Document Format (PDF): An open standard file format licensed by Adobe Systems used for representing documents in a device-independent and display resolution-independent fixed-layout document format.

PART 2 - PRODUCTS

2.1 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by individual Specification Sections by either of the following methods.
 - 1. Submit electronic submittals as PDF electronic files.
- B. Certificates and Certifications Submittals: Provide a statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
 - 1. Provide a digital signature with digital certificate on electronically submitted certificates and certifications where indicated.
 - 2. Provide a notarized statement on original paper copy certificates and certifications where indicated.
- C. Compatibility Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- D. Field Test Reports: Submit reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during product installation or after product installation in its final location, for compliance with requirements in the Contract Documents.
- E. Design Data: Prepare and submit written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.
- F. 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.

- G. **Manufacturer's Field Reports:** Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
1. Name, address, and telephone number of factory-authorized service representative making report.
 2. Statement on condition of substrates and their acceptability for installation of product.
 3. Statement that products at Project site comply with requirements.
 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
 6. Statement whether conditions, products, and installation will affect warranty.
 7. Other required items indicated in individual Specification Sections.
- H. **Insurance Certificates and Bonds:** Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- I. **Material Safety Data Sheets:** When requested, submit information directly to Owner. If submitted to Engineer, Engineer will not review this information but will return it with no action taken.

2.3 REQUESTS FOR INFORMATION

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

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

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

3.2 ENGINEER'S ACTION

- A. General: Engineer will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Informational Submittals: Engineer will review each submittal and will not return it, or will return it if it does not comply with requirements. Engineer will forward each submittal to appropriate party.
- C. Submittals not required by the Contract Documents will not be reviewed and may be discarded.

END OF SECTION 013300

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SECTION 014500 - QUALITY CONTROL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for 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/Architect.
- 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. Requirements of this Section relate to customized fabrication and installation procedures, not production of standard products.
 - 1. Specific quality control requirements for individual construction activities are specified in the Sections that specify those activities. Those requirements, including inspections and tests, cover production of standard products as well as customized fabrication and installation procedures.
 - 2. Inspections, tests and related actions specified are not intended to limit the Contractor's quality control procedures that facilitate compliance with Contract Document requirements.
 - 3. Requirements for the Contractor to provide quality control services required by Engineer/Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

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.
- B. Owner Responsibilities: Owner may as an option provide quality assurance inspections, tests and similar quality assurance 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. However, if testing results reveal non-compliant installations, the Owner may charge the cost of the non-compliant testing to the Contractor.
- 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/Architect, 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 2 - PRODUCTS (NOT APPLICABLE).

PART 3 - 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 014500

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SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Support facilities include, but are not limited to, the following:
 - 1. Waste disposal services.
 - 2. Construction aids and miscellaneous services and facilities.
- C. Security and protection facilities include, but are not limited to, the following:
 - 1. Barricades, warning signs, lights.
 - 2. Temporary protection and support of permanent active utilities within the work area.

1.3 USE CHARGES

- A. General: Installation and removal of and use charges for temporary facilities shall be included in the Contract Sum unless otherwise indicated. Allow other entities engaged in the Project to use temporary services and facilities without cost, including, but not limited to Owner's representatives, testing agencies, and authorities having jurisdiction.
- B. Water and Sewer Service from Existing System: Water from Owner's existing water system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

1.4 INFORMATIONAL SUBMITTALS

- A. Site Utilization Plan: Show temporary facilities, temporary utility lines and connections, staging areas, construction site entrances, vehicle circulation, and parking areas for construction personnel.
- B. Project Identification and Temporary Signs: Show fabrication and installation details, including plans, elevations, details, layouts, typestyles, graphic elements, and message content.

- C. Moisture- and Mold-Protection Plan: Describe procedures and controls for protecting materials and construction from water absorption and damage and mold.
- D. Dust- and HVAC-Control Plan: Submit coordination drawing and narrative that indicates the dust- and HVAC-control measures proposed for use, proposed locations, and proposed time frame for their operation. Include the following:
 - 1. Locations of dust-control partitions at each phase of work.
 - 2. Waste-handling procedures.
 - 3. Other dust-control measures.

1.5 QUALITY ASSURANCE

- A. Regulations: Comply with industry standards and applicable laws and regulations of authorities having jurisdiction, including but not limited to, the following:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Police, Fire Department and Rescue Squad rules.
 - 4. Environmental protection regulations.
- B. Standards: Comply with NFPA Code 241, "Standard for Safeguarding Construction, Alterations, and Demolition Operations," ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition," and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: Comply with NEMA, NECA and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70, "National Electric Code."
 - 2. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary utility before use. Obtain required certifications and permits.
- C. Test and Inspection: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance,, and protection of each permanent service during its use as a construction facility before Owners acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Portable Chain-Link Fencing: Minimum 2-inch (50-mm), 0.148-inch- (3.8-mm-) thick, galvanized-steel, chain-link fabric fencing; minimum 6 feet (1.8 m) high with galvanized-steel pipe posts; minimum 2-3/8-inch- (60-mm-) OD line posts and 2-7/8-inch- (73-mm-) OD corner and pull posts, with 1-5/8-inch- (42-mm-) OD top and bottom rails.
- B. Fencing Windscreen Privacy Screen: Polyester fabric scrim with grommets for attachment to chain link fence, sized to height of fence, in color selected by Architect from manufacturer's standard colors.
- C. Polyethylene Sheet: Reinforced, fire-resistive sheet, 10-mil (0.25-mm) minimum thickness, with flame-spread rating of 15 or less per ASTM E 84 and passing NFPA 701 Test Method 2.

2.2 EQUIPMENT

- A. General: Provide new equipment; if acceptable to Engineer/Architect, undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.
- B. Water Hoses: Provide 0.75 in. heavy-duty, abrasion-resistant, flexible rubber hoses 100 ft. long, with pressure rating greater than maximum pressure of water distribution system; provide adjustable shut-off nozzles at hose discharge.
- C. Electrical power cords: provide grounded extension cords; use "hard-service" cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords, if single lengths will not reach areas where construction activities are in progress.
- D. Temporary Toilet Units: Provide self-contained single-occupant toilet units of the chemical, aerated recirculation, or combustion type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. Locations of units shall be pre-approved by Village.
- E. First Aid Supplies: Comply with governing regulations.
- F. Fire Extinguishers: Provide hand-carried, portable UL-rated, class "A" fire extinguishers for temporary offices and similar spaces. In other locations provide hand-carried, portable, UL-rated, class "ABC" dry chemical extinguishers, or a combination of extinguishers of NFPA recommended classes for the exposures.
 - 1. Comply with NFPA 10 and 241 for classification, extinguishing agent and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 TEMPORARY FACILITIES, GENERAL

- A. Conservation: Coordinate construction and use of temporary facilities with consideration given to conservation of energy, water, and materials. Coordinate use of temporary utilities to minimize waste.
 - 1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. See other Sections for disposition of salvaged materials that are designated as Owner's property.

3.2 SECURITY AND PROTECTION FACILITIES INSTALLATION

- A. Protection of Existing Facilities: Protect existing vegetation, equipment, structures, utilities, and other improvements at Project site and on adjacent properties, except those indicated to be removed or altered. Repair damage to existing facilities.
 - 1. Where access to adjacent properties is required in order to affect protection of existing facilities, obtain written permission from adjacent property owner to access property for that purpose.
- B. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
 - 1. Comply with work restrictions specified in Division 01 Section "Summary of Work."
- C. Security Enclosure and Lockup: Install temporary enclosure around partially completed areas of construction. Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.
- D. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- E. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- F. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241; manage fire-prevention program.
 - 1. Prohibit smoking in construction areas. Comply with additional limits on smoking specified in other Sections.
 - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
 - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish

procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

4. Provide temporary standpipes and hoses for fire protection. Hang hoses with a warning sign stating that hoses are for fire-protection purposes only and are not to be removed. Match hose size with outlet size and equip with suitable nozzles.

3.3 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture-Protection Plan: Describe delivery, handling, storage, installation, and protection provisions for materials subject to water absorption or water damage.

END OF SECTION 015000

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SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements governing Contractor's selection of products for use in Project.
 - 1. Division 01 Section "Submittal Procedures" specifies requirements for submittal of the Contractor's Construction Schedule and the Submittal Schedule.
 - 2. Division 01 Section "Product Substitution Procedures" specifies administrative procedures for handling requests for substitutions made after award of the Contract.

1.3 DEFINITIONS

- A. Products: Items obtained for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
- B. Definitions used in this Article are not intended to change meaning of other terms used in Contract Documents, such as "specialties," "systems," "structure," "finishes," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in construction industry.
 - a. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature that is current as of date of the Contract Documents.
 - b. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
 - c. Comparable Product: Product that is demonstrated and approved by Engineer through submittal process to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

- d. "Foreign Products," as distinguished from "domestic products," are items substantially manufactured (50% or more of value) outside of United States and its possessions; or produced or supplied by entities substantially owned (more than 50%) by persons who are not citizens of nor living within United States and its possessions.
 - 2. "Materials" are products that are substantially shaped, cut, worked, mixed, finished, refined or otherwise fabricated, processed, or installed to form part of Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.
- C. Basis-of-Design Product Specification: A specification in which a single manufacturer's product is named and accompanied by the words "basis-of-design product," including make or model number or other designation. In addition to the basis-of-design product description, product attributes and characteristics may be listed to establish the significant qualities related to type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other special features and requirements for purposes of evaluating comparable products of additional manufacturers named in the specification.
- D. Subject to Compliance with Requirements: Where the phrase "Subject to compliance with requirements" introduces a product selection procedure in an individual Specification Section, provide products qualified under the specified product procedure. In the event that a named product or product by a named manufacturer does not meet the other requirements of the specifications, select another named product or product from another named manufacturer that does meet the requirements of the specifications. Submit a comparable product request, if applicable.

1.4 ACTION SUBMITTALS

- A. Comparable Product Request Submittal: Submit request for consideration of each comparable product. Identify basis-of-design product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.
- 1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.
 - 2. Engineer's Action: If necessary, Engineer will request additional information or documentation for evaluation within seven days of receipt of a comparable product request. Engineer will notify Contractor through Construction Manager of approval or rejection of proposed comparable product request within 15 days of receipt of request, or seven days of receipt of additional information or documentation, whichever is later.
 - a. Form of Engineer's Approval of Submittal: As specified in Section "Submittal Procedures."
 - b. Use product specified if Engineer does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section "Submittal Procedures." Show compliance with requirements.

1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, select product compatible with products previously selected, even if previously selected products were also options.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft and vandalism. Comply with manufacturer's written instructions.
- B. Delivery and Handling:
 - 1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
 - 2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
 - 3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
 - 4. Inspect products on delivery to determine compliance with the Contract Documents and to determine that products are undamaged and properly protected.
- C. Storage:
 - 1. Store materials in a manner that will not endanger Project structure.
 - 2. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
 - 3. Protect foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
 - 4. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
 - 5. Protect stored products from damage and liquids from freezing.
 - 6. Provide a secure location and enclosure at Project site for storage of materials and equipment. Coordinate location with Owner.

1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and

limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Manufacturer's Warranty: Written warranty furnished by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.
 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution.
1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
 2. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
 3. See other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION

- A. General Product Requirements: Provide products that comply with the Contract Documents, are undamaged and, unless otherwise indicated, are new at time of installation.
1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
 2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
 3. Owner reserves the right to limit selection to products with warranties meeting requirements of the Contract Documents.
 4. Where products are accompanied by the term "as selected," Engineer will make selection.
 5. Descriptive, performance, and reference standard requirements in the Specifications establish salient characteristics of products.
 6. Or Equal: For products specified by name and accompanied by the term "or equal," or "or approved equal," or "or approved," comply with requirements in "Comparable Products" Article to obtain approval for use of an unnamed product.
 - a. Submit additional documentation required by Engineer through Construction Manager in order to establish equivalency of proposed products. Evaluation of "or equal" product status is by the Engineer, whose determination is final.
- B. Product Selection Procedures:

1. Limited List of Products: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - a. Limited list of products may be indicated by the phrase: "Subject to compliance with requirements, provide one of the following: ..."
 2. Non-Limited List of Products: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed product, which complies with requirements.
 - a. Non-limited list of products is indicated by the phrase: "Subject to compliance with requirements, available products that may be incorporated in the Work include, but are not limited to, the following: ..."
 3. Limited List of Manufacturers: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will be considered.
 - a. Limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, provide products by one of the following: ..."
 4. Non-Limited List of Manufacturers: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, which complies with requirements.
 - a. Non-limited list of manufacturers is indicated by the phrase: "Subject to compliance with requirements, available manufacturers whose products may be incorporated in the Work include, but are not limited to, the following: ..."
 5. Basis-of-Design Product: Where Specifications name a product, or refer to a product indicated on Drawings, and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with requirements in "Comparable Products" Article for consideration of an unnamed product by one of the other named manufacturers.
 - a. For approval of products by unnamed manufacturers, comply with requirements in Section "Substitution Procedures" for substitutions for convenience.
- C. Visual Matching Specification: Where Specifications require "match Engineer's sample," provide a product that complies with requirements and matches Engineer's sample. Engineer's decision will be final on whether a proposed product matches.
1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Section "Substitution Procedures" for proposal of product.

- D. Visual Selection Specification: Where Specifications include the phrase "as selected by Engineer from manufacturer's full range" or similar phrase, select a product that complies with requirements. Engineer will select color, gloss, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

2.2 COMPARABLE PRODUCTS

- A. Conditions for Consideration of Comparable Products: Engineer will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Engineer may return requests without action, except to record noncompliance with these requirements:
1. Evidence that proposed product does not require revisions to the Contract Documents, is consistent with the Contract Documents, will produce the indicated results, and is compatible with other portions of the Work. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant product qualities include attributes such as type, function, in-service performance and physical properties, weight, dimension, durability, visual characteristics, and other specific features and requirements.
 2. Evidence that proposed product provides specified warranty.
 3. List of similar installations for completed projects with project names and addresses and names and addresses of Engineers and owners, if requested.
 4. Samples, if requested.
- B. Submittal Requirements: Approval by the Engineer of Contractor's request for use of comparable product is not intended to satisfy other submittal requirements. Comply with specified submittal requirements.

PART 3 - EXECUTION

3.1 INSTALLATION OF PRODUCTS:

- A. Comply with manufacturer's instructions and recommendations for installation of products in applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
1. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.

END OF SECTION 016000

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SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:
 - 1. General installation of products.
 - 2. Progress cleaning.
 - 3. Correction of the Work.
 - 4. Construction Phasing.
 - 5. Maintaining public access through or adjacent to the Work.
- B. Related Sections include the following:
 - 1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
 - 2. Division 01 Section "Submittal Procedures" for submitting surveys.
 - 3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.
 - 4. Division 02 Section "Work Items" for coordinating restoration construction activities to maintain Owner's operations during construction.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

- B. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.
 - 1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
 - 2. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
 - 3. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Engineer and Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Engineer's and Owner's written permission.
- B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

3.3 INSTALLATION

- A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.
 - 1. Make vertical work plumb and make horizontal work level.
 - 2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
- B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.
- C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until Substantial Completion.
- D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.
- E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

- F. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.
 - 1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Engineer.
 - 2. Allow for building movement, including thermal expansion and contraction.
- G. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.
- H. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.4 PROGRESS CLEANING

- A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.
 - 1. Comply with requirements in NFPA 241 for removal of combustible waste materials and debris.
 - 2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F (27 deg C).
 - 3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.
- B. Site: Maintain Project site free of waste materials and debris.
- C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.
 - 1. Remove liquid spills promptly.
 - 2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.
- D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.
- E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.
- F. Exposed Surfaces: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Substantial Completion.
- G. Cutting and Patching: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

1. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.
- H. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.
- I. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at Substantial Completion.
- J. Clean and provide maintenance on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of Substantial Completion.
- B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.6 CORRECTION OF THE WORK

- A. Repair or remove and replace defective construction. Restore damaged substrates and finishes.
 1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.
- B. Restore permanent facilities used during construction to their specified condition.
- C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.
- D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.
- E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300

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SECTION 017423 - FINAL CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for final cleaning at Substantial Completion.
 - 1. Special cleaning requirements for specific elements of Work are included in appropriate Sections of Divisions 02 through 33.
- 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.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

- A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from commercial building cleaning and maintenance program. Comply with manufacturer's instructions.
- B. Complete following cleaning operations before requesting inspection for Certification of Substantial Completion for entire Project or a portion of Project.

1. Clean Project site and grounds in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove petro-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
 2. Remove tools, construction equipment, machinery and surplus material from the site.
 3. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
 4. Broom clean concrete floors in unoccupied spaces.
 5. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
 6. 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.
 7. Leave Project clean and ready for occupancy.
- C. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction period.
- D. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of in a lawful manner.
1. Where extra materials of value remain after completion of associated construction have become Owner's property, dispose of these materials as directed.

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SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for 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 02 through 09.

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. Submit specific warranties, workmanship bonds, maintenance agreements, final certifications and similar documents.
 - 3. Complete final clean up requirements, including touch-up painting. Touch-up and otherwise repair and restore marred exposed finishes.
- B. Inspection Procedures: On receipt of request for inspection, Engineer/Architect will either proceed with inspection or advise Contractor of unfilled requirements. Engineer/Architect 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/Architect will repeat inspection when requested and assured that Work has been substantially completed.
2. Engineer/Architect 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/Architect'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/Architect.
- B. Reinspection Procedure: Engineer/Architect will reinspect Work upon receipt of notice that Work, including inspection list items from earlier inspections, has been completed, except items whose completion has been delayed because of circumstances acceptable to Engineer/Architect.
1. Engineer/Architect will provide one repeat inspection under its contract with Owner. Subsequent inspections shall be at Contractor's expense.
 2. Upon completion of reinspection, Engineer/Architect will prepare certificate of final acceptance, or advise Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
 3. If necessary, reinspection will be repeated.

PART 2 - PRODUCTS (NOT APPLICABLE).

PART 3 - EXECUTION (NOT APPLICABLE).

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SECTION 017836 - WARRANTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section 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 01 Section "Submittal Procedures" specifies procedures for submitting warranties.
 - 2. Division 01 Section "Closeout Procedures" specifies contract closeout procedures.
 - 3. Divisions 02 through 33 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 DEFINITIONS

- A. Standard Product Warranties are preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by manufacturer to Owner.
- B. Special warranties are written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 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.**

1.5 SUBMITTALS

- A. **Submit written warranties to Engineer/Architect prior to date certified for Substantial Completion.** If Engineer/Architect'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/Architect.
- 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/Architect within 15 days of completion of that designated portion of Work.**
- C. **Forms for special warranties are included at end of this Section. Prepare written document utilizing appropriate form, ready for execution by Contractor, or by Contractor and subcontractor, supplier or manufacturer. Submit draft to Owner through Engineer/Architect for approval prior to final execution.**

- D. Form of Submittal: At Final Completion compile 2 copies of each required warranty properly executed by Contractor, or by Contractor, subcontractor, supplier, or manufacturer. Organize warranty documents into an orderly sequence based on table of contents of Project Manual.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 017836

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SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - General

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes administrative and procedural requirements for Project Record Documents, including the following:
 - 1. Record Drawings.
- B. Related Requirements:
 - 1. Section "Closeout Procedures" for general closeout procedures.
 - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.

1.3 CLOSEOUT SUBMITTALS

- A. Record Drawings: Comply with the following:
 - 1. Number of Copies: Submit copies of Record Drawings as follows:
 - 1) Submit one paper-copy set of marked-up record prints.
 - 2) Submit PDF electronic files of scanned record prints and one of file prints.

1.4 RECORD DRAWINGS

- A. Record Prints: Maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised drawings as modifications are issued.
 - 1. Preparation: Mark record prints to show the actual installation and unit quantity where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.

- a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
 - b. Accurately record information in an acceptable drawing technique.
 - c. Record data as soon as possible after obtaining it.
 - d. Record and check the markup before enclosing concealed installations.
 - e. Cross-reference record prints to corresponding photographic documentation.
2. Content: Types of items requiring marking include, but are not limited to, the following:
 - a. Dimensional changes to Drawings.
 - b. Revisions to details shown on Drawings.
 - c. Changes made by Change Order or Change Directive.
 - d. Changes made following Engineer/Architect's written orders.
 - e. Details not on the original Contract Drawings.
 - f. Field records for variable and concealed conditions.
 - g. Actual location and quantity of unit price items of the Work.
3. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

1.5 MAINTENANCE OF RECORD DOCUMENTS

- A. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Engineer/Architect's and Construction Manager's reference during normal working hours.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

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SECTION 020010 - WORK ITEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Divisions 1 - 26 Specification Sections apply to this Section.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

WI 1.0 GENERAL REQUIREMENTS

- A. Scope of Work
 - 1. Work consists of performing all tasks, specifically required and incidental, which are not identified under separate Work Item designation, but necessary to perform the work identified in this project. This work includes, but is not limited to the following items:
 - WI 1.1 - Mobilization
 - WI 1.2 - Concrete Formwork
 - WI 1.3 - Concrete Shores and Reshores
 - WI 1.4 - Concrete Reinforcement
 - WI 1.5 - Temporary Signage
 - WI 1.6 - Overhead Protection/Temporary Signage/Traffic Control

WI 1.1 PROJECT MOBILIZATION

- A. Scope of Work
 - 1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower and other essentials and incidentals necessary to perform Work defined in this Contract. Payment of lump sum amount for mobilization shall be according to following schedule and shall be based on percentage of original contract amount earned.
- B. Materials
 - 1. None
- C. Execution

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

WI 1.2 CONCRETE FORMWORK

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install formwork as required for cast-in-place concrete.

B. Materials

1. Forms for Exposed Finish Concrete: Plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on Drawings.
 - a. Use overlaid plywood complying with U.S. Product Standard PS-1 "A-C or B-B High Density Overlaid Concrete Form," Class I
 - b. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood," Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible inspection trademark.
2. Forms for Unexposed Finish Concrete: Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
3. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC meeting local requirements that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces, including but not limited to water-curing, curing compound, stains, or paints.
4. Form Ties: Factory-fabricated, adjustable-length, removable or snap-off metal form ties, designed to prevent form deflection and to prevent spalling concrete upon removal. Provide units that will leave no metal closer than 1.5 in. to exposed surface.
 - a. Provide ties that, when removed, will leave holes not larger than 1.0 in. diameter in concrete surface.
5. Shores:

- a. Nail Ellis clamps, if used with wood shores, to shores with minimum of two nails to prevent slipping.
- b. Wedges: Hardwood or steel. Softwood wedges prohibited.

C. Execution

1. Work shall conform to requirements of latest edition of ACI 301 "Standard Specifications for Structural Concrete," ACI 302.1 R "Guide for Concrete Floor Slab Construction," ACI 318 "Building Code Requirements for Reinforced Concrete," and ACI 347 "Recommended Practice for Concrete Formwork" except as modified by the following paragraphs.
2. Store all formwork and formwork materials clear of ground, protected, so as to preclude damage.
3. Construct forms to sizes, shapes, lines, and dimensions shown and to obtain accurate alignment, location, grades, level, and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
4. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush plates or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces where slope is too steep to place concrete with bottom forms only. Kerf wood inserts for forming keyways, reglets, recesses, and the like, for easy removal.
5. Provide temporary openings where interior area of formwork is inaccessible for cleanout, for inspection before concrete placement, and for placement of concrete. Securely brace temporary openings and set tightly to forms to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
6. Chamfer exposed corners and edges as indicated, using wood, metal, PVC, or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
7. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses, and chases from trades providing such items. Accurately place and securely support items built into forms.
8. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, or other debris just before concrete is placed. Retighten forms and bracing before concrete placement as required to prevent mortar leaks and maintain proper alignment.
9. Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
10. Coat contact surfaces of forms with accepted, nonresidual, low-VOC form-coating compound before reinforcement is placed.
11. Coat steel forms with non-staining, rust-preventive form oil or otherwise protect against rusting. Rust-stained steel formwork not acceptable.

12. For non-post-tensioned concrete, formwork shall remain in place until concrete has reached minimum two-thirds of 28-day strength. Do not place additional loads on structure until concrete has been properly reshored.
13. Clean and repair surfaces of forms to be re-used in Work. Split, frayed, delaminated or otherwise damaged form facing material will not be acceptable for exposed surfaces. Apply new form coating compound as specified for new formwork.
14. When forms are extended for successive concrete placement, thoroughly clean surfaces, remove fins and laitance, and tighten forms to close joints. Align and secure joint to avoid offsets. Do not use "patched" forms for exposed concrete surfaces, except as acceptable to Engineer/Architect.

WI 1.3 CONCRETE SHORES AND RESHORES

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install temporary shoring and to maintain shores in place until Work requiring shores is complete and associated concrete has properly cured.

B. Materials

1. Shores shall be steel, rated at a minimum allowable load of 4,500 lb at 12 ft extension or steel shoring towers rated at a minimum allowable load of 40,000 lbs per four leg tower (based on two 20,000 lb crossed braced frames.).

C. Execution

1. Comply with ACI 301 and ACI 347 for shoring and reshoring in multi-story construction, except as modified in this Section.
2. For purpose of calculations: Construction Load = 50 psf; Dead Load = **120** psf for the floor slab plus the dead load of beams and girders.
3. Shore/Reshore loads on the structure shall not exceed 40 psf distributed load on the Slab, and concentrated loads shall not exceed posted wheel loads or 2,000 lbs., whichever is less. Concentrated bearing pressures shall not exceed 1,200 psi.
4. Shore/Reshore loads on concrete slab-on-grade shall be distributed by steel grillage or timber grillage so as not to exceed soil bearing capacity or 1,500 psf, whichever is smaller.
5. Shore/Reshore loads on asphalt slab-on-grade shall be distributed by steel grillage so as not to exceed asphalt/soil bearing capacity, with consideration of reduced asphalt bearing capacity during extreme hot weather.
6. Shore/Reshore loads shall be distributed horizontally and/or distributed to more than one level to meet shore/reshore load limitations.
7. Shore/Reshore loads shall be distributed to multiple framing members (beams/joists/double tee stems) and extend beyond the immediate work area to ensure proper distribution of loads throughout the structure.

8. Prior to installation of shores, Contractor shall submit shoring scheme prepared and sealed by registered Professional Engineer in California.
9. Engineer/Architect will review shoring scheme for general conformance to requirements stated herein. If it does not conform, Contractor will be informed to resubmit another shoring scheme.
10. Remove shores and reshore in planned sequence to avoid damage to partially cured concrete. Locate and provide adequate reshoring to safely support Work without excessive stress or deflection.
11. Keep reshores in place as required until heavy loads due to construction operations have been removed.
12. If during construction, modifications are necessary to accommodate other trades, revise and resubmit erection plan to Engineer/Architect for review.

WI 1.4 CONCRETE REINFORCEMENT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to fabricate and install all mild steel reinforcement and epoxy coated reinforcement.

B. Materials

1. Reinforcement materials shall be as specified in ACI 301 "Standard Specifications for Structural Concrete."
2. Welded wire reinforcement: provide mats only. Roll stock prohibited.

C. Execution

1. Work shall conform to requirements of latest edition of ACI 301 "Standard Specifications for Structural Concrete," ACI 315 "Details and Detailing of Concrete Reinforcement," ACI 318 "Building Code Requirements for Reinforced Concrete," and Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice."
2. Submittals required include: Product data for proprietary materials and items, including reinforcement and forming accessories, admixtures, patching compounds, waterstops, joint systems, curing compounds, and others as requested by Engineer/Architect including, but not limited to:
 - a. Manufacturer's product data and installation instructions for proprietary form coatings, manufactured form systems, ties, and accessories.
 - b. Steel producer's certificates of mill analysis, tensile tests, and bend tests.
 - c. Manufacturer's product data, specifications, and installation instructions for proprietary materials, welded and mechanical splices, and reinforcement accessories.
 - d. Submit all materials and methods for concrete curing to Engineer/Architect for approval before beginning concreting Work. Include certification of curing compound allowable moisture loss.

3. Store concrete reinforcement materials at site to prevent damage and accumulation of dirt or excessive rust.
4. Reinforcement with any of following defects will be rejected:
 - a. Lengths, depths and bends exceeding CRSI fabrication tolerances.
 - b. Bends or kinks not indicated on Drawings or final Shop Drawings.
 - c. Reduced cross-section due to excessive rusting or other cause.
5. General: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars," for details and methods of reinforcement placement and supports and as herein specified.
 - a. Avoiding cutting or puncturing vapor retarder during reinforcement placement and concreting operations.
 - b. Examine conditions under which concrete reinforcement is to be placed, and immediately notify Engineer/Architect in writing of unsatisfactory conditions. Do not proceed with Work until unsatisfactory conditions have been corrected in acceptable manner.
 - c. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that reduce or destroy bond with concrete.
 - d. Fabricate reinforcement to conform to required shapes and dimensions, with fabrication tolerances complying with CRSI MSP. In case of fabricating errors, do not re-bend or straighten reinforcement in manner that will injure or weaken material.
 - e. Bends in reinforcement are standard 90° bends unless noted otherwise.
 - f. Reinforcement with any of following defects will be rejected:
 - 1) Lengths, depths and bends exceeding CRSI fabrication tolerances.
 - 2) Bends or kinks not indicated on Drawings or final Shop Drawings.
 - 3) Reduced cross-section due to excessive rusting or other cause.
 - g. Perform all welding of mild steel reinforcement, metal inserts and connections with low hydrogen welding electrodes in accordance with AWS D1.4.
 - h. Comply with ACI 301, Chapter 3 for placing reinforcement.
 - i. Use rebar chairs and accessories to hold all reinforcing positively in place. Provide rebar chairs at all formed surfaces, both vertical and horizontal, to maintain minimum specified cover. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces. Maximum spacing of chairs and accessories shall be per CRSI Manual of Standard Practice. In situations not covered by CRSI, provide support at 4 ft on center maximum each way.
 - j. Install welded wire reinforcement in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
 - k. Splices:
 - 1) Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements of ACI 318 for minimum lap of spliced bars.

- 2) For mechanical tension splices of reinforcement:
 - a) Column bar lengths shall not exceed 30 ft between splices. In any bar, no splices shall occur at any floor level.
 - b) Exercise care to assure that no reduction of cross-sectional area of reinforcement occurs.
 - c) Use Barsplice Products, Inc., Bar-Grip or Grip-Twist, NMB Splice Sleeve, or Erico LENTON splices.
 - d) For all mechanical splices, perform splicing in strict accordance with manufacturer's requirements and instructions.
 - e) All splices to develop 125% of specified yield strength of bars, or of smaller bar in transition splices.
 - f) Stagger splices in adjacent bars.
 - g) Except where shown on Drawings, welding of reinforcement prohibited without prior written authorization by Engineer/Architect.
- 3) Compression splices: Mechanically coupled splices in accordance with ACI 318.

WI 1.5 TEMPORARY SIGNAGE

A. Scope of Work

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

B. Materials

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

C. Execution

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

A. Execution

1. Contractor shall verify and provide documentation upon request that verifies erection, maintenance and removal of scaffolding (fixed or movable), and all rigging is in accordance with OSHA standards.
2. Contractor personnel erecting, operating, maintaining and removing scaffold and rigging equipment shall be certified/trained according to current standards of the scaffold and construction industry.
3. Upon request by the Owner or Engineer, the Contractor shall submit to Owner and Engineer a detailed action plan for their scaffolding (erection, maintenance and removal) prior to proceeding for general conformance and informational purposes only.
4. Independent lifelines shall be provided for every person working on suspended scaffolding, per scaffold industry standards. Lifelines shall not be secured to the same points used for suspended scaffold rigging connections.
5. Contractor shall provide access to Architect/Engineer or appointed project representative for performing observations and/or punchlist inspections during the work.

WI 1.6 OVERHEAD PROTECTION/TEMPORARY SIGNAGE/TRAFFIC CONTROL

A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to: provide, erect, maintain and remove following completion of project overhead protection for vehicles and pedestrians, necessary to protect and control the project site for the duration of the project; and provide and install and remove following completion of project, temporary signage, traffic control barricades/fences, and all other traffic controls as required for vehicular and pedestrian traffic control and user information during construction and as required by Owner and Engineer/Architect.

B. Materials

1. Overhead protection shall be capable of handling all construction loads, and shall be a manufactured frame type with ceiling providing overhead protection. The overhead protection shall provide protection from falling materials typically encountered during building façade repair projects, and be waterproofed. All exposed surfaces shall be maintained to the owner's satisfaction, including painting if specifically requested by Owner.
2. Temporary signage shall meet following minimum requirements:

- a. Minimum size: 48" x 48"
 - b. Backing material: 0.5 in. medium density overlay plywood.
 - c. Colors:
 - 1) Background: medium orange or white.
 - 2) Symbols/Lettering: black
 - d. Lettering: silk screened or die-cut.
 - 1) Font Style: Helvetica or similar.
 - 2) Size: 2 in. high minimum for pedestrian information; 4 in. high minimum for traffic information.
3. Barricades/barriers shall at minimum 4 ft. 0 in. high solid temporary barrier constructed of wood or concrete to separate Work areas from areas open to public.

C. Execution

1. Contractor shall submit a detailed action plan to Owner and Engineer for overhead protection, temporary signage and traffic control prior to mobilizing for general conformance and informational purposes only.
2. Erect overhead protection as required to make project site safe for public. Under no circumstances shall construction work be performed without site protection in place to safeguard public.
3. Temporary signage and appropriate barricades for traffic control shall be provided to the satisfaction of the Owner to adequately inform the public (pedestrians and vehicles) of construction operations and how they are to proceed in and around the building site.
4. Signage mounting height: 5 ft. to bottom of sign. Provide mounting brackets as required.
5. Contractor shall submit shop drawings detailing sign size, layout, colors, and mounting schemes for approval prior to fabricating signs and mounting brackets.
6. Typical regulatory signs (that is, STOP, YIELD, etc.) and "Handicap" signs shall conform to all Federal, state, and local requirements for sizes, materials, and colors.
7. After removal of overhead protection/temporary signage/traffic controls, clean areas affected by these elements to condition prior to installation.

WI 2.0 FLOOR SURFACE PREPARATION

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate existing spalls, locate and remove delaminated and unsound concrete and prepare cavities for repair and/or overlay. Refer to Detail Series 2.0 for specific requirements.

B. Materials/Equipment (NOT APPLICABLE)

C. Execution

1. Locating, removals and preparation of deteriorated floor surface concrete shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay."
2. Concrete removals shall be as square or rectangular-shaped as practical.
3. All concrete shall be removed from within deterioration area boundaries until sound concrete is reached on all sides.
4. All exposed steel within cavities shall be cleaned by sandblasting and damaged and defective reinforcement replaced as specified
5. Contractor shall allow for Engineer/Architect inspection of all cavities for condition as specified.

WI 2.1 FLOOR PREPARATION - SCARIFICATION

- A. Work consists of furnishing all labor, materials, equipment, and incidentals necessary to remove the top surface of concrete floor slab to prepare it for overlay installation. Refer to Work Item 2.0, "Floor Surface Preparation" for procedure associated with this Work Item. Refer to Detail 2.1 for specific requirements.

WI 3.0 CONCRETE FLOOR REPAIR

A. Scope of Work

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

B. Materials

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

C. Execution

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

WI 3.1 FLOOR REPAIR - PARTIAL DEPTH/SHALLOW

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

WI 3.3 FLOOR REPAIR - FULL DEPTH

- A. Refer to Work Item 3.0, "Concrete Floor Repair" for Scope of Work, Material and Execution procedures associated with this Work Item. Refer to Details 3.3a, 3.3b, 3.3c for specific requirements.

WI 3.4 FLOOR REPAIR – CURBS/WALKS

- A. Refer to Work Item 3.0, "Concrete Floor Repair" for Scope of Work, Material and Execution procedures associated with this Work Item. Refer to Detail 3.4 for specific requirements.

WI 5.0 CONCRETE BEAM AND JOIST REPAIR

- A. Scope of Work
 - 1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound overhead concrete, prepare cavities and install new concrete and reinforcing (as required) materials to restore concrete beams and joists to original condition and appearance. Refer to Detail Series 5.0 for specific requirements.
- B. Materials
 - 1. Cast-in-place concrete repair materials shall be as specified Division 03 Section "Prepackaged Repair Mortar"
 - 2. Conventional steel reinforcement shall be as specified in Division 03 Section "Cast-in-Place Concrete", Division 03 Section "Cast-in-Place Concrete Restoration" and/or Work Item 1.4, "Concrete Reinforcement."
 - 3. Trowel applied patching material shall be as specified in Division 03 Section "Prepackaged Repair Mortar." This material may be used for shallow removal and repair Work Items only.
- C. Execution
 - 1. Locating, marking, removal, preparation, and inspection of deteriorated concrete and reinforcing steel preparation, repair and installation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay."

- Install shoring at repair locations where required per the Construction Documents prior to starting removals.
2. Final surface preparation, concrete placement, finishing and curing shall be performed as specified in concrete repair material specification. Manufacturer specifications/requirements on these issues shall also be followed in the event proprietary bag mix repair materials are used.
 3. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 5.1 BEAM REPAIR - PARTIAL DEPTH/SHALLOW

- A. Refer to Work Item 5.0, "Concrete Beam and Joist Repair" for scope of Work, materials and procedure associated with this Work Item. Refer to Details 5.1, 5.1.1. and 5.1.2 for specific requirements.

WI 5.3 BEAM REPAIR - FULL DEPTH 12"X15" RAIL SECTION

- A. Refer to Work Item 5.0, "Concrete Beam and Joist Repair" for scope of Work, materials and procedure associated with this Work Item. Cast-in-place concrete shall be used, unless otherwise noted. Refer to Detail 5.3 for specific requirements.

WI 6.0 CONCRETE COLUMN REPAIR

- A. Scope of Work
 1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound concrete, prepare cavities and install concrete and reinforcing (as required) materials to restore concrete columns to original condition and appearance. Refer to Detail Series 6.0 for specific requirements.
- B. Materials
 1. Cast-in-place concrete repair materials shall be as specified in Division 03 Section "Prepackaged Repair Mortar"
 2. Conventional steel reinforcement shall be as specified in Division 03 Section "Cast-in-Place Concrete", Division 03 Section "Cast-in-Place Concrete Restoration" and/or Work Item 1.4, "Concrete Reinforcement."
 3. Trowel applied patching material shall be as specified in Division 03 Section "Prepackaged Repair Mortar." This material may be used for shallow removal and repair Work Items only.
- C. Execution

1. Locating, marking, removal ,preparation, and inspection of deteriorated concrete and reinforcing steel preparation, repair and installation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay." Install shoring at repair locations where required per the Construction Documents prior to starting removals.
2. Final surface preparation, concrete placement, finishing and curing shall be performed as specified in concrete repair material specification. Manufacturer specifications/requirements on these issues shall also be followed in the event proprietary bag mix repair materials are used.
3. Contractor shall take care to protect adjacent areas. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 6.1 COLUMN REPAIR – PARTIAL DEPTH/SALLOW

- A. Refer to Work Item 6.0, "Concrete Column Repair" for scope of Work, materials and procedure associated with this Work Item. Refer to Detail 6.1 for specific requirements.

WI 7.0 CONCRETE WALL REPAIR

- A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound concrete, prepare cavities and install concrete and reinforcing (as required) materials to restore concrete walls to original condition and appearance. Refer to Detail Series 7.0 for specific requirements.

- B. Materials

1. Cast-in-place concrete repair materials shall be as specified in Division 03 Section "Prepackaged Repair Mortar"
2. Conventional steel reinforcement shall be as specified in Division 03 Section "Cast-in-Place Concrete", Division 03 Section "Cast-in-Place Concrete Restoration" and/or Work Item 1.4, "Concrete Reinforcement."
3. Trowel applied patching material shall be as specified in Division 03 Section "Prepackaged Repair Mortar." This material may be used for shallow removal and repair Work Items only.

- C. Execution

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

3. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 7.1 WALL REPAIR - PARTIAL DEPTH/SHALLOW

- A. Refer to Work Item 7.0, "Concrete Wall Repair" for scope of Work, materials and procedure associated with this Work Item. Refer to Detail 7.1 for specific requirements.

WI 8.0 PRECAST TEE BEAM REPAIR

- A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals including shoring necessary to locate precast tee beam elements to be repaired, shore surrounding construction supported by tee beam element being repaired, remove delaminated and unsound concrete and sound concrete, prepare cavities and install concrete and reinforcing (as required) to rebuild precast tee beam elements to original condition and appearance. Refer to Detail Series 8.0 for specific requirements.

- B. Materials/Equipment

1. Cast-in-place concrete repair materials shall be as specified in Division 03 Section "Prepackaged Repair Mortar"
2. Conventional steel reinforcement shall be as specified in Division 03 Section "Cast-in-Place Concrete", Division 03 Section "Cast-in-Place Concrete Restoration" and/or Work Item 1.4, "Concrete Reinforcement."
3. Trowel applied patching material shall be as specified in Division 03 Section "Prepackaged Repair Mortar." This material may be used for shallow removal and repair Work Items only.
4. Chipping hammers shall be 15 lb or less unless directed by Engineer/Architect.

- C. Execution

1. Locating, marking, removal, preparation, and inspection of deteriorated concrete and reinforcing steel preparation, repair and installation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay." Install shoring at repair locations where required per the Construction Documents prior to starting removals.
2. Final surface preparation, concrete placement, finishing and curing shall be performed as specified in concrete repair material specification. Manufacturer specifications/requirements on these issues shall also be followed in the event proprietary bag mix repair materials are used.
3. Contractor shall maintain forms and shores in place until concrete has attained at least 75% of 28-day strength.

4. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 8.1 TEE BEAM REPAIR - PARTIAL DEPTH/SHALLOW

- A. Refer to Work Item 8.0, "Precast Tee Beam Repair" for scope of Work, materials and procedure associated with this Work Item. Refer to Detail 8.1 for specific requirements.

WI 8.4 TEE FLANGE REPAIR – PARTIAL DEPTH

- A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and remove deteriorated tee flange concrete as indicated on the Drawings. Refer to detail 8.4 for specific requirements.

- B. Materials

1. Extended Open Time Corrosion Inhibitor Coating: Corrosion inhibitor coating providing up to 24 hours open time. Product shall be capable of achieving bond strength of 2,700 psi per ASTM C 882.
2. Acceptable materials for this Work are:
 - a. "MasterEmaco P 124," by BASF Building Systems, Shakopee, MN.
 - b. "Duralprep AC" by The Euclid Chemical Company, Cleveland, OH.
 - c. "Sika Armatec 110 EpoCem", by Sika Corporation, Lyndhurst, NJ.
 - d. Other types may be used only with Engineer/Architect's approval in writing prior to bidding.

- C. Concrete Repair materials:

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

- D. Execution

1. Locating, marking and removal of deteriorated concrete and reinforcing steel preparation shall be performed as specified in Division 02 Section "Surface Preparation for Patching and Overlay."
2. Prepare repair areas using chipping hammers of 15 lb or less as directed by Engineer.
3. All exposed steel within cavities shall be cleaned by sandblasting.
4. Contractor shall allow for Engineer/Architect inspection of all cavities for condition as specified.

5. Contractor shall coat exposed prepared steel and entire removal area with specified corrosion inhibitor coating material.

WI 11.0 CRACK AND JOINT REPAIR

WI 11.5 EPOXY INJECTION

A. Scope of Work

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

B. Materials

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

C. Execution

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

WI 16.0 TRAFFIC TOPPING

A. Scope of Work

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

B. Materials

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

C. Execution

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

WI 16.5 TRAFFIC TOPPING - VEHICULAR

- A. Apply new traffic topping to top deck at Village level where the existing traffic coating is removed for seismic retrofit and maintenance repairs.
- B. Refer to Work Item 16.0, "Traffic Topping" for Scope of Work, materials and procedure associated with this Work Item.

WI 25.0 MECHANICAL - DRAINAGE

WI 25.1 MECHANICAL – ALLOWANCE

A. Scope of Work

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

B. Method of Payment

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

WI 30.0 ELECTRICAL – LIGHTING

WI 30.1 ELECTRICAL ALLOWANCE

A. Scope of Work

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

B. Method of Payment

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

WI 43.2 REMOVE/REPLACE HANDRAIL

- #### **A.**
- Refer to Work Item 43.2 "Remove/Replace Handrail "for Scope of Work, Material and Execution procedures associated with this Work Item. Refer to Detail 43.2 for specific requirements.

WI 45.0 PAINTING

WI 45.1 PAINT TRAFFIC MARKINGS

Re-stripe two top levels (Village Level and Pier Level) after maintenance repairs and seismic retrofit are completed.

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate, layout and paint parking stall stripes, traffic arrows, crosswalks, accessible stall access aisles, curbs, symbols, stop bars and all other required pavement markings.

B. Materials

1. Painting materials shall be as specified in Division 09 Section "Pavement Marking."

C. Execution

1. Unless otherwise indicated in the Construction Documents, stripes and paint color shall match all existing marks and be provided at same locations.
2. Where new striping layout is described in the Construction Documents that conflicts with existing striping layout, remove existing stripes in those locations where they conflict with new striping layout. See referenced specification section for removal requirements.
3. Where existing traffic marking layout is to be maintained, Contractor shall prepare drawing of existing traffic marking layout in work areas prior to starting with repairs. Contractor shall note stall width, angle of parking, directional traffic arrows and all other existing pavement markings.
4. Contractor shall submit striping plan for Engineer/Architect's review.
5. Engineer/Architect may inspect all layout and surface preparation for conditions in accordance with Division 09 Section "Pavement Marking."

WI 45.3 PAINT CONCRETE CEILINGS AND BEAMS

Paint concrete columns, ceilings, pipes and beams after maintenance repairs and seismic retrofit are completed.

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to contain, with full height barriers, preparation debris and paint during operations and prepare, prime and paint all structural steel and miscellaneous metal items as located on Drawings.

B. Materials

1. Paint materials shall be as specified in Division 09 Section "Exterior Painting."
2. Cleaning process shall include surface mechanical preparation as required and power washing.

C. Execution

1. Contractor shall locate and verify with Engineer/Architect all Work areas.
2. Contractor shall verify color selection with Owner prior to start of Work.
3. Surface preparation of substrate is required per manufactures recommendations.
4. Contractor shall take all necessary measures to contain, with full height barriers, sandblasting debris and paint to immediate Work area to protect public from injury and property from damage.
5. Contractor shall collect all runoff water from cleaning processes and dispose of per local and EPA requirements.
6. Protect adjacent non-painted surfaces from being painted. Mask off adjacent features not receiving paint.

7. Contractor shall apply primer and/or paint in accordance with referenced specification section listed in "Materials" above and manufacturer's recommendations.

WI 45.7 PAINT STRUCTURAL STEEL

B. Scope of Work

8. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to contain, with full height barriers, preparation debris and paint during operations and prepare, prime and paint all structural steel and miscellaneous metal items as located on Drawings.

D. Materials

1. Paint materials shall be as specified in Division 09 Section "Exterior Painting."

E. Execution

1. Contractor shall locate and verify with Engineer/Architect all Work areas.
2. Contractor shall verify color selection with Owner prior to start of Work.
3. Contractor shall take all necessary measures to contain, with full height barriers, sandblasting debris and paint to immediate Work area to protect public from injury and property from damage.
4. Contractor shall solvent clean any surface area with oil or grease build-up prior to receiving additional preparation in accordance with SSPC-SP1 and Division 09 Section "Exterior Painting."
5. Contractor shall prepare all surfaces with surface corrosion in accordance with SSPC-SP10 "Near White Metal Blast Cleaning" or SSPC-SP11 "Power Tool Cleaning to Bare Metal" and Division 09 Section "Exterior Painting."
6. Contractor shall remove all debris from Work area prior to application of primer or paint.
7. Contractor shall apply primer to all prepared metal surfaces on same day (within 8 hrs) as preparation operations. Apply primer and Paints according to Division 09 Section "Exterior Painting" and in strict accordance with manufacturer's recommendations.

WI 49.0 CATHODIC PROTECTION

WI 49.1 CATHODIC PROTECTION – DISCRETE ANODES

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to install galvanic anodes in concrete repair patches for Work Items 3.1, 3.3a, 3.3b, 3.3c, 4.1, 5.1, 5.2, 6.1, 7.1 and 8.1 as shown on Drawings. Refer to Detail 49.1 for specific requirements.

B. Materials

1. Materials shall be as specified in Division 03 Section "Galvanic Anode Corrosion Protection System."

C. Execution

1. Concrete demolition and patching shall be in accordance with appropriate repair Work Item and is not a part of this Work Item.
2. Contractor shall install discrete anodes at 24 inches on center (maximum) in each patch around the perimeter of the repair. Final anode installation locations will vary, based on existing reinforcing steel layout; determine final installation layout with Engineer input in field.
3. Unless noted otherwise, Contractor shall install discrete anodes on mild reinforcing steel only. Post-tension tendons shall not receive anodes.
4. Discrete anodes are to be installed per Specifications to the reinforcing bar to clean/bare metal. Orient anodes towards center of concrete members where possible to maximize concrete cover.
5. Confirm electrical connection between anode tie wire and reinforcing steel by measuring DC resistance (ohm) with a multi-meter. Connection is acceptable if DC resistance is less than 1 ohm

END OF SECTION 020010

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SECTION 025130 - GENERAL CONCRETE SURFACE PREPARATION

PART 1 - GENERAL

1.1 DEFINITIONS

- A. **DELAMINATIONS:** Fracture planes, "internal cracks," within concrete. Typically these fractures are parallel to the member face and vary in depth.
- B. **NEAR-VERTICAL CHIPPED EDGES:** Provide an edge dressed to within 20° of perpendicular of finished surface.
- C. **SPALLS:** Potholes, cavities or voids in floor slabs, beams, columns, and walls. Usually result of delamination migrating to face of concrete member. When fracture finally reaches surface, concrete encompassed by delamination breaks away, resulting in spall.
- D. **UNSOUND CONCRETE:** Concrete exhibiting one or more of:
 - 1. Incipient fractures present beneath existing delaminated or spalled surfaces.
 - 2. Honeycombing.
 - 3. Friable or punky areas.
 - 4. Deterioration from freeze-thaw action.
- E. **SCALING:** Deterioration which attacks mortar fraction (paste) of concrete mix. First appears as minor flaking and disintegration of concrete surface. Scaling eventually progresses deeper into concrete, exposing aggregate which breaks away. Concrete scaling is caused by freeze-thaw action. If concrete is frozen in saturated state, excess water freezing in concrete causes high internal stresses.
- F. **SHOTBLASTING:** Scarification of concrete surfaces using an abraded metal shot-rebound. See Corps of Engineer's Manual EM 1110-2-2002 and the National Cooperative Highway Research Program's Report #99 for a more detailed definition.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 025130

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SECTION 025140 - SURFACE PREPARATION FOR PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

1.3 REFERENCES

- A. "Specifications for Structural Concrete for Buildings" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
 - 1. "Concrete Repair Guide" (ACI 546R-04)

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. Floor Slabs:

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

B. Vertical and Overhead Surfaces:

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

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

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

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

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

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

H. For overlay installation, boundaries of overlay areas will be as defined in project drawings and verified by Engineer/Architect.

3.2 PREPARATION

A. Temporary shoring may be required at concrete floor repair areas exceeding 5 sq ft and at any beam, joist, or column repair. Contractor: Review all marked removal and

preparation areas and request clarification by Engineer/Architect of shoring requirements in questionable areas. Shores shall be in place prior to concrete removal and cavity preparation in any area requiring shores.

- B. Delaminated, spalled and unsound concrete floor areas: mark boundaries. All concrete shall be removed from within marked boundary to minimum depth of 0.75 in. using 15 to 30 lb chipping hammers equipped with chisel point bits. When directed by Engineer/Architect, chipping hammers less than 15 lb shall be used to minimize damage to sound concrete. Near vertical chipped edge shall be provided along perimeter of repair area where shown on drawings. Areas to be removed shall encompass repair and provide uniform cavity surface. If delaminations exist beyond minimum removal depth, chipping shall continue until all unsound and delaminated concrete has been removed from cavity.
- C. Where embedded reinforcement or electrical conduit is exposed by concrete removal, exercise extra caution to avoid damaging it during removal of unsound concrete. If bond between exposed embedded reinforcement and adjacent concrete is impaired by Contractor's removal operations, Contractor shall perform additional removal around and beyond perimeter of reinforcement for minimum of 0.75 in. along entire length affected at no cost to Owner.
- D. If rust is present on embedded reinforcement where it enters sound concrete, additional removal of concrete along and beneath reinforcement required. Additional removal shall continue until non-rusted reinforcement is exposed, or may be terminated as Engineer/Architect directs.
- E. Sawcut patch and overlay boundaries to depth of 0.75 in. into floor slab, unless otherwise noted. No sawcutting required at overlay boundaries abutting existing vertical surface (wall, beam, curb, etc.). For vertical and overhead surfaces marked boundary may be sawcut, ground or chipped to depth of 0.5 in. to 0.625 in. into existing concrete, measured from original surface. All edges shall be straight and patch areas square or rectangular-shaped. Diamond blade saw or grinder with abrasive disk suitable for cutting concrete is acceptable for performing work. Edge cut at boundary shall be dressed perpendicular to member face. It shall also be of uniform depth, for entire length of cut. Exercise extra caution during sawcutting to avoid damaging existing reinforcement (ESPECIALLY POST-TENSIONING TENDONS AND SHEATHING) and electrical conduit and any other embedded items near surface of concrete. Any damage to existing reinforcement, post-tensioning tendons or sheathing during removals shall be repaired by Contractor with Engineer/Architect-approved methods at no additional cost to Owner.
- F. All sound surfaces (surfaces not requiring spall or delamination repair as previously discussed in this section) to receive overlay shall be heavy abrasive blasted or heavy shotblasted prior to overlay placement, to produce a final concrete surface profile matching ICRI CSP.

3.3 INSPECTION OF REPAIR PREPARATION

- A. After removals are complete, but prior to final cleaning, exposed concrete surfaces and exposed reinforcement shall be inspected by Contractor and verified by

Engineer/Architect for compliance with requirements of this Section. Where Engineer/Architect finds unsatisfactory surface or cavity preparation, Engineer/ Architect shall direct Contractor to perform additional removals. Engineer/Architect shall verify areas after additional removals.

- B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer/Architect of all defective and damaged reinforcement or conduits. Replacement of damaged or defective reinforcement or conduits shall be performed according to this Section and as directed by Engineer/Architect.
- C. After inspections of exposed surfaces and reinforcement are complete, Engineer/ Architect and Contractor shall measure and document removal and replacement quantities for payment, as required.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

- A. All embedded reinforcement exposed during surface preparation that has lost more than **15%** (**10%** if 2 or more consecutive parallel bars and/or tendons are affected) of original cross-section due to corrosion shall be considered DEFECTIVE. All non-defective exposed reinforcement that has lost section to extent specified above as direct result of Contractor's removal operations shall be considered DAMAGED.
- B. **Embedded materials** including, but not limited to, electrical conduit, corrosion protection systems and snow/ice melting equipment **shall be protected by Contractor** during removal operations. **Damage due to removal operations shall be repaired by Contractor in accordance with national code requirements at no cost to Owner.** Embedded materials which are defective due to pre-existing conditions may be repaired or replaced by Contractor or abandoned at Owner's option and cost.
- C. Supplement defective or damaged embedded reinforcement by addition of reinforcement of equal diameter with Class "B" minimum splice per ACI 318 beyond damaged portion of reinforcement. Secure new reinforcement to existing reinforcement with wire ties and/or approved anchors. Supplemental reinforcement shall be ASTM A615 Grade 60 steel installed in accordance with Division 03 specification Sections. Tendon supplement or repair materials, when applicable, shall be as required by Section "Work Items."
- D. Loose and supplemental reinforcement exposed during surface preparation shall be securely anchored prior to concrete placement. Loose reinforcement shall be adequately secured by wire ties to bonded reinforcement or shall have drilled-in anchors installed to original concrete substrate. Drilled-in anchors shall be Powers "Tie-Wire Lok-Bolt" anchors, ITW Ramset/Red Head "TW-1400" anchor, or approved equivalent. Supplemental reinforcing needed to be held off substrate shall be adequately secured by drilled-in anchors installed to original concrete substrate with Powers "Tie-Wire Spike", ITW Ramset/Red Head Redi-Drive "TD4-112" anchors, or approved equivalent. Engineer/Architect will determine adequacy of wire ties and approve other anchoring devices prior to their use. Securing loose and supplemental reinforcement is incidental to surface preparation and no extras will be allowed for this Work.

- E. Concrete shall be removed to provide minimum of 3/4 in. clearance on all sides of defective or damaged exposed embedded reinforcement that is left in place. Minimum of 1.5-in. concrete cover shall be provided over all new and existing reinforcement. Concrete cover over reinforcement may be reduced to 1 in. with Engineer/Architect's approval if coated with an approved epoxy resin.
- F. Supplemental reinforcement and concrete removals required for repairs of defective or damaged reinforcement shall be paid for as follows:
 - 1. Concrete removals and supplemental reinforcement required for repairs of DEFECTIVE reinforcement shall be paid for by Owner at unit price bid.
 - 2. Concrete removals and supplemental reinforcement required for repairs of DAMAGED reinforcement shall be paid for by Contractor.

3.5 CLEANING OF REINFORCEMENT WITH DELAMINATION AND SPALL CAVITIES

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

3.6 PREPARATION OF CAVITY FOR PATCH PLACEMENT

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

END OF SECTION 025140

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SECTION 032117 – GALVANIC ANODES CORROSION PROTECTION SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes furnishing all labor, tools, materials, equipment and services necessary to properly install embedded galvanic anodes.
- B. Embedded galvanic anodes are designed to provide localized corrosion protection to mild steel reinforcement that is located within a partial or full depth concrete repair. Place at 24 inches maximum on center along the perimeter of concrete patches or interface between new and existing concrete, galvanic anodes help control active corrosion and mitigate formation of new corrosion sites.
- C. Related Section: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "General Concrete Surface Preparation."
 - 2. Division 02 Section "Surface Preparation for Patching."
 - 3. Division 03 Section "Cast-In-Place Concrete."
 - 4. Division 03 Section "Prepackaged Repair Mortar."

1.3 QUALITY ASSURANCE

- A. The contractor shall provide submittals confirming the chloride penetration resistance of the repair material by an independent testing laboratory prior to beginning work.
 - 1. Concrete repair material shall have a Rapid Chloride Penetration Resistance (ASTM C1202) above 1350 Coulombs or Bulk Electrical Resistivity (ASTM C1760) below 15,000 Ohm-cm as measured after 28-day wet-cure.
- B. Embedded galvanic anodes shall utilize chemical enhancement to keep the zinc active over the anode design life. Alkali-activated anodes shall have a pH of 14 or greater.
- C. Insulating materials such as epoxy bonding agents shall not be used in any patch or concrete placement protected by galvanic anodes.

D. Testing Agency:

1. Independent testing laboratory provided by Contractor and acceptable to Engineer/Architect.
2. Testing laboratory shall submit documented proof of ability to perform required tests.
3. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency has authority to reject material not meeting Specifications.
4. Testing of repair locations shall be performed by testing agency representatives that are NACE certified to CP2, CP3 or CP4.
5. Testing Agency shall submit the following information for Field Testing of Material unless modified in writing by Engineer/Architect:
 - a. Project name and location.
 - b. Contractor's name.
 - c. Testing Agency's name, address and phone number.
 - d. Anode manufacturer.
 - e. Date of report.
 - f. Testing Agency technician's name.
 - g. Placement location within structure.
 - h. Weather data:
 - 1) Air temperatures.
 - 2) Weather.
 - 3) Wind speed.
 - i. Date, time, and place of test.
 - j. Related test data as required in Section "Field Quality Control by Testing Agency."

1.4 REFERENCES

- A. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
1. ACI/ICRI: Concrete Repair Manual.
 2. ACI Guideline No. 222R: – Corrosion of Metals in Concrete
 3. ACI 562: Code Requirements for Evaluation, Repair and Rehabilitation of Concrete Buildings.
 4. ACI RAP-8: Repair Application Procedure: Installation of Embedded Galvanic Anodes
 5. ICRI Guideline 310.1R: Guide for Surface Preparation for the Repair of Deteriorated Concrete resulting from Reinforcing Steel Corrosion.
 6. ASTM A615/A615M: Standard Specification for Deformed and Plain Carbon-Steel Bar for Concrete Reinforcement.
 7. ASTM A82: Specification for Plain Steel Wire for Concrete Reinforcement.
 8. ASTM B6-09 - Standard Specification for Zinc.

9. ASTM B418: Standard Specification for Cast and Wrought Galvanic Zinc Anodes.
10. ASTM C1202: Standard Test Method for an Electrical Indication of Concrete Ability to Resist Chloride Ion Penetration,
11. ASTM C1760: Standard Test Method for Bulk Electrical Conductivity of Hardened Concrete.”

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
 1. Name of product.
 2. Name of manufacturer.
 3. Batch number
 4. Date of manufacture
- B. Store materials in unopened boxes in dry conditions and protect from extremes in temperature and humidity. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.6 WARRANTY

- A. System manufacturer and Contractor shall furnish Owner written single source performance guarantee that the embedded galvanic anodes will remain electrochemically active, producing galvanic current and provide corrosion protection for a period of ten years starting from the date of substantial completion of the project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Embedded galvanic anodes shall utilize zinc in compliance in compliance with ASTM B418 Type II (Z13000) and ASTM B6 Special High Grade (Z13001) with iron content less than 15 ppm.
- B. Embedded galvanic anodes shall be pre-manufactured and contain sufficient quantity of metallic zinc to mitigate corrosion for a period of ten (10) years. Minimum amount of zinc shall be at least 100 grams. Amount of zinc shall be at least 200% of amount needed to satisfy anticipated service life based on electrochemical theory (Faraday's Law) and based on currents that are expected to flow in anodes. Zinc shall be cast around steel tie wires to provide a durable zinc / steel connection as per NACE practice. Anodes shall be supplied with integral unspliced tie wires for direct connection to reinforcing steel.

- C. Embedded galvanic anodes shall be evaluated and certified by an independent organization.
- D. Embedded galvanic anodes shall have verifiable record with a minimum of 5 projects of similar size showing minimum five years satisfactory performance in similar field environment. Records shall demonstrate satisfactory flow of protective current throughout three-year period; including at least 0.2 mA after 1 year, and at least 0.1 mA after 3 years. Significant cathodic polarization of surrounding reinforcing steel shall be documented throughout this period.
- E. Repair mortars and concrete shall be Portland cement-based materials with volumetric resistivity below 15,000 ohm-cm, as measured after 28-day wet cure and in saturated condition. Contractor shall provide submittals confirming the resistivity of repair materials prior to beginning work. Non-conductive repair materials such as epoxy, urethane, or magnesium phosphate shall not be permitted.
- F. Deformed bars for reinforcement shall be hot-rolled steel in accordance with ASTM A615/A615M-00, Grade 60 (Grade 400).
- G. Deliver, store, and handle all materials in accordance with manufacturer's instructions.
- H. Acceptable Products (Minimum Zinc Content 100 grams) are as follows:
 - 1. Alkali Activated Embedded Galvanic Anodes:
 - a. "Galvashield XP2 or XP4," by Sika Corporation, Lyndhurst, NJ or by Vector Corrosion Technologies, Winnipeg Canada.

PART 3 - EXECUTION

3.1 CONCRETE REMOVAL AND PREPARATION

- A. Concrete removal, preparation of the concrete surface for patching shall be conducted under appropriate concrete partial or full depth repair work item and according to Section "Surface Preparation for Patching."
- B. Remove loose or delaminated concrete.
- C. Undercut all exposed reinforcing by removing concrete from the full circumference of the steel. The minimum clearance between the concrete substrate and reinforcing steel shall be 0.75 in or 0.25 in larger than the top size aggregate in the repair material, whichever is greater.
- D. Concrete removal shall continue along the reinforcing steel until there are no visible signs of corrosion.

3.2 CLEANING AND REPAIR OF REINFORCING STEEL

- A. Clean exposed reinforcing steel of rust, mortar, etc. to provide sufficient electrical connection prior to installation of anodes.
- B. Secure loose reinforcing steel by tying tightly to other bars with steel tie wire. Newly secured reinforcing steel shall be tested to insure electrical continuity according to Section "Galvanic Anode Installation: Electrical Continuity" below.

3.3 GALVANIC ANODE INSTALLATION

- A. Galvanic anodes shall be installed along perimeter of repair or interface with spacing as indicated in Project Documents and in accordance with manufacturer recommendations.
 - 1. In no case shall distance between anodes exceed 24 inches.
 - 2. Handle and install anodes in accordance with manufacturer's written instructions.
 - 3. Provide sufficient clearance between anodes and substrate to allow repair material to encase anode.
 - 4. Install galvanic anodes immediately following preparation and cleaning of steel reinforcement.
 - 5. Galvanic anodes shall be installed to provide minimum 2-inch concrete cover over the anodes. If less than 2 inches of concrete cover is expected, place anode behind bar and secure to clean reinforcing steel.
 - 6. Secure galvanic anodes within 4 inches of patch edge using anode tie wires, preferably Tie wires shall be wrapped at least one full turn in opposite directions around cleaned reinforcing steel and twisted tight to allow little or no free movement. Anode may be tied to a single bar or may be placed at an intersection between two bars and secured to each clean bar.
- B. Electrical Continuity
 - 1. At all anode locations, Contractor to confirm and report electrical continuity between anode tie wire and reinforcing steel and between exposed reinforcing steel within the repair area by using a multi-meter on the lowest DC mV scale. Electrical continuity is acceptable if the DC mV difference between test points is equal to or less than 1 mV. Document testing and submit in accordance with Section "Submittals."
 - 2. If electrical continuity does not exist between anode unit and reinforcing steel, remove the anode, clean the steel, reinstall the anode and retest. If electrical continuity does not exist between reinforcing steel within the repair area, connect discontinuous steel to continuous steel by wrapping tightly with steel tie wire to provide electrical continuity.

3.4 CONCRETE REPLACEMENT

- A. Provide bridging mortar completing surrounding anode and forming a connection to patch perimeter.
- B. Complete repair in accordance with appropriate work item.
- C. Do not damage the anode during concrete replacement or allow anode to be soaked with water greater than 20 minutes.

3.5 FIELD QUALITY CONTROL BY TESTING AGENCY

- A. Field Observations.
 - 1. Presence of insulating materials.
 - 2. Confirmation of material type installed.
 - 3. Confirmation of material spacing and attachment.
 - 4. Confirmation of material installation in accordance to manufacturer requirements. and as indicated in Contract Documents.
 - 5. Confirm continuity of at least 10 anode locations and up to 5% of repair quantity identified by the Contractor as ready for concrete placement.

END OF SECTION 032117

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SECTION 033021 - CAST-IN-PLACE CONCRETE RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section specifies cast-in-place concrete, including reinforcement, concrete materials, mix design, placement procedures, and finishes.
- B. Work in other Sections related to Cast-in-Place Concrete:
 - 1. Division 02 Section "Surface Preparation for Patching."
 - 2. Division 03 Section "Galvanic Anode Corrosion Protection."
 - 3. Division 03 Section "Epoxy Injection Systems."
 - 4. Division 09 Section "Pavement Marking."

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume.

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An experienced installer who has completed concrete work similar in material, design, and extent to that indicated for this Project and whose work has resulted in construction with a record of successful in-service performance.

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

- a. Date, time and place of test.
- b. Slump.
- c. Concrete Temperature.
- d. Slump flow (for SCC).
- e. Air content.

14. Compressive test data:

- a. Cylinder number.
- b. Age of concrete when tested.
- c. Date and time of cylinder test.
- d. Curing time (field and lab).
- e. Cross-sectional area of cylinder.
- f. Compressive strength.
- g. Type of failure (at break).

1.6 REFERENCES

A. American Concrete Institute (ACI):

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

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

1. ASTM A 36, "Standard Specification for Carbon Structural Steel."
2. ASTM A 615, "Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement."
3. ASTM A 706, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
4. ASTM A 775, "Standard Specification for Epoxy-Coated Steel Reinforcing Bars."
5. ASTM A 884, "Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement."
6. ASTM A1064, "Standard Specification for Carbon-Steel Wire and Welded Wire Steel Reinforcement, Plain and Deformed, for concrete."
7. ASTM C 31, "Standard Practice for Making and Curing Concrete Test Specimens in the Field."
8. ASTM C 33, "Standard Specification for Concrete Aggregates."

9. ASTM C 39, "Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens."
10. ASTM C 94, "Standard Specification for Ready-Mixed Concrete."
11. ASTM C 138, "Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete."
12. ASTM C 143, "Standard Test Method for Slump of Hydraulic Cement Concrete."
13. ASTM C 150, "Standard Specification for Portland Cement."
14. ASTM C 171, "Standard Specification for Sheet Materials for Curing Concrete."
15. ASTM C 172, "Standard Practice for Sampling Freshly Mixed Concrete."
16. ASTM C 173, "Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method."
17. ASTM C 231, "Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method."
18. ASTM C 260, "Standard Specification for Air-Entraining Admixtures for Concrete."
19. ASTM C 309, "Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete."
20. ASTM C 494, "Standard Specifications for Chemical Admixtures for Concrete."
21. ASTM C 567, "Standard Test Method for Determining the Density of Structural Lightweight Concrete."
22. ASTM C 618, "Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete."
23. ASTM C 989, "Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars."
24. ASTM C 1218, "Standard Test Method for Water Soluble Chloride Ion in Mortar and Concrete."
25. ASTM C 1315, "Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete."
26. ASTM C 1611/C 1611M, "Standard Test Method for Slump Flow of Self-Consolidating Concrete."

PART 2 - PRODUCTS

2.1 FORMWORK

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

2.2 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M or ASTM A 706, Grade 60 (Grade 420), deformed.
- B. Plain-Steel Welded Wire Fabric: ASTM A 1064, fabricated from as-drawn steel wire into flat sheets, mats only. Roll stock prohibited.
- C. Provide bar supports according to CRSI's "Manual of Standard Practice." Use all-plastic bar supports when in contact with exposed concrete surface.

2.3 CONCRETE MATERIALS

- A. Ready Mixed Concrete: Obtain concrete from plant with current certification from:
 - 1. National Ready Mixed Concrete Association.
- B. Portland Cement: ASTM C 150, Types I or II or Type I/II.
- C. Fly Ash: ASTM C618, Class C or Class F.
- D. Normal-Weight Coarse Aggregate: ASTM C 33, Crushed and graded limestone or approved equivalent, Class 5S uniformly graded, not exceeding **3/4-inch** nominal size. No cherts, opaline or crushed hydraulic-cement concrete is permitted.
 - 1. Combine Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.
- E. Water: Potable and complying with ASTM C 1602.

2.4 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.
- B. General: Admixtures certified by manufacturer that all admixtures used are mutually compatible.
- C. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Use water-reducing or high-range water reducing admixture in concrete, as required, for placement and workability.
 - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 3. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, fiber reinforced concrete, and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.45.
 - 4. Use corrosion-inhibiting admixture in parking structure slabs and other areas noted on drawings.
- D. Normal Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon Series," Euclid Chemical Co.

- b. "WRDA Series," W.R. Grace & Co.
 - c. "Master Pozzoloth Series," or "Master PolyHeed Series," BASF Corporation.
 - d. "Plastocrete Series", Sika Corporation.
- E. Mid-Range Water-Reducing Admixture: ASTM C 494, Type A.
 - 1. Subject to compliance with requirements, provide one of following:
 - a. "Eucon MR" or "Eucon X-15 and X-20," Euclid Chemical Co.
 - b. "Daracem Series" or "MIRA Series," W.R. Grace & Co.
 - c. "Master Polyheed Series," BASF Corporation.
 - d. "Sikaplast Series" or "Plastocrete Series", Sika Corporation.
 - e. "Polychem 1000" or "KB Series," General Resource Technology.
 - f. "Finishease-NC," Russ Tech Admixtures, Inc.
 - g. "OptiFlo Series" or "EcoFlo Series," Premiere Concrete Admixtures.
- F. High-Range, Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon 37" or "Eucon SP-Series" or "Plastol Series," Euclid Chemical Co.
 - b. "Daracem Series" or "ADVA Series," W.R. Grace & Co.
 - c. "Master Rheobuild 1000", "PS 1466" or "Master Glenium Series," BASF Corporation.
 - d. "Sikament Series" or "Sika ViscoCrete Series," Sika Corporation.
 - e. "Melchem Series," General Resource Technology.
 - f. "Superflo 443" or "Superflo 2000 Series," Russ Tech Admixtures, Inc.
 - g. "EcoFlo Series" or "UltraFlo Series," Premiere Concrete Admixtures.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type B or D.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon Retarder-75", "Eucon DS" or "Eucon Stasis." Euclid Chemical Co.
 - b. "Daratard-17" or "Recover," W.R. Grace & Co.
 - c. "MasterSet R Series" or "MasterSet Delvo Series," BASF Corporation.
 - d. "Sikatard Series," or "Plastiment Series" or "Plastocrete Series," Sika Corporation.
- H. Non-Chloride, Non-Corrosive Water-Reducing, Accelerating Admixture: ASTM C 494, Type C or E.
 - 1. Products: Subject to compliance with requirements, provide one of following:
 - a. "Eucon AcN-Series," "Accelguard 80," "Accelguard NCA," or "Accelguard 90," by Euclid Chemical Company.
 - b. "DCI," "PolaraSet," "Lubricon NCA," "Daraset" or "Gilco," by W.R. Grace & Co.
 - c. "MasterSet FP 20" or "MasterSet AC 534," by BASF Corporation.

- d. "Sika Set NC," "Plastocrete 161FL," or "Sika Rapid-1," by Sika Corporation.
 - e. "Catexol 2000 RHE," by Axim Concrete Technologies.
- I. Corrosion Inhibiting Admixture shall be capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.
1. Products: Subject to compliance with requirements, provide one of the following:
- a. "Eucon CIA" or "Eucon BCN," Euclid Chemical Company.
 - b. "DCI" or "DCI-S," W.R. Grace.
 - c. "MasterLife CI 30," BASF Corporation.
 - d. "Sika CNI," Sika Corporation.
 - e. "Catexol 1000 CN-CI," Axim Concrete Technologies.
 - f. "Polychem CI," General Resource Technology.
 - g. "Russ Tech RCI," Russ Tech Admixtures, Inc.

2.5 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
1. Evaporation Retarder:
- a. AquaFilm J74 by Dayton Superior Corporation, Miamisburg, OH
 - b. Eucobar; Euclid Chemical Co.
 - c. E-Con; L&M Construction Chemicals, Inc.
 - d. MasterKure ER 50; BASF Corporation.
 - e. SikaFilm; Sika Corporation.
 - f. Sure-Film (J-74); Dayton Superior Corporation.
 - g. "EVRT", Russ Tech Admixtures, Inc.
 - h. "Barrier," Premiere Concrete Solutions.
- B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry. Materials must be free of harmful substances, such as sugar or fertilizer, or substances that may discolor the concrete. To remove soluble substances, burlap should be thoroughly rinsed in water before placing it on the concrete.
- C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- D. Water: Potable.
- E. Clear, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- F. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

2.6 CONCRETE MIXTURES

- A. Proportion mixtures determined by either laboratory trial mix or field test data bases, as follows:
 - 1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
 - 2. Proportion lightweight structural concrete according to ACI 211.2 and ACI 301.
 - 3. Provide different mixtures as the season warrants, as well as each type and strength of concrete or for different placing methods.
- B. Use a qualified independent testing agency for preparing and reporting proposed Mixture Proportions for the laboratory trial mix basis.
- C. Requirements for normal-weight concrete mix are shown on Drawings:
 - 1. Compressive strength
 - 2. Slump
 - 3. Water-cementitious materials ratio
- D. Alkali-Aggregate Reactivity Resistance: Provide one of the following:
 - 1. Total equivalent alkali content of mixture less than 5 lb. /cu. yd.
 - 2. ASTM C1293: Expansion less than 0.04 % after 1 year for each of the aggregates (both coarse and fine) in the proposed concrete mixture. This data shall be less than 1 year old.
 - 3. ASTM C1260 or AASHTO T303: Expansion less than 0.1 % after 14 days for each of the aggregates (both coarse and fine) in the proposed concrete mixture.
 - 4. ASTM C1567: Expansion less than 0.1 % after 14 days with each of the aggregates (both coarse and fine) and the supplementary cementing materials (both source and quantity) of the proposed concrete mixture design. Alternatively, if satisfactory ASTM C1260 or AASHTO T303 test results can be provided for one of the aggregates that are being used, ASTM C1567 testing does not need to be provided for that aggregate.
 - 5. CE CRD-C662: Expansion less than 0.1 % after 28 days with the each of the aggregates (both coarse and fine), the supplementary cementing materials (both source and quantity) of the proposed concrete mixture design and the lithium admixture source and dosage level of the proposed mixture design. Alternatively, if satisfactory ASTM C1260 or AASHTO T303 test results can be provided for one of the aggregates that are being used, CRD-C662 testing does not need to be provided for that aggregate.
- E. Admixtures: Use admixtures according to manufacturer's written instructions.
 - 1. Consider using water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
 - 2. Use high range water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio of 0.45 or less. Use normal or mid-range water reducing admixture for concrete with water-cementitious materials ratio greater than 0.45.
 - 3. Use corrosion-inhibiting admixture in concrete mixes where indicated.

- F. Slump (ACI 301, Part 4 header "Slump"):
1. Maximum slump for concrete is indicated on Drawings. Where field conditions require slump to exceed that shown, increased slump shall be obtained by use of high range water reducers (superplasticizers) only, and Contractor shall obtain written acceptance from Engineer who may require an adjustment to mix.
 2. All concrete containing high-range water-reducing admixture (superplasticizer) shall have a verified initial slump of 2– 3 in. Final slump after the addition of the superplasticizer shall be 6–9 in. as required by the contractor to properly place the concrete. Before permission for plant addition of superplasticizer to be granted by Engineer, fulfill following requirements:
 - a. Submit letter from testing laboratory which developed original mixture proportions, for each super plasticized mixture, certifying volume of mix water which will produce specified slump and water/cement ratio, taking into account aggregate moisture content.
 - b. Submit plant computer printout of mixture ingredients for each truckload of super plasticized concrete with delivery of that truckload. Mix water volume greater than that certified shall be cause for concrete rejection.
 - c. Over-retarding or crusting of flatwork surface: cause for concrete rejection.
 - d. Segregation or rapid slump loss (superplasticizer life) due to incompatibility or under-dosing: cause for concrete rejection.
- G. Engineer's acceptance of mixture proportions shall not relieve Contractor from responsibility for any variation from requirements of Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.
- H. Adjustment to Concrete Mixtures: Adjustments to mixture proportions may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mixture and strength results shall be submitted to and accepted by Engineer before using in work.

2.7 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch plant-printed ticket information at delivery to site.
1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Provide plant-printed batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mixture identification number, date, time of batching, mixing time, quantity and details of materials, amount of water introduced and water permitted by plant to be added, if any.

- C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.
 - 1. For mixer capacity of 1 cu. yd. (0.76 cu. m) or smaller, continue mixing at least one and one-half minutes, but not more than five minutes after ingredients are in mixer, before any part of batch is released.
 - 2. For mixer capacity larger than 1 cu. yd. (0.76 cu. m), increase mixing time by 15 seconds for each additional 1 cu. yd. (0.76 cu. m).
 - 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mix type, mix time, quantity, and amount of water added. Record approximate location of final deposit in structure.

2.8 MATERIAL ACCESSORIES

- A. For mechanical tension splices of reinforcement:
 - 1. All splices to develop 125 percent of specified yield strength of bars, or of smaller bar in transition splices. Acceptable products:
 - a. Bar-Lock Rebar Coupler, by Dayton Superior.
 - b. Bar-Grip or Grip-Twist, by Barsplice Products, Inc.
 - c. Extender HRC 500 Series Coupler, by Headed Reinforcement Corp.
 - d. Splice Sleeve, by NMB.
 - e. LENTON Splices, by Erico.
- B. Compression splices: Mechanically coupled splices in accordance with ACI 318, Chapter 12.

2.9 TOOLS

- A. Slab Jointing
 - 1. Concrete groovers: For tooled joints in concrete:
 - a. For concrete not exceeding 4 in. thickness, use groover with 1 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
 - b. For concrete exceeding 4 in. thickness, use groover with 1.5 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
 - 2. Saw Cut Joints:
 - a. Acceptable tool: "Soff-Cut Saw Model 310" or "Model G2000," Soff-Cut International, Corona, CA.
 - 1) Cut joint as soon as concrete will support weight of operator and saw without deforming.

- 2) Joint shall be 1 in. deep for concrete thickness of 4 in. or less. Joint shall be 1.5 in. deep for concrete exceeding 4 in. thickness. Do not cut reinforcement.
 - 3) Extend joint to adjacent vertical surface within 30 minutes of cutting.
 - 4) Retool or grind saw cut joint before installing sealant to provide equivalent dimensions, shape and volume as joint obtained by tooled joint. Surface width shall be 0.5 in. with 3/16 to 1/4 in. edge radius.
- B. All joints subject to acceptance by sealant installer. Concrete contractor to rework rejected joints until acceptable to sealant installer.

PART 3 - EXECUTION

3.1 PRECONSTRUCTION MEETING

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

3.2 FORMWORK

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

3.3 STEEL REINFORCEMENT

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

3.4 JOINTS

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

3.5 CONCRETE PLACEMENT

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

3.6 FINISHING FORMED SURFACE.

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

3.7 FINISHING FLOORS AND SLABS

- A. Flatwork in Horizontal Areas (BROOM Finish, ACI 301, Section 5 header "Broom or Belt Finish":
 - 1. Bullfloat immediately after screeding. Complete before any excess moisture or bleed water is present on surface (ACI 302.1R, Article 8.3.3). The use of power trowels is discouraged; however, if they are used the following applies:
 - a. Use minimal passes so as to not overwork the concrete.
 - b. At the contractor's expense a petrographic analysis will be required in each area where a power trowel is used to verify the air content at the slab surface is within specified limits.
 - 2. After excess moisture or bleed water has disappeared and concrete has stiffened sufficiently to allow operation, give slab surfaces coarse transverse scored texture by drawing broom across surface. Texture shall be as accepted by Engineer from sample panels.
 - 3. Finish tolerance: ACI 301, Paragraph 5.3.4.2 and ACI 117, paragraph 4.5.7: The gap at any point between the straightedge and the floor (and between the high spots) shall not exceed 0.5 in. In addition, floor surface shall not vary more than plus or minus 0.75 in. from elevation noted on Drawings anywhere on floor surface.

4. Finish all concrete slabs to proper elevations to ensure that all surface moisture will drain freely to floor drains, and that no puddle areas exist. Contractor shall bear cost of any corrections to provide for positive drainage.

B. Flatwork subject to pedestrian traffic:

1. Concrete surfaces at all walking areas subject to pedestrian traffic shall provide a smooth, slip resistant walking surface for pedestrians with these minimum requirements:
 - a. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces and “2010 ADA Standards for Accessible Design”.
 - b. Adjoining walkway surfaces shall be flush and meet the following minimum requirements:
 - 1) Changes in level of less than ¼ inch in height may be without edge treatment as shown in ADA Figure 303.2 and on the Drawings.
 - 2) Changes in Level between ¼ inch and ½ inch height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3 and on the Drawings.
 - 3) Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp with minimum requirements shown on the Drawings.
 - 4) Openings in floor or ground surfaces shall not allow passage of a sphere more than ½ inch diameter except as allowed for elevators and platform lifts as shown in ADA Figure 302.3 and on the Drawings.
 - c. Walkway surfaces shall provide a slip resistant surface.
 - 1) Concrete surfaces shall be troweled and finished to provide a slip resistant finish.
 - 2) Contractor shall provide sample area with slip resistant surface finish.
 - 3) Static coefficient of friction for walking surfaces shall be measured on a dry surface by the NBS – Brungraber machine using a silastic sensor shoe and shall be 0.6 or larger for a level surface and 0.8 or larger for ramps.

3.8 TOLERANCES

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

3.9 CONCRETE PROTECTION AND CURING

- A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 305R for hot-weather protection during placement. Keep concrete continually moist prior to final

curing by evaporation retarder, misting, sprinkling, or using absorptive mat or fabric covering kept continually moist.

- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.1 lb/sq. ft. x h before and during finishing operations. Apply material according to manufacturer's written instructions one or more times after placement, screeding and bull floating concrete, but prior to float finishing. Repeated applications are prohibited after float finishing has begun.

1. Acceptable evaporation retarder materials for this Work are:

- a. "Cimfilm", by Axim Concrete Technologies.
- b. "MasterKure ER 50," by BASF Corporation.
- c. "Aquafilm", by Conspec Marketing & Manufacturing Co., Inc.
- d. "Sure-Film (J-74)", by Dayton Superior Corporation.
- e. "Eucobar", or "Tamms Surface Retarder", by The Euclid Chemical Company, Cleveland, OH.
- f. "E-Con", by L&M Construction Chemicals, Inc.
- g. "EVRT", by Russ Tech Admixtures, Inc.
- h. "SikaFilm", by Sika Corporation, Lyndhurst, NJ.

- C. Immediate upon conclusion of finishing operation cure concrete in accordance with ACI 308 for duration of at least seven days by moisture curing or moisture retaining covering. **Dissipating curing compounds complying with ASTM C309 may be used in accordance with recommendations of ACI 506.7, "Specification for Concrete."** Provide additional curing immediately following initial curing and before concrete has dried.

1. Continue method used in initial curing.
2. Material conforming to ASTM C171.
3. Other moisture retaining covering as approved by Engineer/Architect.
4. During initial and final curing periods maintain concrete above 50°.
5. Prevent rapid drying at end of curing period.

- D. Dissipating Curing Compound [(VOC Compliant, less than 350 g/l)]: Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/m² when applied at 200 sq. ft/gal. Manufacturer's certification is required. Silicate based compounds are prohibited.

1. Subject to project requirements provide one of the following products:

- a. "Kurez DR VOX" or "Kurez RC," or "Kurez RC Off," The Euclid Chemical Company.
- b. "RxCure WB," or "RxCure VOC" or "W.B. Cure VOC," Conspec Marketing & Manufacturing.
- c. "MasterKure CC 200 WB" or "MasterKure CC 160 WB," BASF Corporation.

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

3.10 FIELD QUALITY CONTROL

- A. Testing Agency: **Contractor** shall engage a qualified independent testing and inspecting agency acceptable to the Engineer to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article. Perform tests according to ACI 301.
- B. Sample concrete in accordance with ASTM C 172.
- C. Temperature:
 1. Test temperature of concrete in accordance with ASTM C 1064/C 1064M and ACI 301 each time cylinders are taken or as directed by the Engineer.
- D. Slump Test:

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

E. Water Content:

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

F. Concrete Compressive Strength:

1. Make test cylinders in accordance with ASTM C 31 and test in accordance with ASTM C 39 as follows:
 - a. Take minimum of three sets of cylinders for each 100 cu yds. or fraction thereof, of each Mixture of concrete placed in any one day.
 - b. A set of cylinders shall be comprised of two 6 inch by 12 inch cylinders or three 4 inch by 8 inch cylinders.
 - c. At Contractor's option and cost, cylinders may be taken to verify concrete strength prior to form removal.
 - d. Testing Agency: Provide and maintain site cure box for cylinders.
2. Sample plastic concrete for testing at point of final placement, in accordance with ASTM C 172. Engineer will select sampling locations which may include points where plastic concrete has already been screeded and floated. Sample concrete for test cylinders to be used to verify concrete compressive strength for post-tensioning as near as possible to actual tendon anchorages.
3. Cover specimens properly, immediately after finishing. Protect outside surfaces of cardboard molds, if used, from contact with sources of water for first 24 hours after molding.
4. Cure test cylinders per ASTM C 31 as follows:
 - a. To verify 28-day compressive strength:
 - 1) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80 degrees F. and prevent loss of moisture from specimens.
 - 2) Remove test specimens from molds at end of 20 +/- 4 hours and store in moist condition at 73.4 +/- 3 degrees F. until moment of test. Laboratory moist rooms shall meet requirements of ASTM C 511.
5. Compression test for non-prestressed concrete:
 - a. Test one set of cylinders at 7 days.
 - b. Test one set of cylinders at 28 days.
 - c. Test one set of cylinders at 56 days for concrete strength requirement of 7000 psi or greater.

6. Hold one set of cylinders in reserve for use as Engineer directs.
 7. Unless notified by Engineer, reserve cylinders may be discarded without being tested after 56 days.
- G. Report all nonconforming test results to Engineer and others on distribution lists via fax or email. Follow up with colored paper copies to flag the non-conformances.
- H. Monthly, submit a graph showing distribution of compressive strength test results and air content test results. Include microwave test results for concretes with a water cementitious ratio less than or equal to 0.40 concrete.

3.11 EVALUATION AND ACCEPTANCE OF WORK

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

3.12 CONCRETE MIX DESIGN FORM

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

END OF SECTION 033021

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APPENDIX: Concrete Mix Design Submittal Form

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

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

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

WALKER SUBMITTAL STAMP
CONTRACTOR SUBMITTAL STAMP

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

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

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

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

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

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

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

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

XI. <u>Remarks:</u>

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

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

Signature _____

Typed or Printed Name _____

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

SECTION 033713 - SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes shotcrete applied by the dry-mix or wet-mix process.
- B. This Section includes the provision of all labor, materials, supervision and incidentals necessary to install shotcrete to horizontal, vertical and overhead surfaces to restore original surface condition and integrity.
- C. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "Work Items."
 - 2. Division 02 Section "General Concrete Surface Preparation."
 - 3. Division 02 Section "Surface Preparation for Patching."
 - 4. Division 03 Section "Galvanic Anode Corrosion Protection."
 - 5. Division 07 Section "Waterproofing Systems".

1.3 DEFINITIONS

- A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.
- B. Dry-Mix Shotcrete: Shotcrete with most of the water added at nozzle.
- C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 SUBMITTALS

- A. Product Data: For manufactured materials and products including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.
- B. Shop Drawings: For details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.
- C. Samples: Approximately 24 by 24 by 2 inches (600 by 600 by 50 mm), to illustrate quality of finishes, colors, and textures of exposed surfaces of shotcrete.

- D. Design Mixes: For each shotcrete mix.
- E. Material Test Reports: For shotcrete materials.
- F. Material Certificates: For each material item, signed by manufacturers.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Shotcrete contractor shall have a minimum of three (3) years experience in the application performed. All Nozzlemen to perform work shall have a current ACI / ASA Nozzlemen Certification. A qualified installer employing nozzle operators who attain mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests.
- B. Testing Agency Qualifications: Independent and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548, and acceptable to authorities having jurisdiction.
- C. Comply with provisions of the following, unless more stringent requirements are indicated:
 - 1. ACI 301, "Specification for Structural Concrete."
 - 2. ACI 506.2, "Specification for Shotcrete."
 - 3. CRSI's "Manual of Standard Practice."
- D. Preconstruction Testing Service: Engage a qualified independent testing agency to perform preconstruction testing and inspections indicated below:
 - 1. Produce test panels before shotcrete placement according to requirements in ACI 506.2 and ASTM C 1140 for each design mix, shooting orientation, and nozzle operator. Produce test panels with dimensions of 24 by 24 inches (600 by 600 mm) minimum and of average thickness of shotcrete, but not less than 3-1/2 inches (90 mm). From each test panel, testing agency will obtain six test specimens: one set of three specimens unreinforced and one set of three specimens reinforced. Agency will perform the following:
 - a. Test each set of unreinforced specimens for compressive strength according to ASTM C 42.
 - b. Visually inspect each set of reinforced shotcrete cores taken from test panels and determine mean core grades according to ACI 506.2.

1.6 PROJECT CONDITIONS

- A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
 2. Do not use frozen materials or materials containing ice or snow.
 3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
 4. Do not use calcium chloride, salt, and other materials containing antifreeze agents.
- B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:
1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
 2. Decrease temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- B. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- C. Galvanized Reinforcing Bars: ASTM A 767/A 767M, Class II zinc coated, hot-dip galvanized after fabrication and bending, as follows:
1. Steel Reinforcement: ASTM A 615/A 615M, Grade 60, deformed.
- D. Plain-Steel-Welded Wire Reinforcement: ASTM A 1064, fabricated from steel wire into flat sheets.
- E. Supports: Bolsters, chairs, spacers, ties, and other devices for spacing, supporting, and fastening reinforcing steel in place according to CRSI's "Manual of Standard Practice" and as follows:
1. For uncoated reinforcement, use all-plastic bar supports.

2.3 SHOTCRETE MATERIALS

A. Shotcrete Cement and Blended Cements

1. Portland Cement: ASTM C 150, Type I, I/II or III. Use only one brand and type of cement for Project. Select supplementary cementing materials from subparagraphs below, if permitted. Blending of fly ash, slag, silica fume with Portland cement is done at ready-mix plant.
2. Fly Ash: ASTM C 618, Class C or F.
3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
4. Blended Hydraulic Cement: ASTM C 595, Type IS IP I(PM) I(SM).
5. Silica Fume: ASTM C 1240, amorphous silica.

B. Blending is done at cement plant. If Contractor may choose either portland cement with supplementary materials, verify availability and types of cements to be compatible or use blended shotcrete cement.

C. Acceptable Blended Shotcrete Cement

1. Gun-Rite Cement: JE Tones, Blue Island, IL

D. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Aggregate Gradation: ACI 506R, Gradation No. 1 with 100 percent passing 3/8-inch (10-mm) sieve.

E. Water: Potable, complying with ASTM C 94, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

F. Synthetic Fiber: Fibrillated polypropylene fibers engineered and designed for use in shotcrete, complying with ASTM C 1116, Type III, not less than 1/2 inch (12 mm) long.

G. Ground Wire: High-strength steel wire, 0.8 to 1 mm in diameter.

2.4 CHEMICAL ADMIXTURES

A. General: ASTM C 1141, Class A or B, but limited to the following admixture materials. Provide admixtures for **dry-mix or wet-mix** shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Air-Entraining Admixture: ASTM C 260.
2. Water-Reducing Admixture: ASTM C 494, Type A.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
6. Accelerating Admixture: ASTM C 494, Type C.

B. Blended Admixture

1. Gun-Rite HP, JE Tones, Blue Island, IL

2. Other types may be used only with Engineer's approval in writing prior to bidding.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.6 SHOTCRETE MIXES, GENERAL

- A. Prepare design mixes for each type and strength of shotcrete.
 1. Limit use of fly ash, ground granulated blast-furnace slag] and silica fume to not exceed, in combination, 25 percent of portland cement by weight.
- B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.
- C. Admixtures: When included in shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.
- D. Synthetic Fiber: Uniformly disperse in shotcrete mix, according to manufacturer's written instructions, at a rate of 1.5 lb/cu. yd. (0.90 kg/cu. m).
- E. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.7 NORMAL-WEIGHT SHOTCRETE MIXES

- A. Proportion dry mixes by field test data methods and wet mixes according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide normal-weight shotcrete with the following properties:
 1. Compressive Strength (28 Days): 5000 psi (34.5 MPa)
- B. Acceptable pre-packaged fiber reinforced shotcrete mixes:
 1. "Eucoshot F", (Dry or Wet Method) by The Euclid Chemical Company, Cleveland, OH.
 2. "Gun-Rite 5000" (Wet Method), by JE Tomes & Associates, Blue Island, IL.

3. "Gun-Rite HP", (Wet Method), by JE Tomes & Associates, Blue Island, IL.
4. "Gun-Rite DS-1", (Dry Method) by JE Tomes & Associates, Blue Island, IL.
5. "MS-D1 Shotcrete", (Dry Method), by King Packaged Materials Company, Burlington, ON.
6. "MasterEmaco S 211 SP", (Dry or Wet Method), by BASF Corporation, Shakopee, MN.
7. "Sikacem 103F", (Dry or Wet Method) by Sika Corporation, Lyndhurst, NJ.
8. "Sikacem 133F", (Dry Method) by Sika Corporation, Lyndhurst, NJ.
9. Other types may be used only with Engineer's approval in writing prior to bidding.

2.8 SHOTCRETE EQUIPMENT

- A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.
- B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.
 1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
 2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.
- C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.9 BATCHING AND MIXING

- A. Dry-Mix Process: Measure mix proportions by weight batching according to ASTM C 94 or by volume batching complying with ASTM C 685 requirements.
 1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
 2. Prepackaged shotcrete materials may be used at Contractor's option. Predampen prepackaged shotcrete materials and mix before use.
- B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94 and ASTM C 1116 and furnish batch ticket information if ready mix is used.
 1. Comply with ASTM C 685 when shotcrete ingredients are delivered dry and proportioned and mixed on-site.
 2. Prepackaged shotcrete materials may be used at Contractor's option.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.
 - 1. Abrasive blast or hydroblast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.
- B. Earth: Compact and trim to line and grade before placing shotcrete. Do not place shotcrete on frozen surfaces. Dampen surfaces before shotcreting.
- C. Rock: Clean rock surfaces of loose materials, mud, and other foreign matter that might weaken shotcrete bonding.
- D. Steel: Clean steel surfaces by abrasive blasting according to SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."

3.2 FORMS

- A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.
 - 1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
 - 2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.
- B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

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

- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.
- C. Securely embed reinforcing anchors into existing substrates, located as required.
- D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.
- E. Place reinforcement to obtain minimum coverages for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.
- F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 JOINTS

- A. Construction Joints: Locate and install construction joints tapered to a 1:1 slope where joint is not subject to compression loads and square where joint is perpendicular to main reinforcement. Continue reinforcement through construction joints, unless otherwise indicated.
- B. Contraction Joints: Construct contraction joints in shotcrete using saw cuts 1/8-inch- (3-mm-) wide-by-1/3 slab depth or premolded plastic, hardboard, or fiberboard strip inserts 1/4-inch- (6-mm-) wide-by-1/3 shotcrete depth, unless otherwise indicated.
 - 1. After shotcrete has cured, remove strip inserts and clean groove of loose debris.
 - 2. Space joints at 15 feet (4.5 m) o.c. horizontally and vertically.
 - 3. Tool edges round on each side of strip inserts if floated or troweled finishes are required.

3.5 ALIGNMENT CONTROL

- A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.6 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by shotcrete. Use Setting Drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.

3.7 APPLICATION

- A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.
- B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.
- C. Apply shotcrete according to ACI 506.2.
- D. Apply dry-mix shotcrete materials within 45 minutes after predampening and wet-mix shotcrete materials within 90 minutes after batching.
- E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.
 - 1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.
- F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent build-up against front face during shotcreting.
- G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.
- H. Do not permit shotcrete to sag, slough, or dislodge.
- I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.
- J. Do not disturb shotcrete surfaces before beginning finishing operations.
- K. Remove ground wires or other alignment control devices after shotcrete placement.
- L. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.8 SURFACE FINISHES

- A. Gun Finish: Textured, uneven, natural finish to exposed surfaces, unless otherwise indicated.
- B. Rod Finish: Rough-textured finish obtained by cutting or screeding exposed face of shotcrete to required plane by rod or straightedge after initial set.
- C. Broom Finish: Rough-textured finish obtained by screeding exposed face of shotcrete to required plane by rod, cutting screed, or trowel, and brooming after initial set.

- D. Flash-Coat Finish: After screeding to rod finish, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, No. 1 gradation, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finely textured finish.
- E. Flash Coat: After screeding to natural rod finish, apply up to 1/4-inch (6-mm) coat of shotcrete using ACI 506R, No. 1 gradation, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve and apply wood-float, granular-textured finish.
- F. Finish-Coat Finish: After screeding to natural rod finish, apply shotcrete finish coat, 1/4 to 1 inch (6 to 25 mm) thick, using ACI 506R, No. 1 gradation, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve to provide a finish of uniform texture and appearance.
- G. Finish Coat: After screeding to natural rod finish, apply shotcrete finish coat, 1/4 to 1 inch (6 to 25 mm) thick, using ACI 506R, No. 1 gradation, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve and apply steel-trowel, smooth, hard finish.

3.9 CURING

- A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.
- B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.
- C. Curing Exposed Surfaces: Cure shotcrete by the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
 - 2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Apply curing compound to natural- or gun-finished shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).
- D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.10 FORM REMOVAL

- A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 deg F (10 deg C) for 24 consecutive hours after gunning, provided shotcrete is hard

enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.11 FIELD QUALITY CONTROL

- A. Engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.
- B. Air Content: ASTM C 173, volumetric method or ASTM C 231, pressure method; 1 test for each compressive-strength test for each mix of air-entrained, wet-mix shotcrete measured before pumping.
- C. Shotcrete Temperature: ASTM C 1064; 1 test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and 1 test for each set of compressive-strength specimens.
- D. In-Place Shotcrete: Take a set of 3 unreinforced cores for each mix and for each workday or for every 50 cu. yd. (38 cu. m) of shotcrete placed, whichever is less. Test cores for compressive strength according to ACI 506.2 and ASTM C 42. Do not cut steel reinforcement.
- E. Strength of shotcrete will be considered satisfactory when mean compressive strength of each set of 3 unreinforced cores equals or exceeds 85 percent of specified compressive strength, with no individual core less than 75 percent of specified compressive strength.
1. Mean compressive strength of each set of 3 unreinforced cubes shall equal or exceed design compressive strength with no individual cube less than 88 percent of specified compressive strength.

3.12 REPAIRS

- A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.
1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at

perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.

- B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

3.13 CLEANING

- A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 033713

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SECTION 033760 – PREPACKAGED REPAIR MORTAR

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, supervision and incidentals necessary to prepare deteriorated or damaged concrete surfaces and install prepackaged concrete repair mortar to formed horizontal, vertical and overhead surfaces to restore original surface condition and integrity.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 02 Section "General Concrete Surface Preparation."
 - 2. Division 09 Section "Pavement Marking."

1.3 QUALITY ASSURANCE

- A. Work shall conform to requirements of ACI 301 as applicable except where more stringent requirements are shown on Drawings or specified in this Section.
- B. Testing Agency:
 - 1. Independent testing laboratory employed by Contractor and acceptable to Engineer.
 - 2. Accredited by AASHTO under ASTM C1077. Testing laboratory shall submit documented proof of ability to perform required tests.
- C. 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.
- D. 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. Testing Agency does not have the authority to accept mortar that does not meet specifications.
- E. Testing Agency shall submit the following information for Field Testing of Concrete unless modified in writing by Engineer:
 - 1. Project name and location.

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

1.4 REFERENCES

- A. "Standard Specification for Structural Concrete" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:
 1. "Building Code Requirements for Structural Concrete" (ACI 318), American Concrete Institute, herein referred to as ACI 318.
 2. "Specification for Hot Weather Concreting," ACI 305.1.
 3. "Standard Specification for Cold Weather Concreting," ACI 306.1.
 4. "Standard Specification for Curing Concrete" (ACI 308.1)
- C. Contractor shall have following ACI publications at Project construction site at all times:
 1. "Standard Specifications for Structural Concrete (ACI 301) with Selected ACI and ASTM References," ACI Field Reference Manual, SP15.
 2. "Specification for Hot Weather Concreting," ACI 305.1.
 3. "Standard Specification for Cold Weather Concreting," ACI 306.1.
- D. ASTM International (ASTM):
 1. ASTM C109, "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)."
 2. ASTM C31, "Test Method for Compressive Strength of Cylindrical Concrete Specimens."

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

1.5 SUBMITTALS

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of following, only where specifically named in product category:
 1. BASF Building Systems (BASF), Shakopee, MN
 2. Euclid Chemical Corporation (Euclid), Cleveland, OH
 3. Mapei Corporation (MAPEI), Deerfield Beach, FL
 4. Sika Corporation (Sika), Lyndhurst, NJ.

2.2 MATERIALS

- A. Horizontal Repair and Form and Pour Mortar: Shall be prepackaged cementitious repair mortar capable of horizontal and form and pour partial depth applications, achieving a minimum 3,000 psi compressive strength at 7 days and 5,000 psi compressive strength at 28 days per ASTM C39 as certified by manufacturer with maximum lineal shrinkage of 0.10% at 28 days. Extend per manufacturer's instructions as required for deeper placements.
 1. Acceptable cementitious repair materials for this Work are as follows:
 - a. "MasterEmaco S440," by BASF Corporation.
 - b. "Eucocrete," by Euclid.
 - c. "Planitop 11," by MAPEI.
 - d. "Sikacrete 211," by Sika.

- e. Other types may be used only with Engineer's approval in writing prior to bidding.
- B. Horizontal Repair and Form and Pour Mortar for use with Galvanic Anodes: Shall be prepackaged cementitious repair mortar capable of horizontal and form and pour partial depth applications, achieving a minimum 3,000 psi compressive strength at 7 days and 5,000 psi compressive strength at 28 days per ASTM C39 as certified by manufacturer with maximum lineal shrinkage of 0.10% at 28 days. Manufacturer shall provide written certification of compatibility with galvanic anode corrosion protection system. Extend per manufacturer's instructions as required for deeper placements.
- 1. Acceptable materials for this Work are as follows:
 - a. "MasterEmaco S440," by BASF Corporation.
 - b. "EucoRepair CP," by Euclid.
 - c. "Sikacrete 211," by Sika.
 - d. Other types may be used only with Engineer's approval in writing prior to bidding.
- C. Rapid Strength Repair Mortar: Shall be prepackaged, cementitious repair mortar. Repair mortar shall be capable of application achieving a minimum 3,500 psi compressive strength at 1 day and 5,000 psi compressive strength at 28 days per ASTM C39 as certified by manufacturer. Extend per manufacturer's instructions as required for deeper placements.
- 1. Acceptable materials for this Work are as follows:
 - a. "MasterEmaco T430," by BASF Corporation.
 - b. "Speedcrete 2028," by Euclid.
 - c. "Planitop 18 ES" by MAPEI.
 - d. "Sikaquick 1000," by Sika.
 - e. Other types may be used only with Engineer's approval in writing prior to bidding.
- D. Trowel Applied Repair Mortar: Shall be prepackaged, cementitious repair mortar capable of vertical/overhead application by trowel achieving a minimum 3,000 psi compressive strength at 7 days and 4,500 psi compressive strength at 28 days per ASTM C 109 as certified by manufacturer.
- 1. Acceptable materials for this Work are as follows:
 - a. "MasterEmaco N425," by BASF Corporation.
 - b. "Verticoat Supreme," by Euclid.
 - c. "Planitop XS," by MAPEI
 - d. "Sikaquick VOH," by Sika.
 - e. Other types may be used only with Engineer's approval in writing prior to bidding.

2.3 MATERIAL ACCESSORIES

- A. Bonding Grout: Bonding grout shall consist of prepackage repair material mixed with sufficient water to form stiff slurry to achieve consistency of "pancake batter."
- B. Clear, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.
- C. Clear, Solvent-Borne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.
- D. Clear, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Bonding Grout:
 - 1. Mix bonding grout and scrub into SSD repair substrate with a stiff broom to all areas as indicated on Drawings.
 - 2. Place repair material prior to initial set of grout. If grout sets prior to placement of repair material, complete remove grout from surface and re-clean prior to proceeding with new grout placement and repair mortar.
- B. Mortar Placement: Mortar materials shall be placed in strict accordance with manufacturer's instructions. Properly proportioned and mixed mortar material shall be placed using tools to consolidate mortar so that no voids exist within new material and continuous contact with base concrete is achieved.
- C. Form and Pour Repair Mortar Placement: Mix and apply in strict accordance with manufacturer's written instructions, to achieve a maximum 9" slump. Consolidate mortar so that no voids exist and continuous contact with base concrete is achieved.
- D. Vertical and Overhead Repairs: Mortar materials shall be placed in strict accordance with manufacturer's instructions. Properly proportioned and mixed mortar material shall be placed using tools to consolidate mortar so that no voids exist within new material and continuous contact with base concrete is achieved. Supplemental wire mesh shall be required for delamination and spall repairs greater than two inches in depth. Fresh bonding grout is required between successive lifts of patching material.
- E. Finishing:
 - 1. Apply a nonslip broom finish to top of floor patches and to exterior concrete platforms, steps, and ramps. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.

2. Provide a surface finish similar to adjacent surfaces for vertical and overhead partial depth repairs.
3. Finish formed surfaces similar to adjacent surfaces.

3.2 CONCRETE PROTECTION AND CURING

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

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor shall engage a qualified independent testing and inspecting agency acceptable to the Engineer to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article. Perform tests according to ACI 301.

- B. Testing Frequency: Perform one set of strength testing and one bond test for each product used for each day's work. Prepare samples in accordance with ASTM C31.
- C. Compressive Strength Testing: Determine strength at **7**, and **28** days. Each test shall consist of three 2-inch cubes. Testing shall be in accordance with ASTM C109 using as placed mortar.
- D. Bond Testing: Bond testing shall be performed at 7 days in accordance with ASTM C1583.

3.4 EVALUATION AND ACCEPTANCE OF WORK

- A. Acceptance of Repairs (ACI 301):
 - 1. Acceptance of completed concrete Work will be according to provisions of ACI 301.
 - 2. Repair areas shall be sounded by Engineer and Contractor with hammer or rod after curing for 72 hours. Contractor shall repair all hollowness detected by removing and replacing patch or affected area at no extra cost to Owner.
 - 3. If shrinkage cracks appear in repair area when initial curing period is completed, repair shall be considered defective, and it shall be removed and replaced by Contractor at no extra cost.
 - 4. Patches shall be considered defective if average strength does not meet minimum strength at 28 days or if average bond strength does not meet minimum requirements of 150 psi.

END OF SECTION 033760

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SECTION 03 63 00 - EPOXY INJECTION SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to prepare cracks in structural concrete members and inject them with a 2-component, moisture-insensitive, 100 percent solids, low-viscosity epoxy resin system.
- B. Related Sections: Following Sections contain requirements that relate to this Section:
 - 1. Division 01 Section "Submittal Procedures."
 - 2. Division 02 Section "Work Items."
 - 3. Division 02 Section "General Concrete Surface Preparation."
 - 4. Division 02 Section "Surface Preparation for Patching and Overlay."

1.3 QUALITY ASSURANCE

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

- c. Width of cracks injected (if applicable).
 - d. Crack conditions (dry or wet).
 - e. Injection port spacing.
 - f. Initial and (if different) constant injection pressures.
 - g. Use rate of epoxy.
- 9. Weather data:
 - a. Air temperatures.
 - b. Weather.
 - c. Wind speed.
- 10. Field test data:
 - a. Date, time and place of test.
 - b. Thickness of epoxy in crack or void.
- D. Qualifications:
 - 1. Contractor Qualifications: Contractor shall be qualified in the field of concrete repair and protection with a minimum of 5 years experience in application of similar systems and products on projects of similar size and scope.
 - a. Successful completion of a minimum of 3 projects of similar size and complexity to specified Work.
 - b. Contractor shall maintain qualified personnel who have received product training by a manufacturer's representative.
 - c. Install materials in accordance with all safety and weather conditions required by the manufacturer, or as modified by applicable rules and regulations of local, state, and federal authorities having jurisdiction.
 - 2. Manufacturer Qualifications: The manufacturer of the specified product shall be ISO 9001:2000 Certified and have in existence a recognized ongoing quality assurance program independently audited on a regular basis. The manufacturer shall have a minimum 15 years of experience in manufacturing of surface hardener.
- E. Pre-Construction Meetings: Conduct Pre-Construction meeting at Project site to comply with requirements of Division 01 and as specified in this Section.
 - 1. Schedule and convene meeting a minimum of 1 week prior to commencing Work of this Section.
 - 2. Review requirements for application, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details, installation procedures, testing and inspection procedures, protection, and repair.
 - 3. Discuss procedures for protecting adjacent finished Work.

1.4 REFERENCES

- A. "Standard Specifications for Structural Concrete," (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.
- B. Comply with provisions of following codes, specifications, and standards except where more stringent requirements are shown on Drawings or specified herein:
 - 1. "Building Code Requirements for Reinforced Concrete," (ACI 318), American Concrete Institute, herein referred to as ACI 318.
 - 2. "Causes, Evaluation, and Repair of Cracks in Concrete Structures" (ACI 224.112), American Concrete Institute.
 - 3. "State-of-the-Art Report on Parking Structures" (ACI 362), American Concrete Institute.
 - 4. "Specification for Crack Repair by Epoxy Injection" (ACI 503.7), American Concrete Institute.
 - 5. "Guide for the Application of Epoxy and Latex Adhesives for Bonding Freshly Mixed and Hardened Concretes", (ACI 503.6), American Concrete Institute.
 - 6. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.
 - 7. "Guide for Repair of Concrete Bridge Superstructures" Reported by ACI Committee 546 (ACI 546.1).
- C. Contractor shall have following ACI/ICRI publications at Project construction site at all times:
 - 1. "Specification for Crack Repair by Epoxy Injection" (ACI 503.7), American Concrete Institute." Structural Crack Repair by Epoxy Injection", ACI RAP Bulletin 1, American Concrete Institute.
 - 2. "Standard Specification for Bonding Hardened Concrete, Steel, Wood, Brick, and Other Materials to Hardened Concrete with a Multi-Component Epoxy Adhesive" (ACI 503.1), American Concrete Institute.

1.5 SUBMITTALS

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

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

1.6 WARRANTY

- A. System manufacturer and Contractor shall furnish Owner written single source performance guarantee that epoxy resin injection system will be free of defects related to design, workmanship or material deficiency for 3-year period from date of acceptance of Work required under this Section against leakage or bond failure:
1. Any adhesive or cohesive failure.
 2. Cracking or other weathering deficiency.
 3. Normal abrasion or tear failure.
- B. Any repair under this guarantee shall be done at no cost to Owner. Guarantee shall be provided by Contractor and manufacturer of system.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- A. Injection epoxy shall be one of following:
1. "MasterInject 1380" or "MasterInject 1500" as manufactured by BASF Construction Chemicals., Shakopee, MN.
 2. "Sikadur 35 Hi-Mod LV" or "Sikadur 52" as manufactured by Sika Chemical Corporation, Lyndhurst, NJ.
 3. "Epoxy HP-LV" as manufactured by Hunt Process Corp-Southern, Ridgeland, MS.
 4. "Pro-Poxy 50 Super LV" as manufactured by Unitex, Kansas City, MO.
 5. "Eucopoxy" or "Duralcrete LV" as manufactured by The Euclid Chemical Company, Cleveland OH.
 6. "Sure Inject J56 SLV" as manufactured by Dayton Superior Corp., Miamisburg OH.
 7. "KonTek 11 LV" as manufactured by Contech Group, Inc. Seattle, WA.
 8. "Kemko 038" as manufactured by ChemCo Systems, Inc., Redwood City, CA.
- B. Epoxy gel shall be as specified by the selected injection epoxy manufacturer.
- C. Equipment:
1. Epoxy injection unit shall be portable and equipped with positive displacement-type pumps with interlock to provide positive ratio control of epoxy injection resin components. Pumps shall be air or electric powered and shall provide in-line mixing and metering system and shall be equipped with drain-back plugs.
 2. Equipment used to inject epoxy shall be capable of following:

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

PART 3 - EXECUTION

3.1 PREPARATION

A. Crack Identification:

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

B. Crack Preparation for Injection:

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

3.2 INSTALLATION

A. Epoxy Injection:

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

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

B. Cleaning:

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

3.3 FIELD QUALITY CONTROL BY TESTING AGENCY

A. Core Testing:

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

B. Evaluation and Acceptance of Epoxy Injection:

1. Results of visual examination will be reviewed by Engineer/Architect for compliance with Article "Field Quality Control by Testing Agency," paragraph "Core Testing."
2. If results of initial cores fail by lack of penetration, work shall not proceed further until area represented by cores has been re-injected and re-tested for acceptance.
3. After cracks have been re-injected, additional cores shall be taken as directed by Engineer/Architect. Cores shall be tested for compliance with Article "Field Quality Control by Testing Agency," paragraph "Core Testing" by Owner's Testing Agency at Contractor's expense.
4. Core holes shall be filled with non-shrink grout material. Grout shall be applied with hard trowel, and be thoroughly rodded and tamped in place. Finish, texture and color to match existing surface. Materials and procedures for filling testing core holes shall be submitted to Engineer/Architect for review prior to starting work.

C. Acceptance of Structure:

Redondo Beach

North Pier Parking Structure Maintenance Repairs

Project No. 37-009397.02

Construction Documents

November 2023

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

END OF SECTION 03 63 00

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SECTION 055213 - PIPE AND TUBE RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Steel pipe railings.
- B. Work in other Sections related to Cast-in-Place Concrete:
 - 1. Division 2 Section "Surface Preparation for Patching."
 - 2. Division 3 Section "Prepackaged Repair Mortar"
 - 3. Division 9 Section "Exterior painting."

1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for railings. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Schedule installation so wall attachments are made only to completed walls. Do not support railings temporarily by any means that do not satisfy structural performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Manufacturer's product lines of mechanically connected railings.
 - 2. Railing brackets.
 - 3. Grout, anchoring cement, and paint products.

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Welding certificates.
- C. Product Test Reports: For pipe and tube railings, for tests performed by a qualified testing agency, according to ASTM E 894 and ASTM E 935.
- D. Evaluation Reports: For post-installed anchors, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

1.8 FIELD CONDITIONS

- A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Railings, including attachment to building construction, shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Handrails and Top Rails of Guards:
 - a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
 - b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
 - c. Uniform and concentrated loads need not be assumed to act concurrently.

2. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Infill load and other loads need not be assumed to act concurrently.

B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C, material surfaces).

2.2 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth surfaces, without seam marks, roller marks, rolled trade names, stains, discolorations, or blemishes.
- B. Brackets, Flanges, and Anchors: Cast or formed metal of same type of material and finish as supported rails unless otherwise indicated.

2.3 STEEL AND IRON

- A. Pipe: ASTM A 53/A 53M, Type F or Type S, Grade A, Standard Weight (Schedule 40), unless another grade and weight are required by structural loads. See specific details for vehicle barrier rails.
 1. Provide galvanized finish for exterior installations and where indicated.
- B. Plates, Shapes, and Bars: ASTM A 36/A 36M.

2.4 FASTENERS

- A. General: Provide the following:
 1. Hot-Dip Galvanized Railings: Type 304 stainless-steel or hot-dip zinc-coated steel fasteners complying with ASTM A 153/A 153M or ASTM F 2329 for zinc coating
 2. Provide exposed fasteners with finish matching appearance, including color and texture, of railings.
- B. Fasteners for Anchoring Railings to Other Construction: Select fasteners of type, grade, and class required to produce connections suitable for anchoring railings to other types of construction indicated and capable of withstanding design loads.
- C. Post-Installed Anchors: Torque-controlled expansion anchors capable of sustaining, without failure, a load equal to 6 times the load imposed when installed in unit masonry and 4 times the load imposed when installed in concrete, as determined by testing

according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Etching Cleaner for Galvanized Metal: Complying with MPI#25.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

2.6 FABRICATION

- A. General: Fabricate railings to comply with requirements indicated for design, dimensions, member sizes and spacing, details, finish, and anchorage, but not less than that required to support structural loads.
- B. Shop assemble railings to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation. Use connections that maintain structural value of joined pieces.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form work true to line and level with accurate angles and surfaces.
- E. Fabricate connections that are exposed to weather in a manner that excludes water. Provide weep holes where water may accumulate.
- F. Cut, reinforce, drill, and tap as indicated to receive finish hardware, screws, and similar items.
- G. Connections: Fabricate railings with either welded or non-welded connections unless otherwise indicated.
- H. Welded Connections: Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove flux immediately.
 - 4. At exposed connections, finish exposed surfaces per drawings.

- I. Form Changes in Direction as Follows:
 - 1. By bending or by inserting prefabricated elbow fittings.
- J. For changes in direction made by bending, use jigs to produce uniform curvature for each repetitive configuration required. Maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- K. Close exposed ends of railing members with prefabricated end fittings.
- L. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is 1/4 inch (6 mm) or less.
- M. Provide inserts and other anchorage devices for connecting railings to concrete or masonry work. Fabricate anchorage devices capable of withstanding loads imposed by railings. Coordinate anchorage devices with supporting structure.

2.7 STEEL AND IRON FINISHES

- A. Galvanized Railings:
 - 1. Hot-dip galvanize steel railings, including hardware, after fabrication.
 - 2. Comply with ASTM A 123/A 123M for hot-dip galvanized railings.
 - 3. Comply with ASTM A 153/A 153M for hot-dip galvanized hardware.
 - 4. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
 - 5. Fill vent and drain holes that are exposed in the finished Work, unless indicated to remain as weep holes, by plugging with zinc solder and filing off smooth.
 - 6. Prepare railings for painting.
- B. For galvanized railings, provide hot-dip galvanized fittings, brackets, fasteners, sleeves, and other ferrous components.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine plaster and gypsum board assemblies, where reinforced to receive anchors, to verify that locations of concealed reinforcements are clearly marked for Installer. Locate reinforcements and mark locations if not already done.

3.2 INSTALLATION, GENERAL

- A. Fit exposed connections together to form tight, hairline joints.

- B. Perform cutting, drilling, and fitting required for installing railings. Set railings accurately in location, alignment, and elevation; measured from established lines and levels and free of rack.
 - 1. Do not weld, cut, or abrade surfaces of railing components that are coated or finished after fabrication and that are intended for field connection by mechanical or other means without further cutting or fitting.
 - 2. Set posts plumb within a tolerance of 1/16 inch in 3 feet (2 mm in 1 m).
 - 3. Align rails so variations from level for horizontal members and variations from parallel with rake of steps and ramps for sloping members do not exceed 1/4 inch in 12 feet (6 mm in 3.5 m).
- C. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.
- D. Adjust railings before anchoring to ensure matching alignment at abutting joints.
- E. Fastening to In-Place Construction: Use anchorage devices and fasteners where necessary for securing railings and for properly transferring loads to in-place construction.

3.3 RAILING CONNECTIONS

- A. Welded Connections: Use fully welded joints for permanently connecting railing components. Comply with requirements for welded connections in "Fabrication" Article whether welding is performed in the shop or in the field.
- B. Expansion Joints: Install expansion joints at locations indicated but not farther apart than required to accommodate thermal movement. Provide slip-joint internal sleeve extending 2 inches (50 mm) beyond joint on either side, fasten internal sleeve securely to one side, and locate joint within 6 inches (150 mm) of post.

3.4 ANCHORING POSTS

- A. Anchor posts to metal surfaces with oval flanges, angle type, or floor type as required by conditions, connected to posts and to metal supporting members as follows:
 - 1. For steel pipe railings, weld flanges to post and bolt to metal supporting surfaces.

3.5 ATTACHING RAILINGS

- A. Attach railings to wall with wall brackets, locate brackets as indicated or, if not indicated, at spacing required to support structural loads.
- B. Secure wall brackets and railing end flanges to building construction per drawings.

3.6 ADJUSTING AND CLEANING

- A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas, and repair galvanizing to comply with ASTM A 780/A 780M.

3.7 PROTECTION

- A. Protect finishes of railings from damage during construction period with temporary protective coverings approved by railing manufacturer. Remove protective coverings at time of Substantial Completion.

END OF SECTION 055213

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SECTION 071800 – TRAFFIC COATINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. A single installer shall be responsible for providing complete water proofing system including all products specified in following Sections:
 - 1. Division 07 Section, "Traffic Coatings"
 - 2. Division 07 Section, "Joint Sealants"
- B. This Section includes traffic coating: Fluid applied, waterproofing, traffic-bearing elastomeric membrane with integral wearing surface, where surface to which membrane is to be applied is one or more of following:
 - 1. Over parking deck.
- C. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
- D. Related Sections: Following Sections contain requirements that relate to this Section.
 - 1. Division 03 Section, "Pre-Packaged Repair Mortar."
 - 2. Division 09 Section, "Pavement Markings."

1.3 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Distribute reviewed submittals to all others whose Work is related.
- B. Make submittals in accordance with requirements of Division 01 Section, "Submittal Procedures:"
 - 1. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
 - 2. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

- C. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including cost of Engineer's services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.
- D. Requests For Information
 - 1. Engineer reserves right to reject, unprocessed, any Request for Information (RFI) that Engineer, at its sole discretion, deems frivolous and/or deems already answered in the Contract Documents.
 - 2. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in Contract documents.

1.4 ACTION SUBMITTALS

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

1.5 INFORMATION SUBMITTALS

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

4. Certification stating static coefficient of friction meets minimum requirements of Americans with Disabilities Act (ADA).
 5. Certification stating materials have been tested and listed for UL 790 Class "A" rated materials/system by UL for traffic coating application specified on project. Containers shall bear UL labels.
 6. Certification from manufacturer confirming compatibility with existing underlying coatings and/or substrate.
- B. Manufacturer's Instructions: for each system indicated.
1. Crack treatment and surface preparation method and acceptance criteria.
 2. Method of application of each coat.
 3. Maximum and minimum allowable times between coats.
 4. Final cure time before resumption of parking and/or paint striping.
 5. Any other special instructions required to ensure proper installation.
- C. Field Quality Control:
1. Quality Control Plan as defined in Part 3.
 2. Two copies each of manufacturer's technical representative's log for each visit.
 3. Testing agency field reports.
- D. Qualification Statements
1. Manufacturer's qualifications as defined in "Quality Assurance" article.
 2. Installer's qualifications as defined in "Quality Assurance" article.
 3. Signed statement from applicator certifying that applicator has read, understood, and shall comply with all requirements of this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Three copies of System Maintenance Manual.
- B. Final executed Warranty.

1.7 QUALITY ASSURANCE

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

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

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Deliver all materials to site in original, unopened containers, bearing following information:
 - 1. Name of product.
 - 2. Name of manufacturer.
 - 3. Date of preparation.
 - 4. Lot or batch number.
- B. Store materials under cover and protect from weather. Replace packages or materials showing any signs of damage with new material at no additional cost to Owner.

1.9 FIELD CONDITIONS

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

1.10 WARRANTY

- A. System Manufacturer (New Application and Complete System Recoating): Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and applicator with regard to warranty requirements (Joint and Several). Warranty shall provide that system will be free of defects, water penetration and chemical damage related to system design, workmanship or material deficiency, consisting of:
 - 1. Any adhesive or cohesive failures.
 - 2. Spalling surfaces.
 - 3. Weathering.
 - 4. Surface crazing (does not apply to traffic coating protection course).
 - 5. Abrasion or tear failure resulting from normal traffic use.
 - 6. Failure to bridge cracks less than 0.0625 in. or cracks existing at time of traffic coating installation on double tees only.
- B. If material surface shows any of defects listed above, supply labor and material to repair all defective areas and to repaint all damaged line stripes.
- C. Warranty period shall be a 5 year Joint and Several Warranty commencing with date of acceptance of work.
- D. Perform any repair under this warranty at no cost to Owner.
- E. Address following in terms of Warranty: length of warranty, change in value of warranty – if any- based on length of remaining warranty period, transferability of warranty, responsibilities of each party, notification procedures, dispute resolution procedures, and limitations of liability for direct and consequential damages.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturer: Available Products: Subject to compliance with the requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - 1. Lymtal International Inc. (Lymtal), Lake Orion, MI.
 - 2. Sika Corporation (Sika), Lyndhurst, NJ.
 - 3. BASF Building Systems (BASF), Shakopee, MN
 - 4. Neogard Division of Jones-Blair Company (Neogard), Dallas, TX.
 - 5. Pacific Polymers, Inc. a Division of ITW (Pacific Polymers), Garden Grove, CA

6. Polycoat Products Division of Amer. Polymers (Polycoat), Santa Fe Springs, CA.
7. Pecora Corporation (Pecora), Harleysville, PA
8. Technical Barrier Systems, Inc. (TBS), Oakville, Ontario.
9. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, TRAFFIC COATING

- A. Available Products: Subject to compliance with the requirements, products that may be incorporated into the Work include, but are not limited to the following: Coatings shall be compatible with all other materials in this Section and related work.
1. VOC Compliant, Extreme Low Odor, High-Solids, Fast Cure, Heavy Duty Coating System:
 - a. Iso-Flex 760 U HL AR and 760 U HL AL, Lymtal.
 - b. Sikalastic 720/745, Sika.
 - c. AutoGard FC HD-48, Autogard E, Neogard.
 - d. Flexodeck Mark 170.2, Poly-Carb.
 - e. Kelmar FCW III, Exposure 3, TBS.
 - f. MasterSeal Traffic 2500, BASF.
 - g. Qualideck Heavy Vehicular (152/252/372/512), APT
 - h. Sikalastic 720/745, Sika.
 - i. Vulkem 360NF/950NF and 951NF, Tremco.
 - B. Provide ultraviolet screening for all traffic coating placed on this project.
 - C. Finish top coat shall be colored grey.

2.3 MATERIALS, CRACK SEALER

- A. Repair for isolated random horizontal cracks 0.01 in. to 0.06 in. wide. Acceptable products:
1. Iso-Flex 609 Epoxy Crack Sealer, Lymtal.
 2. Sikadur 55 SLV Epoxy Crack Healer/Sealer, Sika.
 3. Engineered approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to receive Work and report immediately in writing to Engineer/Architect any deficiencies in surface which render it unsuitable for proper execution of Work.

- B. Coordinate and verify that related Work meets following requirements before beginning surface preparation and application:
 - 1. Concrete surfaces are finished as acceptable for system to be installed. Correct all high points, ridges, and other defects in a manner acceptable to Engineer/Architect.
 - 2. Curing compounds used on concrete surfaces are compatible with system to be installed.
 - 3. Concrete surfaces have completed proper curing period for system selected.
 - 4. Joint Sealants are compatible with traffic coatings.

3.2 PREPARATION

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

3.3 INSTALLATION/APPLICATION

- A. Installation should include all of the following steps:
 - 1. Surface Preparation: Prepare concrete for system application.

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

3.4 FIELD QUALITY CONTROL

- A. Develop a quality control plan for assured specified uniform membrane thickness that utilizes grid system of sufficiently small size to designate coverage area of not more than 5 gallons at specified thickness. In addition, employ wet mil gauge to continuously monitor thickness during application. Average specified wet mil thickness shall be maintained within grid during application with minimum thickness of not less than 80% of average acceptable thickness. Immediately apply more material to any area not maintaining these standards.
- B. Testing Agency employ wet mil gauge to periodically monitor thickness during application.
- C. Install 1 trial section of coating system for each duty grade specified. Do not proceed with further coating application until trial sections accepted in writing by

SECTION 07 81 23 - INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mastic and intumescent fire-resistive coatings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, **4 inches square** in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer**.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.

- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups **to set quality standards for materials and execution.**
 - 1. Build mockup of **each type of fireproofing and different substrate** as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is **50 deg F** or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to **ASTM E119 or UL 263** testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating **Basis of Design UL-N649:** Manufacturer's standard, **factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat**, and complying with indicated fire-resistance design.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. Albi Manufacturing; a division of StanChem, Inc.
 - b. Carboline Company; a subsidiary of RPM International.
 - c. Hilti, Inc.
 - d. International Protective Coatings.
 - e. Isolatek International.
 - f. Sherwin-Williams Company (The).
 2. Application: Designated for **"exterior"** use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **25** or less.
 5. Finish: **As selected by Architect from manufacturer's standard finishes.**
 - a. Color and Gloss: **As selected by Architect from manufacturer's full range.**

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

- E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **Engage** a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC **as indicated on Schedule of Special Inspections.**
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23

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Engineer/Architect. Remove and replace rejected trial sections with acceptable application. Trial section shall also be tested for:

1. Wet mil thickness application.
2. Adhesion to concrete substrate.
3. Overall dry mil thickness.

D. Use trial sections to determine adequacy of pre-application surface cleaning. Obtain Owner, Engineer/Architect and manufacturer acceptance of:

1. Cleaning before proceeding with traffic coating application.
2. Visual appearance of finished coating application.
3. Conformance to ADA static coefficient of friction.
4. Elcometer or equivalent pull test to quantify traffic coating adhesion to concrete and existing traffic coating.

E. Determine overall coating system mil thickness:

1. Contractor shall provide 6 in. by 6 in. bond breaker (coating coupon) on concrete surface for each 25,000 sq ft, or fraction thereof, of coating to be placed as directed by Engineer/Architect and manufacturer. Dimensionally locate coupon for easy removal.
2. Contractor shall assist Testing Agency in removing coating coupons from concrete surface at completion of manufacturer-specified cure period. Contractor shall repair coupon area per coating manufacturer's instructions.
3. Testing Agency shall determine dry mil thickness of completed Traffic Coating System, including bond breaker. Take 9 readings (minimum), 3 by 3 pattern at 2 in. on center. No reading shall be taken closer than 1 in. from coupon edge. Report individual readings and overall coating system average to Engineer/Architect. Readings shall be made with micrometer or optical comparator.

END OF SECTION 071800

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SECTION 07 81 23 - INTUMESCENT FIREPROOFING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Mastic and intumescent fire-resistive coatings.

1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.
 - 1. Review products, design ratings, restrained and unrestrained conditions, thicknesses, and other performance requirements.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Framing plans or schedules, or both, indicating the following:
 - 1. Extent of fireproofing for each construction and fire-resistance rating.
 - 2. Applicable fire-resistance design designations of a qualified testing and inspecting agency acceptable to authorities having jurisdiction.
 - 3. Minimum fireproofing thicknesses needed to achieve required fire-resistance rating of each structural component and assembly.
 - 4. Treatment of fireproofing after application.
- C. Samples: For each exposed product and for each color and texture specified, **4 inches square** in size.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For **Installer**.
- B. Product Certificates: For each type of fireproofing.
- C. Evaluation Reports: For fireproofing, from ICC-ES.

- D. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.
- B. Mockups: Build mockups **to set quality standards for materials and execution.**
 - 1. Build mockup of **each type of fireproofing and different substrate** as shown on Drawings.
 - 2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 3. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 FIELD CONDITIONS

- A. Environmental Limitations: Do not apply fireproofing when ambient or substrate temperature is **50 deg F** or lower unless temporary protection and heat are provided to maintain temperature at or above this level for 24 hours before, during, and for 24 hours after product application.
- B. Ventilation: Ventilate building spaces during and after application of fireproofing, providing complete air exchanges according to manufacturer's written instructions. Use natural means or, if they are inadequate, forced-air circulation until fireproofing dries thoroughly.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.
- B. Source Limitations: Obtain fireproofing from single source.
- C. Fire-Resistance Design: Indicated on Drawings, tested according to **ASTM E119 or UL 263** testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- D. Asbestos: Provide products containing no detectable asbestos.

2.2 MASTIC AND INTUMESCENT FIRE-RESISTIVE COATINGS

- A. Mastic and Intumescent Fire-Resistive Coating **Basis of Design UL-N649:** Manufacturer's standard, **factory-mixed formulation or factory-mixed, multicomponent system consisting of intumescent base coat and topcoat**, and complying with indicated fire-resistance design.
1. **Manufacturers:** Subject to compliance with requirements, provide products by one of the following:
 - a. Albi Manufacturing; a division of StanChem, Inc.
 - b. Carboline Company; a subsidiary of RPM International.
 - c. Hilti, Inc.
 - d. International Protective Coatings.
 - e. Isolatek International.
 - f. Sherwin-Williams Company (The).
 2. Application: Designated for **"exterior"** use by a qualified testing agency acceptable to authorities having jurisdiction.
 3. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design.
 4. Surface-Burning Characteristics: Comply with ASTM E84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 - a. Flame-Spread Index: **25** or less.
 5. Finish: **As selected by Architect from manufacturer's standard finishes.**
 - a. Color and Gloss: **As selected by Architect from manufacturer's full range.**

2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer and complying with required fire-resistance design by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
- C. Reinforcing Fabric: Glass- or carbon-fiber fabric of type, weight, and form required to comply with fire-resistance designs indicated; approved and provided by fireproofing manufacturer.
- D. Reinforcing Mesh: Metallic mesh reinforcement of type, weight, and form required to comply with fire-resistance design indicated; approved and provided by fireproofing manufacturer. Include pins and attachment.

- E. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.
 - 1. Verify that substrates are free of dirt, oil, grease, release agents, rolling compounds, mill scale, loose scale, incompatible primers, paints, and encapsulants, or other foreign substances capable of impairing bond of fireproofing with substrates under conditions of normal use or fire exposure.
 - 2. Verify that objects penetrating fireproofing, including clips, hangers, support sleeves, and similar items, are securely attached to substrates.
 - 3. Verify that substrates receiving fireproofing are not obstructed by ducts, piping, equipment, or other suspended construction that will interfere with fireproofing application.
- B. Conduct tests according to fireproofing manufacturer's written instructions to verify that substrates are free of substances capable of interfering with bond.
- C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Clean substrates of substances that could impair bond of fireproofing.
- C. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.
- D. For applications visible on completion of Project, repair substrates to remove surface imperfections that could affect uniformity of texture and thickness in finished surface of fireproofing. Remove minor projections and fill voids that would telegraph through fire-resistive products after application.

3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Coordinate application of fireproofing with other construction to minimize need to cut or remove fireproofing.
 - 1. Do not begin applying fireproofing until clips, hangers, supports, sleeves, and other items penetrating fireproofing are in place.
 - 2. Defer installing ducts, piping, and other items that would interfere with applying fireproofing until application of fireproofing is completed.
- D. Install auxiliary materials as required, as detailed, and according to fire-resistance design and fireproofing manufacturer's written instructions for conditions of exposure and intended use. For auxiliary materials, use attachment and anchorage devices of type recommended in writing by fireproofing manufacturer.
- E. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- F. Extend fireproofing in full thickness over entire area of each substrate to be protected.
- G. Install body of fireproofing in a single course unless otherwise recommended in writing by fireproofing manufacturer.
- H. Provide a uniform finish complying with description indicated for each type of fireproofing material and matching finish approved for required mockups.
- I. Cure fireproofing according to fireproofing manufacturer's written instructions.
- J. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.
- K. Finishes: Where indicated, apply fireproofing to produce the following finishes:
 - 1. Manufacturer's Standard Finishes: Finish according to manufacturer's written instructions for each finish selected.
 - 2. Spray-Textured Finish: Finish left as spray applied with no further treatment.
 - 3. Rolled, Spray-Textured Finish: Even finish produced by rolling spray-applied finish with a damp paint roller to remove drippings and excessive roughness.

3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **Engage** a qualified special inspector to perform the following special inspections:
 - 1. Test and inspect as required by the IBC **as indicated on Schedule of Special Inspections.**
- B. Perform the tests and inspections of completed Work in successive stages. Do not proceed with application of fireproofing for the next area until test results for previously completed applications of fireproofing show compliance with requirements. Tested values must equal or exceed values as specified and as indicated and required for approved fire-resistance design.
- C. Fireproofing will be considered defective if it does not pass tests and inspections.
 - 1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
 - 2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- D. Prepare test and inspection reports.

3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Protect fireproofing, according to advice of manufacturer and Installer, from damage resulting from construction operations or other causes, so fireproofing is without damage or deterioration at time of Substantial Completion.
- C. As installation of other construction proceeds, inspect fireproofing and repair damaged areas and fireproofing removed due to work of other trades.
- D. Repair fireproofing damaged by other work before concealing it with other construction.
- E. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 07 81 23

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SECTION 099113 - EXTERIOR PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes surface preparation and the application of paint systems on the following exterior substrates:
 - 1. Concrete.
 - 2. Metal Railings

1.3 DEFINITIONS

- A. MPI Gloss Level 1 (Matte Finish): Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. MPI Gloss Level 3 ('Egg-Shell-Like' Finish): 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. MPI Gloss Level 4 ('Satin-Like' Finish): 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. MPI Gloss Level 5 (Semi-Gloss): 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. MPI Gloss Level 6 (Gloss): 70 to 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
 - 1. Include printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
 - 2. Indicate VOC content.
- B. Sustainable Design Submittals:
- C. Samples for Initial Selection: For each type of topcoat product.

- D. Samples for Verification: For each type of paint system and each color and gloss of topcoat.
 - 1. Submit Samples on rigid backing, 8 inches (200 mm) square.
 - 2. Apply coats on Samples in steps to show each coat required for system.
 - 3. Label each coat of each Sample.
 - 4. Label each Sample for location and application area.
- E. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Paint: 5 percent, but not less than 1 gal. (3.8 L) of each material and color applied.

1.6 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
 - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
 - b. Other Items: Architect will designate items or areas required.
 - 2. Final approval of color selections will be based on mockups.
 - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
 - 3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 - 4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F (7 deg C).
 - 1. Maintain containers in clean condition, free of foreign materials and residue.
 - 2. Remove rags and waste from storage areas daily.

1.8 FIELD CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Behr Process Corporation.
 - 2. Benjamin Moore & Co.
 - 3. Dunn-Edwards Corporation.
 - 4. Glidden Professional.
 - 5. Kelly-Moore Paint Company Inc.
 - 6. PPG Architectural Finishes, Inc.
 - 7. Pratt & Lambert.
 - 8. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

- A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
- B. Material Compatibility:
 - 1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
 - 2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.
- C. VOC Content: For field applications, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:

1. Primers, Sealers, and Undercoaters: 100 g/L.
 2. Rust-Preventive Coatings: 100 g/L.
- D. Colors: As selected by Architect from manufacturer's full range by Owner.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
1. Concrete: 12 percent.
 2. Masonry (Clay and CMUs): 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility, with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.
- C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

- D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.
- F. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using methods recommended in writing by paint manufacturer but not less than the following:
 - 1. SSPC-SP 2.
- G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."
 - 1. Use applicators and techniques suited for paint and substrate indicated.
 - 2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
 - 3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
 - 4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
 - 5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

- A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
 - 1. Contractor shall touch up and restore painted surfaces damaged by testing.

2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 CLEANING AND PROTECTION

- A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.
- B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.
- C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

- A. Concrete Ceilings/Vertical Surfaces, Non-traffic Surfaces:
 1. System: Acrylic.
 - a. Topcoat: Sherwin Williams Waterborne Acrylic DryFall Flat (2 coats @ 6 mils wet)
 - b. Equivalent products by other manufacturers and approved by Architect/Engineer
- B. Galvanized-Metal Substrates:
 1. System:
 - a. Prime Coat: Epoxy.
 - 1) Sherwin-Williams; Macropoxy 646 - 100.
 - 2) Equivalent products by other manufacturers and approved by Architect/Engineer.
 - b. Topcoat: Polyurethane Rust Preventative.
 - 1) Sherwin-Williams; – Hi-Solids Polyurethane 100.
 - 2) Equivalent products by other manufacturers and approved by Architect/Engineer.

END OF SECTION 099113

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SECTION 099121 - PAVEMENT MARKING - RESTORATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation and application of high build paint systems to replace existing for the items of types, patterns, sizes, and colors described in this article.
- B. Provide the following systems as shown on Drawings:
 - 1. Parking Stall Stripes.
 - 2. Traffic Arrows, crosswalks, accessible stall access aisles, walkways, symbols, stop bars, words and other markings.
 - 3. International Symbol of Accessibility.
- C. Provide painting of curbs and curb ramps as described in the following paragraphs:
 - 1. Paint vertical surface and the first 6 in. of the abutting horizontal surface at the top of all curbs and islands (including PARCS equipment islands) within parking facility to match existing, unless otherwise noted on the Drawings.
 - 2. Paint color for curbs and curb ramps shall be yellow.
- D. Proportion International Symbol of Accessibility in accordance with ICC A117.1-2009 Accessible and Usable Buildings or 2010 ADA Standards for Accessible Design.
- E. Related Work:
 - 1. Pavement Marking Contractor shall verify compatibility with sealers, joint sealants, caulking and all other surface treatments as specified in Division 07.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Provide product data as follows:
 - 1. Manufacturer's certification that the material complies with standards referenced within this Section.
 - 2. Intended paint use.
 - 3. Pigment type and content.

- 4. Vehicle type and content.
- C. Submit list of similar projects (minimum of 5) where pavement-marking paint has been in use for a period of not less than 2 yrs.
- D. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- E. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.

1.4 PROJECT CONDITIONS

- A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 degrees F.
- B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 degrees F above the dew point; or to damp or wet surfaces.

1.5 QUALITY ASSURANCE

- A. Provide written 1 year warranty to Owner that pavement markings will be free of defects due to workmanship, inadequate surface preparation, and materials including, but not limited to, fading and/or loss of markings due to abrasion, peeling, bubbling and/or delamination. Excessive delamination, peeling, bubbling or abrasion loss shall be defined as more than 15% loss of marking material within one year of substantial completion and/or occupancy of the parking area. With no additional cost to Owner, repair and/or recoat all pavement marking where defects develop or appear during warranty period and all damage to other Work due to such defects.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Pavement marking materials shall meet Federal, State and Local environmental standards.
- B. Paint shall be manufactured and formulated from first grade raw materials and shall be free from defects or imperfections that might adversely affect product serviceability.
- C. Paints shall comply with the National Organic Compound Emission Standards for Architectural Coatings, Environmental Protection Agency, 40 CFR Part 59.
- D. The product shall not contain mercury, lead, hexavalent chromium, or halogenated solvents.

2.2 PAVEMENT MARKING PAINTS:

- A. Low VOC - Solvent based paint may be employed for white and yellow pavement markings and shall meet the requirements of MPI #32
 - 1. Available Products: Subject to compliance with the requirements, products that may be incorporated into the Work include, but are not limited to the following:
 - a. Chlorinated Rubber Traffic & Zone Marking Paint, 7493/7494, by RAE Products & Chemicals Corporation
 - b. Setfast Low VOC Acrylic Marking Paint, TM 5626/5627 by Sherwin Williams Company
 - 2. 100% acrylic waterborne paint for special color pavement markings (blue, green, red, black) shall meet requirements of Federal Specification TT-P-1952E. Special color marking materials shall be compatible with the white and yellow pavement markings where they are layered.
- B. All products shall have performance requirements of Type I and II of Federal Standard TT-P-1952E.

2.3 COLOR OF PAINT

- A. Color of paint shall match existing, unless noted otherwise on Contract Drawings:
 - 1. White: Match federal color chip 37925 and daylight directional reflectance (without glass beads) shall not be less than 84% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.
 - 2. Yellow: Match federal color chip No. 33538. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.
 - 3. Blue: Match federal color chip No. 35180. Color shall have daylight directional reflectance (without glass beads) of not less than 52% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

- B. Document the location of existing striping and traffic marking, and colors utilized prior to removal of traffic lines and markings for surface preparation.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
 - 1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.
- E. Striping shall not be placed until full cure of concrete repairs, sealers or coatings. Sealers (other than silane) generally require 14 days @ 70°F or higher. Silane sealers require 24 hrs @ 70°F or higher. Bituminous surfaces generally require 30 days @ 45° F or higher. Coatings shall be fully cured

3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.
- B. Do not paint or finish any surface that is wet or damp.
- C. Clean substrates of substances that could impair bond of paints, including dirt, dust, oil, grease, release agents, curing compounds, efflorescence, chalk, and incompatible paints and encapsulants.
- D. Concrete Substrates: Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.
- E. Lay out all striping on each tier, using existing layout, dimensions and details unless otherwise noted on Contract Drawings.
- F. Report any discrepancies, interferences or changes in striping due to field conditions to Engineer/Architect prior to painting. Pavement Marking Contractor shall be required to remove paint, repair surface treatment and repaint stripes not applied in strict accordance with Contract Drawings.
- G. Where existing painted pavement markings and/or stripes conflict with new striping layout or must be removed due to installation which does not conform to contract requirements, remove existing paint markings, using care to avoid scarring substrate surface.
 - 1. Concrete and asphalt surfaces: Material shall be removed by methods acceptable to Engineer/Architect and cause as little damage as possible to surface texture of pavement. Methods, that can provide acceptable results, are grinding and air or shot blasting. Use of chemicals to remove pavement markings prohibited. Collect

residue generated by removal of pavement markings and dispose of as required by all applicable laws and regulations. If grinding is used, lightly grind floor surface using wheel mounted floor grinder or similar equipment with positive elevation control of grinder head. For all removal techniques: On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.

2. Traffic Topping/Membrane surfaces: Remove existing pavement markings by solvent washing or high-pressure water washing. Submit letter from traffic topping/membrane manufacturer certifying that solvents and/or water pressures are acceptable for this use and will not damage material. On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.
3. Contractor shall not use paint, bituminous bond coat or other methods of covering markings to obliterate existing pavement markings.
4. Material deposited on pavement as a result of removal shall be removed as work progresses. Accumulation of material, that might interfere with drainage or might constitute a hazard to traffic, prohibited.
5. Curing compounds on new concrete surfaces (less than 1 yr old) shall be removed per existing pavement marking removal requirements prior to installation of new pavement markings.

H. Work Areas:

1. Store, mix and prepare paints only in areas designated by Contractor for that purpose.
2. Provide clean cans and buckets required for mixing paints and for receiving rags and other waste materials associated with painting. Clean buckets regularly. At close of each day's Work, remove used rags and other waste materials associated with painting.
3. Take precautions to prevent fire in or around painting materials. Provide and maintain appropriate hand fire extinguisher near paint storage and mixing area.

I. Mixing:

1. Do not intermix materials of different character or different manufacturer.
2. Do not thin material except as recommended by manufacturer.

J. Disposal:

1. Contractor shall properly dispose of unused materials and containers in compliance with Federal Resource Conservation Recovery Act (RCRA) of 1976 as amended, and all other applicable laws and regulations.

3.3 APPLICATION

- A. Apply painting and finishing materials in accordance with manufacturer's directions. Use applications and techniques best suited for material and surfaces to which applied. Minimum air shall be used to prevent overspray. Temperature during application shall

be minimum of 40° F and rising, unless manufacturer requires higher minimum temperature. Maximum relative humidity shall be as required by manufacturer.

1. Total wet mil thickness of 0.015 in (minimum).
 2. Total dry film thickness of 0.008 in (minimum).
- B. All lines shall be straight, true, and sharp without fuzzy edges, overspray or non-uniform application. Corners shall be at right angles, unless shown otherwise, with no overlaps. Line width shall be uniform (-0%, +5% from specified width). No excessive humping (more material in middle than at edges or vice versa).
- C. All lines shall be 4-inches wide unless otherwise noted.

END OF SECTION 099121

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SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 01 Specification Sections apply to this and the other Sections of Division 26.
- B. References.
 - 1. American Society for Testing and Materials (ASTM):
 - a. ASTM A123, "Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products".
 - 2. ANSI/NFPA 70:
 - a. "National Electrical Code (NEC)", latest edition.
 - 3. National Fire Protection Association (NFPA).
 - 4. Federal Specification (FS).
 - 5. ANSI/IEEE C.2:
 - a. "National Electrical Safety Code (NESC)", latest edition.
 - 6. Underwriters' Laboratories, Inc. (UL).
 - 7. Insulated Cable Engineers Association, Inc. (ICEA).
 - 8. National Electrical Manufacturers Association (NEMA).

1.2 SUMMARY

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

11. Conductors (under 600V).
12. Wiring Devices.
13. Electrical Boxes & Fittings.
14. Equipment Supports Sleeves and Guards.
15. Miscellaneous Metals.
16. Joint Sealers.

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

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

1.3 DEFINITIONS

A. Hazardous Areas:

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

1.4 SUBMITTALS

- A. General: Submit the information specified in accordance with Conditions of Contract and Division 01 Specification Sections.
- B. See requirements of Division 01 Section, "Submittal Procedures," Part 1 heading, "Submittal Procedures," for limits to resubmittals.
- C. See requirements of Division 01 Section, "Submittal Procedures," Part 2 heading, "Requests for Information," for RFI constraints.
- D. General: Follow procedures specified in Division 01 Section "Submittal Procedures" and as specified in this Section.
- E. Shop Drawings. Include:
 1. Power and distribution panels.
 2. Lighting panels.
 3. Disconnect switches.
 4. Motor starters.
 5. Lighting control panel.

6. Light standards (poles) with material certifications.
7. Transformers.

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

1. Light fixtures, lamps and ballasts.
2. Wire and cable.
3. Conduit, fittings and supports.
4. Electric heaters.
5. Thermostats.
6. Controls.
7. Boxes.
8. Emergency batteries.
9. Time switches.
10. Security systems.
11. Contactors.
12. Relays.
13. Photoelectric controls.
14. Fans.
15. Air Conditioners/Heat pump.

G. Substitutions

1. Products are referenced in Specification and Drawings to establish standard of quality, style, design, and function of materials, equipment, apparatus, or product.
2. There are often several satisfactory substitutes for standardized utilitarian items which satisfy design objectives.
3. Since it is impractical to name all possible brands that might be furnished, substitutes may be proposed unless specifically stated otherwise.
4. Submit substitutions in accordance with Division 01 and General Conditions of Specification and as follows:
 - a. Submit proposed substitute material or equipment to be considered for approval as equivalent to Engineer/Architect at least 7 days before time set for receiving Bids.
 - b. Provide IES photometric reports on MS-WINDOWS floppy disk for substitute lighting fixtures.
 - c. Contractor shall assume all costs for engineering studies required to evaluate substitute material or equipment.
 - d. Contractor assumes all engineering and construction costs necessary for revision in Work due to substitute material or equipment.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer for the installation and application joint sealers, access panels, and doors.
- B. Qualify welding processes and welding operators in accordance with AWS D1.1 "Structural Welding Code - Steel".

1. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

A. Conditions Affecting Selective Demolition: Following project conditions apply:

1. Locate, identify, and protect electrical services passing through demolition area and serving other areas outside the demolition limits. Maintain services to areas outside demolition limits. When services must be interrupted, install temporary services for affected areas.

1.7 COORDINATION/SCHEDULING/TEMPORARY POWER/CODES AND STANDARDS

A. Coordination

1. Visit site before Bidding to note apparent features which may affect Work. No subsequent allowance will be made because of failure to make examination before Bidding.
2. Check conditions in actual Project against Drawings for all dimensions door swings, ceiling heights or other features affecting electrical Work.
3. Verify all dimensions in field before ordering any material or doing any Work.
4. No extra compensation will be allowed because of differences between actual measurements and dimensions and those indicated on Drawings.
5. Notify Engineer/Architect in writing of any differences which may be found before proceeding with Work.

B. Scheduling

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

C. Temporary Power

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

D. Codes and Standards:

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

1.8 RECORD DOCUMENTS

- A. Prepare record documents in accordance with the requirements in Division 01 Section "Closeout Procedures". In addition to the requirements specified in Division 01, indicate installed conditions for:
 1. Major raceway systems, size and location, for both exterior and interior; locations of control devices; distribution and branch electrical circuitry; and fuse and circuit breaker size and arrangements.

2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
 3. Approved substitutions, Contract Modifications, and actual equipment and materials installed.
- B. Engage services of a land surveyor or professional engineer registered in the state in which the project is located as specified in Division 01 Section "Execution Requirements" to record locations and invert elevations of underground installations.

1.9 MAINTENANCE MANUALS

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

1.10 DELIVERY, STORAGE, AND HANDLING

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

1.11 SEQUENCE AND SCHEDULING

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

PART 2 - PRODUCTS

2.1 GENERAL

- A. Provide:
 - 1. Materials that are new and listed by Underwriters' Laboratories, Inc., bearing their label.
 - 2. Materials suitable for environment and exposure
 - 3. Weatherproof or raintight outdoor equipment.
- B. Conform with:
 - 1. National Electrical Code (ANSI/NFPA 70).
 - 2. All state and local codes.
 - 3. National Electrical Manufacturers Association (NEMA).
 - 4. American National Standards Institute (ANSI).
 - 5. National Fire Protection Association, Inc. (NFPA).
 - 6. Insulated Cable Engineers Association, Inc. (ICEA).
 - 7. Underwriters' Laboratories, Inc. (UL).
 - 8. Institute of Electrical and Electronic Engineers (IEEE).

2.2 CONDUIT

- A. Exposed: Rigid hot-dipped galvanized steel with threaded fittings. (EMT conduit shall not be used in any location.)
 - 1. Acceptable Manufacturers:
 - a. Allied Tube & Conduit Corp.
 - b. Western Tube & Conduit Corp.
 - c. Wheatland Tube Co.
- B. Embedded and Underground: 100% pure, polyvinyl chloride (PVC) rigid, Schedule 40 with cemented couplings in accordance with NEMA TC-6:
 - 1. Acceptable Manufacturers:
 - a. Carlon.
 - b. Condux International, Inc.
 - c. Certainteed Products Corp.
 - d. Thomas & Betts.
- C. At building expansion joints provide at exposed conduit runs only:
 - 1. O.Z. Gedney Type AX Expansion Fittings.

2.3 ENCASEMENT FOR UNDERGROUND CONDUIT

- A. Underground outside of structure and entire service entrance feed: Concrete, 3 in. separation and 3 in. encasement or as indicated on Drawings. Provide warning tape 6 in. below surface and 12 in. above encasement.

2.4 CONDUCTORS (UNDER 600 V)

- A. Use copper wire, sized as indicated on the drawings or per NEC when not indicated with No. 10 AWG being minimum allowable power conductor size. Control wiring shall not be less than No. 12 AWG unless otherwise indicated on Drawings.
- B. No. 10 AWG and No. 12 AWG; provide solid wire, No. 8 AWG and larger; provide stranded wire.
- C. Conductor Insulation: THWN
- D. Conductors in fluorescent fixture channels: "THHN"
- E. Insulation types of better quality or ratings may be used with Engineer/Architect's approval.
- F. Include green colored grounding conductors, sized as indicated on Drawings or per NEC 250 when not indicated, but no smaller than #10, in conduits to provide electrical grounding continuity to all boxes, devices, and outlets.
- G. Color code secondary service, feeder, and branch circuit conductors with factory applied color as follows:

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

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

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

2.5 WIRING DEVICES:

- A. Wiring devices shall be specification grade with rugged plastic housing and brown in color.
- B. All receptacles will be Ground Fault Circuit Interruptor (GFCI) Type.

- C. Switches shall be heavy duty, AC quiet type, toggle handle, 20 amp, 120-277 volts, Hubbell No. 1221.
- D. Device plates shall be Hubbell (302/304) brushed stainless steel in enclosed finished areas, hot-dip galvanized steel in enclosed unfinished areas and weather proof type cast metal in other areas or approved equivalents.
- E. Fractional Horsepower Manual Starters with thermal overloads (Square "D" Class 2510 or approved equivalent) shall be used to protect all equipment with fractional horsepower motors not controlled from magnetic starter.

2.6 ELECTRICAL BOXES AND FITTINGS:

- A. Outlet, device, pull and junction boxes, conduit bodies and fittings shall be sized per NEC Article 370. All conduit connections shall be threaded.
- B. Surface boxes and covers: (Aluminum boxes are not acceptable)
 - 1. Weatherproof hot-dip galvanized cast metal or malleable iron with threaded fittings.
 - 2. Weatherproof zinc electroplated cast metal or malleable iron with threaded fittings.
- C. Boxes for other areas and uses: Gasketed screw cover boxes, 14 or 12 gage, G-90 grade galvanized bodies, 12 or 10 gage G-90 grade galvanized steel covers, NEMA 3R GSC with threaded hubs.
- D. Boxes embedded in walls: Concrete type.

2.7 MATERIAL AND EQUIPMENT SUPPORTS, SLEEVES, AND GUARDS:

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

2.8 MISCELLANEOUS METALS

- A. Steel plates, shapes, bars, and bar grating: ASTM A 36.

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

2.9 JOINT SEALERS

- A. General: Joint sealers, joint fillers, and other related materials compatible with each other and with joint substrates under conditions of service and application as specified in Division 07 "Joint Sealants".
- B. Colors: As selected by Engineer/Architect from manufacturer's standard colors.
- C. Fire-Resistant Joint Sealers: Two-part, foamed-in-place, silicone sealant formulated for use in through-penetration fire-stopping around cables, conduit, pipes, and duct penetrations through fire-rated walls and floors. Sealants and accessories shall have fire-resistance ratings indicated, as established by testing identical assemblies in accordance with ASTM E 814, by Underwriters' Laboratories, Inc., or other testing and inspection agency acceptable to authorities having jurisdiction.
 - 1. Products: Subject to compliance with requirements, provide 1 of the following:
 - a. "Dow Corning Fire Stop Foam", Dow Corning Corp.
 - b. "Pensil 851", General Electric Co.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 ROUGH-IN

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

- B. Refer to equipment specifications in Divisions 02 through 33 for rough-in requirements.
- C. Do not scale Drawings for rough-in measurements.

3.3 ELECTRICAL INSTALLATIONS

- A. General: Sequence, coordinate, and integrate the various elements of electrical systems, materials, and equipment. Comply with the following requirements:
 - 1. Maintain competent superintendent at site throughout progress of Work until work completed.
 - 2. Use only skilled workers experienced in electrical construction.
 - 3. Coordinate electrical systems, equipment, and materials installation with other building components so as not to delay contractors.
 - 4. Verify all dimensions by field measurements.
 - 5. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for electrical installations.
 - 6. Coordinate installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components as they are constructed.
 - 7. Sequence, coordinate, and integrate installations of electrical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
 - 8. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
 - 9. Coordinate connection of electrical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.
 - 10. Install systems, materials, and equipment to conform with approved submittal data to greatest extent possible. Conform to arrangements indicated by the Contract Documents, recognizing that portions of the Work are shown only in diagrammatic form. Where coordination requirements conflict with individual system requirements, refer conflict to Engineer/Architect.
 - 11. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
 - 12. Install electrical equipment to facilitate servicing, maintenance, and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.
 - 13. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames" and this section.
 - 14. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
 - 15. Provide and install or arrange for installation of anchors supports, support frames, light pole anchor bolts, and other items required for installation of materials or equipment specified under this Division.

16. Circuit lines shown on Drawings indicate locations of proposed conduit runs, unless noted otherwise.
17. Circuit numbers are shown at each outlet or are designated on each home run.
18. Conduit runs between outlets and home-run conduits may be arranged or grouped to suit job conditions, but follow circuit patterns as designated on Drawings.
19. Review location of all electrical conduit with Engineer/Architect before construction.
20. Cooperate with others to locate electrical conduit out of public view.
21. In case of conflict between riser diagram and floor plan, greater quantity or better quality prevails, subject to approval of Engineer/Architect.
22. After equipment suppliers are selected and exact power requirements known, Contractor shall verify that all components of power supply system are sized properly per NEC and any other governing codes. If any component of power supply system is found to be too small, Contractor shall increase component size to meet codes.
23. In case interferences between Work develop, Engineer/Architect will decide which Work is to be relocated regardless of which was first installed.
24. Conduit Slots: Where Drawings indicate conduits routed through slots in precast tees, personnel shall be at site during time tees are being erected so that conduits can be passed through slots in full lengths before end panels are installed. Otherwise it may be necessary to use shorter lengths of conduits.
25. Any galvanized equipment, materials or hardware that is cut, scratched or field threaded, shall be coated with a zinc rich coating (ZRC or approved equivalent) at these locations.
26. In locations where light fixtures, exit signs, emergency battery packs, remote heads, or other pieces of equipment needs to be mounted over piping or other obstacles, provide extension bracket made out of 1/4" hot dipped galvanized steel plates.
27. Trench and backfill in accordance with Division 31 Section "Earth Moving".
28. Cleanup: At completion of Work under this contract, remove from building site and dispose of all rubbish and discarded materials and restore disturbed facilities and surfaces.

3.4 CONDUIT INSTALLATION

- A. Conduit shall be sized to provide maximum 40% fill per NEC with 3/4 in. being minimum allowable size. Use large radius sweeps in all bends.
- B. In parking areas and unfinished equipment storage/utility rooms, run conduit under slab on grade or exposed unless otherwise indicated. Coordinate location with Engineer/Architect.
- C. In elevator lobbies, office areas and other finished areas, conceal conduit runs unless otherwise noted on Drawings.
- D. Terminate conduits at all outlets and switches in suitable outlet boxes. Where 2 or more compatible devices are set side by side, set in gang boxes, unless otherwise noted on Drawings.

- E. Coordinate with Engineer/Architect to locate exposed conduit runs. All exposed conduit shall be run square with building except where specifically noted otherwise on Drawings.
- F. Securely fasten exposed conduits to ceiling or walls with 1 hole malleable iron hot-dip galvanized pipe straps and clamp backs at 8 ft on center maximum. Provide nest backs or other spacers or extensions as required to achieve proper mounting heights. Using blockouts or other structural members as a source of support is prohibited.
- G. Close all unused open knockouts.
- H. Provide nylon pull cords in all empty conduits.
- I. Take precautions to prevent water, dirt, concrete, or other material from entering conduit and junction boxes.
- J. Coring and drilling of walls and beams to conceal conduit and risers are responsibility of this Contractor. Slots in double tees are by precaster. Verify exact locations of penetrations with Engineer/Architect before coring and drilling. Seal all such openings in accordance with Division 07 "Joint Sealants".
- K. Use seal tight flexible conduit in lengths not greater than 2 ft to connect motors, transformers, and for whips connecting trunnion mounted fixtures to junction boxes. Do not install flexible conduit at other locations without written approval of Engineer.
- L. Obtain written approval of Engineer/Architect before making significant changes in conduit runs from those indicated on Drawings. Record all changes on set of Drawings furnished by Engineer/Architect. At completion of Work, prepare corrected Record Drawings on transparencies supplied by Engineer/Architect.
- M. Conduits penetrating through fire rated walls and floor slabs shall be sealed against spread of fire and products of combustion with intumescent fire barrier penetration sealing system with fire/smoke rating of floor or wall through which conduits pass. Firestopping materials are specified in Division 07 Section "Penetration Fire Stopping."
- N. Conduit containing emergency circuits shall not contain any other type of circuit.
- O. Box covers located less than 8 ft above the floor shall be equipped with tamperproof screws.
- P. All empty conduits shall be labeled at termination points.
- Q. Any conduit that is cut, scratched or threaded shall be coated with a zinc rich coating (ZRC or approved equivalent) at these locations.
- R. All conduit connections must be threaded. All conduit connections to panels, boxes, fixtures and other equipment must be made with gasketed threaded hubs.
- S. Do not route vertical conduit risers through expansion joints.

3.5 CONDUCTOR INSTALLATION:

- A. All conductors shall be run in conduit.
- B. All wire to wire connections shall be made with properly sized wire nuts.
- C. Increase wire sizes on long runs to minimize voltage drop to 3% maximum from panel to most distant outlet.
- D. Do not begin wiring until work which might cause damage to wires or conduit has been completed.
- E. When there are more than 3 current carrying conductors in conduit, apply NEC Ampacity Adjustment Factor, assuming no diversity, and increase conductor sizes as required. (Also comply with any additional local requirements.)
- F. Wiring from emergency source or emergency source distribution over current protection to emergency loads shall be kept entirely independent of all other wiring and equipment and shall not enter same raceway, cable, box, or cabinet with other wiring.
- G. Use Burndy reducer adaptors as required to connect oversized conductors to breakers or other pieces of equipment.

3.6 WIRING DEVICE INSTALLATION:

- A. Locate devices as shown on Drawings.
 - 1. Actual location may vary from these dimensions by enough distance to clear any construction interference or other obstruction.
 - 2. Owner's or Engineer/Architect's request for minor changes in location of switches, outlets, or connections shall not constitute an extra, provided changes are requested before particular outlet or circuit is installed.
- B. Switch Installation:
 - 1. Mount at 4 ft above finished floor. Adjust to fit masonry coursing where dimensions are not critical.
 - 2. Install switches on latch side of door unless otherwise noted.
 - 3. Install 2 or more switches together in standard ganged box.
- C. Convenience Outlet: Mount so that bottom of box is 18 in. above finished floor except in parking areas, mount bottom of box 36 in. above finished floor. Adjust to fit masonry coursing, strand rail and other obstructions as required.
- D. Receptacle plates and switch plates: Install specified device plate on every receptacle and switch shown on Drawings.

3.7 ELECTRICAL BOXES AND FITTINGS INSTALLATION:

- A. Provide box for each device and junction box shown on Drawings.
- B. Close unused openings in all boxes in accordance with NEC.
- C. All boxes and enclosures for emergency circuits shall be marked so they will be readily identified as component of emergency circuit.

3.8 CUTTING AND PATCHING

- A. General: Perform cutting and patching in accordance with Division 01 Section "Cutting and Patching". In addition to the requirements specified in Division 01, the following requirements apply:
 - 1. Protection of Installed Work: During cutting and patching operations, protect adjacent installations.
 - 2. Perform cutting, fitting, and patching of electrical equipment and materials required to:
 - a. Uncover Work to provide for installation of improperly scheduled Work.
 - b. Remove and replace defective Work.
 - c. Remove and replace Work not conforming to requirements of the Contract Documents.
 - d. Remove samples of installed Work as specified for testing.
 - e. Install equipment and materials in structures.
 - f. Upon written instructions from Engineer/Architect, uncover and restore Work to provide for Engineer/Architect observation of concealed Work.
 - 3. Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.
 - 4. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
 - 5. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
 - 6. Patch existing finished surfaces and building components using new materials matching existing materials and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - a. Refer to Division 01 Section "Reference Standards and Definitions" for definition of experienced "Installer".
 - 7. Patch finished surfaces and building components using new materials specified for the original installation and experienced Installers. Installers' qualifications refer to the materials and methods required for the surface and building components being patched.
 - a. Refer to Division 01 Section "Reference Standards and Definitions" for definition of experienced "Installer".

- B. Seal all openings in accordance with Division 07 Section "Joint Sealants".

END OF SECTION 260500

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SECTION 31 63 33 - MICROPILES

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. In accordance with Contract Documents, provide all materials, labor, equipment, and supervision to design, test, and install micropiles.
- B. Related Sections include the following:
 - 1. Division 01 Section "Unit Prices."
 - 2. Division 01 Section "Project Management and Coordination."
 - 3. Division 01 Section "Submittal Procedures."
 - 4. Division 01 Section "Closeout Procedures."
 - 5. Division 03 Section "Cast-in-Place Concrete."
 - 6. Division 05 Section "Structural Steel Framing."
 - 7. Division 31 Section "Earthwork."

1.3 SYSTEM DESCRIPTION

- A. Micropile system shall consist of small diameter piles, nominal diameter of 12 inches or less, drilled into the ground, grouted-in-place, and reinforced. Steel pipe casing, either temporary or permanent, may be part of micropile system and permanent steel pipe casing may be used for micropile reinforcement.
- B. Micropiles shall be capable of supporting axial and lateral loads as required.
- C. Drawings are based on assumed elevation of pile tip. If required, pile length will be modified by Engineer/Architect based on recommendation of **GEOTECH ENGINEER:**
GROUP DELTA CONSULTANTS.
- D. Payment will be based on actual total net length of micropiles in place and approved and unit prices stated in Bid Form.
- E. Micropiles require design by a qualified registered Professional Engineer (hereinafter referred to as Designer) to be employed by the micropile contractor (hereinafter referred to as Pile Contractor).

1.4 UNIT PRICES

- A. For purposes of bidding and measurement for payment, pile diameters, top of pile cutoff, and elevation of pile tip are shown on Drawings with reinforcement as determined by Pile Contractor.

Measurement: Using data obtained during micropile placement, Pile Contractor shall calculate actual total net length of micropiles in place and approved and the measurement shall be confirmed by **[Owner's testing agency] or GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**

Additional payment for pile lengths in excess of that indicated and credit for pile lengths less than that indicated will be calculated at unit prices stated in Contract, based on net addition or deduction to total pile length.

1. No additional compensation will be made for excavation, grout, reinforcement, steel casing, or other costs due to unauthorized over drilling.
2. Unit prices shall include engineering, labor, materials, tools, equipment, overhead, profit, and incidentals for excavation, trimming, shoring, casings, dewatering, reinforcement, grout, disposing of cutoffs, and any other items for a complete micropile installation.
3. Test piles that become part of permanent foundation system will be considered as an integral part of Work.
4. No payment will be made for rejected work, including micropiles drilled out of tolerance; defective micropiles, or micropiles damaged during handling or placement.

1.5 SUBMITTALS

- A. Make submittals in accordance with requirements of Division 01 and as specified in this Section.
- B. Prepare and submit to Engineer/Architect for review and approval, design documents describing micropile system or systems intended for use. Design documents shall be submitted 30 calendar days prior to commencement of micropile work. Design documents shall include:
1. Drawing showing location and orientation of each micropile. A micropile schedule giving:
 - a. Micropile number.
 - b. Micropile design load for both single and proposed groups for:
 - 1) Axial Loads.
 - 2) Lateral Loads.
 - 3) Interaction formula, when axial and lateral loads are not independent of each other.
 - c. Type and size (diameter, wall thickness, length, reinforcement, etc) of micropile.

2. Description of equipment, including type, manufacturer, and model of proposed drilling equipment, procedures, and techniques for micropile installation.
 3. Document that states Pile Contractor has reviewed and accepted as basis of design geotechnical report or list and explain any exceptions.
 4. Detailing fabrication of steel micropile components.
 - a. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - b. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
 5. Dimensioned drawings of pile load testing apparatus including, but not limited to, loading arrangement, sizes of primary members, test and anchor pile locations, and testing and measuring equipment.
 6. Signed and sealed structural calculations for different micropile type and loading criteria, splices, and connections to pile cap where applicable.
 7. Signed and sealed calculations showing compensation for section loss due to corrosion for design life specified in section "System Description – Performance Design" based on input from Geotechnical Engineer for in-situ conditions where micropiles will be installed.
- C. Product Data: For each type of product specified. Mill test reports signed by manufacturers certifying that products, including chemical and physical properties, comply with specifications. For steel pipe, either mill certifications or minimum of two coupon tests for each load delivered to project.
- D. Design Mixes: For each class of grout. Include revised mix proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments. Test reports for each design mix shall have been performed by an independent testing agency.
- E. Laboratory Test Reports: For evaluation of grout materials and mix design test.
- F. Welding Certificates: Copies of certificates for welding procedures and personnel.
- G. Qualification Data: For firms and persons specified in Section "Quality Assurance" to demonstrate capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Design Professionals and Owners, and other information specified.
- H. Submit to Engineer/Architect data for each test jack, pressure gauge and master pressure gauge to be used. Calibration tests shall have been performed by an independent testing laboratory and test shall have been performed no more than 30 days prior to date submitted.
- I. Micropile Group Record:
1. Submit Micropile Group Record for each pile group within two working days after placing last pile in group. Record shall include:

- a. Variation of centroid of each individual pile from specified location in plan measured in two orthogonal directions.
 - b. Calculated variation of pile group centroid from specified location in each of two orthogonal directions.
- J. Record drawings at project closeout in accordance with Division 01 Section "Closeout Procedures."
1. Submit to Engineer/Architect within 30 calendar days after completion of micropile work a report containing:
 - a. As-built drawings showing locations of micropiles signed and sealed by registered surveyor.
 - b. Micropile installation report including drilling and grouting logs for each micropile signed and sealed by Designer including a statement that piles were installed per project requirements and industry standards and meet design intent.
 - c. Micropile test results and graphs signed and sealed by Designer including a statement that test piles as installed can support the design loads.

1.6 QUALITY ASSURANCE

- A. Pile Contractor Qualifications: Not less than **[(5)]** projects and minimum of **[(3)]** years experience with micropile installation. Each project shall have included successful installation of minimum of 100 micropiles. At time of bid, Pile Contractor shall submit a narrative containing minimum of **[(5)]** micropile installation projects and providing a brief description of each project, number of micropiles installed, and a reference for each project listed. As a minimum, references shall include either Owner's or General Contractor's firm name, name of contact individual from that firm, current address, and current phone number.
- B. Design Qualifications: Not less than **[(5)]** projects and minimum of **[(3)]** years experience in design, testing, and construction observation of micropiles. Each project shall have included successful completion of minimum of 100 micropiles. At time of bid, Pile Contractor shall submit verification of Designer's experience in similar narrative format as in paragraph above.
- C. Prior to start of work, identify Designer's field engineer, drill operators and on-site supervisors who will be assigned to project. Provide a complete list containing each individual's experience for Engineer/Architect to determine whether or not each individual has satisfied following requirements:
 1. Designer's field engineer shall have at least two years of experience in design and construction of micropiles. Use of consultants or manufacturer's representatives does not satisfy requirements of this section.
 2. Drill operators and on-site supervisors shall have a minimum of one-year experience installing micropiles with Pile Contractor's organization.
- D. Engineer/Architect shall approve or reject Pile Contractor's qualifications and staff within **[10]** working days after receipt of submission. Work shall not be started nor materials

ordered until approval of Pile Contractor's qualifications are given. Engineer/Architect may suspend micropile work if Pile Contractor substitutes unqualified personnel for approved personnel. Pile Contractor shall be fully liable for additional costs resulting from the suspension of work and no adjustment in contract time resulting from suspension of work will be allowed.

- E. Owner reserves right to reject any or all bids on basis of price or in the belief that narrative infers that Pile Contractor has not given due thought to construction process or does not possess appropriate experience.
- F. Survey Work:
 - 1. Contractor shall employ, at its expense, licensed professional surveyor registered in state of **CA** to perform surveys, layouts, and measurements for micropile Work.
 - 2. Record and maintain information log of each micropile and cooperate with Designer to provide data for required reports.
 - 3. Upon completion of Work, before construction continues, Surveyor shall provide reproducible Record Foundation Drawing.
 - 4. Record Drawing shall include exact location, shaft diameter, top elevation, drilled length, deviation from specified tolerances, and other specified data for each micropile.
- G. Testing Agency:
 - 1. Testing Agency will be independent testing laboratory employed by Owner and accepted by Engineer/Architect.
 - 2. Testing Agency is responsible for conducting, monitoring, and reporting results of all material tests required under this Section. Testing Agency has authority to reject work and materials not meeting specification.
 - 3. Testing Agency will observe all micropile operations.
 - 4. Responsibilities of Testing Agency:
 - a. Be present during all micropile placement operations.
 - b. Be present during all micropile load tests.
 - c. Monitor and verify reports required from Designer and Surveyor.
- H. Quality Control:
 - 1. Pile Contractor is responsible for quality control of materials, procedures, and installation, including that furnished by subcontractors and suppliers. Pile Contractor shall meet all requirements indicated in specifications and shown on drawings.
- I. Inspection and testing performed by **[Owner's testing agency] OR GEOTECH ENGINEER: GROUP DELTA CONSULTANTS** as part of a quality assurance program will not relieve contractor or Pile Contractor of responsibility to provide materials, procedures and installation in compliance with specified requirements. If micropile location tolerances are not met or if materials, procedures, or other installation requirements fail to conform to specifications, Pile Contractor shall be liable for cost of any corrective work required including any additional work required by **[Owner's testing agency] or GEOTECH ENGINEER:**

GROUP DELTA CONSULTANTS or Engineer/Architect.

J. Pre-installation Conference:

1. Conduct conference at Project site to comply with requirements of Division 01 Section "Project Management and Coordination".

1.7 REFERENCES (LATEST EDITION UNLESS NOTED)

A. American Institute of Steel Construction (AISC):

1. "Specification for Structural Steel Buildings".

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

1. ASTM A36, "Specification for Carbon Structural Steel".
2. ASTM A252, "Specification for Welded and Seamless Steel Pipe Piles".
3. ASTM A572, "Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel".
4. ASTM A615, "Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement".
5. ASTM A722, "Specification for Uncoated High-Strength Steel Bar for Prestressing Concrete".
6. ASTM C33, "Specification for Concrete Aggregates".
7. ASTM C109, "Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. Cube Specimens)".
8. ASTM C144, "Specification for Aggregate for Masonry Mortar".
9. ASTM C150, "Specification for Portland Cement".
10. ASTM C494, "Specification for Chemical Admixtures for Concrete".
11. ASTM D1143, "Test Method for Piles Under Static Axial Compressive Load".
12. ASTM D3689, "Test Method for Individual Piles Under Static Axial Tensile Load".
13. ASTM D3966, "Test Method for Piles Under Lateral Loads".

C. American Welding Society (AWS):

1. AWS D1.1, "Structural Welding Code – Steel".

D. American Petroleum Institute (API):

1. API 5CT (N-80), "Specification for Casing and Tubing".

E. United States Department of Transportation Federal Highway Administration (FHWA):

1. FHWA Publication No. FHWA-SA-97-070, "Micropile Design and Construction Guidelines – Implementation Manual".

F. International Building Code and/or California Building Code.

G. American Society of Civil Engineers (ASCE):

1. ASCE 20, "Standard Guidelines for the Design and Installation of Pile Foundations".

1.8 PROJECT CONDITIONS

A. Excavation:

1. Initial excavation shall not be accomplished before commencement of Work under this Section. Verify all conditions with Contractor.
2. Initial excavation shall be accomplished before commencement of Work under this Section. Verify all grades and coordinate Work with Contractor.

B. Existing Utilities:

1. Locate existing underground utilities before installing micropiles. If utilities are to remain in place, provide protection from damage during micropile operations.
2. Should uncharted or incorrectly charted utilities be encountered during excavation, notify Engineer/Architect and Designer immediately. Cooperate with Owner and utility companies in keeping services and facilities in operation. Repair damaged utilities to satisfaction of Owner.
3. Do not interrupt existing utilities serving facilities occupied and used by Owner and others, except when permitted in writing by Engineer/Architect and only after acceptable temporary utility services have been provided.

C. Site Information:

1. A geotechnical report has been prepared for this Project and is available for information only. Opinions expressed in this report are those of the geotechnical engineer and represent interpretations of subsoil conditions, tests, and results of analyses conducted by the geotechnical engineer. Owner will not be responsible for interpretations or conclusions drawn from this data by Pile Contractor or Designer.

At Pile Contractor's option, additional test borings or other exploratory operations may be conducted. Pile Contractor shall submit written explanation to justify need for additional exploration and shall not perform such additional exploration without written approval from **GEOTECH ENGINEER: GROUP DELTA CONSULTANTS or [Engineer/Architect]**. Costs of such additional exploration shall be borne by Pile Contractor.

D. Responsibility for Damage:

1. Pile Contractor is fully responsible and liable for all damages to existing structures, utilities, or other construction that may occur due to installation of micropiles. Such liability shall include, but not be limited to, repair or replacement of damaged property. All repairs or replacements shall be subject to the satisfaction of its Owner and at no cost to Owner.

1.9 SEQUENCING

- A. Construct each micropile continuously including placement of grout and any steel reinforcement, dowels, or anchor bolts.
- B. Do not interrupt sequence of operations for micropiles by weekends and holidays, or for any other reason, without acceptance by Engineer/Architect.
- C. Provide completed logs to Engineer/Architect before any other Work is initiated.

1.10 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to project site in such quantities and at such times to ensure continuity of installation. Handle and store materials at project site to prevent physical damage.

1.11 SYSTEM DESCRIPTION – PERFORMANCE SPECIFICATION

- A. Micropiles are based on performance type design for foundation system. Design calculations and shop drawings are required in accordance with this Section. Unless otherwise directed, Pile Contractor shall select micropile type and installation method, and determine length and diameter. Pile Contractor shall be responsible for installation of a safe, functional foundation support system in accordance with testing subsection of this specification. Pile Contractor's proposal for said work shall explain materials, methods, and design assumptions they will employ.
- B. Pile Contractor shall employ a qualified Designer licensed in state of **CA**, to perform design of micropiles. Designer qualifications are subject to approval by Engineer/Architect **and GEOTECH ENGINEER:**

GROUP DELTA CONSULTANTS.

- C. Design Drawings and Specifications: Design shall meet criteria established in project documents and soils report. Designer shall prepare and seal final design drawings, design calculations, shop drawings, and specifications (hereinafter referred to as Design Documents) submitted to Engineer/Architect **and GEOTECH ENGINEER:**

GROUP DELTA CONSULTANTS for review. Designer shall be responsible for design of applicable micropiles and will be required to submit design calculations and shop drawings to Engineer/Architect **and GEOTECH ENGINEER:**

GROUP DELTA CONSULTANTS for review prior to any fabrication and construction for Project. Designer shall also prepare and seal drawings and calculations for submittal to proper governing authorities as required.

- 1. Shop drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to Engineer/Architect.

Submission of Final Design Documents: Submit final Design Documents to Engineer/Architect **and GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**, for review to allow a minimum of **[(15)]** calendar days for such review before proceeding with any fabrication or construction. These Design Documents shall be completed in every detail necessary for fabrication and construction of Project, complying with design intent and requirements of Contract Documents. See Division 01 Section "Submittal Procedures" for Shop Drawings. Upon review, the Engineer/Architect written remark "No Exception Taken" or "Make Corrections Noted" will establish acceptance by Engineer/Architect.

- D. Designer's Insurance and Certificate: Designer shall furnish Owner a Certificate of Professional Liability Insurance in minimum amount of **[\$2,000,000]** per claim. All design Documents prepared by Designer shall be certified and bear seal and signature of Designer before submitted for review.

E. Design Criteria:

1. Design drawings shall be prepared showing proposed method for micropiles, including plan, elevation, sections, and a sufficient number of details to clearly illustrate the work. Relationship of micropiles to right-of-way and easement lines, existing buildings, other structures, utilities, streets, and other construction shall be clearly indicated. Utility locations as provided to Pile Contractor by Owner or Contractor shall be shown. These drawings, showing all of the above information, shall be prepared by Designer, and shall bear their seal and signature.
2. Micropiles shall be designed to safely provide required capacities shown on project documents without allowing undesirable deflections and settlement. Unless shown differently in drawings, maximum allowable total settlement shall be **[1.0] inch[es]** and maximum allowable differential settlement shall be **[.5] inch[es]**.
3. Micropiles shall be designed to address degree of aggressiveness of soils and environment as identified in geotechnical report. Micropile design shall consider loss of section due to corrosion, in addition to other potential factors, for a system life span of **[(50)]** years.

F. Performance Design Calculations:

1. Following specific geotechnical and typical micropile information shall be included at a minimum in Designer's design calculations and drawings.

a. Micropile Information

- 1) Casing size: X" OD – X" ID (Threaded)
- 2) Casing strength: X ksi
- 3) Reinforcement size: #X Bundled
- 4) Reinforcement strength: X ksi
- 5) Grout strength: X psi
- 6) Compression capacity: X kip
- 7) Tension capacity: X kip
- 8) Lateral capacity: X kip (Requires Detailed Analysis)
- 9) Estimated average depth of micropile: X feet (including bond zone)

b. Soil/Rock Information:

- 1) Undrained shear strength (cu): X psf
 - 2) Modulus of subgrade reaction (k): X psi
 - 3) Moist Unit Weight (y): X pcf
 - 4) Bond zone friction strength: X psi
 - 5) Strain at 50% stress: X'
2. Design of micropile capacities shall be in accordance with US DOT, Federal Highway Administration publication "Micropile Design and Construction Guidelines," (FHWA-SA-97-070) chapter 5 using the SLD method.
3. Design and detailing of micropiles shall be in accordance with **IBC 2021 Section 1810.3.10.**
 - a. Micropile details shall include connection to pile caps.
 - b. Battered micropiles shall be connected to the pile caps for the full micropile uplift capacity.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Cement: Type I, II or III conforming to ASTM C150 shall be used. In some applications where voids exist, sand conforming to ASTM C144 may be added to grout in a ratio not to exceed 1:1. Strength requirements for grout are regardless of sand content.
- B. Admixtures: Admixtures shall conform to ASTM C494. Admixtures which control bleed, improve flowability, reduce water content and retard set may be used in grout subject to approval of Designer. Admixtures, if used, shall be compatible with grout and mixed in accordance with manufacturer's recommendations and shall be non-corrosive.
- C. Water: Water for mixing grout shall be potable and free from substances that may be deleterious to grout or steel.

2.2 STEEL PILES COMPONENTS

- A. Steel pipe: Shall meet tensile requirements of ASTM A252 Grade 3, with minimum yield strength as required by Designer. Pipe may be new "Structural Grade" (a.k.a. "Mill Secondary") or API N-80 pipe casing meeting tensile and yield strength requirements.
 1. Piles shall be furnished in necessary pipe sections capable of being spliced in field by threaded connections within a reasonable time. Splice shall be capable of developing full strength of pile or shall be designed to resist 125% of required design axial, shear, and moment strength of pile.
 2. All pipes shall be free of rust, dents, and other imperfections which may adversely affect structural capacity of pipe.
- B. Steel core:

1. Reinforcing steel core shall be deformed bars, free of scale, oil, and other coatings that would preclude a competent bond with grout. Steel core shall meet requirements of ASTM A615 or approved equal. Mechanical splices that provide required yield stress throughout are allowed. Lap splices are not permitted.

C. Plates and Shapes:

1. Structural steel plates and shapes for pile top attachments shall conform to ASTM A36 or ASTM A572 Grade 50.

PART 3 - EXECUTION

3.1 GENERAL

- A. Examine area and conditions under which piles are to be installed. Notify Owner, Engineer/Architect and Designer in writing of conditions detrimental to proper and timely completion of Work. Do not proceed with Work until unsatisfactory conditions have been corrected in a manner acceptable to Contractor and Designer.

3.2 DELIVERY AND STORAGE OF MATERIALS

- A. Deliver materials to site in manufacturer's original containers, unopened. Materials shall be clearly identified with brand name, designation and shelf life. Materials older than their shelf life shall not be used and shall be removed from project site. Store in a protected area at temperatures recommended by manufacturer.

Steel, anchors, and bars shall be handled and stored in such a manner as to avoid damage or corrosion. Damage as a result of abrasions, cuts, nicks, welds, weld splatter and corrosion shall be cause for rejection by **GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**.

Or [Owner's testing agency]. All steel shall be protected from dirt, rust or deleterious substances.

- B. Prior to installation, inspect all materials for signs of damage. **GEOTECH ENGINEER:**

GROUP DELTA CONSULTANTS Or [Owner's testing agency] shall reject damaged materials.

3.3 DRILLING

- A. Unless otherwise directed, core drilling, rotary drilling, percussion drilling, auger drilling or other means acceptable to Designer shall be used. Provide casing, slurry or other means to prevent caving of borehole during drilling and until completion of grouting activities. Pile Contractor shall be responsible for removing soils from hole and to ensure that borehole is stable during grouting activities and does not cave prior to completion of grouting.

- B. Where Owner's Engineer/Architect determines that piles are to be abandoned, they shall be filled with grout. Replacement piles shall be installed at locations determined by Engineer. Compensation for approved abandoned or replacement piles will be based on contracted unit price.
- C. Micropiles shall not be installed, including drilling, within **[7.5]** feet, or as otherwise approved by Designer, of a pile completed less than **[24]** hours previously. Requirement shall not relieve Pile Contractor from responsibility for maintaining integrity of completed micropiles.

Micropiles shall be installed under the observation of Designer's authorized representative **GEOTECH ENGINEER: GROUP DELTA CONSULTANTS, PROJECT NO. LA-1596 DATED MARCH 7, 2023.**

and Owner's testing agency. Report any unusual occurrences observed during drilling and installation to Designer, **GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**

and Engineer/Architect. Casing, if used, shall be slowly withdrawn as pressure is applied to grout. Grout levels must be checked periodically to insure grout level does not drop below bottom of casing.

- D. Steel core shall be placed centered in drilled hole and held 3 to 6 inches from bottom of hole. Failure to place steel core centered and full depth shall require redrilling micropile at no cost to the Owner.
- E. Orient micropiles, micropile groups, and micropile caps as shown on drawings unless altered orientation is unavoidable due to existing conditions, rejected piles, etc. If change in orientation is unavoidable, submit proposed change in orientation to Engineer/Architect for review prior to work.
- F. Drill piles within the following maximum tolerances:
 - 1. Deviation of centroid of top of pile from specified location in plan: 3 in.
 - 2. Deviation from plumb or angle of batter: 1 in. in 10 ft.
 - 3. Variation of top from specified elevation: plus or minus 1 in.
 - 4. Pile group centroid: 3 in. from location indicated.

3.4 GROUTING

- A. Pile Contractor shall use a neat cement grout or a sand-cement grout that shall not contain lumps or other indications of hydration. Admixtures, if used, shall be mixed in accordance with manufacturer's recommendation.
- B. Grouting equipment shall produce a grout free of lumps and undispersed cement. Pump shall be equipped with a pressure gauge to monitor grout pressures. Grout mixer shall be high-shear colloidal mixer. Pressure gauge shall be capable of measuring pressure of at least 150 psi or twice actual grout pressures used by Pile Contractor, whichever is greater. Grouting equipment shall be sized to enable grout to be pumped in one continuous operation. Mixer shall be capable of continuously agitating grout. Time of mixing grout shall not be less than one minute. If agitated continuously, grout may be

held in mixer or agitator for a period not exceeding three (3) hours at air temperatures below 70 degrees F, for a period not exceeding two and one-half (2-1/2) hours at air temperatures between 70 degrees and 90 degrees F, and for a period not exceeding **[1]** hour at air temperatures at 90 degrees F and above. Maximum grout temperature not to exceed 90 degrees F. Pile Contractor to ensure sufficient grout pressure and assist in determining volume of grout pumped into each micropile.

- C. Grout shall be injected from lowest point of the drill hole. Grout may be pumped through grout tubes, casing, hollow-stem-augers or drill rods. Quantity of grout and grout pressures shall be recorded. Grout pressures and grout takes shall be controlled to prevent excessive heave in cohesive soils or fracturing of rock formations. Entire micropile shall be filled with grout.
- D. Grout shall be pumped into pile until grout of the same consistency as being pumped into pile reaches top of pile.
- E. Upon completion of grouting, grout tube may remain in the hole but it shall be filled with grout. After grouting, micropile shall not be loaded until grout has reached design strength.

3.5 TESTING

A minimum of **[one]** test micropile[s] shall be loaded for each type and design capacity of micropile under supervision of Designer. Test load shall be taken to 200% of the design load (compression, tension and lateral). Load test shall be evaluated by Pile Contractor, Designer, **[Owner's testing agency], GEOTECH ENGINEER: GROUP DELTA CONSULTANTS** and Engineer/Architect to assure compliance with job performance requirements.

Test micropiles shall be in addition to quantity of micropiles shown on drawings. Pile Contractor shall coordinate load testing with Designer **[and Owner's testing agency] GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**

- A. Load test locations shall be coordinated with and approved by Owner, Designer and Engineer/Architect. Pile Contractor shall furnish all loading apparatus (reaction beams, platforms, anchor systems, connections, etc.), calibrated jacks, and labor to perform the loading as directed by Designer **[Owner's testing agency], GEOTECH ENGINEER:**

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and acceptable to Engineer/Architect. Designer **[Owner's testing agency], GEOTECH ENGINEER: GROUP DELTA CONSULTANTS.**

- B. loading apparatus and procedures prior to installation, and shall supervise and observe testing, perform and record all necessary measurements and prepare load testing report. Pile Contractor shall furnish all testing equipment (dials, gauges, mirrors, wire, scales, etc.) and labor necessary to observe, measure and record test results. **[Owner's testing agency], GEOTECH ENGINEER:**

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shall review acceptability of testing apparatus, procedure, and results therefrom. Reaction beam and testing apparatus must be of sufficient size and configuration to leave sufficient space around test micropile to allow unobstructed access to test micropile. Pile Contractor shall use test micropiles of same size and depth as proposed for use in Work, and shall drill in same manner as will be employed for production micropiles. Load testing shall not be conducted until grout has reached design compressive strength.

- C. In lieu of reaction micropiles, two rock anchors may be installed to provide reaction load. A structural beam shall be set and attached to anchors to complete reaction assembly. Reaction micropiles or anchors shall not be driven closer than seven (7) feet from any test micropile.
- D. Load shall be applied with a calibrated hydraulic jack. A leveling plate shall be attached to surface of test micropile and jack shall be set in position with load centered on micropile.
- E. Micropile vertical downward load test micropile shall be performed in accordance with referenced standards. Vertical downward load test shall be twice vertical downward design load shown on drawings and result in less than **[1.0]** inches of settlement.
- F. Micropile uplift load test if piles subject to uplift loads shall be performed in accordance with referenced standards. Uplift load test shall be twice uplift design load shown on drawings.
- G. Micropile lateral load test if piles subject to lateral loads shall be performed in accordance with referenced standards. Lateral load test shall be twice lateral design load shown on drawings and result in a gross lateral movement at ground level of less than 1 inch.
- H. Test micropile may be used as production micropile, with approval by Engineer/Architect.
- I. If test micropile fails to give acceptable results, Pile Contractor shall modify design and install and test other micropiles at their expense.

3.6 FIELD QUALITY CONTROL

- A. Inspection and Testing: Designer shall perform a quality assurance program that will include, but shall not be limited to: product verification, installation observation, preparation of a log for each micropile installed, monitoring and review of load testing program, structural testing of micropiles, and welding inspection. No micropiles shall be installed except in presence of **[Owner's testing agency], GEOTECH ENGINEER:**

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Any micropiles installed without the presence of **[Owner's testing agency] or GEOTECH ENGINEER: GROUP DELTA CONSULTANTS**, are summarily rejected. **[Owner's testing agency], GROUP DELTA CONSULTANTS** shall perform materials testing and approve all micropile installation criteria with regard to the requirements of specifications and drawings, job conditions and all other criteria relevant to installation in judgment of **[Owner's testing agency], GROUP DELTA CONSULTANTS**.

B. A report shall be prepared for each micropile by Designer as follows:

1. Micropile identification, weather conditions, and temperature.
2. Date and time of starting and completing excavation and installation of micropile.
3. Ground surface elevation at micropile location.
4. Size and depths of casing, if utilized.
5. Drilled hole diameter, length and micropile tip elevation.
6. Pile diameter, wall thickness, length, location of threaded joints (relative to top at pile) and number of sections.
7. Grout temperature, density, start/completion times and volume used to complete micropile.
8. Micropile cut-off elevation, tip elevation and pay length.
9. Micropile plumbness.
10. Description of obstructions, caving or any unusual conditions encountered during drilling.
11. As-built location.

3.7 DISPOSAL OF MATERIALS

- A. Remove surplus excavated material and slurry and legally dispose of it off Owner's property.

END OF SECTION 31 63 33

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