INVITATION FOR BIDS

City of Santa Rosa

FOR CONSTRUCTING

CITY OF SANTA ROSA
PARKING GARAGE #9 - 2017 REPAIRS

CONTRACT NUMBER
C01823

ISSUED BY

CAPITAL PROJECTS ENGINEERING DIVISION

CITY OF SANTA ROSA, CALIFORNIA

2018

Last Updated: March 1, 2016

ATTENTION
Prebid Conference
See Page 1

City of Santa Rosa

STATE OF CALIFORNIA

INVITATION FOR BIDS

CONTAINING:

NOTICE TO BIDDERS

SPECIAL PROVISIONS

BID FORMS

CONTRACT

FOR

CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

Contract No. C01823

CITY OF SANTA ROSA
PARKING GARAGE #9 - 2017 REPAIRS

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CITY OF SANTA ROSA
STATE OF CALIFORNIA

NOTICE TO BIDDERS

➢	For technical questions regarding this project, contact Steve Dittmer, Supervising Engineer, at (707) 543-3847.
➢	For direct access to plans, specifications and planholders' lists, go to www.srcity.org/bids and click on Bid/Proposal Opportunities or call (707) 543-3800.
➢	For direct access to bid results, go to www.srcity.org/bids. Under Link to Capital Projects, click on Capital Projects Contracts or call (707) 543-3835.

- IMPORTANT -

Bid Acceptance Deadline

Sealed bids will be accepted at the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California 95401 until 2:00 p.m., July 31, 2018, for City of Santa Rosa Parking Garage #9 - 2017 Repairs, Contract No. C01823. (Engineer's Range: $1,600,000 - $2,050,000.)

Bids tendered after this deadline will not be accepted. The official time clock for accepting bids will be an electric date and time stamping clock, located in the Transportation and Public Works Department, 69 Stony Circle, Santa Rosa, California. In order to be accepted, bids must be received prior to 2:00 p.m. Therefore, a bid stamped in at 1:59 p.m. will be accepted, but one delivered at or after 2:00 p.m. is late and will not be accepted.

Pre-Bid Meeting

Prospective bidders, subcontractors, and material suppliers are invited to attend a pre-bid meeting scheduled to be held at 10:00 a.m., July 17, 2018, in the Transportation and Public Works Department located at 69 Stony Circle, Santa Rosa, California.

Subcontractor Information; Department of Industrial Relations Registration

Bidders shall provide the names, business addresses and license numbers of all subcontractors listed on bidder's List of Subcontractors. No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

Estimated Quantities

CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

Item No.	Description	Quantity	Units
1	MOBILIZATION	1	LS
2	ELEVATION SURVEY	1	LS
3	SOLAR PANEL PROTECTION	1	LS
4	FLOOR PREPARATION - SCARIFICATION	47,200	SF
5	FLOOR PREPARATION - EXISTING WATERPROOFING REMOVAL	43,200	SF
6	FLOOR REPAIR - SUBSTRATE PARTIAL DEPTH / DEEP	400	SF
7	FLOOR REPAIR - FULL DEPTH	20	SF
8	FLOOR REPAIR - WEAR SLAB AT TRENCH DRAIN	130	SF
9	FLOOR REPAIR - WEAR SLAB	43,200	SF
10	SEAL CRACKS AND JOINTS	800	LF
11	JOINT REPAIR - EXPANSION BOARD / JOINT SEALANT	1,600	LF
12	JOINT REPAIR - TOOL, ROUT AND SEAL CONTROL JOINTS	4,000	LF
13	CRACK REPAIR - EPOXY INJECTION	800	LF
14	JOINT REPAIR - COVE SEALANT	1,900	LF
15	CRACK REPAIR - HEALER / SEALER	4,000	SF
16	EPOXY BROADCAST OVERLAY SYSTEM	1,100	SF
17	TRAFFIC TOPPING - REPAIR	200	SF
18	TRAFFIC TOPPING - RECOAT (PARTIAL SYSTEM)	4,100	SF
19	MECHANICAL - PIPE AND HANGERS	220	LF
20	MECHANICAL - EXISTING CLEANOUT REMOVAL	17	EA
21	MECHANICAL - BI-LEVEL DRAIN	22	EA
22	WI 43.1: HANDRAIL - INSTALL GUARDRAIL	85	LF
23	WI 43.2: HANDRAIL - INSTALL GUARDRAIL	430	LF
24	PAINT TRAFFIC MARKINGS (TOP LEVEL)	1	LS
25	WEAR SLAB SYSTEM - DEMOLITION CONCRETE SYSTEM	43,200	SF
26	FLUID-APPLIED WATERPROOFING WITH PROTECTION BOARD	43,200	SF
27	WEAR SLAB - DRAINAGE COURSE	43,200	SF
28	WEAR SLAB - SLIP SHEET	43,200	SF
	ALTERNATE 1		
29	P/T SYSTEM REPAIR - TENDON REPLACEMENT REPAIR (ALTERNATE 1)	1	EA
30	P/T TENDON END ANCHORAGE (LIVE) (ALTERNATE 1)	1	EA
31	P/T TENDON END ANCHORAGE (DEAD) (ALTERNATE 1)	1	EA
32	P/T TENDON MATERIAL (ALTERNATE 1)	65	LF

The foregoing quantities are approximate only, being given as a basis for the comparison of bids, and the City of Santa Rosa does not expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or portion of the work, as may be deemed necessary or expedient by the Engineer.

Bids shall be made in accordance with the prevailing hourly rate of per diem wages for this locality and project as determined by the Director of the DIR pursuant to Labor Code sections 1770 *et seq.*

Contractor shall be responsible for compliance with the Immigration Reform Control Act of 1986.

If the project requires the employment of workers in any apprenticeable craft or trade, once awarded, Contractor and subcontractors must apply to the Joint Apprenticeship Council unless already covered by local apprentice standards (see Labor Code section 1777.5).

All bids are to be compared on the basis of the Engineer's estimate of the quantities of work to be performed. No bid will be awarded to a contractor who is not licensed in accordance with the provisions of Chapter 9 of Division 3 of the Business and Professions Code. Contractor must hold a Class A or B license for this project.

Project plans, bid and contract forms for C01823 City of Santa Rosa Parking Garage #9 - 2017 Repairs may be obtained through PlanetBids at **www.srcity.org/bids**. These documents can no longer be obtained at the Transportation and Public Works Department.

No bid will be accepted unless it is made on the contract bid forms furnished by the Transportation and Public Works Department through PlanetBids. The original of the completed bid forms bearing original signatures must be submitted. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at **www.srcity.org/bids**, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

The successful bidder will be required to hold a current City of Santa Rosa business tax certificate issued pursuant to Chapter 6.04 of the Santa Rosa City Code before commencing work on this project. For information regarding the business tax, contact Revenue and Collections at (707) 543-3170.

For any moneys earned by Contractor and withheld by the City of Santa Rosa to ensure the performance of the Contract, Contractor may, at its request and expense, substitute securities equivalent to the amount withheld in the form and manner and subject to the conditions provided in Section 22300 of the California Public Contract Code.

The City of Santa Rosa reserves the right to reject any or all bids and the right to waive minor irregularities or informalities in any bid or bonds. **The lowest bid shall be the lowest total of the bid prices on the Base Contract plus Alternate 1.**

6/29/18

STEPHEN DITTMER
Supervising Engineer

Date

SPECIAL PROVISIONS

General Specifications

CITY OF SANTA ROSA, CALIFORNIA

CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

1 GENERAL

The work described herein shall be done in accordance with the "Contract Documents," which are the:

1. Special Provisions
2. Project Plans, consisting of 15 sheets entitled City of Santa Rosa Parking Garage #9 - 2017 Repairs, 2016-0024
3. City of Santa Rosa Design and Construction Standards (City Standards)
4. City of Santa Rosa Construction Specifications for Public improvements (City Specifications)
5. State of California Department of Transportation Standard Specifications 2010 (Standard Specifications), and
6. State of California Department of Transportation Standard Plans 2010 (Standard Plans).

In the event of a conflict in any of these documents, the order of precedence shall be determined by Section 5-1.02 of these Special Provisions.

Whenever the Standard Specifications use the terms State of California, Department of Transportation, Director, Engineer, or Laboratory, the following terms shall be substituted therefor, and any reference to any of the foregoing terms shall be understood and interpreted to mean and refer to such substituted terms as follows:

For State of California - the City of Santa Rosa;

For Department - the City of Santa Rosa Department of Transportation and Public Works or the City of Santa Rosa Water Department;

For Director - the City Engineer of the City of Santa Rosa;

For Engineer - the City Engineer of the City of Santa Rosa or the City Engineer's authorized agents;

For Laboratory – Materials Engineering of the City of Santa Rosa Water Department, or such other laboratory as may be authorized by the City.

Whenever in the Project Plans the terms, Architect or Owner are used, the following terms shall be substituted therefor, and any reference to any of the above terms shall be understood and interpreted to mean and refer to such substituted terms as follows:

Owner or Owner's Representative, substitute – City Engineer of the City of Santa Rosa;

For Architect or Engineer/Architect, substitute – City Engineer of the City of Santa Rosa.

Unless otherwise provided, whenever in these Special Provisions attention is directed to specific provisions in the Standard Specifications, such direction shall not be interpreted as excluding other applicable provisions of the Standard Specifications.

Unless otherwise provided, when sections and subsections of the Standard Specifications are used in these Special Provisions, such use is not exclusive and shall not be interpreted as excluding other applicable provisions of said sections and subsections, but is only intended to add to or modify such sections or subsections.

Unless otherwise provided, full compensation for compliance with these Special Provisions is included in the contract price and no additional allowance will be made to Contractor therefor.
The Standard Specifications are hereby modified to delete any reference or incorporation of provisions providing for or requiring arbitration of any and all claims and disputes arising under this contract.

Alternate #1 scope of work is located in City of Santa Rosa Parking Garage #1 at 521 7th Street, Santa Rosa, California 95401.

Work Items per Work Item Schedules on Sheet R-001 correlate to the bid item numbers in the special provisions as follows:

BID ITEM TO WORK ITEM EQUIVALENCY TABLE

Bid Item		Work Item
1	=	1.1
2	=	1.6
3	=	1.7
4	=	2.1
5	=	2.2
6	=	3.2
7	=	3.3
8	=	3.5
9	=	3.6
10	=	11.1
11	=	11.2
12	=	11.4
13	=	11.5
14	=	11.7
15	=	11.9
16	=	14.1
17	=	16.3
18	=	16.4
19	=	25.3
20	=	25.4
21	=	25.7
22	=	43.1
23	=	43.2
24	=	45.1
25	=	50.1
26	=	51.1
27	=	52.1
28	=	52.2
29 (Alternate 1)	=	21.1
30 (Alternate 1)	=	21.3
31 (Alternate 1)	=	21.4
32 (Alternate 1)	=	21.9

2 BIDDING

2-1.06 Bid Documents: Prospective bidders will be furnished with an Invitation for Bids which will state the location and description of the contemplated public works project and will show the approximate estimate of the various quantities and kinds of work to be performed and materials to be furnished with a schedule of items for which unit prices are requested.

2-1.07 Approximate Estimate: The quantities given in the Contract Documents are approximate only, being given as a basis for the comparison of bids, and the City does not, expressly or by implication, agree that the actual amount of work will correspond therewith, but reserves the right to increase or decrease the amount of any class or part of the work or to omit parts of the work, as may be deemed necessary or advisable by the Engineer.

2-1.31 Examination of Project Plans, Specifications, City Standards, Invitation for Bids and Work Site: Prior to submitting a bid, the bidder shall carefully examine the Project Plans, Invitation for Bids, City Standards and the proposed work site. If any person contemplating submitting a bid for this public works project is in doubt as to the meaning of any part of the Contract Documents, or finds discrepancies in or omissions from the Contract Documents, he or she may submit a written request for interpretation or correction to the Engineer. The written request must be received by the Engineer a minimum of **96** hours prior to bid opening. Any interpretation or correction of the Contract Documents prior to bid opening will be made only by written addendum issued by the City. A copy of such addendum will be mailed or faxed to each Planholder. The City will not be bound by any other explanations or interpretations of the Contract Documents.

2-1.33 Bid Document Completion: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

2-1.33A Bid Forms: All bids shall be made on bid forms obtained from PlanetBids at **www.srcity.org/bids**. The bidder shall submit its bid on the original bid forms furnished by the City. Bids submitted on forms other than the forms furnished to the bidder by the City will not be considered.

The bid forms to be submitted at the time of and with the bid are:

1. Unit Price Schedule
2. List of Subcontractors
3. List of Previous Similar Jobs
4. Noncollusion Declaration
5. Bid Guaranty Information and Bidder's Information and Signature
6. Bid Guaranty (Bid Bond or alternate security)

All bids shall give the proposed prices and must bear the original signature of the bidder. Bidders shall fill in all blanks on the bid forms where required. A bid will not be accepted unless the bidder registers as a vendor through PlanetBids at **www.srcity.org/bids**, downloads documents/attachments, and is added to the prospective bidders list for this project. If there is an addendum, bidders must log into PlanetBids and acknowledge the addendum to be eligible for bidding.

2-1.33B Registration with DIR: No contractor or subcontractor may be listed on a bid for this public works project unless registered with the Department of Industrial Relations (DIR) pursuant to Labor Code section 1725.5. No contractor or subcontractor may be awarded a contract for this public works project unless registered with the DIR pursuant to Labor Code section 1725.5. This public works project is subject to compliance monitoring and enforcement by the DIR.

2-1.33C Subcontractors: The Subletting and Subcontracting Fair Practices Act, Public Contract Code sections 4100-4113, inclusive (the "Act") shall apply to all subcontracts in excess of one-half of one percent of the total amount of a bid. The Act requires subcontractors, if used for such work, to be listed in the contractor's bid and prohibits the substitution of subcontractors, except as authorized by the Act. Each bidder shall, with respect to the work of any subcontractor in excess of one-half of one percent of the total amount of the bid, include as part of the bid on the bid form provided:

1. The name, business address and DIR registration number of each subcontractor who will perform work or labor or render services to the Contractor in or about the construction of the work or improvement, or a subcontractor licensed by 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 Project Plans or other Contract Documents in an amount in excess of one-half of one percent of the Contractor's total bid; and

2. The portion of the work that will be done by each subcontractor. Only one subcontractor shall be listed for each portion.

The purchase of sand, gravel, crushed rock, batched concrete, aggregate, ready-mixed concrete, and/or any other materials produced and furnished by established and recognized commercial plants, together with the delivery of such materials to the work site by the source of the materials or by recognized commercial hauling companies, is not considered as subcontracting under this section.

2-1.33E Rejection of Bids Containing Alterations, Erasures or Irregularities: Bids may be rejected if they show any alterations of forms, additions not called for, conditional bids, incomplete bids, erasures or irregularities of any kind.

2-1.34 Bid Guaranty: All bids shall be presented under sealed cover and shall be accompanied by cash, cashier's or certified check, or by a bidder's bond made payable to the City of Santa Rosa and executed as surety by a corporate surety authorized and admitted to transact a surety business in the State of California in an amount equal to ten percent of the amount of the bid. No bid shall be considered unless such cash, cashiers or certified check, or bidder's bond is enclosed with the bid. Any bidder's bond shall contain provisions for forfeiture consistent with California Public Contract Code section 20172.

2-1.40 Withdrawal of Bid: A bid may be withdrawn prior to, but not after, the hour fixed in the public notice for the opening of bids, provided that a written request to withdraw the bid, executed by the bidder or the bidder's authorized representative, is filed with the Engineer before this deadline. The withdrawal of a bid shall not prejudice the right of a bidder to submit a new bid.

2-1.43 Public Opening of Bids: Bids will be opened and read publicly at the time and place indicated in the Notice to Bidders. Bidders or their authorized agents are invited to be present.

2-1.46 Disqualification of Bidders: Serial bids from the same bidder will not be accepted. This section shall not be interpreted to mean that the same contractor may not be the contractor in one bid and listed as a subcontractor in another bid, provided that no collusion exists.

2-1.48 Competency of Bidders: No bid will be accepted from or contract awarded to a contractor that is not licensed in accordance with the law, that does not hold a license qualifying it to perform work under this contract, to whom a bid form has not been issued by the Engineer, or that has not successfully completed projects of similar character, scope and cost to the proposed project. Bidders will be required to provide a list of previous similar jobs with their bids.

3 CONTRACT AWARD AND EXECUTION

3-1.04 Contract Award: The City reserves the right to reject any or all bids. Bids are required for the entire work described herein. All bids will be compared with the Engineer's estimate of the quantities of work to be completed. Contract award, if any, will be made to the lowest responsible bidder within sixty days from the date bids are opened.

3-1.05 Contract Bonds:

Within ten days after receipt of the Notice of Award, the successful bidder shall provide the following bonds to the City:

a. Performance Bond: A performance bond to guarantee the faithful performance of the terms and conditions of the Contract by Contractor, which shall be executed in a sum of not less than one-half of the Contract price;

b. Labor and Materials Bond: A labor and materials bond (payment bond) in accordance with Part 6 of Division 4, sections 8000 *et seq.* of the California Civil Code, to guarantee against any and all claims of subcontractors or other third parties furnishing labor, materials, or supplies for the Contract, which shall be executed in a sum of 100% of the Contract price; and

c. Material Guaranty Bond: A material guaranty bond (warranty bond) to serve as surety for the guarantee requirements outlined in Section 6-3.01B, which shall be executed in a sum of not less than one-half of the Contract price.

The bond(s) shall be provided in a form acceptable to the City and issued by a corporate surety in good financial standing and authorized and admitted to transact a surety business in the state of California for the purposes and in the amount(s) stated above.

Whenever the financial or legal status of any surety on any such bond(s) is/are unacceptable to the City, it may make a demand to Contractor for further bond(s) or additional surety, not exceeding the sums originally required. Thereafter, no payment shall be made upon the Contract to Contractor or any assignees of Contractor until such bond(s) or additional surety has/have been provided to the City.

3-1.07 Indemnification and Insurance: Indemnification: Contractor shall defend, hold harmless and indemnify City, its officers, agents and employees, and each and every one of them, from and against any and all actions, damages, costs, liabilities, claims, demands, losses, judgments, penalties, costs and expenses of every type and description, including, but not limited to, any fees and/or costs reasonably incurred by City's staff attorneys or outside attorneys and any fees and expenses incurred in enforcing this provision (hereafter collectively referred to as "Liabilities"), including but not limited to Liabilities arising from personal injury or death; damage to personal, real or intellectual property or the environment; contractual or other economic damages, or regulatory penalties, arising out of or in any way connected with the performance of or the failure to perform the Contract by Contractor, any subcontractor or agent, anyone directly or indirectly employed by any of them or anyone for whose acts any of them may be liable, whether or not such Liabilities are caused in part by a party indemnified hereunder, or such Liabilities are litigated, settled or reduced to judgment; provided, that the foregoing indemnity does not apply to liability for any damage or expense for death or bodily injury to persons or damage to property to the extent arising from (i) the sole negligence, or willful misconduct of, or defects in design furnished by City, its agents, servants, or independent contractors who are directly responsible to City (excluding Contractor), or (ii) the active negligence of City.

The existence of any of the insurance policies or coverages described in this Contract shall not affect or limit any of City's rights hereunder, nor shall the limits of such insurance limit Contractor's liability to the City hereunder. The provisions of this section shall survive any expiration or termination of the Contract.

Insurance: Contractor shall maintain in full force and effect all of the insurance coverage described in and in accordance with the insurance requirements set forth below. Maintenance of such insurance coverage during the entire performance of the Contract is a material element of the Contract. Failure by Contractor to (i) maintain or renew coverage, (ii) provide notice of any changes, modifications, or reductions in coverage, or (iii) provide evidence of renewal, if necessary, may be deemed a material breach of the Contract by Contractor, whereas the City shall be entitled to all rights and remedies at law or in equity. Notwithstanding the foregoing, any failure by Contractor to maintain required insurance coverage shall not excuse or alleviate Contractor from any of its other duties or obligations under the Contract. In the event Contractor retains or utilizes any subcontractors or sub-consultants in performance of the work, Contractor shall assure that any such subcontractor has first obtained, and shall maintain, all of the insurance coverage requirements herein set forth below.

Insurance Requirements:

A. Insurance Policies: Contractor shall maintain and keep in full force and effect, the following policies of insurance with minimum coverage as indicated below and issued by insurers with an AM Best rating of no less than A-:VI or a rating otherwise acceptable to the City.

	Insurance	Minimum Coverage Limits	Additional Coverage Requirements
1.	Commercial general liability	$5 million per occurrence $5 million aggregate	Coverage must be at least as broad as ISO CG 00 01 and must include products liability and completed operations coverage which shall continue for a period of three years after acceptance of the work by the City. If insurance applies separately to a project/location, aggregate may be equal to per occurrence amount. Coverage may be met by a combination of primary and umbrella or excess insurance but umbrella and excess shall provide coverage at least as broad as specified for underlying coverage. Completed Operations Coverage can be provided in the form of an endorsement to Contractor's insurance (at least as broad as ISO Form CG 20 37 04 13. See endorsements below for other Additional Insured Requirements. Coverage shall not exclude subsidence.
2.	Business auto coverage	$3 million	Coverage at least as broad as ISO Form Number CA 00 01 covering any auto (Code 1). Insurance shall cover owned, non-owned and hired autos.

3.	Workers' compensation and Employer's Liability	$1 million	As required by the State of California, with Statutory Limits and Employer's Liability Insurance with limit of no less than $1 million per accident for bodily injury or disease. The Workers' Compensation policy shall be endorsed with a waiver of subrogation in favor of the City for all work performed by Contractor, its employees, agents and subcontractors.
4.	Contractor's pollution legal liability and/or asbestos legal liability and/or errors and omission (if the City determines, in its sole discretion, that the project involves environmental hazards)	$1 million per occurrence or claim $2 million aggregate	If the work involves lead-based paint or asbestos identification/remediation, the pollution liability policy must not contain lead-based paint or asbestos exclusions. If the work involves mold identification, the pollution liability policy must not contain a mold exclusion and a definition of "Pollution" in said policy shall include microbial matter including mold.
5.	Course of construction/ builders' risk	Amount of completed value of project without co-insurance provisions	Required for construction projects over $3 million. The City shall be named as loss payee.

B. Endorsements:

1. All policies shall provide or be endorsed to provide that coverage shall not be canceled by either party, except after prior written notice has been provided to the City in accordance with the policy provisions.
2. Liability policies shall provide or be endorsed to provide the following:
   a. For any claims related to this Contract, Contractor's insurance coverage shall be primary and any insurance or self-insurance maintained by City shall be in excess of Contractor's insurance and shall not contribute with it. Endorsements at least as broad as 20 01 04 13 or evidence of policy language will be required in non ISO CGL policies.
   b. **The City of Santa Rosa, its officers, agents and employees are to be covered as additional insureds on the CGL policy**. Additional Insured Endorsements at least as broad as 20 10 04 13 or 20 38 04 13 are required.

C. Verification of Coverage and Certificates of Insurance: Contractor shall furnish City with original certificates and endorsements effecting coverage required above. Certificates and endorsements shall make reference to policy numbers. All certificates and endorsements are to be received and approved by the City before work commences and must be in effect for the duration of the Contract. The City reserves the right to require complete copies of all required policies and endorsements during the duration of the Contract and for a period of three years following City's acceptance of the work.

D. Other Insurance Provisions:

1. No policy required by this Contract shall prohibit Contractor from waiving any right of recovery prior to loss. Contractor hereby waives such right with regard to the indemnitees.
2. All insurance coverage amounts provided by Contractor and available or applicable to this Contract are intended to apply to the full extent of the policies. Nothing contained in this Contract limits the application of such insurance coverage. Coverage for an additional insured shall NOT be limited to the insured's vicarious liability. Defense costs must be paid in addition to coverage amounts.
3. Self-insured retentions above $10,000 must be approved by the City. At the City's option, Contractor may be required to provide financial guarantees.
4. City reserves the right to modify these insurance requirements, including limits, based on the nature of the risk, prior experience, insurer, coverage, or other special circumstances.

3-1.18 Contract Execution: The fully executed Contract, original bonds and insurance certificates and endorsements required under the Contract shall be delivered to the City within ten calendar days of Contractor's receipt of the Notice of Award.

The Engineer will supply Contractor with up to ten sets of the Invitation for Bids and Project Plans. At least one complete set of the Invitation for Bids and Project Plans shall be kept at the construction site in good condition and made available to the Engineer at all times. Additional copies of the Invitation for Bids and Project Plans will be provided by the Engineer at Contractor's cost.

3-1.20 Failure to Execute Contract: Contractor's failure to deliver to the City the fully executed Contract within ten calendar days of Contractor's receipt of the Notice of Award shall be cause for the cancellation of the award and the forfeiture of the bid guaranty to the City. If the successful bidder refuses or fails to execute the Contract, the City may award the Contract to the second lowest responsible bidder. If the second lowest responsible bidder refuses or fails to execute the Contract, the City may award the Contract to the third lowest responsible bidder. The refusal or failure by the second or third lowest responsible bidder to deliver to the City the fully executed Contract within ten calendar days of receipt of the Notice of Award to the respective bidder shall likewise be cause for the cancellation of the award and the forfeiture of the bid guaranty of the respective bidder. In its discretion, the City may then re-advertise the project or construct it by day labor.

3-1.21 Return of Bid Guarantees: Within ten days after the opening of bids, the City will return the bid guarantees to all bidders except the three lowest responsible bidders. The bid guarantees of the three lowest responsible bidders will be retained until the Contract has been fully executed. In the event all bids are rejected, all bid guarantees will be returned to the respective bidders.

3-1.22 Subcontractors: The successful bidder shall furnish a list of all subcontractors as required under Sections 2-1.33C & D. The list shall include the name, business address, DIR registration number and the state contractor's license number of each subcontractor on the list and the names of the responsible managing employees whose names appear on the subcontractors' licenses.

4 SCOPE OF WORK

4-1.05 Changes and Extra Work: All changes to the Contract shall be made by written change order only.

All extra work shall be recorded by Contractor on a daily report signed by both the City and Contractor. The "daily reports" shall thereafter be considered the true record of extra work performed. A copy of the daily reports will be furnished to Contractor. Contractor is directed to Section 9-1.04 of this Invitation for Bids.

4-1.05C Compensation for Altered Quantities: Payment and compensation for altered quantities shall conform to the provisions of Section 9-1.06 of the Standard Specifications, except as modified herein.

4-2 Permits: The Contractor shall obtain all necessary and required permits for the project. The City will apply for a building permit with the City of Santa Rosa Resilient City Permit Office located at 100 Santa Rosa Avenue, Santa Rosa, California and pay associated permit fees. The Contractor is responsible for picking up the permit with the City of Santa Rosa Resilient City Permit Office and registering as the Contractor of Record. All other required permits shall be obtained at the Contractor's expense; no additional allowance will be made therefor.

The contractor is responsible for all notification and coordination of the inspections for permitting as required.

5 CONTROL OF WORK

5-1.02 Contractor's Copies of Contract Documents: In the event of a conflict in any of the Contract Documents, the order of precedence from highest to lowest shall be as follows:

1. Special Provisions
2. Project Plans, consisting of 15 sheets entitled City of Santa Rosa Parking Garage #9 - 2017 Repairs, 2016-0024
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans

5-1.05 Order of Work: The work as shown on the Project Plans and as specified in the Invitation for Bids shall be constructed in a sequence that is satisfactory to and approved by the Engineer.

Contractor shall prepare a work schedule per Section 8-1.02 of the Standard Specifications.

Contractor shall sequence work in coordination with City Engineer or City's representative.

Contractor shall meet with the City's Parking Supervisors on a weekly basis at Garage #9 (97 D Street, Santa Rosa). The purpose of the meetings is to provide updates of planned construction activities including the type of work to be accomplished and the areas to be closed due to the repair work.

Contractor shall coordinate with City Engineer or City's representative at least one week in advance prior to restricting access to parking spaces in garages and shall schedule work to maximize public convenience.

Contractor may proceed with concurrent work in multiple garages following consultation and approval from City Engineer or City's representative.

Contractor shall take appropriate measures to partition off portions of the garage to protect parkers and their vehicles from overspray or other possible property damage.

With the exception of trenching, all existing street, street light base, curb and gutter, storm drain, water line, and sewer line work shall be completed before any existing street paving is removed.

Full compensation for the conformance to the requirements of this section is included in the Contract price and no additional allowance will be made to Contractor for this work.

5-1.17 Character of Workers: Contractor is directed to Section 5-1.17 of the Standard Specifications which states:

> "If any subcontractor or person employed by the Contractor shall appear to the Engineer to be incompetent or to act in a disorderly or improper manner, he shall be discharged immediately on the request of the Engineer, and such person shall not again be employed on the work."

No additional compensation shall be granted to Contractor in the event City exercises any part of its rights under this section and any and all costs related to such exercise shall be borne by Contractor.

5-1.20 Cooperation with Other Entities: Attention is directed to Section 5-1.20 of the Standard Specifications.

Other construction including but not limited to utility, power, and pipe line relocation, may be in progress by other forces within and adjacent to the project area at the same time work is being performed under this Contract by Contractor.

Contractor shall cooperate with the forces performing other work, to the end that such forces may conduct their operations with as little inconvenience and delay as possible. Contractor shall grant such forces access to the project area as is reasonable and necessary to transport materials and equipment to the site of operations by the other forces.

5-1.20B(4)(a) Offsite Staging Areas and Construction Yards: Attention is directed to Santa Rosa City Code section 20-52.040, Temporary Use Permit.

A Temporary Use Permit shall be obtained for any offsite construction yard on private property to be used for any of the following:

a. Stockpiling of equipment and/or materials;
b. Staging of construction;
c. Placement of work trailers or mobile offices;
d. Storage of trench spoils; or
e. Other construction related activities not specifically enumerated above.

5-1.26 Lines and Grades: Contractor shall carefully preserve all bench marks, grade stakes, and all other survey markers. In the case of willful or careless destruction, Contractor shall bear the cost of replacing the markers.

Contractor shall contact the Engineer directly for coordination of survey staking. Written staking requests must be submitted at least two working days in advance of the date and time stakes are needed.

5-1.27B Examination and Audit: Pursuant to California Government Code section 8546.7, any contract with the City involving expenditures in excess of $10,000 shall be subject to the examination and audit of the California State Auditor for a period of three years after final payment is made to Contractor by City under this Contract. Any such examination and audit will be confined to those matters connected with the performance of this Contract.

5-1.30A Inspection: Contractor shall bear all costs associated with the re-inspection of any defective, rejected or unauthorized work as determined by the Engineer in Engineer's sole discretion. Such costs of re-inspection, including any costs incurred by the City for additional staff time or fees for third-party consultant inspectors, will be deducted from one or more progress payments hereunder.

5-1.36A Property and Facility Preservation: Attention is directed to Section 5-1.36 of the Standard Specifications.

At Contractor's sole expense, all fences, gates, landscaping, drainage ditches, sidewalks, irrigation systems, and any other improvements that are damaged, removed or destroyed because of Contractor's operations, shall be replaced in accordance with City Standards at a minimum and restored to the same or better condition. Concrete surface treatment and score marks shall match adjacent existing concrete improvements.

5-1.36E Obstructions: Attention is directed to Section 5-1.36 of the Standard Specifications and to the possible existence of underground gas mains, high voltage lines, telephone ducts, storm drains

and water and sewers systems, the locations of which are not shown on the Project Plans. The determination of the location of these facilities and the cost of repair or replacement in the event of damage to such facilities are the sole responsibility of Contractor.

Should Contractor alter any public utility or private improvements to facilitate its operations or for its sole benefit, which alteration would not be otherwise required, Contractor shall make whatever arrangements are necessary with the owner or controlling authorities, and shall bear all expenses in connection therewith. Any damages to any public utility or private improvement caused by Contractor shall be repaired by Contractor at its sole expense and to the full satisfaction of the Engineer or the controlling authority.

Any subsurface information and data furnished under any part of this Contract are not intended as a representation or warranty but are furnished for information only. It is expressly understood that the City will not be responsible for the accuracy thereof or for any deduction, interpretation or conclusion drawn therefrom by Contractor. The information is made available so that Contractor may have ready access to the same information available to the City and is not part of this Contract.

PRIOR TO STARTING ANY EXCAVATION, CONTRACTOR SHALL (AT LEAST TWO WORKING DAYS IN ADVANCE) CALL UNDERGROUND SERVICE ALERT (USA) toll free at (800) 227-2600 and provide USA with all necessary data relative to the proposed excavation. USA will accept calls and process information to participating agencies who have underground facilities in the area between the hours of 7:30 a.m. and 5:00 p.m. daily, except Saturdays, Sundays, and holidays. Between the hours of 5:00 p.m. and 7:30 a.m., calls will be recorded and then processed after 7:30 a.m. For emergency situations, after hours, and on Saturdays, Sundays and holidays, Contractor shall contact the owner of the affected facility.

Contractor shall coordinate all work with the appropriate City field personnel. When City work forces are required at the job site to perform Contract items of work, Contractor shall give a minimum of two working days advanced notification to the appropriate field office:

Water Division:	(707) 543-4200
Sewer Division:	(707) 543-4200
Street Division:	(707) 543-3880
Survey Division:	(707) 543-3834

5-1.43 Potential Claims and Dispute Resolution: "Claim" means a separate demand by Contractor sent by registered mail or certified mail with return receipt requested, for one or more of the following: (A) A time extension, including, without limitation, for relief from damages or penalties for delay assessed by the City under the Contract; (B) Payment by the City of money or damages arising from work done by, or on behalf of, Contractor pursuant to the Contract and payment for which is not otherwise expressly provided or to which the claimant is not otherwise entitled; or (C) Payment of an amount that is disputed by the City.

Upon receipt of a Claim, the City shall conduct a reasonable review of the Claim and, within a period not to exceed 45 days, shall provide Contractor a written statement identifying what portion of the Claim is disputed and what portion is undisputed, provided, the parties may extend the 45 day time period by mutual agreement.

If the City needs approval from the City Council to provide the claimant a written statement identifying the disputed portion and the undisputed portion of the Claim, and the Council does not meet within the 45 days or within the mutually agreed to extension of time following receipt of a Claim, the City shall have up to three days following the next duly publicly noticed meeting of the City Council after the 45-day period, or extension expires to provide Contractor a written statement identifying the disputed portion and the undisputed portion.

Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. If the City fails to issue a written statement, the Claim shall be deemed rejected in its entirety.

If a Contractor disputes the City's written response, or if the City fails to respond to a Claim within the time prescribed, the Contractor may demand in writing an informal conference to meet and confer for settlement of the issues in dispute. Upon receipt of a demand in writing sent by registered mail or certified mail, return receipt requested, the City shall conduct a meet and confer conference within 30 days for settlement of the dispute. Within 10 business days following the conclusion of the meet and confer conference, if the Claim or any portion of the Claim remains in dispute, the City shall provide the Contractor a written statement identifying the portion of the Claim that remains in dispute and the portion that is undisputed. Any payment due on an undisputed portion of the Claim shall be processed and made within 60 days after the City issues its written statement. Any disputed portion of the Claim, as identified by Contractor in writing, shall be submitted to nonbinding mediation, with the City and the Contractor sharing the associated costs equally. The City and Contractor shall mutually agree to a mediator within 10 business days after the disputed portion of the Claim has been identified in writing. If the parties cannot agree upon a mediator, each party shall select a mediator and those mediators shall select a qualified neutral third party to mediate with regard to the disputed portion of the Claim. Each party shall bear the fees and costs charged by its respective mediator in connection with the selection of the neutral mediator.

6 CONTROL OF MATERIALS

6-2.01 Source of Supply and Quality of Materials: All materials required to complete the work under the Contract shall be furnished by Contractor and shall be free of hazardous substances.

6-3.01 General: Statistical means will not be used by the City for determination of Standard Specification compliance. Whenever both operating range test results and Contract compliance requirements are specified in these special provisions, the operating range requirements shall apply to the individual test results.

6-3.01A Material Submittals: Upon award of the Contract by City, Contractor shall submit to the Engineer a list of all materials proposed to be used on this project and any supporting documentation and/or samples required and source of supply.

For material listed on the "Engineer's List of Approved Items" which is located in the Sewer and Water sections only of the City Standards, the Engineer shall be provided with the name of the manufacturer and model/part number for all material proposed for this project, unless that item has been replaced as shown on the Project Plans or in the Invitation for Bids.

For all other materials used on this project, regardless of the type of work, Contractor shall provide to the Engineer the name of the manufacturer and model/part number along with supporting documentation and/or samples that will allow the Engineer to determine the material's acceptability.

The Engineer reserves the right to reject any proposed material, whether on the City's "Engineer's List of Approved Items" or not. If the City obtains information indicating that a listed item is not performing satisfactorily or is found to be defective, that item will be rejected and Contractor shall submit a replacement for review at no additional cost to the City.

6-3.01B Material Guarantee: Before any contract is awarded, the bidder may be required to furnish samples of materials and detailed descriptions of equipment to be used in the construction of the project. The materials samples may be subjected to the tests provided for in the Standard Specifications or in this Invitation for Bids to determine their quality and fitness for the project. The successful bidder shall unconditionally guarantee project materials and workmanship for a period of one year from the date of recording of the Notice of Completion. The guarantee shall cover 100% of all costs of repairs within the one year period, including all costs of labor, materials, equipment, and incidentals. Except as may be otherwise provided in Section 3-1.05, the successful bidder shall provide a surety bond executed by a corporate surety authorized and admitted to transact a surety business in the state of California in the minimum amount of one-half of the Contract price to cover this guarantee.

6-3.05 Quality Assurance: California Test 216 (Relative Compaction) testing will be modified as follows: A mechanical compactor (Ploog Engineering Co. Model M 100 or equivalent) with 10-pound hammer and split compaction molds shall be used in lieu of the specified manual compaction equipment.

California Test 231 (Nuclear Gage Determination of In-Place Density) will be modified as follows: In-place density and relative compaction may be determined on the basis of individual test sites in lieu of the area concept, at the discretion of the Engineer.

6-4 Water Utility

6-4.01A Construction Water: All water required for the performance of the work shall be provided by Contractor. Prior to obtaining water from the City's water system, Contractor shall obtain a Water

Use Permit from the City of Santa Rosa Water Department and rent a hydrant or bridge meter. Contractor is responsible for the cost of all water and the cost of all deposits, permits and fees.

Contractor is prohibited from operating gate valves or fire hydrants on the City system.

The acquisition of water from the City's water system through un-metered hydrants or other facilities is a violation of City ordinance and State law. The use of water from sources other than the City's water system must be approved by the Engineer in advance of the use.

Citations and fines will be levied for violation of these and other utility regulations and deductions will be made from payments consistent with Section 7-1.02A(1) of the Standard Specifications.

6-4.01B Water Utility Notification: Contractors or parties requiring work of any kind by the City of Santa Rosa Water Department forces shall request such services a minimum of 48 hours in advance of the time such services are desired. Work requests which will involve the City of Santa Rosa Water Department forces for more than eight hours or an extensive number of City parts shall be requested a minimum of seven calendar days in advance.

If it is necessary to terminate or disrupt utility service to any customer, Contractor shall make the request for such work by City forces an additional 72 hours (three additional working days for a total of five working days advance notice) in advance of the time such services are desired to allow affected customers a minimum of 72 hours' notice. Contractors who fail to keep field appointments will be billed for scheduled City of Santa Rosa Water Department crew standby time which was used and the Contractor shall bear the costs incurred by the City of Santa Rosa's Water Department for re-notification of customers.

City of Santa Rosa Water Department crews work a 9/80 schedule. This schedule may prohibit shutdowns for tie-ins on alternating Fridays. After hours work or weekend work may be performed if prior authorization from the Engineer is obtained.

Other than the hours specified in this Invitation for Bids, requests by Contractor for after hours or weekend work is to be avoided whenever possible. Any overtime costs incurred by City for such work shall be borne by Contractor.

Interruption of utilities service to commercial customers shall be coordinated with the customer to minimize disruption to the enterprise to the greatest extent practicable. After notification by the Contractor of the need, the City of Santa Rosa Water Department will contact all commercial customers and inform Contractor accordingly.

6-4.01C Water Facility Damage: All damage caused to the City's water system shall be immediately reported to the Engineer.

Damage caused to the City's water system by Contractor's operations shall be repaired by the Contractor at Contractor's sole expense in a manner satisfactory to the City of Santa Rosa Water Department. Such repairs shall not be charged to the City or any City project. All repair work shall be witnessed and approved by the City of Santa Rosa Water Department prior to backfilling the excavation. The City will require re-excavation if backfilling occurs prior to inspection, which costs shall be borne by Contractor.

Contractor is responsible for, at its sole cost and expense, the repair and remediation of damage to property and facilities caused by any of the following circumstances:

a. Contractor fails to make a written request for a markout or begins excavation without providing the City of Santa Rosa Water Department a reasonable opportunity to mark facilities;

b. Contractor destroys markouts;
c. Contractor fails to perform hand digging or probing for utilities near markouts; or
d. Contractor fails to use reasonable caution, regardless of whether markouts are present or clear. Reasonable caution includes any efforts to avoid damaging existing facilities, such as when excavating in the vicinity of water mains.

City may, in its discretion, opt to make the repairs for which Contractor is responsible with its own forces. In such cases, the repairs will be made at Contractor's expense in accordance with the emergency repair rate schedule of the City of Santa Rosa Water Department. The City may make repairs whenever restoration of service requires extraordinary speed or special equipment. Contractor will be billed accordingly and City shall have the right and option to withhold payment hereunder, or a portion thereof, for any such costs billed but not promptly paid by Contractor.

6-4.02 Salvage: All valves, hydrants, and other appurtenances of the water system that are the property of City and removed by Contractor shall be delivered to the City's Municipal Services Center (55 Stony Point Road) unless Contractor has obtained specific written approval from the City of Santa Rosa Water Department to otherwise dispose of the materials.

6-4.03 Trade Names and Alternatives: Unless otherwise specified, material and equipment specifications that identify a particular patent, trade name or manufacturer, may be satisfied through substitute materials and equipment accepted by the City. Contractor may offer substitute materials and equipment of equal or better quality to the City. Any such offer shall be made in writing to the Engineer at least four weeks in advance of the time Contractor wishes to order the materials or equipment. Contractor shall include sufficient data which, together with any other information the Engineer may require, will enable the Engineer to determine the acceptability of the materials and equipment. When the substitute materials or equipment necessitate changes to any part of the work, the information shall include drawings and details showing all such changes and Contractor shall perform these changes as a part of any acceptance of substitute materials or equipment. The use of substituted materials and equipment will be permitted only after written acceptance of the materials and equipment by the Engineer. Such acceptance shall not relieve the Contractor from full responsibility for the sufficiency, quality and performance of the substitute materials and equipment.

The City will not, under any circumstances, acknowledge or consider any offers to accept substitute materials or equipment between the dates of public notice of advertisement and the bid opening.

7 LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

7-1.02A(1) Forfeitures for Health and Safety Violations: Contractor shall comply with all applicable provisions of the Santa Rosa City Code and any failure to do so shall constitute a breach of the Contract. In the event of any violation of the Santa Rosa City Code that may impact public health and safety, including, but not limited to Chapter 17-12, "Storm Water" and Chapter 13-04, "Street Encroachments," City shall have the right to impose a charge against Contractor in an amount equal to $500.00 per violation per day. Prior to the imposition of any charge hereunder, City shall first provide a written notice to Contractor of the violation and setting forth a reasonable period of time for Contractor to cure the violation(s). In the event Contractor fails to cure any such violation within the time provided, City shall have the right, in addition to all other rights and remedies available to City, to deduct and withhold as a permanent forfeiture by Contractor the appropriate amounts from any payment otherwise due Contractor under this Contract.

7-1.02K(2) Wages: Pursuant to Labor Code sections 1770 *et seq.*, each laborer or mechanic of Contractor or any subcontractor engaged in work on the project under this contract shall be paid not less than the hourly wage rate of per diem wages set forth in the prevailing wage rate schedule published by the Director of Industrial Relations, regardless of any contractual relationship which may be alleged to exist between Contractor or any subcontractor and such laborers and mechanics. A copy of the schedule of prevailing wage rates can be obtained online at www.dir.ca.gov or from the Department of Transportation and Public Works at 69 Stony Circle, Santa Rosa.

Any laborer or mechanic employed to perform work on the public works project under this Contract, which work is not covered by any of the foregoing classifications, shall be paid not less than the prevailing wage rate of per diem wages specified herein for the classification which most nearly corresponds to the work to be performed by the worker.

The foregoing specified prevailing wage rates are minimum rates only, and Contractor may pay any wage rate in excess of the applicable rate.

Pursuant to Labor Code Section 1775, Contractor as a penalty to the owner shall forfeit not more than $200.00 for each calendar day, or a portion thereof, for each worker paid less than the prevailing wage rate established by the Department of Industrial Relations for such work or craft in which such worker is employed. The difference between such prevailing wage rates and the amount paid to each worker for each calendar day or portion thereof for which the worker was paid less than the prevailing wage rate shall be paid to each worker by Contractor.

Contractor shall only provide prevailing wage reports upon written request from City.

7-1.02K(4) Apprentices: Contractor agrees to comply with Chapter 1, Part 7, Division 2, sections 1777.5 *et seq.* of the California Labor Code. These sections require contractors and subcontractors to employ apprentices in apprenticeable occupations in a ratio of not less than one hour of apprentice work for each five hours of journeyman work (unless an exception is granted in accordance with Section 1777.5), and the contractors and subcontractors shall not discriminate among otherwise qualified employees as apprentices solely on the ground of sex, race, religion, creed, national origin, ancestry, or color. Only apprentices as defined in Labor Code section 3077, who are in training under apprenticeship standards and who have written apprentice agreements will be employed on public works in apprenticeable occupations. The responsibility for compliance with these provisions is fixed with the prime contractor for all apprenticeable occupations.

7-1.02K(6)(a)(1) Notice to Vendors: Attention is directed to the current OSHA Standards. All equipment, tools and materials which are furnished and/or installed as part of this Contract shall meet or exceed the aforementioned standards in order to be considered acceptable.

7-1.02K(6)(b) Excavation Safety: When the digging or excavation occurs during project construction, Contractor shall:

a. Promptly notify City in writing of the following conditions before any such conditions are disturbed:

   1. Material that the Contractor believes may be hazardous waste as defined in Health and Safety Code section 25117 that is required to be removed to a Class I, Class II or Class III disposal site in accordance with provisions of existing law;
   2. Subsurface or latent physical conditions at the site differing from those indicated in the Invitation for Bids; and
   3. Physical conditions at the site of any unusual nature, materially different from those ordinarily encountered and generally recognized as inherent in the type of work under the Contract.

b. The City will investigate the conditions and will issue a change order under the terms of the Contract if it finds that the conditions warrant it.

c. If a dispute arises between City and Contractor as to whether a change order is warranted, Contractor shall not be excused from any scheduled completion date provided for in the Contract, but shall proceed with all work to be performed under the Contract.

7-1.02K(6)(b)(1) Trench Excavation Safety Plans: When the estimated cost for the excavation of any trench or trenches five feet or more in depth will exceed $25,000.00, Contractor shall submit to the Engineer in advance of excavation a detailed plan showing the design of shoring, bracing, sloping or other provisions to be made for worker protection from the hazard of caving ground during the excavation of such trench or trenches. If such plan varies from the shoring system standards established by the construction safety orders, or if the trench is anticipated to be greater than 20 feet, the plan shall be prepared by a registered civil or structural engineer.

A permit to do the above described work shall be obtained from the State of California, Division of Industrial Safety. Proof of such permit shall be submitted to the Engineer prior to starting the trench work.

Full compensation for complying with the provisions of this section shall be considered as included in the Contract price and no additional allowance will be made for the work.

7-1.02K(6)(d) Confined Space Safety: Any confined space entry for this project, including but not limited to manhole or water storage tank entry, will require a confined space entry permit pursuant to Cal/OSHA regulations as set forth in title 8 California Code of Regulations (CCR) sections 5157 or 5158. Confined space entry shall have the meaning ascribed in title 8 CCR sections 5157 and 5158. For any confined space entry for construction operations regulated by title 8 CCR section 1502, Contractor shall comply with title 8 CCR section 5158, "Other Confined Space Operations." For any other confined space operations, Contractor shall comply with title 8 CCR section 5157, "Permit-Required Confined Spaces."

Attention is directed to the technical specifications in the Special Provisions for information regarding entry to any City maintained confined space. Pursuant to title 8 CCR section 5157, Contractor is required to obtain any available information regarding hazards and operations for any City maintained confined spaces. The City maintained Confined Space Entry Manual is available

for viewing at the City of Santa Rosa Water Department or Transportation and Public Works Department office at 69 Stony Circle, Santa Rosa.

Contractor shall immediately inform the Engineer of any previously unidentified hazards confronted or created during confined space entry.

7-1.02L(2)(a) Patents and Royalties: All fees, royalties, or claims for any patented invention, article, process or method that may be used upon or in any manner connected with the work under this Contract shall be paid by Contractor. Contractor and its sureties shall protect and hold harmless City and its officers, agents, and employees from any and all demands made for such fees royalties or claims brought or made by any third party, and before the final payment is made on the account of the Contract, Contractor shall, if requested by City, furnish acceptable proof of a proper release from all such claims and liabilities.

Should Contractor, its officers, agents, or employees, or any one of them be enjoined from furnishing or using any invention, article, material, or plans supplied or required to be supplied or used under the Contract, Contractor shall promptly substitute other articles, materials, or appliances in lieu thereof of equal efficiency, quality, finish, suitability, and market value, and satisfactory in all respects to the Engineer. In the event that the Engineer elects, in lieu of such substitution, to have supplied and to retain and use any such invention, article, materials, or plans as may be required to be supplied by the Contract, Contractor shall pay such royalties and secure such valid licenses as may be requisite and necessary for City, its officers, agents, and employees, or any one of them to use such invention, article, materials, or appliance without being disturbed or in any way interfered with by any proceeding in law of equity on account thereof. Should Contractor neglect or refuse to make the substitution promptly or to pay such royalties and secure such licenses as may be necessary, then in that event the Engineer shall have the right to make such substitutions or City may pay such royalties and secure such licenses and charge Contractor even though final payment under the Contract may have been made.

7-1.02M(3) Mined Materials: California Public Contract Code section 20676 prohibits surface mining operators which are subject to the Surface Mining and Reclamation Act of 1975 (SMARA) from selling California mined construction material to the City unless the operator is identified in a list referred as the **3098 List**. The List, which is maintained by the Department of Conservation's Office of Mine Reclamation (OMR), changes throughout the year and can be viewed at the OMR website: http://www.consrv.ca.gov/OMR/ab_3098_list/index.htm. To confirm whether or not a specific operator is on the List at any given time, Contractor shall call the OMR at (916)323-9198.

7-1.03A Maintaining Traffic: Attention is directed to Sections 7-1.04 of the Standard Specifications and to the following modifications thereof.

If construction is within City owned right-of-way, provisions shall be made for the safe passage of public traffic through the work site at all times consistent with the requirements of Santa Rosa City Code Chapter 13-04.

Except for projects to be performed under a minor contract, Contractor shall install and maintain project identification signs at each end of the project or as directed by the Engineer two weeks prior to any construction activity. City shall furnish the appropriate sign panels upon request from Contractor. To mount the sign panels, Contractor shall furnish and install 4" X 4" posts or mount by other appropriate methods as approved by the Engineer. These sign panels shall be returned to the City Corporation Yard at 55 Stony Point Road after completion of the project.

Two weeks prior to any construction activity, advance notice signs for road closures shall be furnished and installed by Contractor at each end of the project and shall remain in place throughout the duration of the subject closure. Details of panel construction and lettering shall be approved by the Engineer.

Contractor shall furnish, install, and maintain at its expense all barricades, signs, lights, and other devices necessary to adequately warn of any obstructions to the traveled and pedestrian way and provide flaggers as necessary for the safety of public traffic and pedestrians and to provide access to property adjacent to the work site and Contractor shall comply with the Americans with Disabilities Act of 1990 (42 U.S.C. 12101, *et seq.*) (ADA) and any regulations and guidelines issued pursuant to the ADA.

Contractor shall comply with the current edition of the California Manual of Uniform Traffic Control Devices (CA MUTCD) for all items related to traffic within the work site.

Rain and other occurrences that may cause the suspension or delay of the work shall in no way relieve Contractor of its responsibility to provide traffic control and public access through the work site as specified herein. At all times, Contractor shall keep at the work site such materials, forces and equipment as may be necessary to keep roads, streets, and driveways within the work site open to traffic and in good repair and shall expedite the passage of such traffic, using such forces and equipment as may be necessary.

Should Contractor fail, in the opinion of the Engineer, to provide all the materials, forces and equipment necessary to maintain traffic through the work site as set forth herein, City may take steps necessary to remedy any such failure, including but not limited to causing such work to be performed and/or suspending any further work under the Contract. Any such remedial cost and expense incurred by the City, plus an administrative charge of 15%, shall be immediately due and payable by Contractor and may be deducted from any amounts owed to Contractor hereunder. In the event there are insufficient sums owed to Contractor hereunder to cover the foregoing costs and charges, City shall have the right to pursue any other remedy to recover the same, including but not limited to, proceeding against any surety or bond in favor of City. City's rights under Section 7-1.02 are intended to be in addition to and not in lieu of any charges imposed by City against Contractor under Section 7-1.02A(1) above for violations of the Santa Rosa City Code.

Contractor shall be responsible for informing emergency response agencies operating within the area of the work of obstructions to either public or private roads caused by reason of Contractor's operations hereunder.

Contractor shall make provisions for the safe passage of pedestrians around the project work site at all times.

8 PROSECUTION AND PROGRESS

8-1.01A Assignments: Once awarded, this Contract shall not be transferred, assigned, or sub-contracted, except as herein expressly provided without the prior written consent of the City in the City's sole and absolute discretion. See Section 5-1.12 of the Standard Specifications.

8-1.04B Standard Start: Contractor shall begin work within ten calendar days after the date authorized in the Notice to Proceed and shall diligently prosecute the Contract to completion before the expiration of:

170 WORKING DAYS

8-1.05 Time: Working days will be counted beginning with the day the Contractor begins work or with the tenth day after the date authorized in the Notice to Proceed, whichever occurs first.

Unless otherwise directed by Engineer, Contractor shall not conduct any activities that generate noise earlier than 7:00 a.m. or later than 7:00 p.m.

Contractor shall restrict work involving jack hammers and/or other equipment that generates loud noise in Garages 1 to between the hours of 8:00 a.m. and 5:00 p.m., Monday through Saturday to minimize impacts on nearby residential units.

8-1.10 Liquidated Damages: Contractor hereby agrees that Contractor shall pay to the City liquidated damages for each and every calendar day delay over and above the number of working days prescribed above for finishing the work in the amount shown in Section 8-1.10 of the Standard Specifications.

9 MEASUREMENT AND PAYMENT

9-1.04 Force Account Work: All work done on a force account basis shall be recorded daily on report sheets prepared by Contractor and signed by both the Engineer and Contractor. Such reports shall thereafter be considered the true record of force account work performed during the project. Such reports shall be furnished to the Engineer and a copy retained by Contractor.

All extensions of labor, equipment, and material costs shall be completed by Contractor and submitted to the Engineer within 30 days of the completion of the extra work. Completed and extended extra work reports received later than the times herein prescribed may be deemed invalid and rejected without payment at the discretion of the Engineer.

9-1.07 Payment Adjustments For Price Index Fluctuations: Any references to Opt Out of Payment Adjustments for Price Index Fluctuations in the Standard Specifications are deleted in their entirety.

9-1.16 Progress Payments: Once each month for progress pay purposes, the City will prepare a written estimate of the total amount of completed work and accepted materials purchased by Contractor but not installed. The City shall retain five percent of such estimated value of the completed work and the unused materials and pay Contractor the balance after deducting all previous payments and all sums to be retained under the provisions of the Contract. No such estimate or payment shall be required to be made when, in the judgment of the Engineer, the work is not proceeding in accordance with the provisions of the Contract or when, in the Engineer's judgment, the total value of the completed work since the last estimate is less than $500.00. No such estimate or payment shall be construed to be an acceptance of any defective work or improper materials.

After Contract acceptance, the Engineer will prepare a written proposed final estimate of the proposed final quantities of work completed under the Contract and the value of such work and will submit such estimate to Contractor. The City shall retain five percent of such estimated value of the work done and shall pay to Contractor the balance after deducting all amounts to be retained under the provisions of the Contract.

The City may, at its option and at any time, retain out of any amounts due Contractor sums sufficient to cover any unpaid claims of City or others, provided that sworn statements of all non-City claims shall have been filed with the Director of Finance.

9-1.16E(6) Substitution of Securities for Withheld Amounts: Pursuant to Public Contract Code section 22300, securities may be substituted for any moneys withheld by City to ensure performance under this Contract, provided that substitution of securities provisions shall not be required in contracts in which there will be financing provided by the Farmer's Home Administration of the United States Department of Agriculture pursuant to the Consolidated Farm and Rural Development Act (7 USC sections 1921 *et seq.*), and where federal regulations or policies or both do not allow the substitution of securities. At the request and expense of Contractor, securities equivalent to the amount withheld shall be deposited with the City, or with a state or federally chartered bank as the escrow agent, which shall then pay such moneys to Contractor. The Director of Finance is authorized to execute substitution of securities agreements on behalf of the City. The City will return the securities to Contractor upon satisfactory completion of the Contract as determined by City in its sole discretion and the resolution of all outstanding claims against the securities. Contractor shall be the beneficial owner of any securities substituted for moneys withheld and shall receive any interest thereon.

Securities eligible for investment under this section shall include those listed in Government Code section 16430, bank or savings and loan certificates of deposit, interest bearing demand deposit accounts, standby letters of credit or any other security mutually agreed to by Contractor and the City, provided that the substituted security is equal to or not less than five percent of the Contract amount.

Security substitutions must be submitted by Contractor and approved by City prior to the time of the first progress payment to be made under the Contract. No other method of substituting securities for retention will be accepted. The security substitution shall be done only upon execution of an agreement satisfactory to City which includes the following provisions:

a. The amount of securities to be deposited;
b. The terms and conditions of conversion to cash in case of the default of Contractor; and
c. The procedure for return of securities upon completion of the Contract.

9-1.17D Final Payment and Claims: The processing of payment of the final estimate shall not be commenced less than 35 days after the date of recording of the Notice of Completion with the County Recorder's Office. Contractor is advised that it takes approximately ten days for a check to be issued following a request for payment.

Contractor shall submit its written statement of all claims for additional compensation under the Contract to the Engineer within 15 days after submission to Contractor of the proposed final estimate.

If Contractor does not file a claim within the 15 day period, or upon Contractor's approval, the Engineer will issue a final written estimate and the City shall pay to Contractor the entire sum due after deducting all previous payments, if any, and all amounts to be retained under the provisions of the Contract.

If Contractor files a claim within the 15 day period, the Engineer will furnish a semi-final estimate and pay the amount due under the semi-final estimate within 30 days. The semi-final estimate is conclusive as to the amount payable except as may be affected by claims and any amount retained. The Engineer shall then consider and investigate such claim, and shall make such revision in the final quantities as the Engineer may find to be due, and shall then make and issue a final written estimate. The City will pay the amount due, after deducting all previous payments, if any, and amounts to be retained under the provisions of the Contract.

Any and all prior partial estimates and payments shall be subject to correction in the final estimate and payment.

The final estimate shall be conclusive and binding against both parties to the Contract on all questions relating to the performance of the Contract and the amount of work done thereunder and compensation therefor, except in the case of gross error.

9-1.17D(3) Final Determination of Claims: Claims filed by Contractor shall be in sufficient detail to enable the Engineer to determine the basis and amount of the Claims. Contractor shall also furnish reasonable documentation to the City to support Claims. If additional information is required by the Engineer, Contractor shall provide such information to the Engineer no later than the 15th day after receipt of the written request from the Engineer. If the 15th day falls on a weekend, holiday, or day City offices are closed, then the information shall be provided to the Engineer no later than close of the next business day. Failure to submit the requested information to the Engineer within the time specified will be sufficient cause for denying the Claim.

Contractor shall keep full and complete records of the costs and additional time incurred for any work for which a claim for additional compensation is made. The Engineer or any designated Claim

investigator or auditor shall have access to those records and any other records as may be reasonably required by the Engineer to determine the facts or contentions in each Claim. Failure to grant access to such records shall be sufficient cause for denying the Claims.

9-1.22 Arbitration: Any references to Arbitration in the Standard Specifications are deleted in their entirety.

Claims submitted by Contractor shall be accompanied by a notarized certificate containing the following language:

Under the penalty of law for perjury or falsification and with specific reference to the California False Claims Act, Government Code sections 12650 *et seq.*, the undersigned,

_____,
(Name)

_____ of
(Title)

_____
(Contractor)

hereby certifies that the claim for additional compensation made herein is supported by a true statement of the actual costs incurred and time expended on this project, and is fully documented by records maintained by Contractor.

Dated _____

/s/_____

Subscribed and sworn before me this _____ day of

_____

_____
Notary Public

My Commission Expires _____

Failure to submit the notarized certificate will be sufficient cause for denying the claim.

Any claim for overhead expenses, in addition to being certified as stated above, shall be supported by an audit report of an independent Certified Public Accountant. Any such overhead claim shall also be subject to audit by the City at its discretion.

Any costs or expenses incurred by the City in reviewing or auditing any claims that are not supported by Contractor's cost accounting or other records shall be deemed to be damages incurred by the City within the meaning of the California False Claims Act.

TECHNICAL SPECIFICATIONS

City of Santa Rosa
Parking Garage #9 – 2017 Repairs

CONTRACT NO.

CO1823

CITY OF SANTA ROSA, CALIFORNIA

2018

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SECTION 011110 - SUMMARY OF WORK - RESTORATION

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. Work will be performed at locations within parking structure as shown on Drawings.

B. 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%.

C. Work Item specifications and details shall govern all repair operations. Locations where Work Items apply are shown on Drawings as symbols.

D. Final payment shall be made on basis of actual approved Work performed as measured in place.

E. Project comprises the restoration of the top level of Garage 9- City of Santa Rosa.

F. Work consists of the following: Concrete slab removal, Waterproofing, Sealants, concrete slab replacement, mechanical drainage, traffic coating membrane, handrailing, traffic markings, solar panel system protection and cleaning and other miscellaneous work in the parking structure.

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.

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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 UNDER OTHER CONTRACTS

A. Separate contract has been issued to **Sprig Electric** to perform installation of solar panels at the garage site. Those operations precede and are scheduled to be substantially completed prior to construction operations under this Contract.

1.5 WORK SEQUENCE

A. Prior to commencement of work, meet with Engineer/Architect and Owner representatives to establish sequence and schedule of Work. Contractor shall give Owner notice of areas to be cleared of cars at least 5 working days in advance of actual Work.

B. Contractor shall notify Owner's representative at least 24 hr prior to beginning any abrasive blasting operations.

C. Contractor shall remove all broken concrete and debris from Work area on daily basis and dispose of same at authorized dump sites.

D. Contractor shall remove dust and air transported sand/debris from remainder of facility at conclusion of operations in Work area.

1.6 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.

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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.

1.7 BARRICADES

A. Provide positive barricading to separate Work areas from areas open to public and to prevent the need for washing cars parked adjacent to the work area. Minimum acceptable separation: 6 ft. 0 in. high solid temporary barrier constructed of wood or concrete. Provide additional barriers as required to prevent damage to vehicle due to airborne debris. See "Temporary Facilities" for additional requirements.

1.8 TRAFFIC OFFICERS AND FLAGMEN

A. When, in Owner's opinion, it is necessary that uniformed police or security officers be used to protect and control pedestrian traffic, to direct vehicular traffic during construction and to keep traffic off any part of Work, or to protect public safety, a police/security detail will be obtained. All expenses for uniformed officers shall be assumed by Owner.

1.9 CLAIMS

A. Contractor shall promptly address all damages claims. Owner reserves right to resolve any claims not addressed by Contractor within 3 weeks after claim is received by Contractor. Any amounts paid by Owner will be deducted from Contractor's next progress payment.

PART 2 - PRODUCTS (NOT APPLICABLE)

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PART 3 - EXECUTION

END OF SECTION 011110

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SECTION 020010 - WORK ITEMS

PART 1 - GENERAL

RELATED DOCUMENTS

A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Divisions **1, 2, 3, 5, 7, 9,22** Specification Sections apply to this Section.

SERIES 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 – Project Mobilization
WI 1.2 - Concrete Formwork
WI 1.3 - Concrete Shores and Reshores
WI 1.4 - Concrete Reinforcement
WI 1.5 - Temporary Signage/Barricades
WI 1.6 - Elevation Survey
WI 1.7 – Solar Panel Protection
WI 1.8 – Concrete Slab Mock up
WI1.9 - Erosion 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 amount for mobilization shall be according to contract payment section and shall be based on percentage of original contract amount earned.

B. Materials

1. None

WI 1.2 CONCRETE FORMWORK (INCIDENTAL TO CONCRETE WORK)

A. Scope of Work

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1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install shoring and formwork as required for cast-in-place concrete. This work is incidental to the individual concrete work items.

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 of 350 mg/l 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 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

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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 post-tensioned concrete, formwork shall remain in place until post-tensioning has been completed. Do not place additional loads on structure until concrete has been properly reshored.
13. 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.
14. 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.
15. 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 (INCIDENTAL TO PROJECT MOBILIZATION)

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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 restoration Work requiring shores and associated concrete has properly cured. This work is incidental to Work Item 1.1 Project Mobilization.

B. Materials

1. Shores shall be steel, rated at a minimum allowable load of 4,500 lbs. 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 = 150 psf for the floor slab plus the dead load of beams, girders, and pile caps at the top level.
3. Shore/Reshore loads on the structure shall not exceed 40 psf distributed load on the waffle 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 (INCIDENTAL TO CONCRETE WORK)

A. Scope of Work

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1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to fabricate and install all mild steel reinforcement and micro fiber reinforcement. This work is incidental to the individual concrete work items.

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.
3. Epoxy Coating Materials for Reinforcement: ASTM A775 and A884:
4. Supplier shall be certified currently under CRSI Fusion Bonded Epoxy Coating Applicator Plant Certification Program.

5. Corrosion Inhibiting Coating for Existing Exposed Non-prestressed Steel Reinforcement or Welded wire reinforcement:
   a. "MasterEmaco ADH 326," by BASF Building Systems, Shakopee, MN.
   b. "Euco 452", or "Duralcrete Series" by The Euclid Chemical Company, Cleveland, OH.
   c. "Sikadur 32 Hi-Mod LPL," by Sika Corporation, Lyndhurst, NJ.
   d. "Sika Armatec 110 EpoCem," by Sika Corporation, Lyndhurst NJ.

C. Execution

1. Work shall conform to requirements of ACI 301 "Standard Specifications for Structural Concrete," ACI 315-80 "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.

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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.

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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, Chapter 12.

WI 1.5 TEMPORARY SIGNAGE/BARRICADES (INCIDENTAL TO PROJECT MOBILIZATION)

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. This work is incidental to Work Item 1.1 Project Mobilization.

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.

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D. Site Enclosure Fence: Before construction operations begin furnish and install site enclosure fence in a manner that will prevent people from easily entering job site closure work area.

1. Extent of Fence: As required to enclose work area portion determined sufficient to accommodate construction operations.
2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. Furnish one set of keys to Owner.

E. Security Enclosure and Lockup: Provide lockable entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security. Lock entrances at end of each workday.

F. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.

G. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.

H. Covered Walkway: Erect protective, covered walkway for passage of individuals through or adjacent to Project site. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction and requirements indicated on Drawings.

1. Provide overhead decking, protective enclosure walls, handrails, barricades, warning signs, exit signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage.
2. Paint and maintain appearance of walkway for duration of the Work.

I. Temporary Enclosures: Provide temporary enclosures for protection of construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities.

WI 1.6 ELEVATION SURVEY

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to perform elevation survey(s) in parking structure work area(s), to establish reference elevations to all pertinent working points within, and adjacent to, work area(s).

B. Equipment / Materials (Not Applicable)

C. Execution

1. Prior to start of work, Contractor and Surveyor to meet with Engineer to identify minimum required elevation reference points and benchmark. Benchmark shall

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be clearly marked and protected throughout the construction, to prevent damage or shifting.

2. Contractor / Surveyor will be provided with one set of 11" x 17" reproducible copies of floor plans for each structure. Surveyor shall submit copies of survey results to Owner, Engineer, and Contractor within one week of completing each survey.
3. Where work includes full depth slab replacement or overlay removal / replacement, an initial survey shall be made before demolition. Additional surveys shall be performed after removals/repairs are complete and as necessary to set/verify final elevations, drain elevations, flow lines and slopes.

WI 1.7 SOLAR PANEL PROTECTION

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to protect, clean, solar structure framing, panels and associated elements of existing solar assembly during construction. Solar power system will be operational during the construction of this contract and must remain in operation at all times.

B. Equipment / Materials (AS required)

C. Execution

1. PreConstruction Photographs or Videotape: Show existing conditions of solar construction, including finish surfaces, that might be misconstrued as damage caused by work in this contract. Submit survey and photographs of existing conditions before Work begins.

2. Contractor shall take necessary precautions to protect all solar framing, panels, electrical boxes, concrete bases, conduit, feeds, etc. during contractor's construction activities. Contract shall periodically clean solar panels with clean water to remove dust /or debris.

3. Contractor shall submit protection plan and cleaning procedure to the City for approval prior to mobilization on the project.

4. Contractor will be responsible for any and all damage to the solar system during the course of construction activities.

WI 1.8 CONCRETE SLAB MOCK UP (INCIDENTAL TO CONCRETE WORK)

A. Mockups: Lightweight Concrete - Before casting concrete, build mockups to verify typical joints, surface finish, texture, tolerances, placement procedures, and standard of workmanship. See Paragraphs "Finishing Formed Surfaces" and "Finishing Floors and Slabs" within Section 033021 Cast-In-Place Concrete Restoration for criteria. This work is incidental to Work Item 3.6 Floor Repair – Wear Slab.

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B. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. The mockup shall be placed on the roof top level. Coordinate with the Owner and Engineer for location.
2. Contractor shall cast the concrete mockup with the proposed method of conveyance and placement to be utilized during construction.
3. A minimum 3-yard ready-mix order shall be used for the mockup.
4. The mockup shall consist of a minimum 16'x16' x 3 ½" thick formed surface placed on drainage board and protection sheet.
5. Install a representative sample of the proposed control joint and construction joint in the mockup.
6. Concrete shall be tested and results reported per the specification including shrinkage and density.
7. Concrete shall be cured per the specification.
8. Approved mockup shall remain throughout the entirety of Phase 1.
9. Mockup shall be removed and disposed of at the completion of Phase 1.
10. Concrete submittal approval shall be dependent on approved mockup.
11. Obtain Engineer's acceptance of mockups before casting concrete with specified finishes.

WI 1.9 EROSION CONTROL - (INCIDENTAL TO PROJECT MOBILIZATION)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to submit an erosion control plan for approval to the City of Santa Rosa, provide and maintain temporary erosion control facilities and conduct construction as required to comply with environmental regulations and that minimize possible air, waterway, storm drain, sewer drains, and subsoil contamination or pollution or other undesirable effects. This work is incidental to Work Item 1.1 Project Mobilization.

B. Temporary Erosion and Sedimentation Control

1. The Contractor shall obtain all environmental permits required for implementation of the Project. Failure of these specifications to mention any environmental requirement does not relieve the Contractor from compliance.
2. Implement controls and procedures as required by the approved permits.
3. Erosion control measures shall be in place prior to the commencement of demolition.
4. Provide measures to prevent discharge of water runoff and airborne dust to undisturbed areas and to adjacent properties and walkways, according to requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
5. Verify that flows of water redirected from construction areas or generated by construction activity do not enter storm drains or sewer drains.
6. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction.

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7. Clean, repair, and restore affected services, properties and roads affected by construction at the Project site during the course of Project.
8. Remove erosion controls and restore and stabilize areas disturbed during removal.

SERIES 2.0 FLOOR SURFACE PREPARATION

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 substrate slab to prepare it for application of cold fluid applied membrane system. Refer to Detail 2.1 for specific requirements.

B. Materials/Equipment

1. Equipment used shall not exceed weight or clearance restrictions currently in force for structure. No equipment may be used which, in opinion of Owner or Engineer/Architect, will damage existing structural system.
2. Equipment used shall leave a surface profile acceptable for specified use of newly exposed concrete slab, including exposed concrete, waterproofing membrane re-application, or bonded concrete overlay.

C. Execution

1. Provide concrete surface preparation per International Concrete Repair Institute guidelines. (ICRI CSP designation.)
2. Damage to floor slab caused by surface preparation operations shall be corrected to satisfaction of Engineer/Architect and at no additional cost to Owner.
3. Preparation of spall and delamination cavities prior to placement of concrete patch or overlay materials is not part of Work of this Work Item.

WI 2.2 FLOOR PREPARATION – EXISTING WATERPROOFING REMOVAL

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to remove and dispose of bonded waterproofing membrane from concrete substrate slab as indicated/shown on Drawings.

B. Materials/Equipment

1. Equipment used shall not exceed weight or clearance restrictions currently in force for structure. No equipment may be used which, in opinion of Owner or Engineer/Architect, will damage existing structural system.
2. Equipment used shall leave a surface profile acceptable for specified use of newly exposed concrete slab, including exposed concrete, waterproofing membrane re-application, or bonded concrete overlay.

C. Execution

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1. Remove existing membrane from concrete floor slab by mechanical means.
2. Clean final slab surface after removals so slab can be inspected and determine repair areas. All debris incidental to removal and surface cleaning shall be removed from deck and properly disposed of before inspection begins.
3. Damage to floor slab caused by removal operations shall be corrected to satisfaction of Engineer/Architect at no additional cost to Owner.
4. Preparation of spall and delamination cavities prior to placement of concrete patch or overlay materials is not part of Work of this Work Item.

SERIES 3.0 CONCRETE FLOOR REPAIR

WI 3.2 FLOOR REPAIR – SUBSTRATE PARTIAL DEPTH / DEEP

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, prepare cavities and install repair material to restore substrate slab to original condition and appearance. Refer to Detail 3.2 for specific requirements

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and/or "Pre-Packaged Repair Mortar".
2. Conventional steel reinforcement shall be as specified in Section "Cast-in-Place Concrete" and/or Work Item "WI .1.4 Concrete Reinforcement."

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching and Overlay".
2. Procedure for delaminated, spalled and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching and Overlay". Remove all unsound concrete within marked boundary prior to sawcutting and preparation of patch edges.
3. Engineer/Architect shall inspect all cavities for condition according to Section "Surface Preparation for Patching and Overlay."
4. All steel exposed within cavities shall be cleaned to bare metal by sandblasting as specified in Section "Surface Preparation for Patching and Overlay," and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching and Overlay." Exposed steel shall be coated with an approved corrosion inhibitor as specified in Work Item "Concrete Reinforcement."
5. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching and Overlay."
6. Patch materials and associated reference specifications are listed in Work Item "Concrete Floor Repair," Article " Materials," above. Patch installation procedures shall be in accordance with referenced specifications for selected material.

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WI 3.3 FLOOR REPAIR - FULL DEPTH

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and remove full depth unsound floor concrete, prepare cavity, and install repair material to restore floor to original integrity and appearance. Refer to Detail 3.3 for specific requirements.

B. Materials

1. Concrete repair materials shall be as specified in Section "Prepackaged Concrete Repair Mortar".
2. Conventional steel reinforcement shall be as specified in Section Work Item "WI 1.4 Concrete Reinforcement."

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching and Overlay."
2. All concrete shall be removed from within marked boundaries until sound concrete is reached on all sides.
3. Sawcut shall then be made approximately 3 in. from edge of cavity. This sawcut shall be to depth of 0.75 in. and all edges shall be straight. Underside of slab shall have its repair edge ground to depth of 0.5 in. Patches shall be as square or rectangular-shaped as practical. All concrete within sawcut shall be removed to minimum depth of 0.75 in. Also see Section Surface Preparation for Patching and Overlay."
4. Engineer/Architect shall inspect all cavities for condition according to Section "Surface Preparation for Patching and Overlay."
5. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching and Overlay" and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching and Overlay." Exposed steel shall receive corrosion inhibitor coating as specified in Work Item "Concrete Reinforcement."
6. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching and Overlay."
7. Patch materials and associated reference specifications are listed in Work Item "Floor Repair - Full Depth," Article "Materials," above. Patch installation procedures shall be in accordance with referenced specifications for selected material.

WI 3.5 FLOOR REPAIR – WEAR SLAB AT TRENCH DRIAN

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and remove existing sound and unsound concrete in designated repair area, prepare cavities and install patching material to restore

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floor slab to original condition and appearance. Refer to Detail 3.5 for specific requirements

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast in Place Concrete Restoration ".
2. Conventional steel reinforcement shall be as specified in Section Work Item "WI 1.4 Concrete Reinforcement."

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching and Overlay."

WI 3.6 FLOOR REPAIR – WEAR SLAB

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and install a new concrete wearing surface and sealant over the new waterproofing, protection board, and drainage course system. Refer to Detail Series 3.6. for specific requirements.

B. Materials

1. Concrete and isolation joint materials shall be as specified in Section "Cast-in-Place Concrete Restoration" and shown on Details.
2. Sealant materials for use in this Work are specified in Section "Joint Sealants", and are incidental to the Work.

C. Execution

1. Contractor shall install all floor drains, and/or planter drains along with other slab penetrations and have completed all waterproofing requirements prior to installation of the concrete wearing surface.
2. A detailed elevation survey of the proposed top surface elevations is to be provided by the Contractor showing all drain, perimeter, doorway, isolation joint, and expansion joint finished elevations. The results from the elevation survey must be submitted within 7 days of the start of concrete wear surface applications. Maximum spacing allowable for information is 5' –0". A benchmark for the project is to be maintained through the entire construction process. Refer to WI 1.6 Elevation Survey for specific requirements.
3. Install concrete wearing surface per Details taking care to provide specified slope to all drain locations as indicated in Drawing.
4. Concrete placement and curing procedures must be submitted by the Contractor to the Engineer 72 hours prior to start of concrete wear surface placement.

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5. The Contractor must provide 7 days notice for scheduling the Engineer to review form alignment and installation.
6. The new waterproofing system must be protected at all times from damage caused by concrete placement operations. **The slip-sheet between the wearing surface and drainage course must be protected from movement and allow freedom of movement such that concrete wearing surface can shrink and expand without resistance at the interface.**
7. Control joint sealant, perimeter cove sealant, and concrete surface sealer are related to this Work.

SERIES 11.0 CRACK AND JOINT REPAIR

WI 11.1 SEAL CRACKS AND JOINTS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate, prepare and seal random cracks and unsealed construction and control joints in concrete floor and/or topping. Refer to Detail 11.1 for specific requirements.

B. Materials

1. Approved materials for use in this Work are specified in Division 07 Section "Concrete Joint Sealants."

C. Execution

1. Contractor shall thoroughly clean and inspect concrete slabs and/or topping for cracks and unsealed construction and control joints. Those identified as either greater than 0.03 in. wide or showing evidence of water leakage and/or salt staining on ceiling below shall be sealed. All cracks and joints identified for repair shall be marked with chalk to aid in precision routing. Obtain depths to top reinforcing bars and P-T tendons in area of repair by use of a pachometer (rebar locator). Determine depth of electrical conduit (metal or plastic). Do not exceed this depth of routing where the crack to be repaired crosses the embedded items. Damage to embedded items will require repair or replacement at no cost to the Owner.
2. Cracks and construction joints shall be ground or sawcut to an adequate width and depth as required by Work Item Detail. Routing shall be performed by mechanized device that has positive mechanical control over depth and alignment of cut. Hand held power grinders with abrasive disks shall not be used on control/construction joints, but may be used on random cracks.
3. Cavities shall be thoroughly cleaned by either sandblasting or grinding to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion. Groove shall be air blasted to remove remaining debris.
4. Sealant materials and installation procedures shall be in accordance with referenced specifications for selected material.

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5. Traffic topping manufacturer shall verify in writing that joint sealant is compatible with traffic topping. Crack and joint sealant work shall be incidental to traffic topping system.

WI 11.2 JOINT REPAIR- EXPANSION BOARD/JOINT SEALANT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate, layout and install construction joints and joint sealant in concrete wear slab. Refer to Detail 11.2 for specific requirements.

B. Materials

1. Approved materials for use in this Work are specified in Section "Joint Sealants."

C. Execution

1. Contractor shall locate and provide construction joints as indicated on drawings and approved jointing plan.
2. Control joints shall be formed in plastic concrete. Tooled joints shall be of proper dimension in plastic concrete.
3. Approved joint materials shall be installed as specified in "Concrete Joint Sealants", Article "Materials."

WI 11.4 JOINT REPAIR -TOOL, ROUT AND SEAL CONTROL JOINTS

A. Scope of Work

1. Work consists of providing all labor, materials, equipment, supervision and incidentals necessary to provide sealed control joints in concrete slab as shown on Drawings. Refer to Detail 11.4 for specific requirements.

B. Materials

1. Sealant materials shall be as specified in Section "Concrete Joint Sealants."

C. Execution

1. Contractor shall locate and provide control joints at all column grid lines and at all existing control and construction joints.
2. Control joints shall be tooled and formed in plastic concrete or Soft Cut. Sawcutting joints after concrete sets will not be allowed.
3. Tooled joints shall be of proper dimension in plastic concrete.
4. Approved joint materials shall be installed as specified in Section "Concrete Joint Sealants."

WI 11.5 CRACK REPAIR- EPOXY INJECTION

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A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate cracks, prepare and pressure inject approved 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 Section "Epoxy Injection Systems."

C. Execution

1. Epoxy injection materials shall be installed in accordance with Section "Epoxy Injection Systems."
2. Contractor is responsible for location of all cracks requiring epoxy injection prior to start of Work.
3. Engineer/Architect will verify all cracks to be epoxy injected.
4. No payment will be allowed for Work executed prior to Engineer/Architect inspection and verification.

WI 11.7 JOINT REPAIR- COVE SEALANT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to prepare concrete surfaces and install cove sealant between floor and vertical surfaces as shown on Drawings. Refer to Detail 11.7 for specific requirements.

B. Materials

1. Joint sealant materials shall be as specified in Section "Joint Sealants."
2. Joint sealant material shall be compatible with traffic topping materials specified in Section "Traffic Toppings."

C. Execution

1. Wall-floor intersection to be sealed shall be thoroughly cleaned by sandblasting to remove all contaminants and foreign material.
2. Entire Work area shall then be cleaned with compressed air to assure that all loose particles have been removed and that intersection is dry.
3. Properly prepared intersection shall be coated evenly and completely with joint primer material on each of intersecting faces in accordance with sealant manufacturer's recommendations.
4. After primer has cured, apply cove sealant to intersection such that sealant extends 0.75 in. onto each of intersecting faces.
5. Work cove sealant into joint so that all air is removed and tool to concave shape such that minimum throat dimension of no less than 0.5 in. is maintained.

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6. Remove excess sealant and allow to cure.
7. Apply coating on horizontal and vertical surfaces where shown on Drawings in even layers in strict accordance with manufacturer's recommendations. Sealant material and associated reference specifications are listed in Work Item "Cove Sealant," Article "Materials," above for traffic topping coating materials and installation requirements.

WI 11.9 CRACK REPAIR - HEALER / SEALER

A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to prepare surfaces and apply methacrylate penetrating sealer to select ramp driving surfaces as indicated on the Drawings. Refer to Detail Series 11.9 for specific requirements.

B. Materials

1. Low modulus high molecular weight methacrylate penetrating sealer with either fast set or extended working time.
2. Acceptable materials for this Work are:
   a. "MasterSeal 630," by BASF Building Systems, Shakopee, MN.
   b. "Kemko 186 ULV/KonTek 186 ULV," by Chemco Systems, Redwood City, CA.
   c. "Dural LM 50," by The Euclid Chemical Company, Cleveland, OH.
   d. "SikaPronto 19TF," by Sika Corporation, Lyndhurst, NJ.
   e. "Wabo®ConTerete, 2P-RC," by Watson Bowman Acme, Buffalo, NY.

C. Execution

1. Contractor shall locate and mark all work areas to receive the cracked concrete surface repair as indicated on the Drawings.
2. Contractor shall shotblast floor surface to ICRI CSP-3 prior to placing repair material.
3. Surface shall then be cleaned by air blasting.
4. Surface shall be dry prior to application.
5. Engineer/Architect shall inspect surface for condition according to Section "Surface Preparation for Patching and Overlay," Article "Inspection of Repair Preparation."
6. Apply methacrylate sealer per manufacturer's recommendations.
7. Repair materials and associated reference specifications are listed in Article "Materials," above. Installation procedures shall be in accordance with referenced specifications for selected material.

SERIES 14.0 EPOXY OVERLAY

WI 14.1 EPOXY BROADCAST OVERLAY SYSTEM

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A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to prepare surfaces and apply epoxy broadcast overlay to select horizontal surfaces as indicated on the Drawings. Refer to Detail 14.1 for specific requirements.

B. Materials

1. Epoxy Resin System. The epoxy resin system shall be a two-component, 100% solids (Zero VOC), low-modulus, flexible, high-elongation, moisture-insensitive and fuels resistant system.

C. Execution

1. Contractor shall locate and mark all work areas to receive the surface/crack sealer as indicated on the Drawings.
2. Contractor shall shotblast, abrasive blast or hydroblast the concrete deck in a way acceptable to the Manufacturer and Engineer prior to placing repair material.
3. Surface shall then be cleaned by air blasting.
4. Surface shall be dry prior to application.
5. Contractor shall allow for Engineer/Architect inspection of all epoxy broadcast overlay sites for condition as specified.
6. Apply epoxy broadcast overlay per manufacturer's recommendations.

SERIES 16.0 TRAFFIC TOPPING

WI 16.3 TRAFFIC TOPPING - REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to prepare surface of concrete patches and/or adjacent previously traffic topped areas, and install traffic topping on prepared concrete and existing traffic topping. Refer to Detail 16.3 for specific requirements.

B. Materials

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

C. Execution

1. All loose existing coating shall be removed and exposed existing concrete surfaces prepared in accordance with manufacturer's recommendations and referenced specifications.

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2. Preparation of new concrete patches shall be in strict accordance with manufacturer's recommendations and referenced specifications.
3. Completely solvent wash all existing traffic coating within work limits that is to receive new coating material. Ensure existing coating to remain is adequately bonded to existing concrete slab.

WI 16.4 TRAFFIC TOPPING – RECOAT (PARTIAL SYSTEM)

A. Scope of Work

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

B. Materials

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

C. Execution

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

SERIES 25.0 MECHANICAL - DRAINAGE

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WI 25.3 MECHANICAL - PIPE AND HANGERS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to supplement existing floor drain system by installing pipe and hangers. Work Item "Mechanical – Bi-Level Drain" is directly related to this Work Item. Refer to Detail 25.3 for specific requirements.

B. Materials

1. Approved materials for this Work are as shown on Detail 25.3 and in Section "Common Work Results for Plumbing."

C. Execution

1. Contractor shall locate and mark all areas where supplemental floor drain piping is to be installed.
2. Pipes and hangers shall be installed as shown on Detail 25.3 and in accordance with referenced specification section listed in Work Item "Pipe and Hangers," Article "Materials," above.

WI 25.4 MECHANICAL – EXISTING CLEANOUT REMOVAL

B. Scope of Work

3. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to remove existing cleanouts. Work Item "Floor Repair – Full Depth" is directly related to this Work Item. Refer to Detail 25.4 for specific requirements.

D. Materials

1. Approved materials for this Work are as shown on Detail 25.3 and in Section "Common Work Results for Plumbing."

E. Execution

1. Contractor shall locate all areas where cleanouts are to be removed.
2. Pipes and hangers shall be installed as shown on Detail 25.3 and in accordance with referenced specification section listed in Work Item "Pipe and Hangers".

WI 25.7 MECHANICAL – BI-LEVEL DRAINS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and install new two-tiered drains and extend waterproofing membrane and drainage layer into drains. This Work Item also

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includes installing drains in new locations as directed by Engineer. Work Item WI "Pipe and Hangers" is directly related to this Work Item. Refer to Detail 25.7 for specific requirements.

B. Materials

1. Approved materials for this Work are as shown on Detail 25.7 and in Section "Common Work Results for Plumbing."
2. Sealant materials shall be as specified in Section "Joint Sealants".

C. Execution

1. Contractor shall locate and mark all areas where new bi-level drains are to be installed.
2. Contractor shall verify low points on slab by ponding and elevation survey prior to locating drains.
3. For prestressed and post-tensioned concrete construction, and in areas noted by Engineer/Architect, set drain location and core drain opening only after X-ray verification of clear site. The contractor is responsible for determining the type of X-ray equipment needed and provide for all Federal and State requirements in the use of the equipment prior to Bidding.
4. Concrete preparation shall be as shown in Detail 25.7.
5. Drains shall be installed as shown on Detail 25.7

SERIES 43.0 MISCELLANEOUS METALS

WI 43.1 HAND RAIL – INSTALL GUARDRAIL

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, engineering, and incidentals necessary to fabricate, supply and install designated handrails and install guardrails at the designated areas shown on drawings.
2. Contractor shall verify location of existing embeds, reinforcement, and potential conflicts prior to preparation of shop drawings.
3. Contractor shall submit shop drawings for the handrails, guardrails, and connections to the existing concrete walls or substrate.
4. Refer to Detail 43.1 for specific requirements.

WI 43.2 HAND RAIL – INSTALL GUARDRAIL

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, engineering, and incidentals necessary to fabricate, supply and install designated handrails and install guardrails at the designated areas shown on drawings.
2. Contractor shall verify location of existing embeds, reinforcement, and potential conflicts prior to preparation of shop drawings.

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3. Contractor shall submit shop drawings for the handrails, guardrails, and connections to the existing concrete walls or substrate.
4. Refer to Detail 43.2 for specific requirements.

SERIES 45.0 PAINTING

WI 45.1 PAINT TRAFFIC MARKINGS (TOP LEVEL)

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 pavement markings. Refer to Sheet AG-201 and AG-501 for specific requirements.
2. Remove existing stripes in those locations where they conflict with new striping layout.

B. Materials

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

C. Execution

1. Contractor shall prepare drawing of existing parking layout in repair areas prior to starting with repairs. Contractor shall note stall width, angle of parking, directional traffic arrows and all other existing pavement markings.
2. Contractor shall submit striping plan for City approval for top level.
3. Contractor shall locate and layout Work areas as indicated on Drawings. Contract shall confirm location of bollards and concrete bases for solar canopy and verify layout of stripping plan for top level per sheet AG-201.
4. Where existing pavement markings conflict with new striping layout, remove conflicting pavement markings as indicated in Division 9 Section “Pavement Marking.”
5. Engineer/Architect shall inspect all layout and surface preparation for conditions in accordance with Section "Pavement Marking."
6. Paint materials and associated referenced specifications are listed in Article "Materials," above. Procedures shall be in accordance with referenced specifications.

SERIES 50.0 WEAR SLAB DEMOLITION

WI 50.1 WEAR SLAB – DEMOLITION CONCRETE SYSTEM

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate and remove existing wear slab including concrete

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wear surface, concrete parking blocks, concrete light pole bases, light standards and attachments, floor drains and cleanouts, and other miscellaneous items. Refer to Detail 50.1 for specific requirements.

2. Contractor is responsible for locating and removal of all membrane material(s) from concrete floor slab as shown on Drawings, along with the proper disposal of material at an approved site.

B. Equipment

1. Demolition equipment shall be selected to prevent overloading or damage to beams, slabs, or other structural/architectural items to remain. Equipment used shall not exceed weight or clearance restrictions currently in force for structure. No equipment may be used, which in opinion of Owner or Architect/Engineer, will damage existing structural system. Equipment that, during use, causes undue vibration or noise may be restricted to specific time periods.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching and Overlay and Overlay."
2. Remove existing wear surface concrete, and drains as indicated on Drawings. Included is stub up rebar for future columns and associated concrete cover.
3. Remove existing membrane material from all surfaces to receive waterproofing as indicated on the Drawings.
4. Contractor shall disconnect all electrical and water feeds encountered during demolition.
5. All connections shall be capped and termination boxes for any electrical encountered installed flush with the wear surface.
6. Remove existing waterproofing membrane from concrete floor slab by mechanical means.
7. Equipment used shall leave a surface profile appropriate for application of waterproofing membrane.
8. Clean final slab surface, after removals, by shotblasting and air blasting so Architect/Engineer may inspect and determine additional repair areas. All debris incidental to wear surface and waterproofing removal and surface cleaning shall be removed for deck and properly disposed of before inspection begins.
9. Incidental damage to concrete surfaces caused by removal operations shall be corrected to satisfaction of Architect/Engineer at no additional cost to Owner.
10. Preparation of spall and delamination cavities prior to placement of concrete patch or overlay materials is not part of this Work Item. Refer to WI Series 2.0 Floor Surface Preparation and WI Series 3.0 Concrete Floor Repair, for Scope of Work, materials, and execution procedures associated with the repair of the final concrete slab surface to receive waterproofing.
1. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching and Overlay", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching and Overlay." Exposed steel shall be coated with an approved corrosion inhibitor coating as specified in WI 1.4 Concrete Reinforcement.

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2. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching and Overlay."
3. Patch materials and associated reference specifications are listed in Article "Materials," above. Patch installation procedures shall be in accordance with referenced specifications for selected material.

SERIES 51.0 FLOOR SLAB SYSTEM – WATERPROOFING SYSTEM

WI 51.1 FLUID-APPLIED WATERPROOFING WITH PROTECTION BOARD

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to install new waterproofing systems and protection board over substrate surfaces as indicated in Drawings. Refer to Detail 51.1 for specific requirements.

B. Materials

1. Approved waterproofing and protection materials for this Work are specified in Division 7 Section **Fluid-Applied Waterproofing"** and as shown in Drawings.

C. Execution

1. Substrate preparation shall be performed by the waterproofing membrane system applicator under its direct supervision.
2. Waterproofing membrane and protection board shall be installed by licensed applicators.
3. Contractor shall locate and install plaza drains, sub-surface drains, and/or other slab penetrations prior to installation of membrane. All penetrations shall be detailed/flashed as indicated in Drawings.
4. Install membrane according to Division 7 Section **"Fluid-Applied Waterproofing"**.
5. Perimeter terminations shall be installed as indicated on the Drawings and are incidental to the Work.
6. Control joint sealant, cove sealant, and crack sealant in substrate slab surface and all detailing are incidental to this Work Item. Preparation and installation shall be according to the waterproofing manufacturer requirements.

SERIES 52.0 FLOOR SLAB SYSTEM – DRAINAGE/SLIP SHEET

WI 52.1 WEAR SLAB – DRAINAGE COURSE

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to install new molded drainage panel system including: molded drainage panels and filter fabric over entire substrate receiving

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waterproofing as indicated in Drawings. Refer to Detail 51.1& 52.1 for locations and specific requirements.

B. Materials

1. Approved drainage course materials and filter fabrics for this Work Item is specified in Division 7 Section "Fluid-Applied Waterproofing" and as shown in Drawings.

C. Execution

1. Prior to drainage course application, the Contractor is to water test the waterproofed surfaces according to Section "Fluid-Applied Waterproofing."
2. Drainage course and filter fabric shall be installed by the waterproofing applicator or under his direct supervision.
3. Install drainage course components per Drawings.
4. Install filter fabric and slip-sheet for new wear surface.
5. **Slip-sheet between wearing surface and drainage course must allow freedom of movement such that concrete wearing surface can shrink and expand without resistance at the interface.**

WI 52.2 WEAR SLAB – SLIP SHEET

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to install new slip sheet over entire substrate receiving waterproofing as indicated in Drawings. Refer to Detail 51.1 and 52.2 for locations and specific requirements.

B. Materials

1. Approved slip sheet materials for this Work Item is specified in Division 7 Section "Plaza System Surface and Subsurface Systems" and as shown in Drawings.

C. Execution

1. Prior to drainage course application, the Contractor is to water test the waterproofed surfaces according to Section "Fluid-Applied Waterproofing."
2. Drainage course and filter fabric shall be installed by the waterproofing applicator or under his direct supervision.
3. Install drainage course components per Drawings.
4. Install filter fabric and slip-sheet for new wear surface.
5. **Slip-sheet between wearing surface and drainage course must allow freedom of movement such that concrete wearing surface can shrink and expand without resistance at the interface.**

ALTERNATE 1

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SERIES 21.0 P/T SYSTEM REPAIR – MONOSTRAND

WI 21.1 P/T SYSTEM REPAIR – TENDON REPLACEMENT REPAIR

A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to make P/T tendon splice repairs and P/T end anchorage repairs to the monostrand post-tensioning system. Refer to Detail series 21.0 for specific requirements. Refer to Section "Unbonded Post Tensioning Repairs" for further requirements.

2. The furnishing and installing of reinforcing steel as shown on the Details is incidental to this work. Concrete removals and replacement is incidental to this work.

B. Materials

1. Post-Tensioning materials and related materials shall be as specified in Section "Unbonded Post Tensioning Repairs".
2. Reinforcing steel shall be epoxy coated as specified in Section "Cast-in-Place Concrete - Restoration".
3. Epoxy adhesive for reinforcing dowels shall be Hilti HY-150.

C. Execution

1. Prior to concrete removals, submit shoring and bracing plan for engineer review. Engineer review does not absolve contractor's total responsibility for providing the necessary shoring and bracing to maintain the stability of the structure and individual elements. Required post shores shall be incidental to this Work.
2. Refer to Work Item series 21.0 and "P/T General Notes" on drawings for additional requirements.
3. Below is a general procedure for P/T tendon repairs. The actual repair procedure for each repair location may vary depending on existing conditions and shall be reviewed by the Engineer. Contractor shall coordinate with Engineer.

    a. Locate damaged tendon, measure and record length between anchor points.
    b. Measure and record cable separation, failure point and offset from nearest column face. Mark adjacent floor slab beyond concrete removal boundary to reference the failed tendon end points.
    c. Mark cable path on floor surface between anchors with marking paint.
    d. Inspect floor slab top and bottom for cracks, delaminations, and spalls.
    e. Remove all unsound and delaminated concrete only from floor and ceiling surfaces along tendon patch (see item 1 above).

        1) Closely inspect the exposed tendon for damage at all concrete removal sites. If no damage is observed, proceed to step F. If damage is observed, comply with step 2 below.
        2) Mark all damaged points for inspection by Engineer. Do not proceed with further concrete removals until after Engineer's inspection and approval.

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f. As directed by the Engineer, perform full depth removal at tendon anchorage to expose only the nonstressed side of the anchor plate. Excavate the anchorage nearest the failure point first then, excavate the opposite end. Inspect the anchorage for damage. Note that the tendon will probably retain some residual stress from corrosion lock up at the tendon high points. Continue to use extra caution during concrete removals.
g. Coordinate inspection of end anchors by Engineer.
h. As directed by the Engineer, continue partial concrete removals at tendon high points adjacent to the tendon failure locations. Removal should begin at the high point (closest to the failure) and work successively towards the nearest exposed anchor. Perform removals a safe distance away from end anchors and intermediate anchors. Perform removals so as to systematically detension and free up each tendon in small sections between removal points. The Engineer may direct termination of concrete removals if exposed tendons are found to be relaxed and free of corrosion. Cease removals as the Engineer directs, or when damaged tendon is released along its entire length.
i. Perform remaining concrete removals both partial and full depth to accommodate tendon splicing and new end anchor installation.
j. Engineer will determine location, type and extent of tendon repair.
k. Install splice couplings, end anchors, sheathing, new tendons and reinforcing steel per the applicable Work Item and in accordance with Section "Unbonded Post Tensioning Repairs". Cleaning and epoxy coating of all exposed reinforcing steel and P/T materials is incidental to concrete work.
l. Install patch concrete both partial and full depth at all locations except at stressing pockets and splice couplings. Concrete work shall be incidental to this Work.
m. Stress tendon when concrete has achieved 75 percent of required 28-day compression strength. Do not trim tendons until Engineer has approved stressing logs. Additional stressing shall be performed as required by Engineer and is incidental to the work.
n. Install patch concrete at stressing pocket and splice coupling locations.
o. Refer to Section "Unbonded Post Tensioning Repairs" for additional requirements.

WI 21.3 P/T TENDON END ANCHORAGE (LIVE)

A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to remove existing tendon anchorage system, install new reinforcement, install new tendon anchorage system, and re-tension tendon to required stresses. Concrete work performed in association with this work shall be incidental. Refer to Detail series 21.3 for specific requirements.

B. Materials

1. Refer to WI 21.0 "P/T System Repair Monostrand", Article "Materials" and Section "Unbonded Post Tensioning Repairs".

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C. Execution

1. Detension any remaining wires in tendons designated for repair. Remove existing end anchorage system.
2. Install new plastic-coated steel end anchor and install epoxy coated reinforcement as shown in Details at stressing side of end anchor.
3. Grease and wrap new or existing tendon at end anchor repair area in accordance with Section "Unbonded Post Tensioning Repairs" and is incidental to this work.
4. Place concrete at stressing side of end anchor. After concrete has reached specified strength, tension tendon to specified stresses and lock off. Restressing due to tendon lock-up or additional tendon failures during stressing is incidental to this work.
5. After engineer has approved stressing records, install epoxy coated reinforcement and place concrete at non-stressing side of end anchor.
6. Refer to WI 21.0 and Section "Unbonded Post Tensioning Repairs" for additional requirements.

WI 21.4 P/T TENDON END ANCHORAGE (DEAD)

A. Scope of Work

1. This work consists of furnishing al labor, materials, equipment, supervision and incidentals necessary to remove existing tendon anchorage system, install reinforcement, and install new tendon anchorage system. Stressing of the tendon is not part of this work but will occur at a different location along the tendon per WI 21.3. Concrete work performed in association with this work shall be incidental. Refer to Detail series 21.4 for specific requirements.

B. Materials

1. Refer to WI 21.0 "P/T System Repair Monstrand", Article "Materials" and Section "Unbonded Post Tensioning Repairs".

C. Execution

1. Detension any remaining wires in tendons designated for repair. Remove existing end anchor.
2. Install new plastic-coated end anchor and install epoxy coated reinforcement as shown in Details.
3. Grease and wrap new or existing tendon at end anchor repair area in accordance with Section "Unbonded Post Tensioning Repairs". This work is incidental to this work.
4. Place concrete in repair area. After concrete has reached specified strength, tension tendon to specified stresses. Stressing operations is not included in WI 21.4.
5. Refer to WI 21.0 and Section "Unbonded Post Tensioning Repairs" for additional requirements.

WI 21.9 P/T TENDON MATERIAL

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A. Scope of Work

1. This work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to provide and install new P/T monostrand tendon.

B. Materials

1. Refer to Section "Unbonded Post Tensioning Repairs".

C. Execution

1. Install new tendon within concrete removal area as needed to replace damaged or defective tendon.
2. Tendon profile shall match existing. Use chairs and tie wire to maintain Tendon position during concrete placement.
3. Refer to WI 21.0 and Section "Unbonded Post Tensioning Repairs" for additional requirements.

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 concrete. 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.

F. **SHOTBLASTING:** Scarification of concrete surfaces using an abraded metal shot-rebound. See ICRI Guideline 03732 "Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, and Polymer Overlays."

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 025130

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SECTION 025140 - SURFACE PREPARATION FOR PATCHING AND OVERLAY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to locate and remove all delaminated and unsound concrete, all existing failed patches, all existing surface spalls and potholes, and preparation of cavities created by removal to receive concrete patching material.

B. This Section includes the provision of all labor, materials, equipment, supervision and incidentals necessary to prepare existing sound concrete slab surfaces to receive bonded concrete overlay.

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

1. Division 03 Section "Cast-in-Place Concrete – Restoration"
2. Division 03 Section "Pre-Packaged Repair Mortar"

1.3 REFERENCES

A. "Specifications for Structural Concrete for Buildings" (ACI 301) by American Concrete Institute, herein referred to as ACI 301, is included in total as specification for this structure except as otherwise specified herein.

B. Comply with provisions of following codes, specifications and standards except where more stringent requirements are shown on Drawings or specified herein:

1. " Concrete Repair Guide" (ACI 546R-04)

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. Floor Slabs:

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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.**

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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 proved 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.

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B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer/Architect of all defective and damaged reinforcement or conduits. Replacement of damaged or defective reinforcement or conduits shall be performed according to this Section and as directed by Engineer/Architect.

C. After inspections of exposed surfaces and reinforcement are complete, Engineer/ Architect and Contractor shall measure and document removal and replacement quantities for payment, as required.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

A. All embedded reinforcement exposed during surface preparation that has lost more than 20% (15% 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.

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Concrete cover over reinforcement may be reduced to 1 in. with Engineer/Architect's approval if coated with an approved epoxy resin.

F. Supplemental reinforcement and concrete removals required for repairs of defective or damaged reinforcement shall be paid for as follows:

1. Concrete removals and supplemental reinforcement required for repairs of DEFECTIVE reinforcement shall be paid for by Owner at unit price bid.
2. Concrete removals and supplemental reinforcement required for repairs of DAMAGED reinforcement shall be paid for by Contractor.

3.5 CLEANING OF REINFORCEMENT WITH DELAMINATION AND SPALL CAVITIES

A. All exposed steel shall be cleaned of rust to bare metal by sandblasting. Cleaning shall be completed immediately before concrete placement to ensure that base metal is not exposed to elements and further rusting for extended periods of time. Clean entire bar diameter 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 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 2 Section "Work Items."
2. Division 2 Section "General Concrete Surface Preparation."
3. Division 2 Section "Surface Preparation for Patching."
4. Division 7 Section “Plaza Surface and Subsurface Systems.”
5. Division 7 Section “Fluid Applied Waterproofing.”
6. Division 7 Section “Concrete Joint Sealants.”
7. Division 9 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

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

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products complying with ASTM C 94 requirements for production facilities and equipment.

C. Source Limitations: Obtain each type of cement of the same brand from the same manufacturer's plant, each aggregate from one source, and each admixture from the same manufacturer.

D. Comply with ACI 301, "Specification for Structural Concrete," including the following, unless modified by the requirements of the Contract Documents.
1. General requirements, including submittals, quality assurance, acceptance of structure, and protection of in-place concrete.
2. Formwork and form accessories.
3. Steel reinforcement and supports.
4. Concrete mixtures.
5. Handling, placing, and constructing concrete.

E. Testing Agency Qualifications:

1. Independent agency, acceptable to authorities having jurisdiction, and acceptable to engineer, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

F. Testing Agency is responsible for conducting, monitoring and reporting results of all tests required under this Section. Testing Agency shall immediately report test results showing properties that do not conform to Project Specification requirements to Contractor's authorized on-site representative and to Owner's authorized on-site representative.

G. Testing Agency: Submit following Field Test information for Project Concrete unless modified in writing by Engineer:

1. Project name and location.
2. Contractor's name.
3. Testing Agency's name, address, and phone number.
4. Concrete supplier.
5. Date of report.
6. Testing Agency technician's name (sampling and testing).
7. Placement location within structure.
8. Time of batching.
9. Time of testing.
10. Elapsed time from batching at plant to discharge from truck at site.
11. Concrete mixture identification number.
12. Weather data:

    a. Air temperatures.
    b. Weather.

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13. Field test data:

    a. Date, time and place of test.
    b. Slump.
    c. Concrete Temperature.
    d. Air content.

14. Compressive test data:

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

H. **Mockups: Lightweight Concrete** - Before casting concrete, build mockups to verify typical joints, surface finish, texture, tolerances, placement procedures, and standard of workmanship. See Paragraphs "Finishing Formed Surfaces" and "Finishing Floors and Slabs" within this Section for criteria. Build mockups to comply with the following requirements, using materials indicated for the completed Work:

1. The mockup shall be placed on the roof top level. Coordinate with the Owner and Engineer for location.
2. Contractor shall cast the concrete mockup with the proposed method of conveyance and placement to be utilized during construction.
3. A minimum 3-yard ready-mix order shall be used for the mockup.
4. The mockup shall consist of a minimum 16'x16' x 3 ½" thick formed surface placed on drainage board and protection sheet.
5. Install a representative sample of the proposed control joint and construction joint in the mockup.
6. Concrete shall be tested and results reported per the specification including shrinkage and density.
7. Concrete shall be cured per the specification.
8. Approved mockup shall remain throughout the entirety of Phase 1.
9. Mockup shall be removed and disposed of at the completion of Phase 1.
10. Concrete submittal approval shall be dependent on approved mockup.
11. Obtain Engineer's acceptance of mockups before casting concrete with specified finishes.

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."

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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 185, "Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement."
3. ASTM A 615, "Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement."
4. ASTM A 706, "Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement."
5. ASTM A 775, "Standard Specification for Epoxy-Coated Steel Reinforcing Bars."
6. ASTM A 884, "Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement."
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."

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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 185, 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. Portland Cement: ASTM C 150, Types I or II or Type I/II.

B. Fly Ash: ASTM C618, Class C or Class F.

C. Ground-Granulated Blast Furnace Slag: ASTM C989, Gr. 100 or higher.

D. Silica Fume: ASTM C1240.

E. Normal-Weight Coarse Aggregate: ASTM C 33, Crushed and graded limestone or approved equivalent, Class 5S uniformly graded, not exceeding ¾ inch nominal size. No cherts, opaline, or crushed hydraulic-cement concrete is permitted.

F. Normal-Weight Fine Aggregate: Natural sand conforming to ASTM C 33 and having preferred grading shown for normal weight aggregate in ACI 302.1R, Table 5.1.

G. Lightweight Aggregates: ASTM C 330.

H. Water: Potable and complying with ASTM C 1602.

2.4 ADMIXTURES

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A. General: Admixtures certified by manufacturer to contain no more than 0.1 percent water-soluble chloride ions by mass of cement and to be compatible with other admixtures. Do not use admixtures containing calcium chloride.

B. General: Admixtures certified by manufacturer that all admixtures used are mutually compatible.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing or high-range water reducing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use high-range water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs, fiber reinforced concrete, and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.45.
   4. Use non-corrosive accelerator for all concrete, less than 8 inches thick, placed at air temperatures below 50 degrees Fahrenheit.
   5. Use alkali-silica reactivity inhibitor unless ready mix company confirms that the aggregates to be used on the job are non-reactive.

D. Normal Water-Reducing Admixture: ASTM C 494, Type A.

   1. Products: Subject to compliance with requirements, provide one of following:

      a. "Eucon Series," Euclid Chemical Co.
      b. "WRDA Series," W.R. Grace & Co.
      c. "Master Pozzolith Series," or "Master PolyHeed Series," BASF Corporation.
      d. "Plastocrete Series", Sika Corporation.
      e. "OptiFlo Series" or "EcoFlo Series," Premiere Concrete Admixtures.
      f. "Polychem Series" or "KB Series," General Resource Technology.
      g. "LC-400 Series" or "LC-500 Series," Russ Tech Admixtures, Inc.

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 or G (Retarder) or approved lightweight concrete compatible equal.

   1. Products: Subject to compliance with requirements, provide one of following:

      a. "Eucon 37" or "Eucon SP-Series" or "Plastol Series," Euclid Chemical Co.

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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.
h. Engineer approved equal.

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 W.O." 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.
e. "Polychem R," General Resource Technology.
f. "LC-400 Series" or "LC-500 Series," Russ Tech Admixtures, Inc.
g. "OptiFlo Series," Premiere Concrete Admixtures.

H. Air Entraining Admixture: ASTM C260.

1. Products: Subject to compliance with requirements, provide one of following:

a. "Air-Mix," "Eucon Air-Series" or "AEA-92," Euclid Chemical Co.
b. "Daravair Series" or "Darex Series," W.R. Grace & Co.
c. "Master Air AE90", or Master Air AE 200", or "Master Air VR10," BASF Corporation.
d. "Sika AEA Series," or "Sika AIR Series," Sika Corporation.
e. "ConAir Series," Premiere Concrete Admixtures.
f. Polychem "VR" or "VRC" or "Polychem AE," General Resource Technology.
g. "RSA-10," Russ Tech Admixtures, Inc.

I. 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.
f. "Polychem NCA" or "Polychem Super Set," General Resource Technology.
g. "LCNC-166," Russ Tech Admixtures, Inc.

J. Shrinkage Compensating Admixture:

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1. Design requires using materials with combined drying shrinkage characteristic of 0.03 percent maximum at 28 days. Proposed concrete Mixture(s), using actual aggregates, admixtures and cement of the proposed mix for Project as detailed herein and in Drawings, shall meet criteria. Submit ASTM C 157 (may be modified by curing period duration) results for at least 3 specimens. Test takes 28 days minimum. Begin tests as soon as possible so final test results available for submittal to Engineer. Existing test data from previous project with the same materials may be acceptable.
2. Provide powdered admixture used for the compensation and reduction of shrinkage in Portland Cement concrete. Its functional mechanism shall be based on the formation of an expansive Type G component, which produces a calcium hydroxide platelet crystal system based on calcium aluminate/calcium hydroxide, as specified in ACI 223.
3. Acceptable Product:
   a. Conex by The Euclid Chemical Company.
   b. "Eclipse Plus," W.R. Grace & Co.
   c. "Tetraguard AS 20," BASF Construction Chemicals.
   d. "Sika Control 40," Sika Corporation.
   e. "SRA-157," Russ Tech Admixtures, Inc.

K. Macro-Fiber: Polyolefin macro-fibers complying with ASTM C 1116, Type III, minimum 1.5 inches long, minimum tensile strength 73 ksi, minimum Modulus of Elasticity 620 ksi.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. "Forta Ferro," Forta Corp. Minimum dosage rate 5.0 pounds per cubic yard of concrete.
   b. "Novomesh 950," Propex Concrete Systems. Minimum dosage rate 7.5 pounds per cubic yard of concrete.
   c. "Strux 90/40 Structural Synthetic Fibers," W.R. Grace & Co., Inc. Minimum dosage rate at 3.5 pounds per cubic yard of concrete.
   d. "Tuf-Strand SF," Euclid Chemical Co. Minimum dosage rate 5.0 pounds per cubic yard of concrete.
   e. "MasterFiber MAC" Series, BASF Corporation, Minimum dosage rate 5.0 pounds per cubic yard of concrete

2. Conform to ASTM C 1399 and have a minimal residual strength performance of level 3 at 2 mm of beam deflection.

L. Do not change volume of water used in mix when fibers are used. Offset any slump loss due to addition of fibers by addition of superplasticizer.

M. Conform to manufacturer's recommendations for quantity of fibers if higher than the minimum dosage rates.

N. See Drawings for locations of allowable use.

O. Fiber manufacturer or approved distributor: Provide services of qualified representative at pre-construction meeting, concrete pre-installation meeting and first concrete placement containing fibers.

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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 lightweight structural concrete according to ACI 211.2 and ACI 301.
   2. 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 light-weight concrete mix are shown on Drawings:

   1. Compressive strength
   2. Slump
   3. Water-cementitious materials ratio
   4. Air content
   5. Calculated Equilibrium Unit Weight: 110 lb/cu. Ft. plus or minus 3 lb/cu. Ft. as determined by ASTM C 567 for light-weight concrete mix.

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D. Supplementary cementitious materials: For concrete exposed to deicers, limit percentage, by weight, of cementitious materials according to ACI 318 requirements.

E. Air Entrainment:

1. See General Notes on Drawings for total average air content (percent by volume).
2. Average air content shall exceed value stated in General Notes on Drawings.
3. Permissible variation for any one test result from specified average total air content: plus or minus 1.5 percent unless noted otherwise on General Notes on Drawings.
4. Hardened concrete shall have an air void spacing factor of 0.0080 in. maximum. Specific surface (surface area of air voids) shall be 600 in^2 per cu in. of air-void volume, or greater. Concrete mixes not meeting these values as determined by ASTM C 457 may require adjustments unless accepted in writing by Engineer."

F. Chloride Ion Content of Mixture:

1. Water soluble chloride ion content of concrete shall not exceed 0.06 percent by weight of cement for pre-stressed concrete and 0.15 percent for reinforced concrete. (ACI 318 Chapter 4 Table 4.4.1"Maximum Chloride Ion Content for Corrosion Protection of Reinforcement") Testing procedure to determine chloride ion content shall conform to ASTM C 1218.

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

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

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

1. Consider using water-reducing admixture or high-range water-reducing admixture (Superplasticizers), as required, for placement, workability, finishing and when required.

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2. Consider using water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use high range water-reducing admixture in pumped concrete, concrete for parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio of 0.45 or less. Use normal or mid-range water reducing admixture for concrete with water-cementitious materials ratio greater than 0.45.

I. Lightweight Concrete: Proportion mixture as specified. Proportion mixture to produce strength and modulus of elasticity as noted on drawings, with a splitting tensile strength factor (Fct) of not less than $5.5\sqrt{f'_c}$ for 3000-psi concrete and a dry weight of not less than 95 lb. or more than 110 lb. after 56 days. Limit shrinkage to 0.03 percent at 28 days.

J. 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.

K. Shrinkage (Length Change):

1. Determine length change of hardened concrete test specimens in accordance with ASTM C 157, except as noted below. Existing test data from previous project with same materials may be acceptable.
2. Test specimens shall be moist cured, including period in molds for 7 days. Then store specimens in air for period of 28 days.
3. Utilize concrete materials and mix proportions submitted, for use in floor slab beam, in accordance with Part 1 Article "Submittals".
4. Report length change of specimens after periods of air drying after curing of 4, 7, 14, 21, and 28 days.
5. Average length change after 28 days shall be limited to 0.03%, unless otherwise accepted by Engineer. Values exceeding 0.03% shall be rejected.

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L. Engineer's acceptance of mixture proportions shall not relieve Contractor from responsibility for any variation from requirements of Contract Documents unless Contractor has in writing called Engineer's attention to each such variation at time of submission and Engineer has given written approval of each such variation.

M. Adjustment to Concrete Mixtures: Adjustments to mixture proportions may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant, as accepted by Engineer. Laboratory test data for revised mixture and strength results shall be submitted to and accepted by Engineer before using in work.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94 and ASTM C 1116, and furnish batch plant-printed ticket information at delivery to site.

1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.

B. Provide plant-printed batch ticket for each batch discharged and used in work, indicating project identification name and number, date, mixture identification number, date, time of batching, mixing time, quantity and details of materials, amount of water introduced and water permitted by plant to be added, if any.

C. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94. Mix concrete materials in appropriate drum-type batch machine mixer.

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

2.8 MATERIAL ACCESSORIES

A. 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.

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e. LENTON Splices, by Erico.

B. Compression splices: Mechanically coupled splices in accordance with ACI 318, Chapter 12.

C. Joint Fillers

1. Joint filler in slabs and curbs per ASTM D1751 Asphalt impregnated fiber board; as shown on Drawings. Acceptable products as follows:
   a. "Flexcell," Knight-Celotex Corp.
   b. "Fibre Expansion Joint," W.R. Meadows, Inc.

2. Joint filler used vertically to isolate walls from columns or other walls: White molded polystyrene bead board type.

2.9 TOOLS

A. Slab Jointing

1. Concrete groovers: For tooled joints in concrete:
   a. For lightweight concrete 3" in thickness, use groover with 0.75 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
   b. 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.
   c. 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," or approved equal. Soff-Cut International, Corona, CA.
      1) Cut joint as soon as concrete will support weight of operator and saw without deforming
      2) The Soff-Cut sawcutting shall be completed prior to random or un-planned cracking.
      3) Joint shall be 0.75 in. deep for lightweight concrete thickness of 3 in. or less. Do not cut reinforcement.
      4) 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.
      5) Extend joint to adjacent vertical surface within 30 minutes of cutting.
      6) 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

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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 MACRO-FIBER

A. Fiber manufacturer or approved distributor: Provide services of qualified representative at pre-construction meeting, concrete pre-installation meeting and first concrete placement containing fibers.

3.4 STEEL REINFORCEMENT

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

3.5 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.

3.6 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.

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E. Hot Weather Placement: Comply with ACI 305 R.

3.7 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.

3.8 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:

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a. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces and "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG).
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.

3.9 TOLERANCES

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

3.10 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.

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e. "Eucobar", or "Tamms Surface Retarder", by The Euclid Chemical Company, Cleveland, OH.
f. "E-Con", by L&M Construction Chemicals, Inc.
g. "EVRT", by Russ Tech Admixtures, Inc.
h. "SikaFilm", by Sika Corporation, Lyndhurst, NJ.

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

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

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

E. Dissipating Curing Compound (VOC Compliant): Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/m^2 when applied at 200 sq. ft/gal. Manufacturer's certification is required. Silicate based compounds are prohibited.

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

2. Additional requirements:
   a. With product submittal provide plan and procedures for removal of residual curing compound prior to application of sealers, coatings, stains, pavement markings and other finishes.
   b. Provide a summary of testing to show adequate surface preparation for successful application of sealers, coatings, stains, pavement markings, and other finishes.

F. Curing Methods: Cure formed and non-formed concrete moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.

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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.

3.11 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. Air Content:

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

F. Concrete Compressive Strength:

1. Make test cylinders in accordance with ASTM C 31 and test in accordance with ASTM C 39 as follows:

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a. Take minimum of three sets of cylinders for each 100 cu yds. or fraction thereof, of each Mixture of concrete placed in any one day.
b. A set of cylinders shall be comprised of two 6 inch by 12 inch cylinders or three 4 inch by 8 inch cylinders.
c. At Contractor's option and cost, cylinders may be taken to verify concrete strength prior to form removal.
d. Testing Agency: Provide and maintain site cure box for cylinders.

2. Sample plastic concrete for testing at point of final placement, in accordance with ASTM C 172. Engineer will select sampling locations which may include points where plastic concrete has already been screeded and floated. Sample concrete for test cylinders to be used to verify concrete compressive strength for post-tensioning as near as possible to actual tendon anchorages.
3. Cover specimens properly, immediately after finishing. Protect outside surfaces of cardboard molds, if used, from contact with sources of water for first 24 hours after molding.
4. Cure test cylinders per ASTM C 31 as follows:

a. To verify compressive strength prior to form removal or for additional test cylinders required due to cold weather concreting conditions:

1) Store test specimens on structure as near to point of sampling as possible and protect from elements in same manner as that given to portion of structure as specimen represents.
2) Transport to test laboratory no more than 4 hours before testing. Remove molds from specimens immediately before testing.

b. To verify 28-day compressive strength:

1) During first 24 hours after molding, store test specimens under conditions that maintain temperature immediately adjacent to specimens in range of 60 to 80 degrees F. and prevent loss of moisture from specimens.
2) Remove test specimens from molds at end of 20 +/- 4 hours and store in moist condition at 73.4 +/- 3 degrees F. until moment of test. Laboratory moist rooms shall meet requirements of ASTM C 511.

5. Compression test for non-prestressed concrete:

a. Test one set of cylinders at 7 days.
b. Test one set of cylinders at 28 days.

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. Density / Yield:

1. Test density of concrete in accordance with ASTM C 138 each time cylinders are taken or as directed by the Engineer.

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2. Test yield of concrete in accordance with ASTM C 138 each time cylinders are taken or as directed by the Engineer.

H. 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.

3.12 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.

3.13 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. GENERAL INFORMATION:	
Project:City:	
General Contractor:	
Concrete Supplier:	
Mixture Identification No.:	Concrete Grade:
Use (Describe)[1]:	

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

II. MIXTURE PROPORTIONING DATA:		
Proportioning Based on (Check only one): Standard Deviation Analysis: _____ orTrial 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

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III. MATERIALS:		
Aggregates: (size; type; source; gradation report; specification)		
Coarse:		
Fine:		
Other Materials:	Type	Product-Manufacturer (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. MIX PROPORTIONS (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.

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

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VIII. STANDARD DEVIATION ANALYSIS:	Yes	N/A
(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".)		
Number of Tests Evaluated: (One test is average of two cylinder breaks) Attach copy of test data considered:	Standard Deviation: (Single Group) Standard Deviation: (Two Groups)	
Required average compressive strength: f'cr = f'c + _____ 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 = _____ 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 = _____ %		

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IX. TRIAL MIXTURE TEST DATA:		Yes	N/A
(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".)			
Age (days)	Mix #1 (comp. str.)	Mix #2 (comp. str.)	Mix #3 (comp. str.)
7			
7			
28			
28			
28			
28 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 = _____ %	

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X. OTHER TEST DATA		
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. Remarks:

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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

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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

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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 "Work Items."
2. Division 02 Section "General Concrete Surface Preparation."
3. Division 02 Section "Surface Preparation for Patching."
4. Division 03 Section "Cast-In-Place Concrete - Restoration."
5. Division 07 Section "Concrete Joint Sealants."
6. 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:

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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. "Hot Weather Concreting" reported by ACI Committee 305.
3. "Cold Weather Concreting" reported by ACI Committee 306.
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. "Hot Weather Concreting" reported by ACI Committee 305.
3. "Cold Weather Concreting" reported by ACI Committee 306.

D. American Society for Testing and Materials (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.”

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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. King Construction Products (King), Burlington, ON
4. Mapei Corporation (MAPEI), Deerfield Beach, FL
5. The Quikrete Companies (QUIKRETE), Atlanta, GA
6. 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 materials for this Work are as follows:

a. "MasterEmaco S440," by BASF.
b. "Eucocrete," by Euclid.
c. "FA-S10 Concrete," by King.
d. "Planitop 11," by MAPEI.

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e. "Polymer Modified Fiber-Reinforced Deck Mix" by Quikrete
f. "Sikacrete 211," by Sika.
g. Other types may be used only with Engineer's approval in writing prior to bidding.

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

1. Acceptable materials for this Work are as follows:

a. "MasterEmaco T430," by BASF.
b. "Speedcrete 2028," by Euclid.
c. "HP-S10 Concrete," by King.
d. "Planitop 18 ES" by MAPEI.
e. "Sikaquick 1000," by Sika.
f. Other types may be used only with Engineer's approval in writing prior to bidding.

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

1. Acceptable materials for this Work are as follows:

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

2.3 MATERIAL ACCESSORIES

A. 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, Waterborne, Membrane-Forming Curing and Sealing Compound: ASTM C 1315, Type 1, Class A.

PART 3 - EXECUTION

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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 three days by curing methods listed below. Provide additional curing immediately following initial curing and before concrete has dried.

1. During initial and final curing periods maintain concrete above 50°.
2. Prevent rapid drying at end of curing period.

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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. Compressive strength testing shall be by one of the procedures listed below. Perform tests according to ACI 301.

B. Testing Frequency: Perform one set of strength testing and one bond test for each product per pallet or partial pallet of material delivered to job. Prepare samples in accordance with ASTM C31.

C. Compressive Strength Testing: Determine strength at 7 and 28 days. Each test shall consist of two 6-inch diameter cylinders or three 4-inch diameter cylinders. Testing shall be in accordance with ASTM C39.

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.

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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 033818 - UNBONDED POST-TENSIONING REPAIRS

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. In accordance with Contract Documents, provide all materials, labor, equipment, and supervision to fabricate and install all post-tensioning repair Work. Non-prestressed reinforcement shall conform to Division 03 Section, "Cast-in-Place Concrete - Restoration."

B. Meet the requirements of ACI 301, ACI 318, ACI 423.7, CRSI MSP-2, and Contract Documents. In case of a conflict, meet the more stringent requirement.

1.3 REFERENCES

A. Field Reference: Keep a copy of the following reference in the Contractor's field office.

1. PTI's "Field Procedures Manual for Unbonded Single Strand Tendons"

B. American Concrete Institute (ACI):

1. ACI 301, "Specification for Structural Concrete."
2. ACI 318, "Building Code Requirements for Structural Concrete."
3. ACI 347, "Recommended Practice for Concrete Formwork."
4. ACI 362.1R-97, "Guide for the Design of Durable Parking Structures."
5. ACI 423.3R, "Recommendations for Concrete Members Prestressed with Unbonded Tendons."
6. ACI 423.7, "Specification for Unbonded Single-Strand Tendon Materials and Commentary."

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

1. ASTM A416, "Specification for Uncoated Seven-Wire Strand for Prestressed Concrete."
2. ASTM E328, "Recommended Practice for Stress-Relaxation Tests for Materials and Structures."

D. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI MSP-2, "Manual of Standard Practice."

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E. Post-Tensioning Institute (PTI):

1. PTI, "Guide Specifications for Post-Tensioning Materials."
2. PTI, "Performance Specification for Corrosion Preventive Coating."
3. PTI, "Specification for Unbonded Single Strand Tendons."
4. PTI, "Field Procedures Manual for Unbonded Single Strand Tendons."
5. PTI, "Guide for evaluation and Repair of Unbonded Post-Tensioned Concrete Structures."

F. International Code Conference (ICC):

1. ICC, "International Existing Building Code."
2. ICC, "International Existing Building Code Standards."

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Coordinate the tendon and anchor locations with Work of other Sections, including "Cast-in-Place Concrete - Restoration." Immediately inform Engineer/Architect of any potential interference.

B. Sequencing:

1. Deviations in the construction and stressing sequence shown on the Drawings are not permitted without written acceptance from Engineer/Architect.

C. Make submittals in accordance with requirements of Division 01 Section, "Submittal Procedures:"

D. Requests For Information

1. Engineer reserves the right to reject, unprocessed, any Request for Information (RFI) that the Engineer, at its sole discretion, deems frivolous.
2. Engineer reserves the right to reject, unprocessed, any RFI that the Engineer, at its sole discretion, deems already answered in the Contract Documents.
3. Do not use RFI process to request substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

1.5 ACTION SUBMITTALS

A. Product Data: For each product as indicated.

1. Corrosion Inhibiting Coating: Type and chemical analysis.
2. Sheathing: Type, material, density and thickness.
3. Anchorage Device: Type, material and size.
4. Coupler Device: Type, material and size.
5. Intermediate Stressing Coupler Device: Type, material, and size.

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6. Pocket Former: Type, material and size.
7. Sheathing Repair Tape: Type, material and width.
8. Encapsulation System: Type and materials.

B. Shop Drawings: Include the following prepared by or under the supervision of a qualified professional engineer, if requested by Engineer:

1. Number, arrangement and designation of tendons.
2. Tendon profile and method of tendon support. Show tendon profiles at sufficient scale to clearly indicate tendon high and low points.
3. Tendon anchorage details including bundled tendon flaring.

C. Samples: For the following products:

1. Encapsulation system.

D. Delegated-Design: For post-tensioning system.

1. Signed and sealed calculations prepared by a qualified structural engineer indicating method of elongation. Include values used for friction coefficients, anchorage seating loss, elastic shortening, creep, relaxation, wobble and shrinkage.

E. Stressing Records: Same day as stressing operation.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Supplier and Installer using the forms at the end of this section.

B. Mill Test Reports: Certified mill test reports for each coil or pack of strand used on Project, indicating that strand is low relaxation and including the following information:

1. Heat number and identification.
2. Minimum breaking strength.
3. Yield strength at 1 percent extension under load.
4. Elongation at failure.
5. Modulus of elasticity.
6. Diameter and net area of strand.

C. Test and Evaluation Reports: Indicating compliance with the following requirements:

1. Tests required by ACI 301, Section "Post-Tensioned Concrete."
2. Relaxation loss tests required by ACI 423.7 for low relaxation prestressing steel.

D. Field Quality-Control Reports: Within 72 hours of inspection.

E. Stressing Jack Calibration: Calibration certificates for jacks and gages to be used on Project. Calibrate each jack-and-gage set as a pair.

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F. Warranty: Proposed warranty prior to the start of construction.

1.7 QUALITY ASSURANCE

A. Supplier Qualifications:

1. Use a fabricating plant certified by PTI.
2. Successfully provided all materials for at least 5 post-tensioning repair projects in parking structures in the United States with a structural system similar to Project within the previous 5 years. Provide all information requested on the form at the end of this section.

B. Installer Qualifications:

1. Certified by PTI.
2. Successfully performed at least 5 post-tensioning repair projects in parking structures in the United States with a structural system similar to Project within the previous 5 years. Provide all information requested on the form at the end of this section.
3. Use a full-time Project superintendent that has supervised at least 5 projects of similar magnitude.
4. Use PTI Certified Field Installers to install and stress post-tensioning system.

C. Suppliers, who do not meet the qualification requirements above, shall be rejected:

D. Comply with requirements in ACI 301, Section "Post-Tensioned Concrete."

E. Perform all post-tensioning Work under the supervision of a Project Superintendent who is present during all operations including installation, concrete placement, stressing and finishing.

1.8 DELIVERY, STORAGE AND HANDLING

A. Assign all tendons in same member the same heat number and identify accordingly.

B. Package each tendon bundle at source to prevent physical damage to tendon during transportation and storage, and to protect strand from moisture. Use heavy padding; cardboard is not permitted. Do not use wire binding or other materials that could cut the sheathing or tendon.

C. Deliver, store and handle post-tensioning materials according to ACI 423.7.

D. Immediately remove damaged components from Project site and replace at no cost to Owner.

E. Do not remove sheathing on stressing end until the day of stressing.

F. Materials Stored on Slabs:

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1. Prior to final stressing of beams and slabs, do not store any materials on slab.
2. After final stressing of beams and slabs but before concrete has reached the specified 28 day strength, do not store materials on slab such that the weight exceeds 50 percent of the design live load.
3. After final stressing and after concrete has reached the specified 28 day strength, do not store materials on slab such that the weight exceeds the design live load.

1.9 WARRANTY

A. The Contractor shall guarantee against any and all defects in workmanship and materials for newly installed tendon strands, splices, anchorages, and anchoring hardware for a period of 1 year.

B. The Manufacturer shall guarantee against any and all defects in materials for newly installed tendon strands, splices, anchorages, and anchoring hardware for a period of 1 year.

C. Written warranty, signed by Contractor/Manufacturer, including:

1. Repair or replacement of post-tensioning tendon repairs installed by Contractor:

   a. That do not comply with requirements.
   b. With corroded or fractured prestressing steel or corroded post-tensioning accessories in repair area.
   c. With corroded or fractured prestressing steel or corroded post-tensioning accessories in areas away from repair, which are directly due to post-tensioning repairs installed by Contractor.

2. Removal and patching of concrete necessary to remedy distress of post-tensioning repairs covered by warranty.
3. Repair or replacement, to satisfaction of Owner, of other work or items which may have been displaced or damaged as consequence of defective work.
4. Make immediate emergency repairs within 48 hours of notice of defective post-tensioning repairs.
5. Owner will reimburse Contractor for reasonable costs if post-tensioning distress is not due to Work performed by Contractor.
6. Warranty Period: 1 year after Substantial Completion date.

PART 2 - PRODUCTS

2.1 POST-TENSIONING SYSTEM CRITERIA

A. Post-tensioning repair anchorage and hardware described in this Section intended to satisfactorily perform in ACI 362.1R-97 Zone I environment without long-term corrosion or other distress.

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1. PT repairs are to be based on the following: Do not exceed the maximum tensile stress in the tendon during the stressing operation. The maximum tensile stress is 74 percent of the specified tensile strength of the tendon.

2. Do not exceed 64 percent of the specified tensile strength after the anchors are seated.

2.2 PRESTRESSING TENDONS

A. Prestressing Strand: ASTM A416, Grade 270, uncoated, seven-wire, low-relaxation strand with minimum ultimate strength of 270 ksi.

1. Manufactured by a single source.
2. Strands manufactured outside United States subject to Engineer/Architect's approval based on evidence of satisfactory performance in the United States during the previous 5 years.
3. Use of high stress bar system instead of strand system is not permitted unless accepted in writing by the Engineer.
4. Conform to ACI 423.7 for relaxation loss requirements.

B. Tendon Sheathing: Seamless and extruded high density polypropylene or seamless and extruded high density polyethylene with a specific gravity greater than 0.95 conforming to ACI 423.7.

1. Sufficient strength to withstand damage during fabrication, transport, installation, concrete placement and stressing.
2. Minimum thickness of 50 mils (–0 mils +15 mils)
3. Minimum inside diameter 0.03 inches greater than maximum strand diameter.
4. Chemically stable without becoming brittle or softening over anticipated temperature range and service life of structure.
5. Non-reactive with concrete, steel and corrosion inhibiting coating.
6. Contrasting color of corrosion inhibiting coating to enhance visibility of damage. Black/dark colored sheathing is not acceptable.
7. Annular space between sheathing and strand completely filled with corrosion inhibiting coating.
8. Watertight including all connections and components over entire length.

C. Tendon Anchor: Non-porous casting free of sand, blow holes, voids and other defects meeting the testing and material requirements of ACI 423.7.

1. Plastic coated bearing plates sized in accordance with ACI 423.7, unless certified test reports substantiate comparable or superior performance, for transfer at minimum stressing concrete strength.
2. Capable of complying with PTI Guide Specification requirements for aggressive environments.
3. Capable of developing at least 95% of the actual ultimate strength of tendon.
4. Minimum wedge cavity opening of at least 0.19 inches larger than tendon diameter. Reaming of anchor wedge cavity is not permitted.

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5. Wedges capable of precluding failure of tendon due to notching or pinching effects during static and fatigue load tests stipulated in ACI 423.7.
6. Provisions for a plastic cap which fits tightly and seals barrel end on stressing side of anchor.
7. Provisions for a plastic sleeve which prevents moisture infiltration into anchor casting or tendon sheathing on bearing side of anchor.

D. Coupler Assembly: Assembly of strands and wedges meeting the testing and material requirements of ACI 301.

1. Capable of complying with PTI Guide Specification requirements for aggressive environments.
2. Capable of developing at least 95 percent of the ultimate strength of tendon.
3. Wedges capable of precluding failure of tendon due to notching or pinching effects during static and fatigue load tests stipulated in ACI 423.7.

E. Encapsulation System for New Prestressing Steel: Watertight encapsulation along the entire length of new tendon, including new anchorages and new couplers, when subjected to hydrostatic testing required in ACI 423.7 for aggressive environments.

1. Sleeve: Translucent plastic with a positive mechanical connection to anchorages capable of resisting 100 lbs. pulling force. Minimum 10 inches long and 4 inches overlap with sheathing, completely filled with corrosion inhibiting coating.
2. Anchor Cap: Translucent plastic with a positive mechanical connection to anchorages capable of resisting 100 lbs. pulling force. At intermediate anchorages, open to allow passage of strand.
3. Subject to the requirements provide one of the following systems:

   a. "Zero Void," General Technologies, Inc.
   b. "Hayes Posi-Lock Plus," Hayes Industries, Ltd.
   c. Accepted equivalent.

2.3 ACCESSORIES

A. Pocket Formers: Capable of completely sealing wedge cavity from intrusion of concrete or cement slurry; sized to provide at least a 2 inch recess and allow access for cutting strand tail.

1. If Zero Void encapsulation system in used, the "Zero Void Nail-Less Pocket Former" is required.

B. Anchorage Fasteners: Stainless-steel ring nails. Subject to the requirements use one of the following:

1. Clendenin Brothers, Baltimore, MD.
2. Swan Secure Products, Baltimore, MD.
3. R.J. Leahy Co., San Francisco, CA.
4. Accepted equivalent.

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C. Sheathing for Repair at Existing Prestressing Steel :

1. Watertight, chemically-stable, and non-reactive with prestressing steel, corrosion inhibiting PT coating, and reinforcing steel.
2. Color shall contrast with PT coating so that sheathing tears will be readily visible.
3. Polypropylene or polyethylene tubing:

   a. Minimum thickness of 0.050 inches.
   b. Inside diameter at least 0.030 inches greater than prestressing steel diameter.
   c. Slit tubing longitudinally for sheathing repairs at continuous prestressing steel.

D. Sheathing at New Intermediate Anchorage and Couplers:

1. Heat-shrink tubing to encapsulate couplers and splicing hardware at intermediate stressing locations.
2. Heat shrink tubing shall be: watertight, chemically-stable, and non-reactive with prestressing steel, corrosion-inhibiting PT coating, and reinforcing steel.
3. Use one of following or approved equal:

E. Protection at New End and Intermediate Anchorages:

1. Epoxy coating field-applied to all surfaces of wires, plates, anchor washers, etc. at locations of end and intermediate anchorages and center stressing splices.

F. Sheathing Repair Tape: Elastic, self-adhesive, moisture-proof tape with a minimum width of 2 inches in contrasting color to tendon sheathing, and that is non-reactive with sheathing, corrosion inhibiting coating, or tendon. Subject to the requirements use one of the following:

1. "3M Tape No. 226," 3M, St. Paul, MN.
2. "Polyken 826," Berry Plastics Corp, Evansville, IN
3. "Tyco Adhesives No. 398," Tyco Adhesives, Franklin, MA

G. Sheathing Repair Material: For nicks and cuts less than 0.25 inches use one of the following:

1. "Scotch-Weld DP-8005," by 3M.

H. Corrosion inhibiting coating: Capable of meeting the requirements of ACI 423.7. Subject to the requirements use one of the following

1. "Greasrex K-218," ExxonMobil Oil Corp., Irving, TX.
2. "Red-i PT Coating Grease," Lubricating Specialties Co., Pico Rivera, CA
3. "Renolit PTG," Fuch's Lubricant Co., Harvey, IL
4. "Royal PT-1 and PT-2 Corrosion Inhibiting Grease," Troco Oil Co., Tulsa, OK

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I. Tendon supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening tendons in place. Use tendon supports capable of meeting the requirements in CRSI's "Manual of Standard Practice" and as follows:

1. Clearly marked to differentiate by height.
2. Capable of resisting overturning during construction operations.
3. Minimal contact with forms where concrete is exposed to view.
4. Do not cause voids or damage to surrounding concrete.
5. All-plastic supports conforming to CRSI Class 1 protection requirements and with a compressive strength higher than concrete.
6. Acceptable manufacturers:

    a. Aztec Concrete Accessories, Inc.
    b. General Technologies, Inc.
    c. Accepted equivalent.

2.4 GROUT MATERIALS

A. Premixed, nonmetallic, noncorrosive, non-staining grout product containing selected silica sands, Portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with ASTM C 1107, Grade B, with fluid consistency and a 30-minute working time.

B. Non-reactive with prestressing strand, anchorage materials, or concrete and without chlorides or other chemicals known to be deleterious to prestressing strand.

C. Subject to compliance with requirements, provide one of the following:

1. Sure Grip Grout, Dayton Superior.
2. Euco N.S., Euclid Chemical Co.
3. Masterflow 928, BASF.

2.5 EQUIPMENT

A. Stressing Equipment: Hydraulic jacks with calibrated pressure gauges, capable of gripping prestressing steel and stressing prestressing steel to specified level. Maintain equipment in safe, working condition.

1. Provide certified pressure gauges with means to cross check accuracy constantly. Second gauges are recommended for larger projects.
2. Provide at Site current, not to exceed 6 months, calibration chart for each jack relating gauge pressure to jacking force.
3. Exercise care in handling of stressing equipment.

B. Necessary equipment to detension, cut, and splice prestressing strands.

C. Calibration of hydraulic equipment and gauges.

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D. The Contractor shall provide the equipment, and use appropriate methods to expose the embedded post-tensioning sheathing. The demolition to expose embedded post-tensioning sheathing shall not compromise the structural integrity of the slab and shall minimize damage to the tendon sheathing. The following equipment, or an approved equal, may be used on this project.

1. Chipping hammers of nominal 15-lb. class or less for removal of concrete to expose tendon sheathing.
2. Compressed air equipment capable of removing dust and dirt from concrete repair areas.

E. All equipment is to be operated and maintained according to the manufacturer's recommendations or the approved testing procedures.

F. Operation of stressing equipment shall be performed by tradesman experienced in this work with a PTI level 1 Unbonded – Field Installation certification.

PART 3 - EXECUTION

3.1 PRECAUTIONS

A. Prestressing steel under stress has significant stored energy. Exercise 1 care in detensioning and stressing.

1. Erect and maintain work platforms in safe condition, in conformance with Government regulations.
2. Protect areas around, adjacent to, and below work area, including vehicular traffic, from damage.
3. Protect construction personnel and passersby from injury.

    a. Do not allow anyone to stand in front of, behind, over or beneath hydraulic jack, or anywhere along the tendon during stressing or prestressing steel to be detensioned.
    b. After stressing, when releasing jack pressure to transfer force to wedges, laborers' fingers shall be kept clear of assembly. .

B. Close off area around, adjacent to, and below work area or use canopies and barriers as necessary to protect public.

C. Detensioning shall be performed by cutting, preferably while tendon is still embedded in concrete, by use of specialty detensioning equipment, or by other approved means.

3.2 PREPARATION

A. Prior to concrete removal, locate prestressing steel using non-destructive testing (NDT) methods at locations along the length of each tendon in each bay, or by other approved means.

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B. Identify and clearly mark fractured, corroded, or otherwise damaged sections of prestressing steel. Create exploratory openings in concrete as necessary to locate fractured or corroded sections. Engineer will inspect tendon and determine appropriate repair method before replacement. Tendons with fractured or severely corroded wires shall be replaced for its entire length or repaired by splicing in sections of new tendons similar in kind and size, and restressing of tendons.

C. Where significant concrete removal is required or a significant number of tendons require spliced repair and restressing, install shoring and/or sequence repairs as directed by Engineer. This shoring must be designed by an Engineer competent in shoring design.

D. Remove unsound concrete as approved by Engineer. Exercise care to avoid damaging prestressing steel, sheathings, anchorages, and remaining sound concrete. Do not remove concrete at post-tensioning anchorages unless directed to do so by Engineer.

E. Maintain tendon profile. Use grout or other means as necessary to securely maintain tendon position during Work.

F. Identify damaged sheathing and document locations.

3.3 SHEATHING REPAIR

A. At locations of damaged sheathing, remove concrete to expose sheathing at least 4 inches beyond damaged portion and to create space between the sheathing and the concrete. Exercise care to avoid further damage to sheathing. Concrete removal beneath a stressed tendon shall be minimized where the profile of the tendon may be affected.

B. At small localized areas of sheathing damage, as determined by Engineer (Note: Items 1 through 4 below are the repair procedure for isolated punctures, holes and slits where sheathing is mostly intact with minimal damage):

1. Remove rough portions of existing sheathing at damaged area.
2. Fill sheathing with corrosion-inhibiting PT coating.
3. Clean and prepare surface of existing sheathing per tape manufacturer's recommendations. Outer surface of sheathing shall be dry and free of corrosion-inhibiting PT coating.
4. Tape damaged area of sheathing. Wrap tape spirally around sheathing to provide at least layers of tape at all locations. Extend tape at least 2 inches beyond damaged area.

C. Remove damaged portion of sheathing.

D. Lightly sandblast exposed prestressing steel to remove rust. Protect existing sheathing from damage (at least a minimum of 4 in. of existing sheathing should be protected at each end of the exposed portion of the sheathing within a repair opening).

E. Coat exposed prestressing steel or pressure-inject with corrosion-inhibiting PT coating. PT coating must extend to, but not cover, 4 in. of intact existing sheathing at ends of the exposed portion of sheathing.

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F. Clean and prepare the existing sheathing per tape manufacturer's recommendations. At a minimum, the surface of the sheathing shall be dry, clean, and free of corrosion-inhibiting PT coating.

G. Install new slit tube sheathing (For sheathing repairs where slit tube sheathing does not completely cover the stand, use waterproof tape in place of split sheathing).

1. Place slit tubing around prestressing strand. Position slit on side of prestressing steel, with shingle overlap (i.e., with upper portion overlapping lower portion).
2. Extend new sheathing at least 2 inches over existing sheathing.
3. Tape new sheathing. Wrap tape spirally around sheathing to provide at least 2 layers of tape. Extend tape at least 2 inches onto existing sheathing.

H. Install new wrapped sheathing (For sheathing repairs where slit tube sheathing of sufficient width to be placed around the entire circumference of the prestressing strand/wires is not available).

1. Wrap polyethylene sheeting around prestressing strand/wires, continuing around the prestressing steel at least three times to provide 3 layers of sheeting at all locations.
2. Position edge of sheeting on side of prestressing steel, with shingle overlap (i.e., with upper portion overlapping lower portion).
3. Extend new sheeting at least 2 inches over existing sheathing.
4. Wrap specialty sheathing tape spirally around sheathing to provide at least 2 layers of tape at all locations. Extend tape at least 2 inches onto existing sheathing.

I. Sheathing at couplers, central stressing splices (for 7-wire strand tendons), shall consist of heat shrink tubing. Place heat-shrink tubing over coupler, central stressing splice, or tendon during assembly of spliced tendon repair. Do not heat shrink tubing into final position until stressing is completed. Shrink tubing using a heat gun as approved by the Engineer, open flames shall not be permitted. Provide 2 in. minimum overlap with sheathing for adjacent section of tendon.

J. Protection of Anchorages (and Center Stressing Splices)

1. All new end anchor castings shall be supplied fully encased in 1 protective plastic cover, with plastic trumpet and plastic-covered encapsulation cap, to provide for full encapsulation of the new anchor.

K. Sheathing repairs shall be watertight.

3.4 SPLICING PRESTRESSING STEEL

A. Scope:

1. Repair tendons with broken or severely corroded wires at the locations determined by the Engineer by splicing in sections of new strands/tendons similar in kind, tensile strength, and size.

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2. Restress the spliced tendons to obtain their design long-term effective post-tensioning force, 0.64 P_u (or other force determined by the Engineer after seating losses. Typically, to obtain 64% of specified tensile strength in tendon after the anchors are seated, the jacking force should not exceed 74% of the specified tensile strength of the strand.)

B. Detension prestressing steel as necessary by cutting, preferably while still embedded in concrete, or by the use of specialty detensioning equipment or by other approved means. Where detensioning of only a portion of the tendon length is desired, install lock-off anchor at location determined by Engineer.

C. Remove concrete as required to expose sufficient length of prestressing steel that is not deteriorated, on both sides of deteriorated strand section, and to permit installation of splice hardware allowing adequate room for movement of the splice during elongation of the prestressing steel. Exercise care to avoid damaging remaining sound concrete and sheathing.

D. If prestressing steel drapes into or across the area of concrete removal, discuss method of removing prestressing steel with Engineer. Maintain the design tendon profile.

E. Remove deteriorated section of prestressing steel.

F. Discuss splicing procedure with Engineer to ensure that remaining concrete is not overstressed during stressing. (It is very important to ensure that the prestressing force gets into the concrete. As a result, it is generally desirable to limit the size of the tendon repair openings so that a significant portion of the member cross-section remains available to resist the prestressing force as it is restored to the structure. This is particularly critical at anchorage zones of repaired end anchors, but extent of concrete removal should be considered at all cross-sections along a member being repaired.)

G. Form as necessary and cast concrete repairs that are necessary for stressing prestressing steel. (This will include the anchorage zone in front of new tendon end anchors, and may include other locations along the tendon length as appropriate for restoring the member cross-section prior to stressing. Note that prestressing steel will elongate, so repair openings must not be recast prior to stressing in a manner that would inhibit movement of the tendon and its couplers and central stressing splices. A common technique is to leave "boxouts" of sufficient size around couplers and central stressing splices to allow them to move during stressing.) Do not stress prestressing steel until repair concrete has achieved at least 3,000 psi. Concrete repair areas shall be prepared per Section 025140, the exposed prestressing steel addressed per Paragraph I below, and the repair opening formed and cast.

H. Install splice materials.

1. Pull ends of existing prestressing steel (strand/wires/tendon) taut.
2. Install couplers, new end anchors, and central stressing 1 splices with new section of prestressing strand.
3. New sheathing may need to be placed on the tendon during splicing operations.

I. Prepare existing prestressing steel.

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1. Coat exposed existing prestressing steel with corrosion-inhibiting PT coating.
2. Install slit-tube sheathing (or wrapped sheathing for button-head wire tendons) over existing prestressing steel, and wrap with specialty waterproof tape as described above in Section 3.3.

J. At locations of couplers (and center stressing splices for 7-wire strand tendons) (and sections of new tendon wires for button-head wire tendons), use heat shrink tubing to make sheathing continuous across repair opening. Install per Paragraph above.

K. Stress PT tendon per below.

L. When stressing operation has been completed and following tendon force verification, prepare repair openings, and form and cast repair openings with concrete.

1. Inspect anchors for correct installation.
2. Inspect sheathing for damage and for continuous seal between sheathing and anchor.

    a. Repair sheathing damage to watertight condition and correct anchor deficiencies.
    b. Do not leave tendons and repair area exposed to weather without protection prior to concrete placement. The Contractor shall propose to the Engineer the plan to guarantee a full protection of the PT system to weather aggression.

3. Apply PT coating to exposed prestressing tendons/strands/wires, including strand tails at anchorages, and restore sheathing per Paragraph 3.3.
4. Shrink heat-reactive tubing into position to encapsulate prestressing steel. Seal ends of new sheathing with specialty moisture-proof sheathing tape.
5. Sandblast clean exposed concrete and steel surfaces. Protect tendons from damage.
6. Coat other exposed steel, epoxy, galvanized coating, or approved method.
7. Install dowels into sides of full-depth repair openings as required, anchoring with epoxy.
8. Add supplemental reinforcing as directed by Engineer.
9. Install encapsulation caps over strand tails and secure. Fill stressing anchorage pockets with grout. When grout will be visible, trowel smooth and rub to match adjoining surface.

3.5 EXTRACTION AND THREADING OF NEW POST-TENSIONING STRAND/WIRES

A. Provide access to tendon to be removed at appropriate locations. (Excavate access openings at high and low points and/or and end anchors: Remove external cover; etc.)

B. Detension post-tensioning strand/wires as necessary by sawcutting, preferably while still embedded in concrete, or specialty detensioning equipment. Provide protection at the end anchorages to prevent anchorage, wedges, or tendon from rebounding during detensioning and causing damage to property or passerby.

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C. Extract existing strand and thread new strand through existing sheathing. If existing strand is wet when exposed, dry sheathing. At the Engineer discretion, clean sheathing with clean rags until two clean passes are achieved. Rags may be saturated with an approved cleaning solvent prior to use. Fill sheathing with new corrosion inhibiting grease. Thread new strand through existing sheathing.

D. Install new end anchorages and repair concrete. Provide new wedges and hardware compatible with new end anchor.

E. Stress new strand per Paragraph 3.6.

F. Restore access openings at the completion of re-stressing.

3.6 STRESSING PRESTRESSING STEEL

A. Stressing operations shall be performed by personnel experienced in this Work with a minimum of PTI level 1, or under direct supervision of stressing equipment supplier's representative with a minimum of PTI level 1. Exercise care in handling stressing equipment to maintain accuracy of calibration.

B. Before stressing, verify that prestressing steel is free-moving along its length. Orient anchorage wedges in the cavity perpendicular to the jack position during stressing.

C. Stress tendon to provide a final tensile force after seating loss of 0.64 P_u or (Insert value by Engineer Typically, to obtain 64% of specified tensile strength in tendon after the anchors are seated, the jacking force should not exceed 74% of the specified tensile strength of the strand).

1. Calculate elongation for specified tensile stress for each tendon.
2. Sequence stressing as necessary.
3. Monitor hydraulic pressure and convert to jacking force with jack calibration curve.
4. Measure prestressing steel elongation and compare with calculated elongation. If difference is more than 7 percent notify the Engineer for direction. When specified tensile stress has been attained, anchor prestressing steel with wedges).
5. If required, perform lift-off test in presence of Engineer after stressing and seating of wedges (for 7-wire strand tendons). As an example, Liftoff testing may be required if the elongations do not meet the 7% as shown above.
6. Maintain stressing records during stressing operations.

D. If turnbuckle-type cable splice is used, stress tendon per the manufacturer's recommendations.

1. Calculate elongation for specified tensile stress for each tendon.
2. Restress tendon using calibrated torque wrench. Stress to designated tensile force using calculated correlation between applied torque and tensile force.
3. Measure prestressing steel elongation at various levels of stressing force and compare with calculated elongation.
4. If measured and calculated elongations differ by more than 7 percent, cease stressing operations until cause of deviation is found and corrected.

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5. Record applied torque, determine calculated tensile force, and submit to Engineer for review and approval.

E. After Engineer has accepted stressing records, prepare repair openings for concrete placement per Paragraph 3.4.L above.

1. Cut off tails of prestressing strand.
2. Clean prestressing steel, anchorages, and concrete pockets of corrosion-inhibiting grease. Use non-corrosive solvent.
3. Cut end of prestressing steel within pocket, providing for at 1 least 3/4 inches of concrete cover at remaining steel.

    a. Do not damage prestressing steel, anchorage, or concrete. Leave prestressing steel end clean and free of burrs.
    b. Do not cut strands less than ½ inch from wedges.

4. Install protective cap on cut ends where possible to prevent moisture infiltration.
5. Prestressing steel ends shall be accessible for inspection prior to and during cutting, and prior to placement of protective caps and grout.

3.7 FIELD QUALITY CONTROL

A. Stressing records shall be filled out during retensioning operations, and then be submitted to the Engineer for review and verification, per PTI M-10. The following data shall be recorded as a minimum:

1. Name of the project
2. Tendon number correlated to a plan view identifying tendon locations
3. Gauge pressure to achieve required force as per supplied calibration chart
4. Calculated elongation, and allowable range of elongations, at design tensile force.
5. Actual elongation achieved
6. Actual gauge pressure at end of stressing
7. Date of stressing operation
8. Name and signature of the stressing operator or inspector
9. Serial or identification number of jacking equipment
10. Date of approved shop drawings used for installation and stressing

B. Maintain drying records documenting changes in moisture content during drying operations, and submit to Engineer.

C. Contractor shall inspect tendons after installation. Reject, repair or replace nonconforming work.

D. Inspect sheathing for unrepaired damage, for watertight seal between sheathing and anchor, and for correct installation of anchors, before concrete is placed around tendons.

E. Engineer or testing agency retained by Owner will inspect installed Work prior to concrete placement:

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END OF SECTION 033818

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POST-TENSIONING SUPPLIER QUALIFICATION FORM

GENERAL INFORMATION:	
Project:	City:
Supplier:	
General Contractor:	

SAMPLE PROJECT #1	Date Completed:
Project Name:	$ Value of PT Sub-contract:
City and State:	Tonnage of PT tendons:
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

SAMPLE PROJECT #2	Date Completed:
Project Name:	$ Value of PT Sub-contract:
City and State:	Tonnage of PT tendons:
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

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POST-TENSIONING SUPPLIER QUALIFICATION FORM

SAMPLE PROJECT #3	Date Completed:
Project Name:	$ Value of PT Sub-contract:
City and State:	Tonnage of PT tendons:
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

SAMPLE PROJECT #4	Date Completed:
Project Name:	$ Value of PT Sub-contract:
City and State:	Tonnage of PT tendons:
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

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POST-TENSIONING SUPPLIER QUALIFICATION FORM

SAMPLE PROJECT #5	Date Completed:
Project Name:	$ Value of PT Sub-contract:
City and State:	Tonnage of PT tendons:
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

REQUIRED ATTACHMENTS	
	Quality plan for manufacture, delivery, and detailing of post-tensioning system.
	Verification letter stating that the post-tensioning system will be manufactured in a plant with a current PTI certification and that all materials conform with ACI 301, ACI 318, and are approved by the International Code Council (International Building Code.)

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POST-TENSIONING INSTALLER QUALIFICATION FORM

GENERAL INFORMATION:	
Project:	City:
Installer:	
General Contractor:	

SAMPLE PROJECT #1	Date Completed:
Project Name:	$ Value of PT Contract:
City and State:	
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

SAMPLE PROJECT #2	Date Completed:
Project Name:	$ Value of PT Contract:
City and State:	
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

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POST-TENSIONING INSTALLER QUALIFICATION FORM

SAMPLE PROJECT #3	Date Completed:
Project Name:	$ Value of PT Contract:
City and State:	
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

SAMPLE PROJECT #4	Date Completed:
Project Name:	$ Value of PT Contract:
City and State:	
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

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POST-TENSIONING INSTALLER QUALIFICATION FORM

SAMPLE PROJECT #5	Date Completed:
Project Name:	$ Value of PT Contract:
City and State:	
Engineer of Record	General Contractor
Name:	Project Manager:
Firm:	Firm:
Phone Number:	Phone Number:
Email:	Email:

REQUIRED ATTACHMENTS	
	Resume of Project Superintendent indicating required experience.
	Letter from post-tensioning Supplier accepting Installer.
	Verification letter stating that the Installer has a current PTI certification and that PTI Certified Field Installers will be used to install and stress post-tensioning system.

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SECTION 036300 - 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."

1.3 QUALITY ASSURANCE

A. 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.

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B. 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

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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.

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 1-year period from date of acceptance of Work required under this Section against leakage or bond failure:

1. Any adhesive or cohesive failure.
2. Crazing 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:

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1. Epoxy injection unit shall be portable and equipped with positive displacement-type pumps with interlock to provide positive ration control of epoxy injection resin components. Pumps shall be air or electric powered and shall provide in-line mixing and metering system and shall be equipped with drain-back plugs.
2. Equipment used to inject epoxy shall be capable of following:

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

PART 3 - EXECUTION

3.1 PREPARATION

A. Crack Identification:

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

B. Crack Preparation for Injection:

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

3.2 INSTALLATION

A. Epoxy Injection:

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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.

END OF SECTION 036300

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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.

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.

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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."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."

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.

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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.

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.

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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.

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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.

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).

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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 071416 - FLUID-APPLIED WATERPROOFING

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. Polyurethane waterproofing.

B. Related Requirements:

1. Section 071800 "Traffic Coatings" for exposed, fluid-applied membrane with an integral wearing surface.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at **Project site**. Meet at project site well in advance (30 days minimum) of time scheduled for Work to proceed to review requirements for Work and conditions that could interfere with successful membrane installation/performance. Require every party concerned with fluid applied membrane Work, or required to coordinate with it or protect it thereafter, to attend. Include manufacturer's technical representative and warranty officer.

1. Review waterproofing requirements including, but not limited to, the following:

a. Surface preparation specified in other Sections.
b. Minimum curing period.
c. Forecasted weather conditions.
d. Special details and sheet flashings.
e. Repairs.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

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.

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4. Include construction details, material descriptions, and tested physical and performance properties of waterproofing.
5. Include manufacturer's written instructions for evaluating, preparing, and treating substrate prior to application.

B. Shop Drawings:

1. Show locations and extent of waterproofing.
2. Include details for substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

C. Samples: For each exposed product and for each color and texture specified, including the following products:

1. Flashing sheet, 8 by 8 inches (200 by 200 mm).
2. Membrane-reinforcing fabric, 8 by 8 inches (200 by 200 mm).
3. Drainage panel, 4 by 4 inches (100 by 100 mm).
4. Isolation Layer (Slip Sheet), 4 by 4 inches (100 by 100 mm).

1.5 INFORMATIONAL 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. VOC shall also comply with Bay Area Air Quality Management District (BAAQMD) regulations and limits.
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.

B. Field quality-control reports.

C. Sample Warranties: For special warranties.

D. 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 protection course is installed.
5. Any other special instructions required to ensure proper installation.

E. Field Quality Control:

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

F. Qualification Statements

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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 QUALITY ASSURANCE

A. Installer Qualifications: An entity that employs installers and supervisors who are certified, trained and approved by waterproofing manufacturer.

B. Mockups: Build mockups to verify selections made under Sample submittals and to set quality standards for installation.

1. Build mockup for each typical waterproofing installation including accessories to demonstrate surface preparation, crack and joint treatments, inside and outside corner treatments, protection and drainage course and slip sheet.

   a. Size: **100 sq. ft. (9.3 sq. m) in area]**
   b. Description: Each type of **deck** installation.

2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Owner/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: Apply waterproofing within the range of ambient and substrate temperatures recommended in writing by waterproofing manufacturer.

1. Do not apply waterproofing to a damp or wet substrate, when relative humidity exceeds 85 percent, or when temperatures are less than 5 deg F (3 deg C) above dew point.
2. Do not apply waterproofing in snow, rain, fog or mist, or when such weather conditions are imminent during application and curing period.

B. Maintain adequate ventilation during application and curing of waterproofing materials.

1.8 WARRANTY

A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace waterproofing that fails in materials or workmanship within specified warranty period.

1. Warranty Period: **Ten [10]** years from date of Substantial Completion.

B. Installer's Special Warranty: Specified form, signed by Installer, covering Work of this Section, for warranty period of **two** (2) years.

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1. Warranty includes removing and reinstalling protection board, drainage panels, and concrete wear surface.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Source Limitations for Waterproofing System: Obtain waterproofing materials from single source from single manufacturer.

2.2 TWO-COMPONENT POLYURETHANE WATERPROOFING

A. Two-Component, Modified Polyurethane Waterproofing: **ASTM C 836/C 836M**.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. C.I.M Industries Inc. - CIM 1000/CIM1000TG – 90 dry mil application.

b. Engineers approved equal prior to bidding.

2.3 MATERIALS DRAINAGE COURSE GEOTEXTILE

A. Acceptable products for drainage and filtration are listed below:
1. Geogrid Drainage System:
a. Non-woven Geotextile Faced:
1) "Hydrodrain 300"; Hydrotech
2) "J-Drain 300"; JDR

2. Isolation Layer (Slip Sheet) - Nonwoven needlepunched geotextile fabric. Tensile strength 90lbs, with water flow rate of 150 g/min/sf.

a. US 90NW – US Fabrics. Inc.

b. Engineers approved equal.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials recommended in writing by waterproofing manufacturer for intended use and compatible with one another and with waterproofing.

1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.

B. Primer: Manufacturer's recommended. **CIM EMT PRIMER - C.I.M Industries Inc.**

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C. Joint Reinforcing Strip: Manufacturer's recommended scrim, fiberglass mesh or polyester fabric.

D. Joint Sealant: Multicomponent polyurethane sealant, compatible with waterproofing; and as recommended by manufacturer for substrate and joint conditions.

2.5 PROTECTION COURSE

A. Protection Course: ASTM D 6506, semi-rigid sheets of fiberglass or mineral-reinforced-asphaltic core, pressure laminated between two asphalt-saturated fibrous liners and as follows:

1. Manufacturers: Subject to compliance with requirements, provide products from one of the following:

   a. Henry Company; Asphalt Protection Board.
   b. Soprema, Inc; Sopraboard.
   c. W. R. Meadows, Inc; Protection Course.

2. Thickness: 1/8 inch (3 mm) nominal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work.

1. Verify that concrete has cured and aged for minimum time period recommended in writing by waterproofing manufacturer.
2. Verify that substrate is visibly dry and within the moisture limits recommended in writing by manufacturer. Test for capillary moisture by plastic sheet method according to ASTM D 4263.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean, prepare, and treat substrates according to manufacturer's written instructions. Provide clean, dust-free, and dry substrates for waterproofing application.

B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage and overspray affecting other construction.

C. Close off deck drains and other deck penetrations to prevent spillage and migration of waterproofing fluids.

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D. Remove grease, oil, bitumen, form-release agents, paints, curing compounds, acid residues, and other penetrating contaminants or film-forming coatings from concrete.

1. Abrasive blast clean concrete surfaces uniformly to expose top surface of fine aggregate according to ASTM D 4259 with a self-contained, recirculating, blast-cleaning apparatus. Remove material to provide a sound surface free of laitance, glaze, efflorescence, curing compounds, concrete hardeners, or form-release agents. Remove remaining loose material and clean surfaces according to ASTM D 4258.

E. Remove fins, ridges, and other projections, and fill honeycomb, aggregate pockets, holes, and other voids.

3.3 PREPARATION AT TERMINATIONS, PENETRATIONS, AND CORNERS

A. Prepare surfaces at terminations and penetrations through waterproofing and at expansion joints, drains, sleeves, and corners according to waterproofing manufacturer's written instructions and to recommendations in **ASTM C 898/C 898M**

B. Apply waterproofing in two separate applications, and embed a joint reinforcing strip in the first preparation coat when recommended by waterproofing manufacturer.

3.4 JOINT AND CRACK TREATMENT

A. Prepare, detail, treat, rout, and fill joints and cracks in substrate according to waterproofing manufacturer's written instructions and to recommendations in **ASTM C 898/C 898M**. Before coating surfaces, remove dust and dirt from joints and cracks according to ASTM D 4258.

1. Comply with ASTM C 1193 for joint-sealant installation.
2. 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.

B. Install flashing and bond to deck and wall substrates where required according to waterproofing manufacturer's written instructions.

1. Extend flashings for **2.5 inches** onto perpendicular surfaces and items penetrating substrate.

3.5 WATERPROOFING APPLICATION

A. Apply waterproofing according to manufacturer's written instructions and to recommendations in **ASTM C 898/C 898M**. Start installing waterproofing in presence of manufacturer's technical representative.

B. Apply primer over prepared substrate unless otherwise instructed in writing by waterproofing manufacturer.

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C. Unreinforced Waterproofing Applications: Mix materials and apply waterproofing by spray, roller, notched squeegee, trowel, or other application method suitable to slope of substrate.

1. Apply one or more coats of waterproofing to obtain a seamless membrane free of entrapped gases and pinholes, with a **dry film thickness of 90 mils (2.25 mm)**].
2. Apply waterproofing to prepared wall terminations and vertical surfaces.
3. Verify manufacturer's recommended wet film thickness of waterproofing every 200 sq. ft. (18.6 sq. m).

D. Cure waterproofing, taking care to prevent contamination and damage during application and curing.

E. Install protection course with butted joints over waterproofing before starting subsequent construction operations.

1. For horizontal applications, install protection course loose laid over fully cured membrane.
2. For vertical applications, set protection course in nominally cured membrane, which will act as an adhesive. If membrane cures before application of protection course, use adhesive.

3.6 MOLDED-SHEET DRAINAGE PANEL INSTALLATION

A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesive or another method that does not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

3.7 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 90% of average acceptable thickness. Immediately apply more material to any area not maintaining these standards.

B. Testing Agency: Contractor shall provide and engage a qualified testing agency to perform tests and inspections:

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1. Testing agency shall verify thickness of waterproofing during application for each **1000 sq. ft. of** installed waterproofing or part thereof.

2. Electronic Leak-Detection Testing:

   a. Testing agency shall test **each deck area (phase)** for leaks using an electronic leak-detection method that locates discontinuities in the waterproofing membrane.
   b. Testing agency shall perform tests on abutting or overlapping smaller areas as necessary to cover entire test area.
   c. Testing agency shall create a conductive electronic field over the area of waterproofing to be tested and electronically determine locations of discontinuities or leaks, if any, in the waterproofing.
   d. Testing agency shall provide survey report indicating locations of discontinuities, if any.

C. Manufacturer's Field Service: Engage a site representative qualified by waterproofing membrane manufacturer to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components and to furnish daily reports to Engineer.

D. If test results or inspections show waterproofing does not comply with requirements, remove and replace or repair the waterproofing as recommended in writing by manufacturer, and make further repairs after retesting and inspecting until waterproofing installation passes.

E. Prepare test and inspection reports.

3.8 PROTECTION

A. Do not permit foot or vehicular traffic on unprotected membrane.

B. Protect waterproofing from damage and wear during remainder of construction period.

C. Protect installed membrane system from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

D. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.

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

END OF SECTION 071416

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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:

A. At stairs as shown on drawings.

B. Over occupied space as shown on the drawings.

C. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.

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

1. Division 03 Section, "Cast-in-Place Concrete - Restoration."
2. Division 03 Section, "Pre-Packaged Repair Mortar."
3. Division 07 Section, “Concrete Joint Sealants”
4. Division 09 Section, "Pavement Markings."

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Distribute reviewed submittals to all others whose Work is related.

B. Pre-installation Conference: Meet at project site well in advance of time scheduled for Work to proceed to review requirements for Work and conditions that could interfere with successful coating performance. Require every party concerned with coating Work, or required to coordinate with it or protect it thereafter, to attend. Include manufacturer's technical representative and warranty officer.

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C. Make submittals in accordance with requirements of Division 01 Section, "Submittal Procedures:"

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. 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. **VOC shall also comply with Bay Area Air Quality Management District (BAAQMD) regulations and limits.**
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 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.

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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

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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.

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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.

F. Vandalism, and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of 1 of following, only where specifically named in product category:

1. Advanced Polymer Technology (APT), Harmony, PA
2. BASF Building Systems (BASF), Shakopee, MN
3. Lymtal International Inc. (Lymtal), Lake Orion, MI.
4. Neogard Division of Jones-Blair Company (Neogard), Dallas, TX.
5. Sika Corporation (Sika), Lyndhurst, NJ.

2.2 MATERIALS, TRAFFIC COATING

A. Acceptable low odor coatings are listed below. Coatings shall be compatible with all other materials in this Section and related work.
1. VOC Compliant, **Extreme** Low Odor, High-Solids, Fast Cure, Heavy Duty Coating System:

a. AutoGard FC HD-48, Neogard.
b. Iso-Flex 760 U HL AR and 760 U HL AL, Lymtal.
c. MasterSeal Traffic 2500, BASF.
d. Qualideck Heavy Vehicular (152/252/372/512), APT
e. Sikalastic 720/745, Sika.

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B. Recoating [**Complete System**]: Provide complete traffic coating system with all components specified for new, heavy-duty applications, including all waterproofing and wearing courses.

C. Recoating [**Partial System**]: Provide all wearing course components specified for new heavy-duty applications.

D. Provide ultraviolet screening for all traffic coating placed on this project.

E. Finish top coat shall be colored grey.

F. Substitutions: **None** for this project. Contact Engineer/Architect for consideration for future projects.

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 debonded traffic coatings. Remove all laitance and surface contaminants, including oil, grease and dirt, by waterblasting and appropriate degreasers, or as specified by manufacturer's written recommendations to provide warranty.

D. 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.

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E. 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.

F. 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.

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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.

END OF SECTION 071800

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SECTION 079233 – CONCRETE JOINT SEALANTS

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 the following Sections:

1. Division 07 Section, "Joint Sealants"

B. This Section includes the following:

1. Exterior joints in the following horizontal traffic bearing surfaces:

a. Construction joints in cast-in-place concrete.
b. Control joints in topping slabs.
c. Perimeter of all floor drains.
d. Perimeter of floor penetrations identified on the Drawings.
e. Other joints as indicated on the Drawings.

2. Exterior joints in the following vertical and horizontal non-traffic surfaces:

a. Construction joints in cast-in-place concrete.
b. Cove joints at intersection of horizontal and vertical concrete.
c. Other joints as indicated on the Drawings.

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

1. Division 03 Section, "Cast-in-Place Concrete Restoration."
2. Division 03 Section, "Pre-Packaged Repair Mortar."
3. Division 09 Section, "Pavement Markings."

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. Materials shall be compatible with materials or related Work with which they come into contact, and with materials covered by this Section.
2. Distribute reviewed submittals to all others whose Work is related.
3. Coordinate layout of joint system and approve methods for providing joints with concrete contractors.

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B. Make submittals in accordance with requirements of Division 01 Section, "Submittal Procedures:"

1.4 ACTION SUBMITTALS

A. Product Data: For each system indicated at least 14 days prior to application.

1. Product description, technical data, appropriate applications and limitations.
2. Primer type and application rate

B. Samples:

1. One for each system indicated.

C. Sample Warranty: For each system indicated.

1.5 INFORMATION SUBMITTALS

A. Certificates:

1. Evidence of installer's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
2. Certification from the Manufacturer that joint details as specified are acceptable for system to be installed at least 1 month before placement of any concrete which will receive joint sealant.

B. Field Quality Control:

1. Two copies each of manufacturer's technical representative's log for each visit.
2. Testing agency field and test reports.

C. Qualification Statements:

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

1.6 CLOSEOUT SUBMITTALS

A. Final executed Warranty.

1.7 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Owner retains right to reject any manufacturer.

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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 10 or more projects completed with submitted sealant, to include:

    a. Name and location of project.
    b. Type of sealant 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 installer or subcontractor.

1. Installer shall be legally licensed to perform work in the state of California. 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 sealant.
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. Licensing/certification document from system manufacturer that confirms sealant installer is a licensed/certified applicator for the manufacturer and is legally licensed to perform work in the state of California.
2. 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.

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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. Manufacturer: Furnish Owner with written total responsibility Joint and Several Warranty, detailing responsibilities of manufacturer and installer with regard to warranty requirements (Joint and Several). The warranty shall provide that sealant 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. Weathering.
3. Abrasion or tear failure resulting from normal traffic use.

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 the following in the terms of the 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.

F. Snowplows, vandalism, and abnormally abrasive maintenance equipment are not normal traffic use and are exempted from warranty.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturer: Subject to compliance with requirements, provide products of 1 of following, only where specifically named in product category:

1. BASF Building Systems (BASF), Shakopee, MN.
2. Dow Corning Corp. (Dow Corning), Midland, MI.
3. Lymtal International Inc. (Lymtal), Lake Orion, MI.

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4. Pecora Corporation (Pecora), Harleysville, PA.
5. Sika Corporation (Sika), North Canton, OH.
6. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, JOINT SEALANT SYSTEM

A. Provide complete system of compatible materials designed by manufacturer to produce waterproof, traffic-bearing control joints as detailed on Drawings.

B. Compounds used for sealants shall not stain masonry or concrete. Aluminum pigmented compounds not acceptable.

C. Color of sealants shall match adjacent surfaces.

D. Closed cell or reticulated backer rods: Acceptable products:

1. "Sof Rod," Nomaco Inc., 501 NMC Drive, Zebulon, NC 27597. (800) 345-7279 ext. 341.
2. "ITP Soft Type Backer Rod," Industrial Thermo Polymers Limited, 2316 Delaware Ave., Suite 216, Buffalo, NY 14216. (800) 387-3847.
3. "MasterSeal 921 Backer Rod," BASF.

E. Bond breakers and fillers: as recommended by system manufacturer.

F. Primers: as recommended by sealant manufacturer.

G. Acceptable sealants are listed below. Sealants shall be compatible with all other materials in this Section and related work.

H. Acceptable polyurethane control joint sealants (traffic bearing):
1. Iso-flex 880 GB or Iso-flex 881, Lymtal.
2. Dynatrol II-SG or Urexpan NR 200, Pecora.
3. Sikaflex-2c SL, Sika.
4. THC-900, THC-901, Vulkem 45SSL, Dymeric 240, Dymeric 240 FC or Dymonic 100, Tremco.

I. Acceptable polyurethane vertical and cove joints sealants (non-traffic bearing):

1. Sikaflex-2c NS, Sika.
2. MasterSeal NP-2, BASF.
3. Dymeric 240/240FC, Dymonic 100 or THC 901 (cove only), Tremco.
4. Dynatred, Pecora.
5. Iso-flex 881, Lymtal.

J. Proposed Substitutions: None for this project. Contact Engineer/Architect for consideration for future projects.

PART 3 - EXECUTION

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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 installation

1. Concrete surfaces are finished as acceptable for system to be installed.
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.

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. Correct unsatisfactory conditions before installing sealant system.

C. Acid etching is prohibited.

D. Grind joint edges smooth and straight with beveled grinding wheel before sealing. All surfaces to receive sealant shall be dry and thoroughly cleaned of all loose particles, laitance, dirt, dust, oil, grease or other foreign matter. Obtain written approval of method from system manufacturer before beginning cleaning.

E. Final preparation of joints shall be a sandblast with medium that removes dust and ground material from surfaces to receive sealant.

F. Check preparation of substrate for adhesion of sealant.

G. Prime and seal joints and protect as required until sealant is fully cured. A primer coat is required for all systems.

3.3 INSTALLATION/APPLICATION

A. Do all Work in strict accordance with manufacturer's written instructions and specifications including, but not limited to, moisture content of substrate, atmospheric conditions (including relative humidity and temperature), thicknesses and texture, and as shown on Drawings.

B. Completely fill joint without sagging or smearing onto adjacent surfaces.

C. Self-Leveling Sealants: Fill horizontal joints slightly recessed to avoid direct contact with wheel traffic.

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D. Non-Sag Sealants: Tool joints concave: Wet tooling not permitted.

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

F. 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.

3.4 FIELD QUALITY CONTROL

A. Contractor and Engineer/Architect will jointly determine which one of following 2 methods of sealant testing to verify sealant profile:

1. Contractor, at Engineer/Architect's direction, shall cut out lesser of 1% of total lineal footage placed or total of 100 lineal ft of joint sealant at isolated/random locations (varying from in. to ft of material) for Engineer/Architect and Manufacturer's Representative inspection of sealant profile.
2. Contractor, at Engineer/Architect's direction, shall install 3 trial joint sections of 20 ft each. Contractor shall cut out joint sections, as selected by Engineer/Architect, for Engineer/Architect and Manufacturer's Representative inspection. Additional isolated/random removals may be required where sealant appears deficient. Total cut out sealant shall not exceed lesser of 1% of total lineal footage placed or total of 100 lineal ft of joint sealant at isolated/random locations (varying from in. to ft of material) for Engineer/Architect and Manufacturer's Representative inspection of sealant profile.

B. Repair all random joint sealant "cut out" sections at no cost to Owner.

C. Testing Agency:

1. Check shore hardness per ASTM standard specified in sealant manufacturer's printed data.

END OF SECTION 079233

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SECTION 099120 - PAVEMENT MARKING

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 paint systems for the high build, two coat systems for the items of types, patterns, sizes, and colors described in this article.

B. Provide the following systems:
   1. Provide new traffic markings on Top Level of the parking structure to as indicated on drawings.
   2. Provide painting of curbs and curb ramps as described in the following paragraphs:

   3. 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 except those which do not exceed 3'0" in width and abut a wall, spandrel panel, bumper wall guardrail or other construction (not including landscaping or equipment) which prevents passage of pedestrians.
   4. Paint color for curbs and curb ramps shall be yellow.

C. Proportion International Symbol of Accessibility in accordance with ICC A117.1-2009 Accessible and Usable Buildings or 2010 ADA Standards for Accessible Design.

D. 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.

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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.

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. 100% acrylic waterborne - paint shall be used for white and yellow pavement markings and shall meet requirements of MPI #70.

1. All products shall have performance requirements of Type I and II of Federal Standard TT-P-1952E.

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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.

2.3 COLOR OF PAINT

A. Color of paint unless noted otherwise on Contract Drawings, shall be white and shall 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.

B. Paint color for traffic yellow, where shown on Contract Drawings or specified herein, shall match federal color chip No. 33538 commonly referred to as federal highway yellow. 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.

C. Paint color for blue accessible parking space pavement markings, if shown on Contract Drawings, shall 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.

D. Paint color for green special-use parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 34108. 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.

E. Paint color for red special-use parking space pavement markings, if shown on Contract Drawings, shall match federal color chip No. 31136. 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.

F. Paint color for black special-use pavement markings, if shown on Contract Drawings, shall match federal color chip No. 37038. Black paint shall also meet Federal Specification TT-P-110.

2.4 BEADS

A. Use Glass Beads (Spheres) in all pavement markings except stall striping lines. Conform to Federal Specification TT-B-1325D, Type I. Broadcast beads into markings at rate not less than 6 lbs. per gallon of paint.

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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. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

C. 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.

D. Striping shall not be placed until full cure of concrete slab and sealer. Concrete surfaces generally require 30 to 90 days @ 70°F or higher. 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.

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, and incompatible paints and encapsulants.

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. 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

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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.

F. 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.

G. Mixing:

1. Do not intermix materials of different character or different manufacturer.
2. Do not thin material except as recommended by manufacturer.

H. 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 paint in 2-coat system; first coat shall be 50% of total 15 wet mil minimum thickness, not to exceed 8 mils. First coat shall be cured prior to installation of second coat.

1. Two coat system total wet mil thickness of 0.015 in (0.381 mm).

B. Apply painting and finishing materials in accordance with manufacturer's directions. Use applications and techniques best suited for material and surfaces to which applied.

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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.

C. Application of beads and/or silica sand shall coincide with application of paint, but shall be done as separate operation by a suitable dispenser. Sand may be premixed with paint for application to curbs only. Glass beads and silica sand shall adhere to the cured paint or all marking operations shall cease until corrections are made.

D. 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).

3.4 APPLICATION OF TEMPORARY PAVEMENT MARKING

A. Temporary pavement markings shall be preformed tape, conforming to ASTM D4592, type 1, removable.

B. Temporary pavement markings shall be applied after paving, but before being opened to traffic and parking. Markings that are improperly applied and come loose shall be replaced at Contractor's expense, as directed by Engineer/Architect.

C. Temporary pavement markings on finished pavement surface shall be installed allowing for lateral tolerance of ±2 in. center to center. Temporary pavement markings that are installed outside specified lateral tolerances shall be removed and replaced, as directed by Engineer/Architect, at Contractor's expense.

D. All marking shall have width of 4 in. unless otherwise specified. Markings shall be either white or yellow per Contract Drawings.

E. Apply and remove preformed tape per manufacturer's instructions.

F. Remove all temporary pavement markings prior to placing permanent pavement markings.

END OF SECTION 099120

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SECTION 220500 - COMMON WORK RESULTS FOR PLUMBING

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 other Sections of Division 22.

B. References:

1. American National Standards Institute (ANSI):
2. National Standard Plumbing Code (NAPHCC):
3. American Society for Testing and Materials (ASTM):

    a. ASTM A74, "Specification for Cast Iron Soil Pipe and Fittings".
    b. ASTM A120, "Specification for Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless Steel Pipe for Ordinary Use".
    c. ASTM A234, "Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures".
    d. ASTM B88, "Specification for Seamless Copper Water Tube".
    e. ASTM C76, "Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe".
    f. ASTM C700, "Specification for Extra Strength and Standard Strength Clay Pipe and Perforated Clay Pipe".
    g. ASTM D3034, "Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings".

1.2 SUMMARY

A. This Section includes general administrative and procedural requirements for mechanical installations. Following administrative and procedural requirements are included in this Section to expand the requirements specified in Division 01:

1. Submittals.
2. Coordination/Scheduling/Quality Assurance.
3. Record documents.
4. Maintenance manuals.
5. Rough-ins.
6. Mechanical installations.
7. Cutting and patching.
8. Testing/Guarantee
9. Piping materials and installation common to most piping systems.
10. Fittings and Joints.
11. Floor and Trench Drains
12. Cleanouts.

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13. Labeling & Identifying.

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

1. The remainder of Division 22, plus general related specifications including:

a. Access to mechanical installations.
b. Excavation for mechanical installations within the building boundaries, and from building to utilities connections.

C. Definitions:

1. Term "Contractor" used throughout Division 22 shall mean Mechanical Subcontractor.
2. 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.

1.3 SUBMITTALS

A. General: Follow the procedures specified in Division 01 Section "Submittal Procedures" and as specified in this Section.

B. Shop Drawings and Catalog Sheets. Include:
1. Floor drains.
2. Cleanouts.
3. Expansion joints for plumbing lines.
4. Support material and hardware.

C. Substitutions:

1. Products are referenced in Specification and on 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. Contractor assumes all engineering and construction costs necessary for revision in Work due to substitute material or equipment.

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1.4 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 this examination before Bidding.
2. Verify all dimensions in field before ordering any material or doing any Work.
3. Verify ceiling heights or other architectural and structural details before installing any piping.
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 difference which may be found before proceeding with Work.

1.5 SEQUENCING AND SCHEDULING

1. Coordinate mechanical equipment installation with other building components.
2. Arrange for chases, slots, and openings in building structure during progress of construction to allow for mechanical installations.
3. Coordinate the installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
4. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Coordinate installation of large equipment requiring positioning prior to closing in the building.
5. Coordinate connection of electrical services.
6. Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies.
7. Schedule Work so as to coordinate with other Contractors.
8. Before starting Work, prepare and submit to Prime Contractor schedule of operations outlining proposed order of procedure, giving dates of execution and estimated time requited for completion of each step.
9. After schedule has been accepted by Prime Contractor and Engineer/Architect, do not deviate from schedule without written consent of Prime Contractor.
10. No subsequent extras will be allowed for materials and labor not included by Bidder for Mechanical Work due to lack of familiarity with Contract Documents as they relate to Work of all other trades required for Project.

1.6 QUALITY ASSURANCE

A. Qualify welding processes and operators for structural steel according to AWS D1.1 "Structural Welding Code--Steel".

B. Qualify welding processes and operators for piping according to ASME "Boiler and Pressure Vessel Code", Section IX, "Welding and Brazing Qualifications".

1. Comply with provisions of ASME B31 Series "Code for Pressure Piping".
2. Certify that each welder has passed AWS qualification tests for the welding processes involved and that certification is current.

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C. ASME A13.1 for lettering size, length of color field, colors, and viewing angles of identification devices.

D. Equipment Selection: Equipment of greater or larger power, dimensions, capacities, and ratings may be furnished provided such proposed equipment is approved in writing and connecting mechanical and electrical services, circuit breakers, conduit, motors, bases, and equipment spaces are increased. No additional costs will be approved for these increases, if larger equipment is approved. If minimum energy ratings or efficiencies of the equipment are specified, the equipment must meet the design requirements and commissioning requirements.

1.7 CODES AND STANDARDS

1. Comply with:

    a. American Welding Society (AWS).
    b. American Society of Mechanical Engineers (ASME).
    c. American National Standards Institute (ANSI).
    d. American Society for Testing and Materials (ASTM).
    e. American Insurance Association (A.I.A.).
    f. National Fire Protection Association (NFPA).
    g. Underwriters' Laboratories, Inc. (UL).
    h. Manufacturer's Standardization Society of the Valve & Fittings Industry, Inc. (MSS).
    i. Factory Mutual Research Corp. (FM).
    j. Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
    k. American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE)

2. All local, state, and federal rules and regulations.

    a. 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.

3. Should any change in Drawings and Specifications be required to comply with local regulations, notify Engineer/Architect at least 7 days before time set for receiving Bids. After entering into contract, Contractor will be held to complete all Work necessary to meet local requirements without extra expense to Owner.
4. Maintain a competent superintendent at Project throughout progress of Work and until Work is completed.

1.8 RECORD DOCUMENTS

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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 the following installed conditions:

1. Mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.). Valve location diagrams, complete with valve tag chart. Indicate actual inverts and horizontal locations of underground piping.
2. Equipment locations (exposed and concealed), dimensioned from prominent building lines.
3. Approved substitutions, contract modifications, and actual equipment and materials installed.
4. Contract modifications, actual equipment and materials installed.

1.9 MAINTENANCE MANUALS

A. Prepare maintenance manuals in accordance with Division 01 Section "Closeout Procedures" In addition to the 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.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 ROUGH-IN

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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. Drawings are generally diagrammatic and indicative of Work to be installed.

D. Do not scale Drawings for rough-in Work.

3.2 MECHANICAL INSTALLATIONS

A. General: Sequence, coordinate, and integrate the various elements of mechanical systems, materials, and equipment. Comply with the following requirements:

1. Coordinate mechanical systems, equipment, and materials installation with other building components so as not to delay Contractors.
2. Verify all dimensions by field measurements.
3. Arrange for chases, slots, and openings in other building components during progress of construction, to allow for mechanical installations.
4. Coordinate the installation of required supporting devices and sleeves to be set in poured-in-place concrete and other structural components, as they are constructed.
5. Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing in the building.
6. Where mounting heights are not detailed or dimensioned, install systems, materials, and equipment to provide the maximum headroom possible.
7. Coordinate connection of mechanical 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.
8. 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 the Engineer/Architect.
9. Install systems, materials, and equipment level and plumb, parallel and perpendicular to other building systems and components, where installed exposed in finished spaces.
10. Install mechanical 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. Extend grease fittings to an accessible location.
11. Install systems, materials, and equipment giving right-of-way priority to systems required to be installed at a specified slope.
12. Install piping to occupy minimum of space. Install parallel and close to walls, ceiling, columns or other members providing proper space for covering or removal of pipes.
13. Coordinate Work to avoid interferences with other trades.

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14. Due to small scale of Drawings, it is not possible to indicate all offsets, fittings or valves which may be required. Investigate structural and finish conditions affecting this Work. Plan accordingly, furnishing such offsets, fittings and valves as may be required.
15. Where possible, locate all plumbing lines in areas which are out of public view.
16. Review plumbing layout with Engineer/Architect before construction.
17. In case of conflict between riser diagram and floor plan, greater quantity or better quality prevails, subject to approval of Engineer/Architect.
18. Coordinate all Work specified in this Division with Work of all other trades required for Project.
19. Check Structural Drawings for location of drains, vents and other Mechanical Work. In case of conflict between Structural Drawings and Mechanical Drawings, Structural Drawings take precedence.
20. Notify Engineer/Architect immediately and confirm in writing of any conflict between Mechanical and Structural Drawings.
21. Finish painting will be done by others.
22. Any galvanized equipment, material, or hardware that is cut, scratched, field threaded or grooved shall be coated with a Zinc Rich Coating (ZRC or approved equivalent).
23. In case interferences between Work develop, Engineer/Architect will decide which Work is to be relocated regardless of which was first installed.
24. Cleanup:

    a. At completion of Work under this contract, remove from site and dispose of all rubbish and discarded materials and restore disturbed facilities and surfaces.
    b. Provide entire installation thoroughly free from all oil and grease after successfully completing all tests and before Work is turned over to Owner.

3.3 PIPING SYSTEMS-COMMON REQUIREMENTS

A. General: Install piping as described below, except where system Sections specify otherwise.

B. General Locations and Arrangements: Drawings (plans, schematics, and diagrams) indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated.

C. Install all piping parallel to building walls and column lines at such height for proper drainage and so not to interfere with doorways, stairway or traffic.

D. Install suspended pipes as close to ceiling as possible and at uniform grade.

E. Where interferences develop in field, offset or reroute piping as required to clear such interferences. Use proper fittings, no bent pipe is permitted.

F. Install full-time water lines in areas not subject to freezing within building and below frost line and minimum of 36 in. below grade outside building.

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G. .Use small amount of prepared, pipe thread lubricant on outside threads.

H. Work pipe into place without springing

I. Install all piping such that it will drain and vent as shown or required.

J. Provide uniform grade to all horizontal pipes and provide drains at all low points in water piping system.

K. Cast-in-Place Insert Installation: Before placement of concrete, furnish, locate and set on forms, cast-in-place inserts which support Mechanical Work.

L. Furnish hot dipped galvanized steel pipe sleeves extended one inch above finished floor line for all pipe running through floors.

M. Install piping at indicated slope.

N. Install components having pressure rating equal to or greater than system operating pressure.

O. Install piping free of sags and bends and neat in appearance.

P. Install couplings according to manufacturer's printed instructions.

Q. Fire Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestopping sealant material. Firestopping materials are specified in Division 07 Section "Penetration Firestopping".

R. Refer to equipment specifications in other Sections for roughing-in requirements.

S. Piping Joint Construction: Join pipe and fittings as follows and as specifically required in individual piping system Sections.

1. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
2. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
3. Soldered Joints: Construct joints according to AWS "Soldering Manual", Chapter 22 "The Soldering of Pipe and Tube".
4. Brazed Joints: Construct joints according to AWS "Brazing Manual" in the "Pipe and Tube" Chapter.
5. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full inside diameter. Join pipe fittings and valves as follows:

    a. Note the internal length of threads in fittings or valve ends, and proximity of internal seat or wall, to determine how far pipe should be threaded into joint.
    b. Apply appropriate tape or thread compound to external pipe threads (except where dry seal threading is specified).
    c. Align threads at point of assembly.

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d. Tighten joint with wrench. Apply wrench to valve end into which pipe is being threaded.
e. Damaged Threads: Do not use pipe or pipe fittings having threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

T. All piping routed over finished areas must be insulated.

3.4 HANGER AND SUPPORT INSTALLATION:

A. Support piping in building on standard clevis type (MSS SP-69, No. 1) hangers, with adjustable rods.

B. Properly support all piping installed on suitable pipe hangers and supports. Permanent hangers, supports, and anchors shall be fabricated from durable materials, hot dipped galvanized or stainless steel, suitable for service conditions in accordance with details on Drawings.

C. Base required strength of all supporting equipment on combined weight of piping filled with water, plus any insulating covering.

D. Install hangers for horizontal piping with following minimum rod sizes:

Nominal Pipe Size	Minimum Rod Size
0.75 in. to 2 in. pipe	0.375 in.
2.5 in. to 3.5 in. pipe	0.5 in.
4 in. to 5 in. pipe	0.625 in.
6 in. pipe	0.75 in.
8 in. to 12 in. pipe	0.875 in.

E. Provide and install anchors in piping system to fix direction of expansion and contraction. Fabricate and assemble anchors to secure desired points of piping in relatively fixed positions. Hangers shall permit line to take up expansion and contraction freely in opposite directions away from anchored point and shall be so arranged as to be structurally suitable for particular location, line, and loading conditions in question.

F. Use expansion anchors to anchor pipe hanger and supports where inserts have been improperly located, or where necessary to support piping from existing concrete construction. Provide expansion anchors equal to Ackerman-Johnson, Paine, Phillips, Hilti, ITW Ramset/Red Head, or Rawl. Expansion anchor locations must have approval of Engineer/Architect before installation. Coordinate location with structural.

G. Support parallel pipe lines at same level on approved trapeze or saddle type hangers.

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H. Use steel rods to attach ring or trapeze hangers to building structure. Space hangers at sufficiently close intervals to support piping and its contents, 12 ft on center maximum for threaded pipes.

I. Support copper piping with copper clevis hangers, or clevis hanger with copper supporting loop.

J. Provide sheet metal collar at each pipe hanger for insulated pipe with vapor barrier.

K. Any support hardware or material that is cut, scratched or treaded shall be coated with a zinc rich coating (ZRC or equivalent) at these locations.

3.5 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 mechanical 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 the Engineer/Architect, uncover and restore Work to provide for Architect/Engineer observation of concealed Work.

B. Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including but not limited to removal of mechanical piping, heating units, and trim, and other mechanical items made obsolete by the new Work.

1. Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.
2. Provide and maintain temporary partitions or dust barriers adequate to prevent the spread of dust and dirt to adjacent areas.
3. 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".

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4. Respective trades will provide openings in floors, walls, and other members as required for installation of piping and equipment, provided that necessary information regarding such openings is furnished by contractor in timely manner.
5. If contractor fails to provide information regarding required openings, cutting and repairing of completed Work will be performed by respective trades at expense of contractor.
6. Seal all such openings in accordance with Division 07 Section "Joint Sealants."
7. Cut, channel, chase, and drill floors, walls, partitions, ceilings, and other surfaces necessary for mechanical installations only with written approval of Engineer/Architect. Perform cutting by skilled mechanics of the trades involved.
8. Repair cut surfaces to match adjacent surfaces.

3.6 LABELING AND IDENTIFYING

A. Piping Systems: Install pipe markers on each system. Include arrows showing normal direction of flow.

1. Stenciled Markers: Complying with ASME A13.1.
2. Locate pipe markers wherever piping is exposed in finished spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums), and exposed exterior locations as follows:

    a. Near each valve and control device.
    b. Near each branch, excluding short take-offs for fixtures and terminal units. Mark each pipe at branch, where flow pattern is not obvious.
    c. Near locations where pipes pass through walls, floors, ceilings, or enter inaccessible enclosures.
    d. At access doors, manholes, and similar access points that permit view of concealed piping.
    e. Near major equipment items and other points of origination and termination.
    f. Spaced at a maximum of 50 ft (15m) intervals along each run. Reduce intervals to 25 ft (7.6 m) in congested areas of piping and equipment.

B. Adjusting: Relocate identifying devices which become visually blocked by work of this Division or other Divisions.

3.7 PAINTING AND FINISHING

A. Damage and Touch Up: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.8 TESTING AND GUARANTEE

A. Testing:

1. Take out all necessary permits, arrange for all required inspections, and pay all fees and expenses associated with performing Mechanical Work.

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2. Test all piping systems at full operating pressure under normal conditions of use in accordance with requirements of Water Department, Board of Health, Fire Department, and all other authorities having jurisdiction. As a minimum, the standpipe system at 225 psi for 2 hrs.
3. Provide all instruments for making tests.
4. Perform tests on following systems:
   a. Standpipe System.

5. Test all parts of system in presence of Contractor, Engineer/Architect, Owner and Authority having jurisdiction for sufficient period of time to permit complete examination and inspection.
6. Successfully test all concealed piping before its being permanently covered up.
7. Remedy all defects in materials or workmanship which appear during test or retest of system.

B. Guarantee:

1. In addition to any specific guarantee called for by Specifications, furnish to Owner written guarantee against defects in materials, workmanship for all apparatus and materials furnished, and for entire workmanship of installation for period of 1 yr from date of acceptance of Work.
2. During guarantee period and without expense to Owner, repair all defects in workmanship or material provided under this Section.

END OF SECTION 220500

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CITY OF SANTA ROSA

STATE OF CALIFORNIA

CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

The work to be performed and referred to herein is in the City of Santa Rosa, California and consists of improvements to be constructed in accordance with the provisions of the Invitation for Bids, containing the Notice to Bidders, the Special Provisions, the Project Plan(s), the Bid Forms and the Contract, all of which are by reference incorporated herein, and each Addendum, if any is issued, to any of the above which is also incorporated by reference herein.

TO THE AWARD AUTHORITY OF THE CITY OF SANTA ROSA

The undersigned, as bidder, declares that the only person or parties interested in this bid as principals are those named herein; that this bid is made without collusion with any other person, firm, or corporation; that Contractor has carefully examined the Project Plans, Invitation for Bids and conditions therefor, and is familiar with all bid requirements, that Contractor has examined this Contract and the provisions incorporated by reference herein, and Contractor hereby proposes, and agrees that if its bid is accepted by the City, Contractor will provide all necessary machinery, tools, apparatuses, and other means of construction, and to do all the work and furnish all the materials and services required to complete the construction in accordance with the Contract, the Special Provisions, the Project Plan(s), and Addenda to any of the above as incorporated by reference, in the time stated herein, for the unit prices and/or lump sum prices as follows:

UNIT PRICE SCHEDULE

CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

NAME OF BIDDER: _____

Item No.	Item	Quantity	Units	Unit Price	Total Price
1	MOBILIZATION	1	LS	$_____	$_____
2	ELEVATION SURVEY	1	LS	$_____	$_____
3	SOLAR PANEL PROTECTION	1	LS	$_____	$_____
4	FLOOR PREPARATION - SCARIFICATION	47,200	SF	$_____	$_____
5	FLOOR PREPARATION - EXISTING WATERPROOFING REMOVAL	43,200	SF	$_____	$_____
6	FLOOR REPAIR - SUBSTRATE PARTIAL DEPTH / DEEP	400	SF	$_____	$_____
7	FLOOR REPAIR - FULL DEPTH	20	SF	$_____	$_____
8	FLOOR REPAIR - WEAR SLAB AT TRENCH DRAIN	130	SF	$_____	$_____
9	FLOOR REPAIR - WEAR SLAB	43,200	SF	$_____	$_____
10	SEAL CRACKS AND JOINTS	800	LF	$_____	$_____
11	JOINT REPAIR - EXPANSION BOARD / JOINT SEALANT	1,600	LF	$_____	$_____
12	JOINT REPAIR - TOOL, ROUT AND SEAL CONTROL JOINTS	4,000	LF	$_____	$_____
13	CRACK REPAIR - EPOXY INJECTION	800	LF	$_____	$_____
14	JOINT REPAIR - COVE SEALANT	1,900	LF	$_____	$_____
15	CRACK REPAIR - HEALER / SEALER	4,000	SF	$_____	$_____
16	EPOXY BROADCAST OVERLAY SYSTEM	1,100	SF	$_____	$_____
17	TRAFFIC TOPPING - REPAIR	200	SF	$_____	$_____
18	TRAFFIC TOPPING - RECOAT (PARTIAL SYSTEM)	4,100	SF	$_____	$_____
19	MECHANICAL - PIPE AND HANGERS	220	LF	$_____	$_____
20	MECHANICAL - EXISTING CLEANOUT REMOVAL	17	EA	$_____	$_____
21	MECHANICAL - BI-LEVEL DRAIN	22	EA	$_____	$_____
22	WI 43.1: HANDRAIL - INSTALL GUARDRAIL	85	LF	$_____	$_____
23	WI 43.2: HANDRAIL - INSTALL GUARDRAIL	430	LF	$_____	$_____
24	PAINT TRAFFIC MARKINGS (TOP LEVEL)	1	LS	$_____	$_____
25	WEAR SLAB SYSTEM - DEMOLITION CONCRETE SYSTEM	43,200	SF	$_____	$_____
26	FLUID-APPLIED WATERPROOFING WITH PROTECTION BOARD	43,200	SF	$_____	$_____
27	WEAR SLAB - DRAINAGE COURSE	43,200	SF	$_____	$_____
28	WEAR SLAB - SLIP SHEET	43,200	SF	$_____	$_____

BASE CONTRACT TOTAL $_____

ALTERNATE 1

29	P/T SYSTEM REPAIR - TENDON REPLACEMENT REPAIR (ALTERNATE 1)	1	EA	$_____	$_____
30	P/T TENDON END ANCHORAGE (LIVE) (ALTERNATE 1)	1	EA	$_____	$_____
31	P/T TENDON END ANCHORAGE (DEAD) (ALTERNATE 1)	1	EA	$_____	$_____
32	P/T TENDON MATERIAL (ALTERNATE 1)	65	LF	$_____	$_____
	TOTAL ALTERNATE 1				$_____
	TOTAL BID (BASE CONTRACT + ALTERNATE 1)				$_____

In the case of any discrepancy between the unit price and the total set forth for the item, the unit price shall prevail; provided, however, that if the amount set forth as a unit price is ambiguous, unintelligible or uncertain for any reason, or is omitted, or in the case of lump sum items, is not the same amount as the entry in the "Total" column, then the amount set forth in the "Total" column for the item shall prevail in accordance with the following:

1. As to lump sum items, the amount set forth in the "Total" column shall be the unit price;

2. As to unit basis items, the amount set forth in the "Total" column shall be divided by the estimated quantity for the item and the price thus obtained shall be the unit price.

The Total Base Bid shall be the sum of the "Total" column. In case of discrepancy between the sum of the "Total" column and the amount entered as Total Base Bid, the sum of the "Total" column shall prevail. The bid comparison will be based on the sum of the "Total" column for each bidder.

If this Contract Bid is accepted by the City and the undersigned fails to execute the Contract and to give all the bonds required under the Contract, with a surety satisfactory to the Award Authority of the City of Santa Rosa, within ten calendar days after bidder has received the Notice of Award from the Engineer, then the Award Authority may, at its option, determine that the bidder has abandoned the Contract, and thereupon this bid and the acceptance thereof shall be null and void, and the forfeiture of the security accompanying this bid shall be in accordance with California Public Contract Code section 20172.

The undersigned understands and agrees that the City is not responsible for any error or omissions on the part of the undersigned in making this bid.

The bidder to whom the Contract is awarded agrees to execute the Contract in favor of the City, in the form attached, and to deliver any and all required bond(s) and insurance certificates within ten calendar days from the date of Contractor's receipt of the Notice of Award. Following the award of the Contract, Contractor shall commence work within ten calendar days from the day authorized in the Notice to Proceed and diligently prosecute the same to completion in accordance with Section 8-1.04.

LIST OF SUBCONTRACTORS

NAME OF BIDDER: _____

The following is a list of each subcontractor who will perform work or labor or render services to the undersigned for the construction of the project in an amount in excess of ½ of 1% of the total amount of this bid.

The undersigned agrees that any portion of the work in excess of ½ of 1% of the total amount of this bid and for which no subcontractor is designated herein will be performed by the undersigned.

SUBCONTRACTOR NAME	SUBCONTRACTOR LICENSE NUMBER	SUBCONTRACTOR DIR REGISTRATION NUMBER	SUBCONTRACTOR BUSINESS ADDRESS	DESCRIPTION OF WORK (ITEM NO.)

LIST OF PREVIOUS SIMILAR JOBS

NAME OF BIDDER: _____

NONCOLLUSION DECLARATION
TO BE EXECUTED BY BIDDER AND SUBMITTED WITH BID

The undersigned declares:

I am the _____ of _____, the party making the foregoing bid. The bid is not made in the interest of, or on behalf of, any undisclosed person, partnership, company, association, organization, or corporation. The bid is genuine and not collusive or sham. The bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid. The bidder has not directly or indirectly colluded, conspired, connived, or agreed with any bidder or anyone else to put in a sham bid, or to refrain from bidding. The bidder has not in any manner, directly or indirectly, sought by agreement, communication, or conference with anyone to fix the bid price of the bidder or any other bidder, or to fix any overhead, profit, or cost element of the bid price, or of that of any other bidder. All statements contained in the bid are true. The bidder has not, directly or indirectly, submitted his or her bid price or any breakdown thereof, or the contents thereof, or divulged information or data relative thereto, to any corporation, partnership, company, association, organization, bid depository, or to any member or agent thereof, to effectuate a collusive or sham bid, and has not paid, and will not pay, any person or entity for such purpose.

Any person executing this declaration on behalf of a bidder that is a corporation, partnership, joint venture, limited liability company, limited liability partnership, or any other entity, hereby represents that he or she has full power to execute, and does execute, this declaration on behalf of the bidder.

I declare under penalty of perjury under the laws of the State of California that the foregoing is true and correct and that this declaration is executed on _____ [date], at _____ [city], _____ [state].

NOTE: The above Noncollusion Declaration is part of the Contract Bid. Signing this Bid on the signature portion thereof shall also constitute signature of this Noncollusion Declaration.

BID BOND AFFIDAVIT AND BIDDER'S SIGNATURE PAGE

Accompanying this bid is a guaranty in the form of (Notice: Insert the words "cash $," "Cashier's Check," "Certified Check," or "Bidder's Bond" as the case may be):

_____

in an amount equal to at least ten percent of the total of this bid.

The undersigned further agrees that if Contractor does not execute the Contract and deliver the necessary bonds to the City within the period of time specified in this Invitation for Bids, the proceeds of the security accompanying this bid shall become the property of the City of Santa Rosa, California, and this bid and the acceptance thereof may, at the option of the City, be considered null and void.

The undersigned is licensed in accordance with an act providing for the registration of Contractors, License No. _____, Class _____, expiration date _____.

The undersigned in registered with the Department of Industrial Relations, Registration No. _____.

IMPORTANT NOTICE: If bidder or other interested person is a corporation, state legal name of corporation, also names of the president, secretary, treasurer, and manager of the corporation; if a partnership, state true name of partnership, also the names of all partners in the partnership; if the bidder is a sole proprietor, state the business name and the proprietor's name in full.

Secretary of State Business Entity Number: _____.

_____

_____

_____

_____

Business Address

_____

Telephone Number

I declare under penalty of perjury that the foregoing is true and correct.

BIDDER'S SIGNATURE: _____

TITLE: _____

DATE: _____

CONTRACT

CITY OF SANTA ROSA

CALIFORNIA

CONTRACT NO. C01823
CITY OF SANTA ROSA PARKING GARAGE #9 - 2017 REPAIRS

This Contract is made and entered into as of date to be added upon award at Santa Rosa, California, between the City of Santa Rosa ("City") and _____ of _____ ("Contractor").

ARTICLE I - For and in consideration of the payment and agreement hereinafter mentioned, to be made and performed by City, and under the conditions expressed in the required bonds hereunto annexed, Contractor agrees that for the benefit of City, at its own cost and expense, to do all the work and furnish all the materials, except such as are mentioned in the Special Provisions to be furnished by City, necessary to construct and complete the work herein described in a good, workmanlike, and substantial manner. The work embraced herein shall be done in accordance with the Standard Specifications of the State of California Department of Transportation, dated 2010, insofar as the same may apply (Standard Specifications); in accordance with the City of Santa Rosa Construction Specifications for Public Improvements (City Specifications); in accordance with the City of Santa Rosa Design and Construction Standards, (City Standards); in accordance with the State of California Department of Transportation Standard Plans, dated 2010 (Standard Plans), (collectively, "Contract Documents") and in accordance with the Special Provisions hereinabove set forth, all of which are hereby incorporated into and made part of this Contract.

The work to be performed is further shown upon a plan consisting of 15 sheets entitled, City of Santa Rosa Parking Garage #9 - 2017 Repairs, File Number 2016-0024, approved by the Deputy Director of Transportation and Public Works, hereinafter referred to as the Project Plan(s).

ARTICLE II - Contractor agrees to receive and accept the following prices as full compensation for furnishing all materials and doing all the work contemplated and embraced in this Contract; also for all loss or damages arising out of the nature of the work aforesaid, or from the acts of the elements, or from any unforeseen difficulties or obstructions which may arise or be encountered in the prosecution of the work until its acceptance by City and for all expenses incurred by or in consequence of the suspension or discontinuance of work, and for well and faithfully completing the work, and the whole thereof in the manner and according to the Project Plans and Invitation for Bids therefor, and the requirements of the Engineer under them to wit:

ITEM NUMBER	QUANTITY	DESCRIPTION	UNIT PRICE	TOTAL
			$ _____	$ _____

TOTAL BASE BID (SUM OF "TOTAL" COLUMN) $ _____

BID ITEMS IN THIS SECTION WILL BE INSERTED UPON AWARD OF THE CONTRACT AND SHALL BE THE SAME AS THOSE BID UPON.

ARTICLE III - City and Contractor hereby promise and agree that Contractor shall provide the materials and do the work according to the terms and conditions herein contained and referred to, for the prices aforesaid, and City hereby agrees to pay for the same at the time, in the manner, and upon the conditions set forth; and the parties for themselves, their heirs, executors, administrators, successors, and assigns, do hereby agree to full performance of the covenants herein stated.

ARTICLE IV - By execution of this Contract, Contractor hereby represents and certifies that Contractor is aware of the provisions of Labor Code section 3700 which require every employer to be insured against liability for Workers' Compensation or to undertake self-insurance in accordance with the provisions of that Code, and Contractor hereby agrees to comply with such provisions before commencing the performance of the work of this Contract.

ARTICLE V - It is further expressly agreed by and between the parties hereto that the Invitation for Bids, containing the Notice to Bidders including any required Bonds, the Contract Documents, and any Addenda are all essential parts of this Contract and are specially referred to and by such reference made a part hereof. In the event of any conflict in the provisions thereof, the terms of said documents shall control each over the other, in the following order:

1. Special Provisions
2. Project Plans
3. City Standards
4. City Specifications
5. Standard Specifications
6. Standard Plans

ARTICLE VI - Contractor agrees to commence work pursuant to this Contract within ten calendar days from the date authorized in the Notice to Proceed and to diligently prosecute the same to completion in accordance with Section 8-1.04C of the Special Provisions.

This Contract shall not be transferred or assigned without the prior written consent of City, which may be withheld by City in its sole and absolute discretion.

If Contractor is a corporation, two corporate officers of Contractor, one from each of the following two groups shall execute this Contract: a) the chairman of the board, president or any vice-president; b) the secretary, any assistant secretary, chief financial officer, or any assistant treasurer. The name and title of the corporate officers shall be printed under the signature.

In witness whereof, the parties hereto have executed this Contract as of the date first written above.

City:	**Contractor:**
City of Santa Rosa, a Municipal corporation	Name of Contractor, Type of entity
By: _____	By: _____
Title: _____	Name: _____
ATTEST: By: _____	Title: _____
Title: _____	By: _____
Approved as to form:	Name: _____
By: _____ Office of City Attorney	Title: _____