Division of Finance and Business Operations

Wayne State University

2015 Parking Structures 1, 2 & 5 Renovations 2015

WSU Project Number 051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5

Prevailing Wage Work

FOR:
Board of Governors
Wayne State University
Detroit, Michigan

Owner's Representative:
Robert Jacobs, Project Manager
Facilities Planning & Management
Design & Construction Services
5454 Cass
Wayne State University
Detroit, Michigan 48202

Owner's Agent:
Kimberly Tomaszewski, **Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3757 / 313-577-3747 fax
ac9934@wayne.edu and copy **rfpteam1@wayne.edu**

Consultant:
Walker Parking Consultants
525 Avis Drive, Suite 1
Ann Arbor, MI 48108

March 5, 2015

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INFORMATION FOR BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: **2015 Parking Structures 1, 2 & 5 Renovations 2015**
Project No. **051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**

LOCATION: Wayne State University
PS-1 450 West Palmer, PS-2 5150 John C Lodge, PS-5 5501 Anthony Wayne
Detroit, Michigan 48202

OWNER'S AGENT: **Kimberly Tomaszewski**, **Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3757 / 313-577-3747 fax
ac9934@wayne.edu & copy **rfpteam1@wayne.edu**

OWNER'S REPRESENTATIVE: **Robert Jacobs,** Project Manager
Facilities Planning & Management
Design & Construction Services
Wayne State University
5454 Cass Avenue
Detroit, Michigan 48202

Architect: **Walker Parking Consultants**
525 Avis Drive, Suite 1
Ann Arbor, MI 48108

SPECIAL NOTE: Right to reject any and all proposals, either in whole or in part and to waive any irregularities therein is reserved by the Owner.

BIDS ADVERTISED: March 5, 2015

BIDDING: Bidding documents may be obtained by vendors from the University Purchasing Web Site at **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html** beginning **March 5, 2015**. When visiting the Web Site, click on the "**Construction**" link in green. Copies of the RFP will not be available at the pre-proposal meeting.

MANDATORY Pre-Bid Conference: 2:30 PM, local time, March 12, 2015 to be held at Wayne State University – **5700 Cass Ave. AAB**, **4002 AAB,** Detroit, MI, 48202. Late Arrivals may not be permitted to submit bids.

OPTIONAL Second Walk Through: (if needed) **To be determined at the conclusion of the pre-bid conference, by those in attendance.**

DUE DATE FOR QUESTIONS: Due Date for questions shall be **March 16, 2015 at 12:00 Noon.** All questions must be reduced to writing and emailed to the attention of **Kimberly Tomaszewski**, **Senior Buyer** at **ac9934@wayne.edu**, copy to **Loretta McClary**, **Senior Buyer** at: **rfpteam1@wayne.edu**.

Bids Due: Sealed proposals for lump-sum General Contract will be received at the office of the Procurement & Strategic Sourcing located at 5700 Cass Avenue, Suite 4200, Detroit, MI 48202 on **March 20, 2015,** until 2:00 p.m. (local time).

No public bid opening will be held.

Bid Qualification Meeting: Bidders must be available for bid prequalification meeting the day following the bid opening. The lowest qualified bidder will be contacted and requested to meet with Facilities Planning & Management at their office located at 5454 Cass Avenue, Detroit, MI 48202. During the prequalification, the Vendor must provide a

Project Schedule and a Schedule of Values, including a list of Contractor's suppliers, subcontractors and other qualifications.

An unsigned contract will be given to the successful Contractor at the conclusion of the Pre Award meeting, if all aspects of the bid are in order. The Contractor has 5 business days to return the contract to the Project Manager for University counter signature. The contractor must also submit a Performance Bond as outlined above and a Certificate of Insurance in the same 5 business day period. In the event the Contractor fails to return the documents in this 5 day period, the University reserves the right to award the contract to the next most responsive bidder.

All available information pertaining to this project will be posted to the Purchasing web site at
http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html.
Information that is not posted to the website is not available/not known

INSTRUCTIONS TO BIDDERS

OWNER: Board of Governors
Wayne State University

PROJECT: **2015 Parking Structures 1, 2 & 5 Renovations 2015**
Project No. **051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**

LOCATION: Wayne State University
PS-1 450 West Palmer, PS-2 5150 John C Lodge, PS-5 5501 Anthony Wayne,
Detroit, Michigan 48202

OWNER'S AGENT: **Kimberly Tomaszewski**, **Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3757 / 313-577-3747 fax
ac9934@wayne.edu & copy **rfpteam1@wayne.edu**

1. PROPOSALS

A. The Purchasing Agent will receive sealed Proposals for the work as herein set forth at the place and until the time as stated in the "Information for Bidders", a copy of which is bound herewith in theses specifications. **No public bid opening will be held.**

B. Proposals shall be for a **lump-sum General Contract for the entire work of the Project as provided in the Form of Proposal.**

C. Proposals shall be submitted in duplicate on forms furnished with the Bidding documents. The forms must be fully filled out in ink or typewritten with the signature in longhand, and the completed forms shall be without alterations, interlineations, or erasures. Forms shall contain no recapitulations of the work to be done. Each proposal shall be delivered in an opaque sealed envelope, marked **"PROPOSAL"** AND SHALL BEAR THE NAME OF THE PROJECT AND THE NAME OF THE BIDDER. Proposals submitted by telephone or telegraph will not be accepted. Modifications by telephone or telegraph to previously submitted proposals will not be accepted.

D. (***revised 5-29-2009***) All base bids must be conforming to the detailed specifications and drawings provided by the University, including any Addenda issued. Voluntary Alternates will only be considered if the Contractor has also submitted a conforming base bid. Any stipulation of voluntary alternates or qualifications contrary to the Contract requirements made by the Bidder in or accompanying his proposal as a condition for the acceptance of the Contract will not be considered in the award of the Contract and will cause the rejection of the entire Proposal.

E. **The competency and responsibility of Bidders will be considered in making the award. The Owner does not obligate himself to accept the lowest or any other bids. The Owner reserves the right to reject any and all bids and to waive any informalities in the Proposals**.

2. PROPOSAL GUARANTEE *(revised 3-22-2012)*

A. A certified check or bank draft payable to the Owner, or satisfactory Bid Bond executed by the Bidder and Surety Company, in an amount equal to not less than five percent (5%) of the maximum proposal amount shall be submitted with each Proposal, which amount may be forfeited to the Board of Governors, Wayne State University, if the successful Bidder refuses to enter into a Contract within ninety (90) days from receipt of Proposals.

B. Bond must be issued by a Surety Company with an "A rating as denoted in the AM Best Key Rating Guide"

C. The bid deposit of all bidders except the lowest three will be returned within three (3) days after the bids are opened. After the formal Contract and bonds are approved, the bid deposit will be returned to the lowest three bidders, except when forfeited.

D. Bid bonds shall be accompanied by a Power of Attorney authorizing the signer of the bond to do so on behalf of the Surety Company.

E. Withdrawal of Proposals is prohibited for a period of ninety (90) days after the actual date of opening thereof.

3. CONTRACT SECURITY *(revised 3-22-2012)*

A. The successful Bidder will be required to furnish a Performance Bond and Labor and Material Payment bond in an amount equal to 100% of the contract award amount, and include such cost in the Proposal, complying with the laws of the State of Michigan. The graduated formula no longer applies.

B. Performance Bond and Labor and Material Payment Bond shall be from a surety company acceptable to the Owner and made payable as follows:

(1) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University, and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any cause whatsoever on account of the Contractor in accordance with the laws of the State of Michigan relating to such bonds.

(2) A bond for 100% of the contract award amount to the Board of Governors of Wayne State University to guarantee and insure the completion of work according to the Contract.

C. The only acceptable Performance Bond shall be the AIA A312 – 2010.

D. Bond must be issued by a Surety Company with an “A rating as denoted in the AM Best Key Rating Guide”.

4. BOND CLARIFICATION

For bids below $50,000.00,

A. Bid bond will not be required.
B. Performance Bond will not be required.

5. INSPECTION

A. Before submitting his Proposal, each Bidder shall be held to have visited the site of the proposed work and to have familiarized himself as to all existing conditions affecting the execution of the work in accordance with the Contract Documents. No allowance or extra consideration on behalf of the Contractor will subsequently be made by reason of his failure to observe the Conditions or on behalf of any subcontractor for the same reason.

6. EXPLANATION TO BIDDERS AND ADDENDA

A. Neither the Owner nor Representative nor Purchasing Agent will give verbal answers to any inquiries regarding the meaning of drawings and specifications, and any verbal statement regarding same by any person, previous to the award, shall be unauthoritative.

B. Any explanation desired by Bidders must be requested of the Purchasing Agent in writing, and if explanation is necessary, a reply will be made in the form of an Addendum, a copy of which will be forwarded to each Bidder registered on the Bidders' List maintained by Procurement & Strategic

Sourcing.

C. All addenda issued to Bidders prior to date of receipt of Proposals shall become a part of these Specifications, and all proposals are to include the work therein described.

7. INTERPRETATION OF CONTRACT DOCUMENTS

A. If any person contemplating submitting a bid for the proposed Contract is in doubt as to the true meaning of any part of the drawings, specifications, or other Contract Documents, he may submit to the Purchasing Agent, a written request for an interpretation thereof. The person submitting the request will be responsible for its prompt delivery. Any interpretation of the Contract Documents will be made by an addendum duly issued. A copy of such addendum will be mailed and delivered to each registered Bidder. Each proposal submitted shall list all addenda, by numbers, which have been received prior to the time scheduled for receipt of proposal.

8. SUBSTITUTION OF MATERIALS AND EQUIPMENT*

A. Whenever a material, article or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors which will perform adequately the duties imposed by the general design will be considered equally acceptable provided that the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance and function. It shall not be purchased or installed by the Contractor without the Architect's written approval.

9. TAXES

A. The Bidder shall include in his lump sum proposal and make payment of all Federal, State, County and Municipal taxes, including Michigan State Sales and Use Taxes, now in force or which may be enacted during the progress and completion of the work covered.

10. REQUIREMENTS FOR SIGNING PROPOSALS AND CONTRACTS

A. The following requirements must be observed in the signing of proposals that are submitted:

(1) Proposals that are not signed by individuals making them shall have attached thereto a Power of Attorney, evidencing the authority to sign the Proposal in the name of the person for whom it is signed.

(2) Proposals that are signed for partnership shall be signed by all of the partners or by an Attorney-in-Fact. If signed by an Attorney-in-Fact, there must be attached to the Proposal a Power of Attorney evidencing authority to sign the Proposal, executed by the partners.

(3) Proposals that are signed for a corporation shall have the correct corporate name thereof and the signature of the President or other authorized officer of the corporation, manually written in the line of the Form of Proposal following the words "signed by". If such a proposal is signed by an official other than the President of the Corporation, a certified copy of resolution of the Board of Directors, evidencing the authority of such official to sign the bid, shall be attached to it. Such proposal shall also bear the attesting signature of the Secretary of the Corporation and the impression of the corporate seal.

11. QUALIFICATIONS OF BIDDERS

A. The Owner may request each of the three (3) low bidders to submit information necessary to satisfy the Owner that the Bidder is adequately prepared to fulfill the Contract. Such information may include past performance records, list of available personnel, plant and equipment, description of work that will be done simultaneously with the Owner's Project, financial statement, or any other pertinent information. This information and such other information as may be requested will be used in determining whether a Bidder is qualified to perform the work required and is responsible and reliable.

12. SPECIAL REQUIREMENTS

A. The attention of all Bidders is called to the General Conditions, Supplementary General Conditions, and Special Conditions, of which all are a part of the Specifications covering all work, including Subcontracts, materials, etc. Special attention is called to those portions dealing with Labor Standards, including wages, fringe benefits, Equal Employment Opportunities, and Liquidated Damages.

B. Prior to award of the project, the apparent low bidder will be required to produce a schedule of values which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A contract will not be issued to the apparent low bidder until this document is provided. A contractor will have one week to produce this document. If the required document is not received within this time, the bidder will be disqualified.

13. NOTICE OF AWARD/ACCEPTANCE OF BID PROPOSAL *(revised 12-15-2009)*

A. The Proposal shall be deemed as having been accepted when a copy of the Contract (fully executed by both the vendor and the appropriate signatory authority for the University), with any/all Alternates, Addenda, and Pre-Contract Bulletins, as issued by the office or agent of the Owner has been duly received by the Contractor. After signing the Contracts, the Contractor shall then return all copies, plus any required bonds and certificates of insurance, to the office of the Owner's Representative, at 5454 Cass, Wayne State University, Detroit, MI 48202. Construction will begin when the fully-executed contract has been returned to the Contractor.

14. TIME OF STARTING AND COMPLETION

A. It is understood that the work is to be carried through to substantial completion with the utmost speed consistent with good workmanship and to meet the established start and completion dates.

B. The Contractor shall begin work under the Contract without delay, upon receipt of a fully-executed contract from the Owner, and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the Contract.

C. The Contractor shall, immediately upon receipt of fully-executed contract, schedule his work and expedite deliveries of materials and performance of the subcontractors to maintain the necessary pace for start and completion on the aforementioned dates.

15. CONTRACTOR'S PERFORMANCE EVALUATION *(2-2015)*

In an effort to provide continuous process improvement regarding the construction of various university projects, Wayne State University is embarking upon a process of evaluating the contractor's overall performance following the completion of work. At the conclusion of the construction project a subjective evaluation of the Contractor's performance will be prepared by the Project Manager and the supervising Director of Construction. The evaluation instrument that will be used in this process is shown in Section **00440-01 - Contractor's Performance Evaluation**.

16. BIDDING DOCUMENTS

A. Bid specifications are not available at the University, but are available beginning **March 5, 2015** through Wayne State University Procurement & Strategic Sourcing's Website for Advertised Bids: **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html**. The plans for this project can be viewed in advance and/or printed from the above website. Copies of the RFP will not be available at the pre-proposal meeting.

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B. **DOCUMENTS ON FILE *(revised 12-2007)***

(1) *Wayne State University Procurement & Strategic Sourcing's Website.*
All available information pertaining to this project will be posted to the Purchasing web site

at **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html**.
Information that is not posted to the website is not available/not known.

(2) Notification of this Bid Opportunity has been sent to *DUNN BLUE (for purchase of Bid Documents only), DODGE REPORTS, REED CONSTRUCTION, CONSTRUCTION NEWS and the CONSTRUCTION ASSOCIATION OF MICHIGAN (CAM).*

(3) Please note: Effective December 1, 2007, bid notices will be sent only to those Vendors registered to receive them via our Bid Opportunities list serve. To register, to **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html**, and click on the "Join our Listserve" link at the top of the page.

NOTICE OF MANDATORY PRE-BID CONFERENCE

PROJECT: **2015 Parking Structures 1, 2 & 5 Renovations 2015**,

PROJECT NOS.: **WSU PROJECT NO. 051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**

It is **MANDATORY** that each Contractor proposing to bid on this work must attend a pre-bid conference at the following location:

Wayne State University
5700 Cass Ave. AAB, 4002 AAB
Detroit MI 48202

2:30 PM, local time, March 12, 2015

The purpose of this conference is to clarify the procedures, scope of work, and to identify any omissions and/or inconsistencies that may impede preparation and submission of representative competitive bids.

An attendance list shall be prepared and minutes of the conference shall be furnished to all those attending.

Any clarifications or corrections that cannot be made at the conference will be by Addendum.

For your convenience a map of the University and appropriate parking lots can be downloaded and printed from: **http://campusmap.wayne.edu/**. Guest parking in any of the University student and guest lots is **$7.00**. A detailed list of Cash & Coin operated lots can be viewed at **http://purchasing.wayne.edu/cash_and_credit_card_lots.php**. Cash lots dispense change in quarters. Due to time constraints, Vendors are encouraged to avoid parking at meters on the street (especially blue "handicapped" meters).

All available information pertaining to this project will be posted to the Purchasing web site at
http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_bid.html.
Information that is not posted to the website is not available/not known.

AGENDA

I. Welcome and Introductions
   A. Wayne State University Representatives
   B. Vendor Representatives
   C. Sign in Sheet- be sure to include your fax number and email address (LEGIBLY) on the sign in sheet.

II. Brief Overview of Wayne State University
   A. Purpose and Intent of RFP.
   B. Detailed review of the RFP and the requirements for a qualified response.
   C. Review of all pertinent dates and forms that are REQUIRED for a qualified response.

III. Vendor Questions/Concerns/Issues
   A. Questions that can be answered directly by the appropriate person in this meeting will be answered and both question and answer will be recorded in the minutes of the meeting.
   B. Questions that need to be researched will be answered and a nature of clarification will be emailed to the appropriate ListServ. See **http://www.forms.purchasing.wayne.edu/Adv_bid/Adv_Bid_Listserve.html** for a list of ListServ Bid Lists.
   C. Minutes will be emailed to all participants of the meeting within a reasonable amount of time. (be sure to include your email address/addresses on the sign in sheet)
   D. Questions and concerns that come up after this meeting are to be addressed to **Kimberly Tomaszewski**, Procurement & Strategic Sourcing. Discussion with other University members is seriously discouraged and could lead to disqualification from further consideration. All questions and answers will be recorded and emailed to all participants of the RFP.
   E. Due date for questions is **March 16, 2015, 12:00 noon**.

IV. Proposal Due Date- **March 20, 2015, 2:00 p.m.**

V. Final Comments

VI. Adjourn

VENDOR NAME_____

GENERAL CONTRACT - PROPOSAL FORM *(revised 1 - 2011)*

Please Note – Vendors must Pre-qualify themselves when responding to this bid opportunity. Our Prequalification questions can be found on page 4 of this section.

OWNER: Board of Governors
Wayne State University

PROJECT: **2015 Parking Structures 1, 2 & 5 Renovations 2015**

PROJECT NO.: WSU PROJECT NO. **051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**

PROJECT TYPE: **General Construction, mechanical, electrical Work**

PURCHASING AGENT: **Kimberly Tomaszewski**, **Senior Buyer**
WSU – Procurement & Strategic Sourcing
5700 Cass, Suite 4200
Detroit, Michigan 48202
313-577-3757/ 313-577-3747 fax
ac9934@wayne.edu & copy **rfpteam1@wayne.edu**

OWNER'S REPRESENTATIVE: **Robert Jacobs,** Project Manager
Design & Construction Services
Facilities Planning & Management
Wayne State University
5454 Cass Avenue
Detroit, Michigan 48202

TO: Board of Governors
Wayne State University
Detroit, Michigan

BASE PROPOSAL:

The undersigned agrees to enter into an Agreement to complete the entire work of the **2015 Parking Structures 1, 2 & 5 Renovations 2015** project (WSU Project No. **051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**) in accordance with the Bidding Documents for the following amounts:

_____ $ _____ Dollars

LAWN REPLACEMENT: The undersigned agrees that, in the event of existing lawn or landscaping damage, due to the Contractor's work, that has not been properly addressed and repaired to the satisfaction of the University, the University may repair/replace the lawn and/or landscaping, and that the expense will be at a **unit cost of $10.00 per square yard for lawn, and landscaping at a rate of 1.5 times the cost of said repairs**, the full cost of which shall be reimbursed by the contractor.

CONTRACT CHANGE ORDERS: *(revised 4-01-2011)* The undersigned agrees to the following pricing formula and rates for changes in the contract work:

1. For subcontract work, Contractor's markup for handling, overhead, profit and bonding on subcontractors sell price, shall not exceed **5%.**

   1.1. For subcontract work that is provided on a time and material basis, the subcontractor shall be permitted a single markup for handling, overhead, profit and bonding of 5%. When a markup is identified in the subcontractor's hourly labor rate, additional markup on labor is not permitted.

   1.1.1 For changes that are based upon a lump sum value, subcontractor shall provide all labor and material back-ups to ensure that duplicative charges are avoided and authorized mark-ups for OH&P can be confirmed

2. For work by his own organization, Contractor's markup for job* and general overhead, profit and bonding shall not exceed **5%** of the net labor** and material costs.

Within 14 days of the project's contract execution Contractor shall provide to the Owner; Subcontractor's hourly labor rate breakdown details. This requirement shall extend to the lowest level of subcontractor participation.

* Job and general overhead includes supervision and executive expenses; use charges on small tools, scaffolding, blocking, shores, appliances, etc., and other miscellaneous job expenses.

** Net labor cost is the sum of the base wages, fringe benefits established by governing trade organizations, applicable payroll taxes, and increased expense for contractor's liability insurance (Workman's Compensation, P.L. and P.D.).

TIME OF COMPLETION:

(revised 4-01-2011)
The Contract is expected to be fully executed on or about 25 calendar days after successful bidder qualification and recommendation of award. The undersigned agrees to start construction **immediately after** receipt of a fully executed contract, and to complete the work as follows:

Substantial Completion will be completed no later than **Parking Structure 1 – Has two substantial completion dates; July 31, 2015 Phase 1 Level 6 , Bays 7 & 8, August 28, 2015 Phase 2 Level 2, Bay 8. Alternates as identified on drawing R-003 in work schedule.**
Parking Structure 2 date of substantial completion is July 30, 2015.
Parking Structure 5 date of substantial completion is July 17, 2015. .

LIQUIDATED DAMAGES:

It is understood and agreed that, if project is not completed within the time specified in the contract plus any extension of time allowed pursuant thereto, the actual damages sustained by the Owner because of any such delay, will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by Owner would be the sum of **$7.00 per parking space per day**, and therefore the contractor shall pay as liquidated damages to the Owner the sum of **$7.00 per parking space per day** for each day's delay in substantially completing said project beyond the time specified in the Contract and any extensions of time allowed thereunder.

TAXES:

The undersigned acknowledges that prices stated above include all applicable taxes of whatever character or description. Michigan State Sales Tax is applicable to the work. Bidder understands that the Owner reserves the right to reject any or all bids and to waive informalities or irregularities therein.

ADDENDA:

The undersigned affirms that the cost of all work covered by the following Addenda are included in the lump sum price of this proposal.

Addendum No._____Date_____ Addendum No._____Date_____

Addendum No._____Date_____ Addendum No._____Date_____

Addendum No._____Date_____ Addendum No._____Date_____

Addendum No._____Date_____ Addendum No._____Date_____

Addendum No._____Date_____ Addendum No._____Date_____

CONTRACTOR'S PREQUALIFICATION STATEMENT & QUESTIONNAIRE:

Our Minimum Requirements for Construction Bids are:

WSU considers this project: General Construction, mechanical, electrical Work.

Criteria	Small Project bid less than $50,000	Medium Project bid between $50,001 and $250,000	Large Project bid between $250,001 and $2 million	Very Large Project bid greater than $2 million
EMR Rating (Experience Modification Rating)	1.0 or Less	1.0 or Less	1.0 or Less	1.0 or Less
Bondable Vendor	N.A.	Required	Required	Required
Length of Time in Construction Business	2 Years	3 Years	5 Years	5 Years
Demonstrated Experience in Projects Similar in Scope and Price in the last 3 years	1 or more	1 or more	2 or more	3 or more
Unsuccessful Projects on Campus in last 3 years	None Allowed	None Allowed	None Allowed	None Allowed
Failure to comply with Prevailing Wage and/or Project Labor requirements	None Allowed	None Allowed	None Allowed	None Allowed
Withdrawn University Bid (with or without Bond forfeiture) within the last 3 years **	1 or less	1 or less	1 or less	1 or less
Company currently not in Chapter 11 of the US Bankruptcy Code	1 Year	2 Years	3 Years	3 Years

** Withdrawal of a bid is subject to the University suspension policy, for a period up to one year.

Contractors must complete the following information to determine their eligibility to participate in this bid. This information is required with your Bid to the University

Failure to complete this form in its entirety will result in your bid being disqualified.

Check one of the following on the makeup of your company:

_____ Corporation _____ Individual

_____ Partnership _____ Joint Venture

_____ Other (Explain)

_____

_____

1. How many years has your organization been in business as a contractor? _____

2. How many years has your organization been in business under its present business name? _____

3. List states in which your organization is legally qualified to do business. _____

_____

4. Provide the Name and Address of your Liability Insurance Carrier. _____

_____

5. What is your current EMR Rating? _____
The minimum requirement is an EMR Rating of 1.0 or less for all projects. Bidders with a rating higher than 1.0 understand that their bid may be disqualified, at the sole discretion of the University.

6. What percentage of work performed on projects are by company employees; excluding any hired subcontracting and outsourced relationships, for the bid submitted? _____%

7. What percentage of work performed on your companies behalf are by subcontracted business relationships; disallowing 1099 contracting work forces, for the bid submitted? _____%

8. Have you ever failed to complete any work awarded to you? If so, attach a separate sheet of explanation. Include the name of the Project, the customer, the dates of the work, and the amount of the contract?

_____

9. Have you withdrawn a bid after a University bid opening and/or refused to enter into a contract with the University upon notification of award within the last 3 years? If so, state the Project Name and Number, and the date of bid submission below.

_____

10. Has any officer or partner of your organization ever been an officer or partner of another organization that failed to complete a construction contract? If so, attach a separate sheet of explanation.

_____

11. List the construction experience of the principals and superintendents of your company.

Name: _____ Title: _____

_____

_____

Name: _____ Title: _____

_____

_____

Name: _____ Title: _____

_____

12. List the construction Projects, and approximate dates, when you performed work similar in Scope to this project.

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount:_____ Date Completed: _____

13. List the construction Projects, and approximate dates, when you performed work similar in Dollar Amount to this project.

Project:_____ Owner:_____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

Project: _____ Owner: _____

Contract Amount: _____ Date Completed: _____

14. Is your Company "bondable"? Yes _____ No _____

15. What is your present bonding capacity? $ _____

16. Who is your bonding agent?

NAME: _____

ADDRESS: _____

PHONE: (_____) _____

CONTACT: _____

17. Does your company agree to provide financial reports to the University upon request? Failure to agree may result in disqualification of your bid. Yes _____ No _____

18. Does your company agree that all of the Terms and Conditions of this RFP and Vendor's Response Proposal become part of any ensuing agreement? Yes _____ No _____

19. Does your company agree to execute a contract containing the clauses shown in Section 00500 "Agreement Between Contractor and Owner for Construction"? Yes _____ No_____

If "No", clearly note any exceptions to any information contained in the contract documents and include with your proposal.

20. Did your company quote based upon **Prevailing Wage Rates**? Yes _____ No_____

Note: Contractors submitting proposals for this project may, at the discretion of the University, be required to submit references including contact information to be used to assist in the post bid evaluation process for the subject project

ACKNOWLEDGEMENT OF MINIMUM QUALIFICATIONS:

The undersigned has read and understands the minimum qualifications for University construction projects, and has completed the Prequalification section completely and accurately. The undersigned understands that a contractor, who fails to meet the minimum qualifications **in the category identified for this project, will be disqualified from consideration for the project**.

ACCEPTANCE OF PROPOSAL:

The undersigned agrees to execute a Contract, being the Wayne State University standard form titled "Agreement Between Contractor and Owner for Construction" (see section 00500 of the bid documents), provided that we are notified of the acceptance of our Proposal within sixty (60) days of the date set for the opening thereof.

The undersigned below understands that the bid will be disqualified if the Prequalification information above is not completed in its entirety.

NAME OF COMPANY: _____

OFFICE ADDRESS: _____

PHONE NUMBER: _____ DATE _____

FAX NUMBER: _____

SIGNED BY: _____
Signature

_____
(Please print or type name here)

TITLE _____

EMAIL ADDRESS: _____@_____

PREVAILING WAGE RATE SCHEDULE *(revised 4-05-2010)*

A. See also Page 00100-4 Section 12.B

B. Wayne State University requires all project contractors, including subcontractors, who provide labor on University projects to compensate at a rate no less than prevailing wage rates.

C. The rates of wages and fringe benefits to be paid to each class of laborers and mechanics by each VENDOR and subcontractor(s) (if any) shall be not less than the wage and fringe benefit rates prevailing in Wayne County, Michigan, as determined by the United States Secretary of Labor. Individually contracted labor commonly referred to as "1099 Workers" and subcontractors using 1099 workers are not acceptable for work related to this project.

D. To maintain compliance with State of Michigan Ordinances, Certified Payroll must be provided for each of the contractor's or subcontractor's payroll periods for work performed on this project. Certified Payroll should accompany all Pay Applications. Failure to provide certified payroll will constitute breach of contract, and pay applications will be returned unpaid, and remain so until satisfactory supporting documents are provided.

A Prevailing Wage Rate Schedule has been issued from the State of Michigan that is enclosed in this section

Additional information can be found on the University Procurement & Strategic Sourcing's web site at the following URL address:

http://purchasing.wayne.edu/vendors/wage-rates.php

If you have any questions, or require rates for additional classifications, please contact:

Michigan Department of Consumer & Industry Services,
Bureau of Safety and Regulation, Wage and Hour Division,
7150 Harris Drive,
P.O. Box 30476,
Lansing, Michigan 48909-7976

http://www.michigan.gov/dleg/0,1607,7-154-27673_27706---,00.html

F. **Wayne State University's Prevailing Wage Requirements:**

When compensation will be paid under prevailing wage requirements, the University shall require the following:

A. The contractor shall obtain and keep posted on the work site, in a conspicuous place, a copy of all current prevailing wage and fringe benefit rates.

B. The contractor shall obtain and keep an accurate record showing the name and occupation of and the actual wages and benefits paid to each laborer and mechanic employed in connection with this contract.

C. The contractor shall submit a completed certified payroll document [U.S. Department of Labor Form WH 347] verifying and confirming the prevailing wage and benefits rates for all employees and subcontractors for each payroll period for work performed on this project. The contractor shall include copies of pay stubs for all employee or contract labor payments related to Wayne State University work. The certified payroll form can be downloaded from the Department of Labor website at **http://www.dol.gov/whd/forms/wh347.pdf**.

D. A properly executed sworn statement is required from all tiers of contractors, sub-contractors and suppliers which provide services or product of $1,000.00 or greater. Sworn statements must accompany applications for payment. All listed parties on a sworn statement and as a subcontractor must submit Partial or Full Conditional Waivers for the amounts invoiced on the payment application. A copy of the acceptable WSU Sworn Statement and Waiver will be provided to the awarded contractor.

E. Apprentices for a skilled trade must provide proof of participation in a Certified Apprenticeship Program and the level of hours completed in the program.

F. Daily project sign-in sheets and field reports for the project must be turned in weekly.

Note: Contractor invoices WILL NOT be processed until all listed certified payroll documents are received.

G. If the VENDOR or subcontractor fails to pay the prevailing rates of wages and fringe benefits and does not cure such failure within 10 days after notice to do so by the UNIVERSITY, the UNIVERSITY shall have the right, at its option, to do any or all of the following:

1. Withhold all or any portion of payments due the VENDOR as may be considered necessary by the UNIVERSITY to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this contract and the actual wages and fringe benefits paid;

2. Terminate this contract and proceed to complete the contract by separate agreement with another vendor or otherwise, in which case the VENDOR and its sureties shall be liable to the UNIVERSITY for any excess costs incurred by the UNIVERSITY.

3. Propose to the Director of Purchasing that the Vendor be considered for Debarment in accordance with the University's Debarment Policy, found on our website at **http://purchasing.wayne.edu/docs/appm28.pdf**

   Terms identical or substantially similar to this section of this RFP shall be included in any contract or subcontract pertaining to this project.

H. The current applicable prevailing wage rates as identified by the State of Michigan Department of Consumer & Industry Services, Bureau of Safety and Regulation, Wage and Hour Division are attached. Refer to item C above if additional information is required.

I. Prior to award of the project, the apparent low bidder will be required to produce a schedule of values which will include the proposed subcontractors for each division of work and whether the subcontractor is signatory or non-signatory. A letter of intent or **contract will not** be issued to the apparent low bidder until this document is provided. The apparent low bidder will have one week to produce this document. If the required document is not received within this time, the bidder will be disqualified, and the next low bidder will be required to provide this schedule of values.

SEE ATTACHED STATE PREVAILING WAGE INFORMATION

State of Michigan

WHPWRequest@michigan.gov

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015
Project Number: 090-258510

Wayne County

Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015

Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Asbestos & Lead Abatement Laborer							
Asbestos & Lead Abatement Laborer	4 ten hour days @ straight time allowed Monday-Saturday, must be consecutive	MLDC	10/1/2014	$40.25	$53.64	$67.03	H H H X X X X D Y
Asbestos & Lead Abatement, Hazardous Material Handler							
Asbestos and Lead Abatement, Hazardous Material Handler	4 ten hour days @ straight time allowed Monday-Saturday, must be consecutive	AS207	10/1/2014	$40.25	$53.58	$66.90	H H H X X X X D Y
Boilermaker							
Boilermaker		BO169	2/17/2015	$54.70	$81.08	$107.45	H H H H H H H D Y

Apprentice Rates:			
1st 6 months	$40.31	$59.49	$78.67
2nd 6 months	$41.45	$61.21	$80.95
3rd 6 months	$42.57	$62.88	$83.19
4th 6 months	$43.69	$64.57	$85.43
5th 6 months	$44.81	$66.24	$87.67
6th 6 months	$48.63	$72.50	$96.36
7th 6 months	$49.32	$73.01	$96.69
8th 6 months	$51.58	$76.40	$101.21

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015

Contract must be awarded by: 6/2/2015

Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Bricklayer							
Bricklayer, stone mason, pointer, cleaner,		BR1	10/15/2014	$52.43	$78.65	$104.86	H H D H D D D D Y
Make up day allowed comment							
Saturday for 5 day 8 hour week Friday for 4 day 10 hour week 4 10s allowed M-TH							
	Apprentice Rates:						
	First 6 months			$31.87	$47.81	$63.74	
	2nd 6 months			$33.72	$50.60	$67.44	
	3rd 6 months			$35.57	$53.37	$71.14	
	4th 6 months			$37.42	$56.14	$74.84	
	5th 6 months			$39.27	$58.92	$78.54	
	6th 6 months			$41.12	$61.70	$82.24	
	7th 6 months			$42.97	$64.46	$85.94	
	8th 6 months			$44.82	$67.24	$89.64	
Carpenter							
Diver Four 10s allowed M-Sat; double time due when over 12 hours worked per day		CA 687 D	6/25/2014	$64.65	$93.14	$121.63	X X H X X H H D Y
Make up day allowed comment							
Saturday							

Official Request #: 275
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Project Number: 090-258510
County: Wayne

Official Rate Schedule

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Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015

Contract must be awarded by: 6/2/2015

Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Carpet and Resilient Floor Layer, (does not include installation of prefabricated formica & parquet flooring which is to be paid carpenter rate)		CA1045	6/12/2014	$49.21	$70.18	$91.14	X X H X X X X D Y
	Apprentice Rates:						
	1st 6 months			$24.23	$32.71	$41.18	
	2nd 6 months			$28.25	$38.73	$49.22	
	3rd 6 months			$30.35	$41.88	$53.42	
	4th 6 months			$32.44	$45.02	$57.60	
	5th 6 months			$34.54	$48.17	$61.80	
	6th 6 months			$36.63	$51.31	$65.98	
	7th 6 months			$38.74	$54.48	$70.20	
	8th 6 months			$40.82	$57.59	$74.36	
Carpenter four 10s allowed Mon-Sat; double time due when over 12 hours worked per day *Make up day allowed comment* Saturdays		CA687Z1	6/24/2014	$55.24	$79.04	$102.84	X X H X X H H D Y
	Apprentice Rates:						
	1st year			$33.82	$46.92	$60.00	
	3rd 6 months			$36.21	$50.49	$64.78	
	4th 6 months			$38.58	$54.05	$69.52	
	5th 6 months			$40.97	$57.64	$74.30	
	6th 6 months			$43.33	$61.17	$79.02	
	7th 6 months			$45.72	$64.77	$83.80	
	8th 6 months			$48.09	$68.32	$88.54	

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

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Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Piledriver	Four 10s allowed Monday-Saturday; double time due when over 12 hours worked per day	CA687Z1P	6/24/2014	$55.24	$79.04	$102.84	X X H X X H H D Y
Make up day allowed comment	Saturday						
	Apprentice Rates:						
	1st 6 months			$33.82	$46.92	$60.00	
	2nd 6 months			$38.58	$54.05	$69.52	
	3rd 6 months			$43.33	$61.17	$79.02	
	4th 6 months			$48.09	$68.32	$88.54	
Cement Mason							
Cement Mason		br1cm	10/15/2014	$50.05	$71.17	$92.28	X X H H H H H D N
	Apprentice Rates:						
	1st 6 months			$29.13	$39.45	$49.77	
	2nd 6 months			$31.20	$42.54	$53.87	
	3rd 6 months			$35.31	$48.67	$62.01	
	4th 6 months			$39.46	$54.85	$70.23	
	5th 6 months			$41.52	$57.91	$74.30	
	6th 6 months			$45.67	$64.10	$82.52	
Cement Mason		CE514	11/10/2011	$46.30	$64.89	$83.48	H H D H H H H D N
	Apprentice Rates:						
	1st 6 months			$26.77	$36.07	$45.36	
	2nd 6 months			$28.68	$38.91	$49.13	
	3rd 6 months			$32.50	$44.59	$56.66	
	4th 6 months			$36.32	$50.26	$64.19	
	5th 6 months			$38.24	$53.11	$67.98	
	6th 6 months			$42.06	$58.79	$75.51	

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Drywall						
Drywall Taper	PT-22-D	9/5/2014	$44.41	$57.66	$70.91	H H D H D D D D Y
Four 10s allowed Monday-Thursday						
Make up day allowed comment						
Friday make-up day for bad weather or holidays						
	Apprentice Rates:					
	First 3 months		$31.16	$37.79	$44.41	
	Second 3 months		$33.81	$41.76	$49.71	
	Second 6 months		$36.46	$45.73	$55.01	
	Third 6 months		$39.11	$49.71	$60.31	
	4th 6 months		$40.43	$51.69	$62.95	
Electrician						
Inside Wireman	EC-58-IW	10/2/2014	$58.91	$77.39	$95.87	H H H H H H H D N
	Apprentice Rates:					
	0-1000 hours		$36.73	$44.12	$51.51	
	1000-2000 hours		$38.58	$46.89	$55.21	
	2000-3500 hours		$40.43	$49.67	$58.91	
	3500-5000 hours		$42.27	$52.44	$62.59	
	5000-6500 hours		$45.97	$57.98	$69.99	
	6500-8000 hours		$49.67	$63.53	$77.39	
Sound and Communication Installer/Technician	EC-58-SC	10/2/2014	$37.48	$50.29	$63.09	H H H H H H H D N
	Apprentice Rates:					
	Period 1		$24.67	$31.07	$37.47	
	Period 2		$25.95	$32.99	$40.03	
	Period 3		$27.24	$34.93	$42.61	
	Period 4		$28.51	$36.83	$45.15	
	Period 5		$29.79	$38.75	$47.71	
	Period 6		$31.07	$40.67	$50.27	

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Elevator Constructor							
Elevator Constructor	Elevator Constructor	EL 36	8/7/2007	$56.46		$94.99	D D D D D D D D Y
	Make up day allowed						
	Apprentice Rates:						
	1st Year Apprentice			$37.74		$58.93	
	2nd Year Apprentice			$41.90		$66.94	
	3rd Year Apprentice			$43.98		$70.95	
	4th Year Apprentice			$48.14		$78.96	
Glazier							
Glazier	If a four 10 hour day workweek is scheduled, four 10s must be consecutive, M-F.	GL-357	10/2/2014	$47.35	$65.97	$84.58	H H H H H H H D Y
	Apprentice Rates:						
	1st 6 months			$32.45	$43.62	$54.78	
	2nd 6 months			$33.94	$45.85	$57.76	
	3rd 6 months			$36.92	$50.33	$63.72	
	4th 6 months			$38.41	$52.56	$66.70	
	5th 6 months			$39.90	$54.79	$69.68	
	6th 6 months			$41.39	$57.03	$72.66	
	7th 6 months			$42.88	$59.27	$75.64	
	8th 6 months			$45.86	$63.73	$81.60	
Heat and Frost Insulator							
Spray Insulation		AS25S	3/5/2007	$20.14	$29.14		H H H H H H H H N

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Statewide

Official Rate Schedule

Every contractor and subcontractor shall keep posted on the construction site, in a conspicuous place, a copy of all prevailing wage and fringe benefit rates prescribed in a contract.

Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Heat and Frost Insulator and Asbestos Worker							
Heat and Frost Insulators and Asbestos Workers		AS25	1/29/2014	$60.25	$76.00	$91.74	H H H H H H H D Y

Four 10s must be worked for a minimum of 2 weeks consecutively, Monday thru Thursday. All hours worked in excess of 10 will be paid at double time. All hours worked on the fifth day,

comment

Four 10s must be worked for a minimum of 2 consecutive weeks. OVERTIME is different on a four 10 week. OT is 2x for hours beyond 10. All hours on fifth day, M-F require time and one half. Sat first 8 hours, 1.5, all hours after 8 require double time.

Apprentice Rates:			
1st Year	$46.08	$54.74	$63.40
2nd Year	$49.23	$59.46	$69.70
3rd Year	$50.80	$61.82	$72.84
4th Year	$53.95	$66.54	$79.14

Ironworker							
Fence, Sound Barrier & Guardrail erection/installation and Exterior Signage work Four ten hour work days may be worked during Monday-Saturday.		IR-25-F1	2/24/2015	$34.65	$46.65	$58.65	X X H X X X H D Y

Apprentice Rates:			
60% Level	$24.25	$31.45	$38.65
65% Level	$25.55	$33.35	$41.15
70% Level	$26.86	$35.26	$43.66
75% Level	$28.15	$37.15	$46.15
80% Level	$29.45	$39.05	$48.65
85% Level	$30.75	$40.95	$51.15

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

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Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
Page 8 of 33

Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Siding, Glazing, Curtain Wall		IR-25-GZ2	9/4/2014	$46.41	$58.07	$69.73	X X H H H H D D Y
4 tens may be worked Monday thru Thursday @ straight time.							
Make up day allowed comment							
Friday							
	Apprentice Rates:						
	Level 1			$29.48	$36.09	$42.68	
	Level 2			$31.59	$38.83	$46.05	
	Level 3			$33.71	$41.58	$49.44	
	Level 4			$35.83	$44.33	$52.82	
	Level 5			$37.94	$47.07	$56.20	
	Level 6			$40.06	$49.82	$59.58	
Pre-engineered Metal Work		IR-25-PE-Z1	6/3/2014	$45.24	$55.53	$65.81	X X H X X X X D Y
Make up day allowed comment							
4 tens allowed M-Th with Saturday make up day							
	Apprentice Rates:						
	1st Year			$26.11	$31.58	$37.06	
	3rd 6 month period			$28.23	$34.46	$40.68	
	4th 6 month period			$30.36	$37.35	$44.33	
	5th 6 month period			$32.48	$40.21	$47.95	
	6th 6 month period			$34.61	$43.99	$53.37	
Reinforced Iron Work		IR-25-RF	9/3/2014	$55.36	$82.91	$110.45	H H D H D D D D N
Make up day allowed							
	Apprentice Rates:						
	Level 1			$36.01	$53.89	$71.75	
	Level 2			$38.38	$57.43	$76.49	
	Level 3			$40.74	$60.98	$81.21	
	Level 4			$43.28	$64.78	$86.29	
	Level 5			$45.81	$68.59	$91.35	
	Level 6			$48.35	$72.39	$96.43	

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

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Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015

Contract must be awarded by: 6/2/2015

Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Rigging Work		IR-25-RIG	9/3/2014	$61.33	$91.67	$122.00	H H H H H H H D N
	Apprentice Rates:						
	Level 1& 2			$36.63	$54.59	$72.55	
	Level 3			$39.46	$58.84	$78.21	
	Level 4			$42.28	$63.07	$83.85	
	Level 5			$45.11	$67.31	$89.51	
	Level 6			$47.94	$71.56	$95.17	
Decking 4 tens may be worked Monday thru Thursday @ straight time. If bad weather, Friday may be a make up day. If holiday celebrated on a Monday, 4 10s may be worked Tuesday thru Friday. Work in excess of 12 hours per day must be paid @ double time. *Make up day allowed comment* Friday for 4 tens M-Th Saturday for 5 eights M-F		IR-25-SD	9/4/2014	$53.29	$79.63	$105.96	X X H H H H D D Y
Structural, ornamental, welder and pre-cast 4 tens may be worked Monday thru Thursday @ straight time. If bad weather, Friday may be a make up day. If holiday celebrated on a Monday, 4 10s may be worked Tuesday thru Friday. Work in excess of 12 hours per day must be paid @ double time. *Make up day allowed*		IR-25-STR	9/3/2014	$61.46	$91.84	$122.21	H H H H H H D D Y
	Apprentice Rates:						
	Levels 1 & 2			$36.05	$54.01	$71.97	
	Level 3			$38.88	$58.26	$77.63	
	Level 4			$41.70	$62.49	$83.27	
	Level 5			$44.53	$66.73	$88.93	
	Level 6			$47.36	$70.98	$94.59	
	Level 7			$50.18	$75.20	$100.23	
	Level 8			$53.01	$79.46	$105.89	

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

Official Rate Schedule

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Official 2015 Prevailing Wage Rates for State Funded Projects

Issue Date: 3/4/2015
Contract must be awarded by: 6/2/2015
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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Industrial Door erection & construction	IR-25-STR-D	9/4/2014	$42.02	$62.68	$83.33	H H H H H H D D Y

Make up day allowed comment

Friday for bad weather when 4 tens scheduled for M-Th. If holiday celebrated on M, 4 tens may be worked T-F. Work in excess of 12 hours per day must be paid @ double time.

Laborer

Construction Laborer, Demolition Laborer, Mason Tender,Carpenter Tender, Drywall Handler, Concrete Laborer, Cement Finisher Tender, Concrete Chute, and Concrete Bucket Handler	L33401-A-CC	7/15/2013	$43.54	$61.94	$80.33	H H H H H H H D Y

If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8

Make up day allowed comment

Saturday

Apprentice Rates:			
0-1,000 work hours	$37.60	$53.03	$68.45
1,001 - 2,000 work hours	$38.79	$54.81	$70.83
2,001 - 3,000 work hours	$39.98	$56.60	$73.21
3,001 - 4,000 work hours	$42.35	$60.15	$77.95

Signal Man (on sewer & caisson work), Air, Electric or Gasoline Tool Operator, Concrete Vibrator Operator, Acetylene Torch & Air Hammer Operator; Scaffold Builder, Caisson Worker	L33401-B-SB	7/16/2013	$43.80	$62.33	$80.85	H H H H H H H D Y

If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8

Make up day allowed comment

Saturday

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Furnace Battery Heater Tender, Burning Bar & Oxy-Acetylene Gun	L33401-D-HH	7/16/2013	$44.04	$62.69	$81.33	H H H H H H H D Y
If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.						
Make up day allowed comment Saturday						
Expediter Man, Top Man and/or Bottom Man (Blast Furnace Work or Battery Work)	L33401-E-EX	7/16/2013	$44.79	$63.81	$82.83	H H H H H H H D Y
If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.						
Make up day allowed comment Saturday						
Cleaner/Sweeper Laborer; Furniture Laborer	L33401-F-CL	7/16/2013	$38.09	$53.76	$69.43	H H H H H H H D Y
If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8 hours of work on Saturdays @ straight time.						
Make up day allowed comment Saturday						
Lansing Burner, Blaster & Powder Man; Air, Electric or Gasoline Tool Operator (Blast Furance Work or Battery Work)	L334C	7/16/2013	$44.29	$63.06	$81.83	X X H X H H H D Y
Make up day allowed comment Saturday						

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Plasterer Tender, Plastering Machine Operator		LPT-1	10/25/2013	$43.54	$61.94	$80.33	X X H H H H H D Y

If conditions beyond the employer/employee's control prevent one or more hours of working during Mon-Fri, the employer may choose to work up to 10 hour straight time weekdays. Work may be scheduled up to 10 hours per Mon-Fri for the purpose of reaching 40 hours @ straight time. Make up days may also include 8

Make up day allowed comment

Saturday

Apprentice Rates:			
0 - 1,000 hours	$37.60	$53.03	$68.45
1,001 - 2,000 hours	$38.79	$54.81	$70.83
2,001 - 3,000 hours	$39.98	$56.60	$73.21
3,001 - 4,000 hours	$42.35	$60.15	$77.95

Laborer - Hazardous

Class A performing work in conjunction with site preparation and other preliminary work prior to actual removal, handling, or containment of hazardous waste substances not requiring use of personal protective equipment required by state or federal regulations; or a laborer performing work in conjunction with the removal, handling, or containment of hazardous waste substances when use of personal protective equipment level "D" is required.	LHAZ-Z1-A	11/7/2014	$43.54	$61.94	$80.33	H H H H H H H D Y

Make up day allowed comment

4 10s allowed M-Th or T-F; inclement weather makeup day Friday

Apprentice Rates:			
0-1,000 work hours	$37.60	$53.03	$68.45
1,001-2,000 work hours	$38.79	$54.81	$70.83
2,001-3,000 work hours	$39.98	$56.60	$73.21
3,001-4,000 work hours	$42.35	$60.15	$77.95

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class B performing work in conjunction with the removal, handling, or containment of hazardous waste substances when the use of personal protective equipment levels "A", "B" or "C" is required.	LHAZ-Z1-B	11/7/2014	$44.54	$63.44	$82.33	H H H H H H H D Y
Make up day allowed comment						
4 10s allowed M-Th or T-F; inclement weather makeup day Friday						
Apprentice Rates:						
0-1,000 work hours			$38.36	$54.17	$69.97	
1,001-2,000 work hours			$39.59	$56.01	$72.43	
2,001-3,000 work hours			$40.83	$57.87	$74.91	
3,001-4,000 work hours			$43.30	$61.58	$79.85	

Laborer Underground - Tunnel, Shaft & Caisson

Class I - Tunnel, shaft and caisson laborer, dump man, shanty man, hog house tender, testing man (on gas), and watchman.	LAUCT-Z1-1	9/6/2013	$37.87	$48.66	$59.44	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.05	$41.43	$49.80	
1,001-2,000 work hours			$34.02	$42.88	$51.74	
2,001-3,000 work hours			$34.98	$44.32	$53.66	
3,001-4,000 work hours			$36.91	$47.21	$57.52	
Class II - Manhole, headwall, catch basin builder, bricklayer tender, mortar man, material mixer, fence erector, and guard rail builder.	LAUCT-Z1-2	9/6/2013	$37.98	$48.82	$59.66	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.14	$41.56	$49.98	
1,001-2,000 work hours			$34.10	$43.00	$51.90	
2,001-3,000 work hours			$35.07	$44.45	$53.84	
3,001-4,000 work hours			$37.01	$47.37	$57.72	

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class III - Air tool operator (jack hammer man, bush hammer man and grinding man), first bottom man, second bottom man, cage tender, car pusher, carrier man, concrete man, concrete form man, concrete repair man, cement invert laborer, cement finisher, concrete shoveler, conveyor man, floor man, gasoline and electric tool operator, gunnite man, grout operator, welder, heading dinky man, inside lock tender, pea gravel operator, pump man, outside lock tender, scaffold man, top signal man, switch man, track man, tugger man, utility man, vibrator man, winch operator, pipe jacking man, wagon drill and air track operator and concrete saw operator (under 40 h.p.).	LAUCT-Z1-3	9/6/2013	$38.04	$48.91	$59.78	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.18	$41.62	$50.06	
1,001-2,000 work hours			$34.15	$43.07	$52.00	
2,001-3,000 work hours			$35.12	$44.53	$53.94	
3,001-4,000 work hours			$37.07	$47.45	$57.84	
Class IV - Tunnel, shaft and caisson mucker, bracer man, liner plate man, long haul dinky driver and well point man.	LAUCT-Z1-4	9/6/2013	$38.22	$49.18	$60.14	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.32	$41.83	$50.34	
1,001-2,000 work hours			$34.30	$43.30	$52.30	
2,001-3,000 work hours			$35.28	$44.77	$54.26	
3,001-4,000 work hours			$37.24	$47.71	$58.18	

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class V - Tunnel, shaft and caisson miner, drill runner, keyboard operator, power knife operator, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars)	LAUCT-Z1-5	9/6/2013	$38.47	$49.56	$60.64	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.50	$42.10	$50.70	
1,001-2,000 work hours			$34.50	$43.60	$52.70	
2,001-3,000 work hours			$35.49	$45.09	$54.68	
3,001-4,000 work hours			$37.48	$48.07	$58.66	
Class VI - Dynamite man and powder man.	LAUCT-Z1-6	9/6/2013	$38.80	$50.05	$61.30	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$33.75	$42.47	$51.20	
1,001-2,000 work hours			$34.76	$43.99	$53.22	
2,001-3,000 work hours			$35.77	$45.51	$55.24	
3,001-4,000 work hours			$37.79	$48.53	$59.28	
Class VII - Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes and flagstones.	LAUCT-Z1-7	9/6/2013	$32.08	$39.97	$47.86	X X X X X X X D Y
Apprentice Rates:						
0-1,000 work hours			$28.71	$34.91	$41.12	
1,001-2,000 work hours			$29.38	$35.92	$42.46	
2,001-3,000 work hours			$30.06	$36.94	$43.82	
3,001-4,000 work hours			$31.41	$38.97	$46.52	

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Landscape Laborer							
	Landscape Specialist includes air, gas, and diesel equipment operator, skidsteer (or equivalent), lawn sprinkler installer on landscaping work where seeding, sodding, planting, cutting, trimming, backfilling, rough grading or maintenance of landscape projects occurs. Sundays paid at time & one half. Holidays paid at double time.	LLAN-Z1-A	6/26/2014	$28.58	$39.49	$50.39	X X H X X X H D Y
	Skilled Landscape Laborer: small power tool operator, lawn sprinkler installers' tender, material mover, truck driver when seeding, sodding, planting, cutting, trimming, backfilling, rough grading or maintaining of landscape projects occurs Sundays paid at time & one half. Holidays paid at double time.	LLAN-Z1-B	6/26/2014	$24.36	$33.16	$41.95	X X H X X X H D Y
Marble Finisher							
	Marble Finisher A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	BR1-MF	10/20/2014	$43.48	$54.29	$65.10	H H D H D D D D Y

Apprentice Rates:			
Level 1	$19.04	$25.12	$31.20
Level 2	$20.24	$26.92	$33.60
Level 3	$27.01	$33.96	$40.90
Level 4	$28.47	$36.14	$43.82
Level 5	$29.99	$37.84	$45.70
Level 6	$31.61	$39.86	$48.10
Level 7	$33.30	$41.59	$49.87
Level 8	$34.79	$43.48	$52.17

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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Marble Mason						
Marble Mason	BR1-MM	10/17/2014	$50.29	$64.51	$78.72	H H D H D D D Y
A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.						
	Apprentice Rates:					
	Level 1		$25.14	$32.65	$40.15	
	Level 2		$28.20	$36.49	$44.78	
	Level 3		$33.41	$41.97	$50.53	
	Level 4		$36.15	$45.66	$55.17	
	Level 5		$38.42	$48.17	$57.92	
	Level 6		$42.07	$53.56	$65.05	
	Level 7		$42.74	$54.38	$66.02	
	Level 8		$43.67	$55.78	$67.88	
Operating Engineer						
Crane with boom & jib or leads 120' or longer	EN-324-A120	6/12/2014	$57.11	$74.62	$92.13	X X H H D D D Y
comment						
Double time after 12 hours M-F						
Crane with boom & jib or leads 140' or longer	EN-324-A140	6/12/2014	$57.93	$75.85	$93.77	X X H H D D D Y
Work in excess of 12 per day M-F shall be paid at double time.						
Crane with boom & jib or leads 220' or longer	EN-324-A220	6/12/2014	$58.23	$76.30	$94.37	X X H H D D D Y
Work in excess of 12 per day M-F shall be paid at double time.						
Crane with boom & jib or leads 300' or longer	EN-324-A300	6/12/2014	$59.73	$78.55	$97.37	X X H H D D D Y
Work in excess of 12 per day M-F shall be paid at double time.						

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Crane with boom & jib or leads 400' or longer Work in excess of 12 per day M-F shall be paid at double time.	EN-324-A400	6/12/2014	$61.23	$80.80	$100.37	X X H H D D D D Y
Compressor or welding machine Work in excess of 12 per day M-F shall be paid at double time.	EN-324-CW	6/12/2014	$46.26	$58.35	$70.43	X X H H D D D D Y
Forklift, lull, extend-a-boom forklift Work in excess of 12 per day M-F shall be paid at double time.	EN-324-FL	6/12/2014	$53.57	$69.31	$85.05	X X H H D D D D Y
Fireman or oiler Work in excess of 12 per day M-F shall be paid at double time.	EN-324-FO	6/12/2014	$45.23	$56.80	$68.37	X X H H D D D D Y
Regular crane, job mechanic, concrete pump with boom Work in excess of 12 per day M-F shall be paid at double time.	EN-324-RC	6/12/2014	$56.25	$73.33	$90.41	X X H H D D D D Y
Regular engineer, hydro-excavator, remote controlled concrete breaker Work in excess of 12 per day M-F shall be paid at double time.	EN-324-RE	6/12/2014	$55.28	$71.88	$88.47	X X H H D D D D Y

Apprentice Rates:

0-999 hours	$44.32	$55.94	$67.55
1,000-1,999 hours	$45.99	$58.45	$70.89
2,000-2,999 hours	$47.64	$60.92	$74.19
3,000-3,999 hours	$49.30	$63.41	$77.51
4,000-4,999 hours	$50.96	$65.90	$80.83
5,000-5,999 hours	$52.62	$68.39	$84.15

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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Operating Engineer - DIVER						
Diver/Wet Tender/Tender/Rov Pilot/Rov Tender	GLF D	4/2/2014	$52.80	$79.20	$105.60	H H H H H H H D N
Operating Engineer - Marine Construction						
Diver/Wet Tender, Engineer (hydraulic dredge)	GLF-1	2/12/2014	$65.00	$84.85	$104.70	X X H H H H H D Y

Make up day allowed

Subdivision of county all Great Lakes, islands therein, & connecting & tributary waters

Crane/Backhoe Operator, 70 ton or over Tug Operator, Mechanic/Welder, Assistant Engineer (hydraulic dredge), Leverman (hydraulic dredge), Diver Tender	GLF-2	2/12/2014	$63.50	$82.60	$101.70	X X H H H H H D Y

Holiday pay = $120.80 per hour, wages &
Make up day allowed

Subdivision of county All Great Lakes, islands therein, & connecting & tributary waters

Friction, Lattice Boom or Crane License Certification	GLF-2B	2/12/2014	$64.50	$84.10	$103.70	X X H H H H H D Y

Holiday pay = $123.30
Make up day allowed

Subdivision of county All Great Lakes, islands, therein, & connecting & tributary waters

Deck Equipment Operator, Machineryman, Maintenance of Crane (over 50 ton capacity) or Backhoe (115,000 lbs or more), Tug/Launch Operator, Loader, Dozer on Barge, Deck Machinery	GLF-3	2/12/2014	$59.30	$76.30	$93.30	X X H H H H H D Y

Holiday pay = $110.30 per hour, wages &
Make up day allowed
Subdivision of county All Great Lakes, islands therein, & connecting & tributary waters

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Deck Equipment Operator, (Machineryman/Fireman), (4 equipment units or more), Off Road Trucks, Deck Hand, Tug Engineer, & Crane Maintenance 50 ton capacity and under or Backhoe 115,000 lbs or less, Assistant Tug Operator	GLF-4	2/12/2014	$53.60	$67.75	$81.90	X X H H H H H D Y
Holiday pay = $96.05 per hour, wages & fringes						
Make up day allowed						
Subdivision of county	All Great Lakes, islands therein, & connecting & tributary waters					

Operating Engineer Steel Work

Forklift, 1 Drum Hoist	EN-324-ef	9/5/2014	$58.16	$76.37	$94.58	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 120' boom or longer	EN-324-SW120	9/5/2014	$60.86	$80.42	$99.98	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 120' boom or longer w/ Oiler	EN-324-SW120-OY	9/5/2014	$61.86	$81.92	$101.98	H H D H H H D D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 140' boom or longer	EN-324-SW140	9/5/2014	$62.04	$82.19	$102.34	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 140' boom or longer W/ Oiler	EN-324-SW140-OY	9/5/2014	$63.04	$83.69	$104.34	H H D H H H D D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Boom & Jib 220' or longer	EN-324-SW220	9/5/2014	$62.31	$82.60	$102.88	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 220' boom or longer w/ Oiler	EN-324-SW220-OY	9/5/2014	$63.31	$84.10	$104.88	H H D H H H D D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						

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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Boom & Jib 300' or longer	EN-324-SW300	9/5/2014	$63.81	$84.85	$105.88	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 300' boom or longer w/ Oiler	EN-324-SW300-OD	9/5/2014	$64.81	$86.35	$107.88	H H D H H H D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Boom & Jib 400' or longer	EN-324-SW400	9/5/2014	$65.31	$87.10	$108.88	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane w/ 400' boom or longer w/ Oiler	EN-324-SW400-OD	9/5/2014	$66.31	$88.60	$110.88	H H D H H H D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Crane Operator, Job Mechanic, 3 Drum Hoist & Excavator	EN-324-SWCO	9/5/2014	$60.50	$79.88	$99.26	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
	Apprentice Rates:					
	0-999 hours		$47.87	$61.43	$75.00	
	1,000-1,999 hours		$49.81	$64.35	$78.88	
	2,000-2,999 hours		$51.74	$67.24	$82.74	
	3,000-3,999 hours		$53.68	$70.15	$86.62	
	4,000-4,999 hours		$55.62	$73.07	$90.50	
	5,000 hours		$57.56	$75.97	$94.38	
Crane Operator w/ Oiler	EN-324-SWCO-OD	9/5/2014	$61.50	$81.38	$101.26	H H D H H H D
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						
Compressor or Welder Operator	EN-324-SWCW	9/5/2014	$53.15	$68.86	$84.56	H H D H H H D D Y
Make up day allowed comment						
4 10s allowed M-Th with Friday makeup day because of bad weather						

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Hoisting Operator, 2 Drum Hoist, & Rubber Tire Backhoe		EN-324-SWHO	9/5/2014	$59.86	$78.92	$97.98	H H D H H H D D Y
Make up day allowed comment							
4 10s allowed M-Th with Friday makeup day because of bad weather							
Oiler		EN-324-SWO	9/5/2014	$51.64	$66.59	$81.54	H H D H H H D D Y
Make up day allowed comment							
4 10s allowed M-Th with Friday makeup day because of bad weather							
Tower Crane & Derrick where work is 50' or more above first level		EN-324-SWTD50	9/5/2014	$61.59	$81.52	$101.44	H H D H H H D D Y
Make up day allowed comment							
4 10s allowed M-Th with Friday makeup day because of bad weather							
Tower Crane & Derrick 50' or more w/ Oiler where work station is 50' or more above first		EN-324-SWTD50-O	9/5/2014	$62.59	$83.02	$103.44	H H D H H H D D Y
Make up day allowed comment							
4 10s allowed M-Th with Friday makeup day because of bad weather							

Operating Engineer Underground

Class I Equipment	EN-324A1-UC1	10/14/2014	$51.74	$66.98	$82.22	H H H H H H H D Y

Apprentice Rates:			
0-999 hours	$41.79	$52.45	$63.12
1,000-1,999 hours	$43.32	$54.75	$66.18
2,000-2,999 hours	$44.84	$57.03	$69.22
3,000-3,999 hours	$46.36	$59.31	$72.26
4,000-4,999 hours	$47.89	$61.61	$75.32
5,000-5,999 hours	$49.41	$63.89	$78.36

Class II Equipment	EN-324A1-UC2	10/14/2014	$47.01	$59.89	$72.76	H H H H H H H D Y
Class III Equipment	EN-324A1-UC3	10/14/2014	$46.28	$58.79	$71.30	H H H H H H H D Y

Official Request #: 275
Requestor: Wayne State University
Project Description: FPM Parking Structure - Renovations 2015

Project Number: 090-258510
County: Wayne

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class IV Equipment		EN-324A1-UC4	10/14/2014	$45.71	$57.94	$70.16	H H H H H H H D Y
Master Mechanic		EN-324A1-UMM	10/14/2014	$51.99	$67.81	$83.63	H H H H H H H D Y

Painter

Painter (8 hours of repaint work performed on Sunday shall be paid time & one half rate)	PT-22-P	10/8/2014	$42.82	$55.63	$68.43	H H D H D D D D Y

Four 10s allowed Monday-Thursday with Friday makeup day if job down due to weather, holiday or other conditions beyond the control of the employer.

Make up day allowed comment
Fridays for bad weather or holidays

Apprentice Rates:			
First 6 months	$30.02	$36.43	$42.83
Second 6 months	$33.86	$42.19	$50.51
Third 6 months	$35.14	$44.11	$53.07
Fourth 6 months	$36.42	$46.03	$55.63
Fifth 6 months	$37.70	$47.95	$58.19
Final 6 months	$38.98	$49.87	$60.75

Pipe and Manhole Rehab

General Laborer for rehab work or normal cleaning and cctv work-top man, scaffold man, CCTV assistant, jetter-vac assistant	TM247	10/15/2012	$27.20	$36.70		H H H H H H H H N
Tap cutter/CCTV Tech/Grout Equipment Operator: unit driver and operator of CCTV; grouting equipment and tap cutting equipment	TM247-2	10/15/2012	$31.70	$43.45		H H H H H H H H N

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Classification Name Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
CCTV Technician/Combo Unit Operator: unit driver and operator of cctv unit or combo unit in connection with normal cleaning and televising work	TM247-3	10/15/2012	$30.45	$41.57		H H H H H H H H N
Boiler Operator: unit driver and operator of steam/water heater units and all ancillary equipment associated	TM247-4	10/15/2012	$32.20	$44.20		H H H H H H H H N
Combo Unit driver & Jetter-Vac Operator	TM247-5	10/15/2012	$32.20	$44.20		H H H H H H H H N
Pipe Bursting & Slip-lining Equipment Operator	TM247-6	10/15/2012	$33.20	$45.70		H H H H H H H H N

Pipefitter

Pipefitter	PF-636	6/30/2014	$66.73	$87.93	$105.13	H H D H D D D D Y

comment

Four 10s allowed during the week preceding, following and/or the week of a holiday.

Apprentice Rates:			
1st & 2nd periods	$26.93	$35.28	$42.28
3rd period	$28.93	$38.28	$46.28
4th period	$30.18	$40.16	$48.78
5th period	$31.43	$42.03	$51.28
6th period	$32.68	$43.90	$53.78
7th period	$33.93	$45.78	$56.28
8th period	$34.93	$47.28	$58.28
9th period	$35.93	$48.78	$60.28
10th period	$37.36	$50.92	$63.14

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Plasterer							
Plasterer		BR1P	11/1/2012	$45.04	$67.56	$90.08	H H H H H H H D N
Make up day allowed comment							
Saturday							
	Apprentice Rates:						
	1st 6 months			$32.11	$48.17	$64.22	
	2nd 6 months			$33.40	$50.10	$66.80	
	3rd 6 months			$34.69	$52.04	$69.38	
	4th 6 months			$37.28	$55.92	$74.56	
	5th 6 months			$39.87	$59.81	$79.74	
	6th 6 months			$42.45	$63.68	$84.90	
Plasterer		PL67	9/8/2010	$44.72	$60.11	$75.50	H H H X D D D D N
	Apprentice Rates:						
	1st 6 months			$29.33	$37.02	$44.72	
	2nd 6 months			$30.87	$39.34	$47.80	
	3rd 6 months			$32.41	$41.64	$50.88	
	4th 6 months			$35.49	$46.26	$57.04	
	5th 6 months			$38.56	$51.16	$63.76	
	6th 6 months			$41.64	$55.49	$69.34	

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Plumber							
Plumber		PL-98	7/18/2013	$64.45	$84.87	$101.29	H H D H D D D D Y
	comment						
	4 tens allowed M-Th or T-F; OT of time and one half required on 11th & 12th hour of any ten hour days						
	Apprentice Rates:						
	Period 1			$19.93	$26.43	$32.93	
	Period 2			$23.90	$31.40	$38.90	
	Period 3			$30.60	$39.19	$47.77	
	Period 4			$31.23	$40.13	$49.03	
	Period 5			$32.39	$41.87	$51.35	
	Period 6			$33.54	$43.59	$53.65	
	Period 7			$34.69	$45.32	$55.95	
	Period 8			$35.86	$47.07	$58.29	
	Period 9			$37.01	$48.80	$60.59	
	Period 10			$38.16	$50.53	$62.89	
Roofer							
Commercial Roofer Straight time is not to exceed ten (10) hours per day or forty (40) hours per week.		RO-149-WOM	8/18/2008	$48.46	$62.29	$76.62	H H D H H H D D N
	Make up day allowed						
	Apprentice Rates:						
	Apprentice 1			$32.62	$39.86	$48.04	
	Apprentice 2			$36.80	$44.80	$53.30	
	Apprentice 3			$38.22	$46.93	$56.14	
	Apprentice 4			$39.25	$48.48	$58.20	
	Apprentice 5			$40.47	$50.30	$60.64	
	Apprentice 6			$41.87	$52.40	$63.44	
Sewer Relining							
Class I-Operator of audio visual CCTV system including remote in-ground cutter and other equipment used in conjunction with CCTV		SR-I	11/3/2014	$42.76	$57.75	$72.74	H H H H H H H D N

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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Class II-Operator of hot water heaters and circulation system; water jetters; and vacuum and mechanical debris removal systems and those assisting.	SR-II	11/3/2014	$41.23	$55.46	$69.68	H H H H H H H D N

Sheet Metal Worker

Sheet Metal Worker A 4 10 schedule may be worked, 4 consecutive days Monday thru Friday.	SHM-80	9/9/2014	$61.83	$78.74	$95.65	H H D X H H H D Y
Apprentice Rates:						
1st & 2nd Periods Indentured after 6-1-11			$39.18	$46.79	$54.40	
3rd & 4th Periods Indentured after 6-1-11			$40.88	$49.34	$57.80	
5th & 6th Periods Indentured after 6-1-11			$42.56	$51.86	$61.16	
7th & 8th Periods Indentured after 6-1-11			$44.25	$54.40	$64.54	
9th & 10th Periods Indentured before 6-1-11			$51.92	$64.44	$76.96	
Siding and decking *Make up day allowed*	SHM-80-SD	1/13/2014	$42.07	$54.28	$66.48	H H H H H H H D Y

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Sprinkler Fitter							
Sprinkler Fitter	4 ten hour days allowed Monday-Friday Double time pay due after 12 hours worked M-F	SP 704	12/19/2014	$64.92	$86.15	$107.38	H H D H D D D D Y
	Apprentice Rates:						
	1st Period			$28.29	$36.78	$45.27	
	2nd Period			$41.57	$51.12	$60.68	
	3rd Period			$43.69	$54.30	$64.92	
	4th Period			$45.81	$57.48	$69.16	
	5th Period			$47.94	$60.68	$73.42	
	6th Period			$50.06	$63.86	$77.66	
	7th Period			$52.18	$67.04	$81.90	
	8th Period			$54.30	$70.22	$86.14	
	9th Period			$56.43	$73.42	$90.40	
	10th Period			$58.55	$76.60	$94.64	
Terrazzo							
Terrazzo Finisher	A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	BR1-TRF	10/17/2014	$43.97	$55.03	$66.08	H H D H D D D D Y
	Apprentice Rates:						
	Level 1			$19.04	$25.12	$31.20	
	Level 2			$20.24	$26.92	$33.60	
	Level 3			$27.01	$33.96	$40.90	
	Level 4			$28.47	$36.14	$43.82	
	Level 5			$29.99	$37.84	$45.70	
	Level 6			$31.61	$39.86	$48.10	
	Level 7			$33.30	$41.59	$49.87	
	Level 8			$34.79	$43.48	$52.17	

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Terrazzo Worker A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.		BR1-TRW	10/17/2014	$49.73	$63.67	$77.60	H H D H D D D D Y
	Apprentice Rates:						
	Level 1			$25.14	$32.65	$40.15	
	Level 2			$28.20	$36.49	$44.78	
	Level 3			$33.41	$41.97	$50.53	
	Level 4			$36.15	$45.66	$55.17	
	Level 5			$38.42	$48.17	$57.92	
	Level 6			$42.07	$53.56	$65.05	
	Level 7			$42.74	$54.38	$66.02	
	Level 8			$43.67	$55.78	$67.88	

Tile

Tile Finisher A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.		BR1-TF	10/17/2014	$43.50	$54.32	$65.14	H H D H D D D D Y
	Apprentice Rates:						
	Level 1			$19.04	$25.12	$31.20	
	Level 2			$20.24	$26.92	$33.60	
	Level 3			$27.01	$33.96	$40.90	
	Level 4			$28.47	$36.14	$43.82	
	Level 5			$29.99	$37.84	$45.70	
	Level 6			$31.61	$39.86	$48.10	
	Level 7			$33.30	$41.59	$49.87	
	Level 8			$34.79	$43.48	$52.17	

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Classification Name	Description	Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Tile Layer A 4 ten workweek may be worked Monday thru Thursday or Tuesday thru Friday.	BR1-TL	10/17/2014	$49.68	$63.59	$77.50	H H D H D D D D Y
	Apprentice Rates:					
	Level 1		$25.14	$32.65	$40.15	
	Level 2		$28.20	$36.49	$44.78	
	Level 3		$33.41	$41.97	$50.53	
	Level 4		$36.15	$45.66	$55.17	
	Level 5		$38.42	$48.17	$57.92	
	Level 6		$42.07	$53.56	$65.05	
	Level 7		$42.74	$54.38	$66.02	
	Level 8		$43.67	$55.78	$67.88	
Truck Driver						
on all trucks of 8 cubic yard capacity or less (except dump trucks of 8 cubic yard capacity or over, tandem axle trucks, transit mix and semis, euclid type equipment, double bottoms and low boys)	TM-RB1	8/8/2013	$41.92	$37.85		H H H H H H H H Y
of all trucks of 8 cubic yard capacity or over	TM-RB1A	8/8/2013	$41.30	$38.00		H H H H H H H H Y
on euclid type equipment *Make up day allowed*	TM-RB1B	8/8/2013	$41.45	$38.23		H H H H H H H H Y

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Underground Laborer Open Cut, Class I							
Construction Laborer		LAUC-Z1-1	9/5/2013	$37.72	$48.43	$59.14	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$32.94	$41.26	$49.58	
	1,001-2,000 work hours			$33.90	$42.70	$51.50	
	2,001-3,000 work hours			$34.85	$44.13	$53.40	
	3,001-4,000 work hours			$36.76	$46.99	$57.22	
Underground Laborer Open Cut, Class II							
Mortar and material mixer, concrete form man, signal man, well point man, manhole, headwall and catch basin builder, guard rail builders, headwall, seawall, breakwall, dock builder and fence erector.		LAUC-Z1-2	10/25/2013	$37.83	$48.60	$59.36	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$33.02	$41.38	$49.74	
	1,001-2,000 work hours			$33.98	$42.82	$51.66	
	2,001-3,000 work hours			$34.95	$44.27	$53.60	
	3,001-4,000 work hours			$36.87	$47.15	$57.44	
Underground Laborer Open Cut, Class III							
Air, gasoline and electric tool operator, vibrator operator, drillers, pump man, tar kettle operator, bracers, rodder, reinforced steel or mesh man (e.g. wire mesh, steel mats, dowel bars, etc.), cement finisher, welder, pipe jacking and boring man, wagon drill and air track operator and concrete saw operator (under 40 h.p.), windlass and tugger man, and directional boring man.		LAUC-Z1-3	9/5/2013	$37.88	$48.67	$59.46	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$33.06	$41.44	$49.82	
	1,001-2,000 work hours			$34.02	$42.88	$51.74	
	2,001-3,000 work hours			$34.99	$44.33	$53.68	
	3,001-4,000 work hours			$36.92	$47.23	$57.54	

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Underground Laborer Open Cut, Class IV							
Trench or excavating grade man.		LAUC-Z1-4	9/5/2013	$37.96	$48.79	$59.62	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$33.12	$41.53	$49.94	
	1,001-2,000 work hours			$34.09	$42.99	$51.88	
	2,001-3,000 work hours			$35.06	$44.44	$53.82	
	3,001-4,000 work hours			$36.99	$47.33	$57.68	
Underground Laborer Open Cut, Class V							
Pipe Layer		LAUC-Z1-5	9/5/2013	$38.02	$48.88	$59.74	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$33.16	$41.59	$50.02	
	1,001-2,000 work hours			$34.14	$43.06	$51.98	
	2,001-3,000 work hours			$35.11	$44.51	$53.92	
	3,001-4,000 work hours			$37.05	$47.43	$57.80	
Underground Laborer Open Cut, Class VI							
Grouting man, top man assistant, audio visual television operations and all other operations in connection with closed circuit television inspection, pipe cleaning and pipe relining work and the installation and repair of water service pipe and appurtenances.		LAUC-Z1-6	9/5/2013	$35.47	$45.06	$54.64	X X X X X X X D Y
	Apprentice Rates:						
	0-1,000 work hours			$31.25	$38.73	$46.20	
	1,001-2,000 work hours			$32.10	$40.00	$47.90	
	2,001-3,000 work hours			$32.94	$41.26	$49.58	
	3,001-4,000 work hours			$34.63	$43.79	$52.96	

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Classification Name	Description		Last Updated	Straight Hourly	Time and a Half	Double Time	Overtime Provision
Underground Laborer Open Cut, Class VII							
	Restoration laborer, seeding, sodding, planting, cutting, mulching and topsoil grading and the restoration of property such as replacing mail boxes, wood chips, planter boxes, flagstones etc.	LAUC-Z1-7	9/5/2013	$32.09	$39.99	$47.88	X X X X X X X D Y

Apprentice Rates:			
0-1,000 work hours	$28.72	$34.93	$41.14
1,001-2,000 work hours	$29.39	$35.93	$42.48
2,001-3,000 work hours	$30.07	$36.95	$43.84
3,001-4,000 work hours	$31.42	$38.98	$46.54

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WAYNE STATE UNIVERSITY
PAYMENT PACKAGE DOCUMENT REQUIREMENTS *(Revised 5-06-2011)*:

Review and comply with Section 410 of Bid Front End Documents.
Review and comply with Article 15 of the Supplemental General Conditions.

AIA DOCUMENT G702 & G703 – (or facsimile thereof) Payment Application Checklist:

- Correct Project Name – Found on your contract.
- Correct Project Number – Found on your contract.
- Purchase Order Number – Required prior to beginning work.
- Correct Application Number. (i.e. 1, 2, 3, etc.)
- Correct Period Reporting Dates – Applications support docs must be sequential and within application range.
- Approved & Executed Change Orders must be listed. (Cannot invoice for unapproved changes.)
- Schedule of values percentages and amounts match the approved Pencil Copy Review – Signed by the Architect, Contractor, and University Project Manager.
- Correct Dates – Back dating not accepted.
- Signed and Notarized.

SWORN STATEMENT – Checklist:

- List all contractors, sub-contractors, suppliers… ≥ $1000.00
- Contractor's Sworn Statement amounts must coincide with Column "C" of the schedule of values document. Any unassigned or uncommitted value of contract shall be shown on an entry "Contractor – Unassigned" followed by the amount necessary to cause the „contracted to date" column of the sworn statement to equate with the schedule of value column totals.
- Current Date – Back dating not accepted.
- Signed and Notarized.
  A Sworn Statement is required from every Sub Contractor on the job with a material purchase or sub-subcontract of $1,000 or more. (all the way down to the bottom tier)

DEPT. of LABOR FORM WH-347 – Certified Payroll Checklist: (Union and Non-Union)

- For every contractor & sub-contractors work, for each week within the application for payment reporting period. (For every „boot" on the floor representing the weeks within the application period)
- Wayne State University Project Number – Found on your contract.
- List ALL workers who have worked on the project site.
- Make sure workers addresses are listed.
- NO Social Security Numbers, if present they MUST be blackened out or listed in XXX-XX-1234 format.
- Work classifications based on the job specific Prevailing Wage Schedule descriptions. If you require rates for additional classifications, contact the Michigan Department of Consumer & Industry Services. (Refer to Section 410 of Bid Front End Documents.)
  http://www.cis.state.mi.us/bwuc/bsr/wh/revised_rates/whc_tbl.htm
- Apprenticeship program status – proof of enrolled program and current completion required for any workers paid at Apprenticeship rates.
- Rate of Pay verified against the Prevailing Wage Schedule with an hourly costs breakdown of fringes paid. (Refer to attachment for State of Michigan instructions and example)
- Authorized signatures on affidavit.

APPLICATION PACKAGE SUPPORTING DOCUMENTATION – Must accompany all package reporting periods: (Union and Non-Union)

- Copies of Pay Stubs may be required for each Certified Payroll period reported – (Social Security Numbers MUST be blackened out or listed in XXX-XX-1234 format. Pay stubs need to reflect claimed participation of fringes like Medical, Dental, Retirement or 1099 classification.)
- Proof of Ownership for any „Owner Operator" (Sole Proprietor) contractors not claiming their time under prevailing wage act. – (Must list their hours and dates worked on the WH-347 Form and enter EXEMPT on the income brackets.). The Owner Operator must provide copies of "DBA" registration form confirming status as exempt from prevailing wage requirements.

- Proof of Stored Materials – (Detailed Bill of Sale, certificate of insurance or endorsement page specifically insuring the stored materials, pictures, when large value. WSU reserves the right to on site verification of material. Stored material must be separated from ordinary inventory and labeled for WSU project.
- Partial Unconditional Waivers – Must release the accumulated amount paid for work and be immediately provided, or provided with the subsequent application for payment. Waivers shall be provided for contractors, sub-contractors, and suppliers listed on the Sworn Statements. (This is required at all tiers)
- Full Unconditional Waivers – Prime Contractor must deliver fully executed Full Unconditional Waiver upon receipt of final payment. Full Unconditional waivers may be required of sub-contractors and suppliers in advance of final Contractor payment on bonded projects This requirement shall be determined on a project-by-project basis. Full Unconditional waivers shall be required in advance of or at the time of final payment on all non-bonded projects from all subcontractors and suppliers listed on Sworn Statements, or who have provided a notice of furnishing.
- Partial Conditional Waivers – The Contractor shall provide a Partial Conditional Waivers covering the entire amount of the application for payment. For non-bonded Projects – A partial conditional waiver from all subcontractors must accompany any application for payment within which a subcontractor draw is included.
- Sworn Statements – Required for all Sub Contractors, and Sub-subcontractors (etc.) with any contracts or purchases exceeding $1,000.

FINAL PAYMENT EXCHANGE – Checklist:

- Clear and concise As-Built drawings.
- Operation and Maintenance Manuals.
- Required training must be completed (if applicable).
- Warranty of work in accordance with project documents.
- Certificate of Substantial Completion.
- Full Unconditional Waiver

The Project Manager may provide additional requirements as may apply to individual jobs

Revised 5-6-2011

Contractor Performance Evaluation

In an effort to provide continuous process improvement regarding the construction of various university projects, Wayne State University is embarking upon a process of evaluating the contractor's overall performance following the completion of work. At the conclusion of the construction project a subjective evaluation of the Contractor's performance will be prepared by the Project Manager and the supervising Director of Construction. The evaluation instrument that will be used in this process is presented below:

Contractor Evaluation Sheet

Contractor Name : _____ Project Name: _____
Contractor's PM:_____ PM Name:_____
Superintendent:_____ Project Number:_____ PO#:_____
Designer:_____

EVALUATION SCORING: 1 = Unacceptable, 2 = Less than Satisfactory, 3 = Satisfactory or Neutral, 4 = Good, 5 = Excellent
Note: Comments are REQUIRED if any score is less than 3. Write comments on the back of the evaluation.

		Score					Weight	Total
Field Management								
1)	Work Planning / Schedule:	1	2	3	4	5	8	
2)	Compliance with Construction Documents:	1	2	3	4	5	8	
3)	Safety Plan & Compliance:	1	2	3	4	5	5	
4)	Compliance with WSU procedures:	1	2	3	4	5	7	
5)	Effectiveness of Project Supervision:	1	2	3	4	5	8	
6)	Project Cleanliness:	1	2	3	4	5	3	
7)	Punch List Performance:	1	2	3	4	5	5	
8)	Contractor Coordination with WSU Vendors:	1	2	3	4	5	3	
9)	Construction Quality:	1	2	3	4	5	8	
Administrative Management								
10)	Responsiveness:	1	2	3	4	5	4	
11)	Contractor communication:	1	2	3	4	5	4	
12)	Contractor Professionalism:	1	2	3	4	5	3	
13)	Subcontractor Professionalism:	1	2	3	4	5	3	
14)	Compliance with Contract Requirements:	1	2	3	4	5	3	
15)	Submittal\RFI Process:	1	2	3	4	5	4	
16)	Close-out - Accuracy of Documents	1	2	3	4	5	7	
Invoice and Change Management								
17)	Change Management	1	2	3	4	5	7	
18)	Applications for Payment	1	2	3	4	5	6	
19)	Timely payment of Subs/Suppliers:	1	2	3	4	5	4	
							Total 100	**Total**
20)	Level of Self-Performance:	Low		Med		High		
21)	Would you work with this Contractor again?			Yes		No		
22)	Would you work with this team again?			Yes		No		
One year follow up								
23)	Warranty Support:	1	2	3	4	5		

Evaluator

Signature_____ Date:_____
Title:
Name:
Please Print

Rev. 2-17-2015 RGP

We are providing the evaluation instrument at this time to allow the bidder's to review and understand the criterion that the University's project management team will use to evaluate the successful bidder's performance at the conclusion of the project. It is the intent of the university to utilize the results of this evaluation to determine if it will continue to conduct business with the Contractor in future bidding opportunities.

The scoring range is between 100 to 500 points, with 100 being low and 500 being high. Each question has an associated 'weight' factor, and the higher the weight; the greater the importance of satisfactory performance on the final score. At the conclusion of the project, and after the Project Manager and the supervising Director has prepared their independent evaluation, the University's project representative will meet with the Contractor to review the results. Acceptable contractor performance is essential to avoid having the University decline future work with the Contractor. An appeals process is available for Contractor disagreement with evaluation scores.

Contractors engaged in work are encouraged to maintain an open and regular dialog with the Design and Construction Department over the course of the construction project to ensure that the final evaluation is an accurate representation of the Contractor's performance.

WAYNE STATE UNIVERSITY

AGREEMENT BETWEEN THE UNIVERSITY AND CONTRACTOR FOR CONSTRUCTION SERVICES (rev 6-2013)

Executed as of the _____ day of _____, 2014 by and between:

The Board of Governors, Wayne State University
Detroit, Michigan 48202
(The University)

and

CONTRACTOR'S_NAME
CONTRACTOR'S_ADDRESS

regarding

2015 Parking Structures 1, 2 & 5 Renovations 2015
PS-1 450 West Palmer, PS-2 5150 John C Lodge, PS-5 5501 Anthony Wayne
WSU Project No. 051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5

In consideration of the mutual covenants and conditions contained herein, the Parties agree as follows:

Article 1 - Scope of Work

1.1 This Agreement provides for **Work includes parking structure renovations, waterproofing, traffic coatings, sealants, concrete repairs, tee stem and beam repairs, column repairs, patching and various drains and electrical work as described. Allowances are to be included as identified within the project.** , located at **PS-1 450 West Palmer, PS-2 5150 John C Lodge, PS-5 5501 Anthony Wayne**. The documents listed in Article 4 fully define the scope of work.

1.2 The Contractor shall furnish all the labor, materials, equipment, services, and supervision to perform all the work shown on the drawings and specifications listed in Article 18, including any addenda issued during the bid phase, and approved change orders issued during the construction phase.

1.3 The Contractor shall notify the University in writing within five (5) calendar days when the Contractor discovers any condition that will affect the contract amount or the completion date.

Article 2 - Time of Completion

2.1 The work to be performed under this Agreement shall commence upon the Contractor's receipt of a fully-executed Agreement, and substantial completion shall be achieved by **Parking Structure 1 – Has two substantial completion dates; July 31, 2015 Phase 1 Level 6 , Bays 7 & 8, August 28, 2015 Phase 2 Level 2, Bay 8. Alternates as identified on drawing R-003 in work schedule.**
Parking Structure 2 date of substantial completion is July 30, 2015.
Parking Structure 5 date of substantial completion is July 17, 2015. .

Article 3 - The Contract Sum

3.1 The University shall pay the Contractor a "lump sum/not-to-exceed (pick one)" amount of $$$$$$$ ("Amount in words 00" /100 dollars) for the performance of all work associated with the Contractor's Base Bid "and Alternates (List)".

3.2 The University may, at its sole discretion, during the life of the contract, award the following alternates at the amounts indicated: "(If section 3.2 is not used, delete all text and enter_Deleted"

Description	Amount
Alternate #1	
Alternate #2	
Alternate #3	

3.3 In the event additional work becomes necessary, the following unit prices will apply:
(If section 3.3 is not used, delete all text and enter_Deleted)

Work Item	Unit Price
1.	
2.	
3.	

Article 4 - The Contract Documents

4.1 The Contract Documents shall consist of this Agreement, the drawings and specifications as listed in Article 18, the General Conditions of the Contract for Construction as defined by AIA Document A201 1970 Edition, except as otherwise provided herein, and Wayne State University's Supplementary General Conditions 1997 Edition.

4.2 For any inconsistencies found among or between these Contract Documents, the language contained in this Agreement shall prevail over all other documents and the Supplementary General Conditions shall prevail over the General Conditions. In the event of a conflict between the Drawings and Specifications, the

requirement for the higher quantity and/or higher quality shall prevail.

Article 5 – Examination of Premises

5.1 The Contractor acknowledges that the University provided the opportunity for a thorough examination of the project site and its surroundings and that the Contractor knows of no conditions preventing accomplishment of the full scope of work within the time and for the amount specified in this Agreement.

5.2 The University will deny all claims for additional time and/or cost for conditions that could have been reasonably discovered during such an examination.

Article 6 - The Architect/Engineer

6.1 The Architect/Engineer for this project is:
"(List the Architect and Engineer separately if appropriate)"

Walker Parking Consultants
525 Avis Drive, Suite 1
Ann Arbor, MI 48108
(Architect Phone No / Fax No)

6.2 The University will appoint a Project Manager who will be the University's point of contact for all matters of contract administration including, but not limited to, interpretation of documents, defining the scope of work, approving work schedules, and approving contract payments.

Article 7 - Additional Work

7.1 The University reserves the right to let other Agreements in connection with this work. The Contractor will afford other Contractors or the University's own workforce reasonable opportunity for the delivery and storage of their material and for the performance of their work and shall properly connect and coordinate its work with theirs.

7.2 If any part of the Contractor's work depends for proper execution or results upon the work of another Contractor or the University's own workforce, the Contractor shall inspect and promptly report to the University's Project Manager any defects in such work that render it unsuitable for such proper execution and results. The Contractor's failure to so inspect and report shall constitute an acceptance of the work of others as fit and proper for reception of the Contractor's work and as a waiver of any claim or defense against the University or other contractor which relies in whole or in part upon the contention that such work was unsuitable for proper execution and resolution.

Article 8 – Dispute Resolution

8.1 Jurisdiction over all claims, disputes, and other matters in question arising out of or relating to this contract or the breach thereof, shall rest in the Court of Claims of the State of Michigan. No provision of this agreement may be construed as Wayne State University's consent to submit any claim, dispute or other matter in question for dispute resolution pursuant to any arbitration or mediation process, whether or not provisions for dispute resolution are included in a document which has been incorporated by reference into this agreement. Specifically, all references to Arbitration contained in the General Conditions are superceded by this Article.

8.2 In any claim or dispute by the Contractor against the University, which cannot be resolved by negotiation, the Contractor shall submit the dispute in writing for an administrative decision by the University's Vice President for Finance and Administration, within 30 days of the end of negotiations. Any decision of the Vice President shall be made within 45 days of receipt from the Contractor and is final unless it is challenged by the Contractor by filing a lawsuit in the Court of Claims of the State of Michigan within one year of the issuance of the decision. The Contractor agrees that appeal to the Vice President is a condition precedent to filing suit in the Michigan Court of Claims.

8.3 For purposes of this section, the "end of negotiations" shall be deemed to have occurred when:

8.3.1 Either party informs the other that pursuant to this section, negotiations are at an impasse; or

8.3.2 The Contractor submits the dispute in writing to the Vice President.

8.4 Unless otherwise agreed by the University in writing, and notwithstanding any other rights or obligations of either of the parties under any Contract Documents or Agreement, the Contractor shall continue with the performance of its services and duties during the pendency of any negotiations or proceedings to resolve any claim or dispute, and the University shall continue to make payments in accordance with the Contract Documents; however, the University shall not be required or obligated to make payments on or against any such claims or disputes during the pendency of any proceeding to resolve such claims or disputes.

Article 9 - Termination for Convenience

9.1 Upon thirty days written notice to the Contractor, the University may, without cause and without prejudice to any other right or remedy of the University, elect to terminate the contract. In such case, the Contractor shall only be paid (without duplication of any items), using a Close out Change Order, for the following:

9.1.1 For completed and acceptable work executed in accordance with the Contract Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work;

9.1.2 For expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the Contract Documents in connection with uncompleted work, including fair and reasonable sums for overhead and profit on such expenses.

9.2 The Contractor shall not be paid on account of loss of anticipated profits or revenue, delay or disruption, or other economic loss arising out of or resulting from such termination. For purposes of this section, "fair and reasonable sums for overhead and profit" shall be determined by reference to Michigan law, without reference to principles used for such determinations in arbitration.

Article 10 - Progress Payments

10.1 On or before the 20th day of each month, the Contractor shall submit a written application for payment, using form AIA G702, to the Architect/Engineer and the University's Project Manager for review. The Architect/Engineer shall have ten (10) calendar days to accept or reject the Contractor's application for payment. Acceptable applications for payment shall then be submitted to the University for Payment of authorized amount(s) within thirty (30) calendar days of receipt by the University's Project Manager.

10.2 The application for payment shall contain a full schedule of values organized and sorted by subcontractor, by Construction Specifications Institute standard work categories, or in another format acceptable to the University.

10.3 Monthly progress payments shall show the percentage of work installed as of the date of the application, less amount previously installed and the amount due for the application period. The Contractor shall deduct a 10% retainage from the balance due for each progress payment and indicate the net amount due on each application.

10.4 When 50% of the work associated with this Agreement is installed, the Contractor shall not deduct additional retainage from the balance due from the University. When substantial completion is achieved and acknowledged by the Architect/Engineer, the Contractor and the University in writing, the University shall remit to the Contractor all but 2% of the retainage. The remaining 2% shall be retained by the University until the final payment is authorized and remitted to the Contractor.

Article 11 - Acceptance and Final Payments

11.1 Final payment shall be due thirty (30) days after the completion of the work, including all punch list items, provided the work is fully completed and the Agreement fully performed.

11.2 Upon receipt of written notice that the work is ready for final inspection and acceptance, the Architect/Engineer shall promptly inspect the work. When the Architect/Engineer concludes that the work is acceptable and the Agreement to be fully performed, the Architect/Engineer shall promptly issue a final certificate with an original signature, stating that the work provided is complete and acceptable and that the entire remaining balance found to be due the Contractor shall be remitted by the University once the final application for payment is received.

11.3 If, after the work has been substantially completed, full completion thereof is materially delayed through no fault of the Contractor, and the Architect/Engineer so certifies, the University shall, upon certificate of the Architect/Engineer, and without terminating the Contract, make payments of the balance due for that portion of the work fully completed and accepted. Such payments shall be made under the terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

Article 12 - Non-Discrimination

12.1 The Contractor agrees that it will not discriminate against any employee or applicant for employment, to be employed in the performance of this Agreement, with respect to hire, tenure, terms, conditions or privileges of employment or any matter directly or indirectly related to employment, because of race, color, religion, sex, age, national origin, or ancestry. Breach of this covenant may be regarded as material breach of this Agreement.

12.2 The Contractor further agrees that it will, in all subcontracts relating to the performance of the work under this Agreement, provide in its subcontracts that the subcontractor will not discriminate against any employee or applicant for employment, to be employed in the performance of such contract, with respect to hire, tenure, terms, conditions or privileges of employment, or any matter directly or indirectly related to employment because of race, sex, age, color, religion, national origin or ancestry. Breach of this covenant may also be regarded as a material breach of this Agreement.

Article 13 – Laborers and Mechanics

13.1 All laborers and mechanics must be covered by Worker's Compensation and Employer's Liability Insurance as required by Federal and Michigan law. The Contractor shall also require all of its Subcontractors to maintain this insurance coverage.

13.2 The Contractor acknowledges and shall abide by the University's prohibition on use of 1099 independent contractors and owner / operator business entities. The Contractor shall ensure that all classifications of laborers and construction mechanics performing Work on the Project job site are employees of the Contractor or any Trade Contractor for any tier thereof, and that each worker is covered by workers compensation insurance.

Article 14 - Prevailing Wages

14.1 The Contractor and each subcontractor shall pay to each class of mechanics and laborers not less than the wage and fringe benefit rates prevailing in the Detroit Metropolitan Area, as determined by the United States Department of Labor. The Contractor shall post on site, in a conspicuous place, a copy of all applicable wage and benefit rates, and shall provide the University with a copy of the applicable wage and benefit rates.

14.2 The Contractor and each subcontractor shall keep an accurate record showing the name and occupation of and the actual benefits and wages paid to each laborer and mechanic employed in connection with this contract. The Contractor and each subcontractor shall make certified payroll records available to the University's representatives upon request.

14.3 If a Contractor or subcontractor fails to pay the prevailing rates of wages and fringe benefits and does not cure such failure within ten (10) days after notice to do so by the University, the University shall have the right, at its option, to do any or all of the following:

14.3.1 Withhold all or any portion of payments due the Contractor as may be considered necessary by the University to pay laborers and mechanics the difference between the rates of wages and fringe benefits required by this Agreement and the actual wage and fringe benefits paid.

14.3.2 Terminate part or all of this Agreement or any subagreement and proceed to complete the Agreement or subagreement by separate agreement with another Contractor or otherwise, in which case the Contractor and its sureties shall be liable to the University for any excess costs incurred by the University.

14.4 The Contractor shall include terms identical or substantially similar to this section in any Agreement or subagreement pertaining to the project.

Article 15 - Save Harmless (Revised 2-2015)

15.1 To the fullest extent permitted by law, the Contractor shall hold harmless, defend, and indemnify the Board of Governors of Wayne State University, the University, the Architect and Architect's Consultants, and officers, employees, representatives and agents of each of them, from and against any and all claims or losses arising out of or alleged to be resulting from, or relating to (1) the failure of the Contractor to perform its obligations under the Contract or the performance of its obligation in a willful or negligent manner; (2) the inaccuracy of any representation or warranty by the Contractor given in accordance with or contained in the Contract Documents; and (3) any claim of damage or loss by any subcontractor, or supplier, or laborer against the University , the Architect or the Architect's consultants arising out of any alleged act or omission of the Contractor or any other subcontractor, or anyone directly or indirectly employed by the Contractor or any subcontractor.

The Contractor shall also be liable for and hereby agrees to pay, reimburse, fully indemnify and hold the University, the Architect and Architect's Consultants, harmless from and against all costs and expenses of every nature (including attorney fees and expenses incident thereto) incurred by the University in collecting the amounts due from the Contractor, or otherwise enforcing its rights, under the indemnification described in this Article.

Article 16 - Liquidated Damages

16.1 It is understood and agreed that, if the project is not completed within the time specified in the Agreement plus any extension of time allowed pursuant thereto, the actual damages sustained by the University because of any such delay will be uncertain and difficult to ascertain, and it is agreed that the reasonable foreseeable value of the use of said project by the University would be the sum of **$7.00 per parking space per day, Seven and 00/100 Dollars per parking space** per day. Therefore, the Contractor shall pay as liquidated damages to the University the sum of **$7.00 per parking space per day. Seven and 00/100 Dollars per parking space** per day for each day's delay in substantially completing said project beyond the time specified in this Agreement and any extensions of time allowed thereunder.

"ENTER N/A FOR ABOVE AMOUNT IF NO LIQUIDATED DAMAGES"

Article 17- Interpretation

17.1 This Agreement shall be interpreted and construed according to the laws of the State of Michigan.

17.2 If one part of this Agreement is found to be void by legal or legislative action, the remainder of the contract remains in full effect.

Article 18 - Drawings and Specifications

18.1 The Technical Specifications and the Project Manual dated **March 5, 2015,** and the following List of Drawings represents the scope of work as defined in the Contract Documents from Article 4.

DRAWINGS

Drawing No.:	**Description**	**dated**
Parking Structure 1 -		
R-001	General Notes, ISO, Legend and Work Item List	
R-002	Temporary Shoring (W.I. 18.1)	
R-003	Traffic Control & Phasing	
R-003A	Traffic Control & Phasing	
R-101	Permanent Shoring	
R-201	Level 2 Plan View	
R-202	Level 6 Plan View (Base Bid)	
R-203	Level 6 Plan View (Alternates)	
R-301	Existing Reinforcement	
R-501	Repair Details	
R-502	Repair Details	
Parking Structure 2 & 5 –		
R-001	General Notes and Work Item List	
R-201	Structure #2 Levels 1 & 2 Plan Views	
R-202	Structure #2 Levels 3 & 4 Plan Views	
R-203	Structure #2 Levels 5 & 6 Plan Views	
R-204	Structure #5 Typical Level Plan View	
R-501	Repair Details	
R-502	Repair Details	

IN WITNESS WHEREOF the parties to these presents have hereunto set their hands as of the day and year first written above.

Signed, sealed and delivered
in the presence of:

CONTRACTOR'S NAME GOES HERE

By_____
signature

_____
Please print name here

_____
Date signed

_____
Title

_____
Witness

THE BOARD OF GOVERNORS of
WAYNE STATE UNIVERSITY

By_____
Richard J. Nork, Vice President for
Finance and Facilities

_____
Date signed

Form Contract Approved by OGC 06/13 – LG
File_reference_here

FORM OF GUARANTEE

PROJECT: 2015 Parking Structures 1, 2 & 5 Renovations 2015

OWNER: BOARD OF GOVERNORS, WAYNE STATE UNIVERSITY

CONTRACTOR: _____

DATE: _____

Know all men by these presents that, in consideration of my (our) having been awarded the Contract or Subcontract for complete furnishing and installation of:

2015 Parking Structures 1, 2 & 5 Renovations 2015 (**051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5**)

For: **Board of Governors, Wayne State University**

In conformity with drawings and specifications prepared by Architect or Engineer, **Walker Parking Consultants**, and known as the buildings indicated above, I (we) do hereby agree that, should I (we) be notified that the said work has proved faulty, etc., that I (we) will return to the buildings within three (3) working days of the receipt of such notice, and will furnish the necessary labor and material to repair such work to the satisfaction of the Owner and without cost to the Owner.

The Agreement shall remain in full force and effect **for a one year period (DATE TBD)**

WITNESS:

signed:_____
Subcontractor

by:_____

address:_____

city/state/zip:_____

signed:_____
General Contractor

by:_____

(THIS FORM TO BE FILED IN DUPLICATE.)

GENERAL CONDITIONS (Revised 10-2009)

A. Although AIA Document A201 - Twelfth Edition (April 1970) - "General Conditions of the Contract for Construction" is not bound herein, it forms a part of these construction documents.

B. A reference copy of AIA Document A201 - Twelfth Edition (April 1970) - "General Conditions of the Contract for Construction" is on file at the following location:

Wayne State University
Finance & Facilities Management
Procurement & Strategic Sourcing
Academic / Administrative Services Building
5700 Cass Avenue
Detroit Michigan 48202

SUPPLEMENTARY GENERAL CONDITIONS

OF

THE CONTRACT FOR CONSTRUCTION

Facilities Planning & Management - Design & Construction Services

Wayne State University

WSU SUPPLEMENTARY GENERAL CONDITIONS OF THE CONTRACT FOR CONSTRUCTION

NOTE: The following items related to A.I.A. General Conditions, A.I.A. Document A-201 - Twelfth Edition (April 1970), by specific number being amended to. These items, as amendments, shall have precedence over the article being amended.

ARTICLE 1 - CONTRACT DOCUMENTS

1.1 DEFINITIONS

1.1.5 The Agreement

The Agreement executed by the Contractor and the Owner.

1.2 EXECUTION, CORRELATION, INTENT, AND INTERPRETATIONS

1.2.6 "General Conditions and "Supplementary General Conditions" apply with equal force to all Contractors, Subcontractors work, and extra work required under this Contract.

1.2.7 Precedence of Drawings and Specifications.
The Agreement has precedence over WSU Supplementary General Conditions.

WSU Supplementary General Conditions have precedence over A.I.A. A-201 General Conditions of the Contract.

Specifications have precedence over drawings. Full-size drawings have precedence over scale drawings. Large-scale plans and details have precedence over small-scale plans and details. Figured dimensions have precedence over plans and elevations.

ARTICLE 2 - ARCHITECT

2.1 DEFINITION

2.1.1.1 The term Architect or Architect/Engineer as used in these specifications refers to Facilities Planning and Management - Design Services, and/or Consulting Architect/Engineer.

2.2 ADMINISTRATION OF THE CONTRACT

2.2.16 The Architect will assign Field Representatives to make periodic visits to the project for the purpose of assisting the Architect in carrying out his field responsibilities at the site. The duties, responsibilities and limitations of authority of any such Field Representative shall be as follows:

a. Explain Contract Documents: Assist the Contractor via the Contractor's Superintendent to understand the intent of the Contract Documents.

b. Observations: Conduct on-site observations and spot checks of the work in progress as a basis for determining conformance of the work, material, and equipment with the Contract Documents.

c. Additional Information: Obtain from the Architect, additional details or information, if and when required, at the job site for proper execution of the work.

d. Modifications: Consider and evaluate suggestions or modifications that may be submitted by the Contractor and report them with recommendations to the Architect for final decision.

e. Construction Schedule and Completion: Be alert to the completion, and report same to the Architect. When the construction work has been completed in accordance with the Contract Documents, advise the Architect that the work is ready for general inspection and

acceptance.

f. Job Conferences: Attend and report to the Architect on all required conferences held at the job site.

g. Observe Tests: See that tests which are required by the Contract Documents are actually conducted; observe, record and report to the Architect all details relative to the test procedures; and advise the architect's office in advance of the schedules of tests.

h. Inspection by Others: If inspectors, representing local, state or federal agencies having jurisdiction over the project, visit the job site, accompany such inspectors during their trips through the project, record the outcome of these inspections, and report same to the Architect's office.

i. Shop Drawings: Do not permit the installation of any materials and equipment for which shop drawings are required unless such drawings have been duly approved and issued by the Architect.

j. Contractor's Requisitions for Payment: Review and make recommendations to the Architect for disposition.

k. List of Items for Correction: After substantial completion, make a list of items for correction before final inspection and check each item as it is corrected.

l. Owner's Occupancy of the Building: If the Owner occupies (to any degree) the building prior to actual completion of the work by the Contractor, be especially alert to possibilities of claims for damage to completed work prior to the acceptance of the building.

m. Owner Existing Operation: In the case of additions to or Demolitions of an existing facility, which must be maintained as an operational unit, be alert to conditions on the job site which may have an effect on the Owner's existing operation.

n. Limitations of Authority: Do not become involved in any of the following areas of responsibility unless specific exceptions are established by written instructions issued by the Architect.

aa. Do not authorize deviations from the Contract Documents.

bb. Avoid conducting any test personally.

cc. Do not enter into the area of responsibility of the Contractor's field superintendent.

dd. Do not expedite job for Contractor unless so instructed by the Architect.

ee. Do not advise on or issue directions relative to any aspect of the building technique or sequence unless a specific technique or sequence is called for in the Specifications or by written instructions from the Architect.

ff. Do not approve shop drawings or samples.

gg. Do not authorize or advise the Owner to occupy the Project, in whole or in part, prior to the final acceptance of the building.

hh. Do not issue a Certificate for Payment.

ARTICLE 3 - OWNER

3.5 OWNER'S RIGHT TO DO WORK

3.5.1 The Owner may exercise his right, which is hereby acknowledged by the Contractor, to let independent of the Contract for the work herein specified, any other work on the premises even if of

like character and trades, and the Owner shall not be liable for any damage, loss or expense incurred by the Contractor through the fault of any other Contractor so employed by the Owner. The Contractor acknowledges the necessity of work by others, to be performed at approximately the same time as the work hereunder, and agrees to perform his work in full cooperation with the work of such other trades and/or Contractors, partially or entirely completed, by such other trades and/or Contractors, or by the Owner, when, in the opinion of the Architect, such access or use is necessary for the performance and completion of any portion or all of the work of others or of any work on the site.

3.6 OWNER'S ACCESS AND PARTIAL OCCUPANCY

3.6.1 The Owner shall have access to the work at all times, and at his election, may from time to time (prior to the stipulated contract completion date) occupy any of the units or parts of the project as the work in connection therewith is complete to such a degree as will, in the opinion of the Owner, permit their temporary or permanent use. The Owner will, prior to any such partial occupancy, give notice to the Contractor thereof and such occupancy shall be upon the following terms:

a. Such occupancy shall not constitute an acceptance of work not performed in accordance with the Contract nor shall such occupancy relieve the Contractor of liability to perform any work by the Contract by not complete at the time of occupancy.

b. Except as otherwise provided by an agreement at the time of such partial occupancy, the Contractor shall be relieved of all maintenance costs on units or parts so occupied.

c. The Contractor shall not be responsible for wear and tear or damage resulting from partial occupancy.

d. The Owner shall assume risk of loss with respect to any unit or part so occupied.

e. The Contractor shall, if required by the Owner, furnish heat, light, water, or other such services to the units or parts occupied and the Owner shall make proper remuneration therefore to the Contractor.

3.6.2 The Contractor agrees that the Owner shall have the right, after seven (7) days' written notice to the Contractor, to place and install as much equipment and machinery during the progress of the work as is possible before the completion of the various parts of the work; and further agrees that such placing and installation of equipment shall not in any way evidence the completion of the work or any portion thereof, nor signify the Owner's acceptance of the work or any portion thereof. Should the Owner place or install such equipment and machinery with his own forces he shall be responsible for any damage to work of the Contractor caused by the Owner's work or workmen. Should the Owner have such placement or installation performed by another Contractor, then the Owner shall require said Contractor to be responsible for all such damage caused by his work, his workers, or his subcontractors.

ARTICLE 4 - CONTRACTOR

4.4 LABOR AND MATERIALS

4.4.3 All materials shall be so delivered, stored and handled to prevent the inclusion of foreign materials and the damage of materials by water or breakage. Packaged materials shall be delivered and stored in original packages until ready for use. Packages or materials showing evidence of water or other damage shall be rejected. All materials shall be of the respective qualities specified herein.

4.4.4 The Contractor shall be responsible for the proper care and protection of all his materials, equipment, etc., delivered at the site. Building materials, equipment, etc., may be stored on the premises subject to the approval of the Architect.

4.4.5 To insure timely availability of critical materials in case of national emergency, the Contractor may order his subcontractors to proceed with fabrication of the same earlier than required by normal sequence of construction. In the event storage facilities are not available on the site or at the source of fabrication, the Owner will endeavor to provide such storage space as may be available to care for same. Where this is necessary, the Contractor shall be paid for all stored material on the

Owner's property or on the properties approved by the Owner upon approval of certified invoices. It shall be the Contractor's obligation to pay for all handling costs and damage to this material. The Contractor shall protect this property against damage.

4.6 TAXES

4.6.1 The Bidder shall include in his proposal and make payment of all Federal, State, County and Municipal taxes including Michigan State Sales and Use Taxes, now in force or which may be enacted during the progress and completion of the work covered.

4.7 PERMITS, FEES AND NOTICES

4.7.3 The Contractor shall pay highway or DPW fees for damages to sidewalks, streets, or other public property or to any public utilities.

4.7.4 Permits and licenses of a temporary nature necessary for the execution of the work shall be secured and paid for by the Contractor.

4.7.5 **Except for the General Building Permit (which is not required), the Contractor shall secure and pay for all other required permits, including the following:**

Electrical	**-**	**State of Michigan**
Plumbing	**-**	**State of Michigan**
Mechanical	**-**	**State of Michigan**
Elevator	**-**	**City of Detroit**

4.7.6 The Contractor shall secure certificates of inspection and of occupancy that may be required by authorities having jurisdiction over the work. These certificates shall be delivered to the Architect upon completion of the work.

4.9 SUPERINTENDENT

4.9.2 The Contractor shall give sufficient supervision to the work, using his best skill and attention. He shall carefully study and compare all drawings, specifications, and other instructions, and shall at once report to the Architect any error, inconsistency, or omission which he may discover, but he shall not be held responsible for their existence or discovery.

4.9.3 The Contractor's superintendent shall periodically inspect the entire project to make certain that all of the stipulations of all of the articles of the General Conditions are being observed.

4.12 DRAWINGS AND SPECIFICATIONS AT THE SITE

4.12.1.1 Refer to Paragraph 4.12.1, of A.I.A. General Conditions of the Contract for Construction. Modify the last sentence of this paragraph to read:

> "The Drawings, marked to record all changes made during construction, shall be incorporated in the Contractor's 'Informational Package'."

4.12.2 As a basic and interim step for the fulfillment of the "Informational Package", accurate records of all non-structural underground and concealed work shall be kept, including, but not limited to, all piping, conduit, equipment, and drainage and tunnel work. In addition, such records shall be available for review during various steps of the project.

4.13 SHOP DRAWINGS AND SAMPLES

4.13.9 Immediately before and as a condition of substantial completion, the Contractor shall provide the Owner an "Informational Package" and instructional sessions on the operation, maintenance, and service of the facility. The "Informational Package" shall include:

1. One (1) set of transparency (sepia) of the approved shop drawings and descriptive material submitted during construction. Any shop documents unobtainable in sepia shall be supplied in three (3) sets.

2. One (1) set of transparency (sepia) of constructional shop drawings with all installation revisions incorporated to reflect the as-built condition. Examples of constructional shop drawings are dimensioned conduit, piping and ductwork layout drawings.

3. Three (3) sets of instructional manuals on the installation, operation, maintenance and service of equipment and systems, including parts lists.

Examples of Specific Information Required:

1. Electrical

   a. Conduit layout of light, power, and special systems, indicating dimensionally the locations and size of runs; circuit grouping and conductor size and number in conduit runs.
   b. System description and elementary diagrams, connection and interconnection diagrams, and device internal diagrams.

2. Mechanical

   a. Piping and ductwork layout indicating dimensionally the location and size of the runs.

   b. Description and diagrams of control systems.

Following the submittal of the "Informational Package", the Contractor shall schedule and provide, at the Owner's convenience, instructional sessions for Owner's personnel to acquaint them with the operation, maintenance, and service of the system.

3. Elevators

   a. Elementary diagrams and description of sequence of operation of the system control components, connection and interconnection diagrams, and device internal diagrams.

ARTICLE 5 - SUBCONTRACTORS

5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

5.2.3 Delete Article 5.2.3 in its entirety.

5.2.4 Delete Article 5.2.4 in its entirety.

ARTICLE 7 - MISCELLANEOUS PROVISIONS *(Revised 6-13-2011)*

7.5 PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND

7.5.1 The successful Bidder will be required to furnish a Performance Bond and Labor and Material Payment bond in an amount equal to 100% of the contract award amount, and include such cost in the Proposal, complying with the laws of the State of Michigan. The graduated formula no longer applies.

A. Performance Bond and Labor and Material Payment Bond shall be from a surety company acceptable to the Owner and made payable as follows:

(1) A Labor and Material Payment bond for 100% of the contract award amount to the Board of Governors of Wayne State University, and guaranteeing the payment of all subcontractors and all indebtedness incurred for labor, materials, or any cause whatsoever on account of the Contractor in accordance with the laws of the State of Michigan relating to such bonds.

(2) A Performance bond for 100% of the contract award amount to the Board of Governors of Wayne State University to guarantee and insure the completion of work according to the Contract.

B. The only acceptable Performance Bond shall be the AIA A312 – 2010.

C. The Contractor shall include with his bid evidence of his ability to obtain a Performance Bond in the amount of 100% of the bid amount, and in accordance with the terms and conditions outlined in this section, Such evidence shall be project specific and shall be submitted on a form provided by the Surety or Agent thereof.

7.7 ROYALTIES AND PATENTS

7.7.1 Indemnification and Hold Harmless (***Revised 2-2015***).
To the fullest extent permitted by law, the Contractor shall hold harmless, defend, and indemnify the Board of Governors of Wayne State University, the University, the Architect and Architect's Consultants, and officers, employees, representatives and agents of each of them, from and against any and all claims or losses arising out of or alleged to be resulting from, or relating to (1) the failure of the Contractor to perform its obligations under the Contract or the performance of its obligation in a willful or negligent manner; (2) the inaccuracy of any representation or warranty by the Contractor given in accordance with or contained in the Contract Documents; and (3) any claim of damage or loss by any subcontractor, or supplier, or laborer against the University , the Architect or the Architect's consultants arising out of any alleged act or omission of the Contractor or any other subcontractor, or anyone directly or indirectly employed by the Contractor or any subcontractor.

The Contractor shall also be liable for and hereby agrees to pay, reimburse, fully indemnify and hold the University, the Architect and Architect's Consultants, harmless from and against all costs and expenses of every nature (including attorney fees and expenses incident thereto) incurred by the University in collecting the amounts due from the Contractor, or otherwise enforcing its rights, under the indemnification described in this Article.

7.9 INTEREST

7.9.1 Delete Article 7.9 in its entirety.

ARTICLE 8 - TIME

8.1 DEFINITIONS

8.1.3 The Date of Substantial Completion of the Work is the Date certified by the Architect when construction of the entire work is sufficiently complete, in accordance with the Contract Documents, so the Owner may occupy the Work for the use for which it is intended. It is the beginning date for the guarantees on all the Project Work.

8.3.5 LIQUIDATED DAMAGES

It is understood that if said Contract is not completed within the time specified in the Contract plus any extension of time thereto, the Contractor shall pay Liquidated Damages to the Owner as set forth in Article 11 of the Agreement between Contractor and Owner for Construction.

ARTICLE 9 - PAYMENT AND COMPLETION

9.3 PROGRESS PAYMENTS

9.3.1 On or before the 20th day of each month, the Contractor shall submit to the Architect on the Owner's Standard Form, a written application for payment showing the proportionate value of the work installed to date from which shall be deducted, a reserve of 10% and all previous payments, and the balance of the amount as approved by the Architect shall be due and payable to the Contractor on or about the 15th day of the succeeding month.

9.3.2.2 No payments will be made because of materials or equipment stored off the site, except as provided for in Subparagraph 4.4.5 of the Supplementary General Conditions or other special cases the Owner may approve.

9.6 FAILURE OF PAYMENT

9.6.1 Delete Article 9.6 in its entirety.

ARTICLE 11 - INSURANCE *(Revised 2-06-2015)*

11.1 CONTRACTOR'S LIABILITY INSURANCE

11.1.2 The insurance required by Subparagraph 11.1.1 shall be written for not less than any limits of liability specified herein, or required by law, whichever is greater, and shall include contractual liability insurance as applicable to the Contractor's obligations under Paragraph 4.18.

During the life of the Contract, the Contractor shall maintain the following types of insurance:

A. General Requirements

Type of Insurance	**Minimum Requirement**
1. Commercial General Liability (CGL) Contractor shall maintain commercial general liability (CGL) CGL insurance shall be written on Insurance Services form CG 00 01 (or substitute form providing equivalent coverage) and shall cover liability arising from premises, operation, independent contractors, products-completed operation, and personal injury, contractual liability broad form property damage liability, products and completed operations coverage and X,C,U (explosion, collapse, underground) hazards.	$1,000,000 combined single limit per occurrence $2,000,000 aggregate Umbrella Liability per occurrence and in the annual aggregate of $5,000,000.
2. Commercial Automobile Liability (CSL) (including hired and non-owned vehicles)	$1,000,000 combined single limit
3. Workers' Compensation (Employers' Liability)	Statutory-Michigan $500,000
4. Professional Liability insurance This limit shall be dedicated to the risks of Professional Liability and it shall not be combined with limits of any other coverages such as Environmental/Pollution General Liability, or Umbrella Liability unless otherwise approved by the Owner. Coverage shall be for the benefit of the Contracting or Design- Build entity, its principles, Employees, affiliates, agents, and partners-whether joint or several. It is presumed that this insurance will be Claims Made, and therefore must have a Retro-active date prior to the performance of any work for the Owner, whether or not such work is under contract or purchase order. This insurance will be placed with an insurer licensed to do	$5,000,000 **0** Per Occurrence and in the Aggregate annually.

business in the State of Michigan and rated no less that A
X; by AM Best

B. Maximum Acceptable Deductibles

Type of Insurance	Maximum Deductible
Comprehensive General Liability	$5,000
Fire Legal Liability	$5,000
Comprehensive Automobile Liability	-0-
Workers' Compensation	-0-
Property - All Risk	$ 500

11.1.3 The Board of Governors, Wayne State University, shall be named as an additional insured but only with respect to accidents arising out of the performance of said contract. The contractor shall prepare a certificate of insurance which shall name the "Office of Risk Management; 5700 Cass Avenue" as the Wayne State University certificate holder.

11.1.3.1 The Contractor shall either 1) require each of his Subcontractors to procure and to maintain during the life of his subcontract, Subcontractors' Comprehensive General Liability, Automobile Liability and Property Damage Liability Insurance of the type and in the same amounts as specified in the Subparagraph, or 2) insure the activity of his subcontractors in his own policy.

11.2 OWNER'S LIABILITY INSURANCE

Delete Article 11.2 in its entirety.

11.3 PROPERTY INSURANCE

Delete Article 11.3 in its entirety and replace with the following:

11.3.1 The Contractor shall purchase and maintain property insurance upon the entire work at the site to the full insurable value thereof. This insurance shall include the interests of the Owner, the Contractor, Subcontractors, and sub-subcontractors in the work and shall insure against the perils of Fire, Extended Coverage, Vandalism, and Malicious Mischief.

11.3.2 The Owner and Contractor waive all rights against each other for damages caused by fires or other perils to the extent covered by insurance provided under Subparagraph 11.3.1. The Contractor shall require similar waivers by Subcontractors and sub-subcontractors in accordance with Clause 5.3.1.5.

11.3.3 Insurance must be issued by an insurance company with an "A rating as denoted in the AM Best Key Rating Guide".

ARTICLE 12 - CHANGES IN THE WORK

12.1 CHANGE ORDERS

12.1.8 Percentage markups in pricing under Subparagraphs 12.1.3.1, 12.1.3.3, and 1.2.4 shall be as limited in the Contract Documents. Unit price of Subparagraph 12.1.3.2 shall represent total unit cost to the Owner and shall include the Contractor's markup for overhead and profit.

ARTICLE 14 - TERMINATION OF THE CONTRACT

14.1 TERMINATION BY THE CONTRACTOR

14.1.1 If the work is stopped for a period of thirty days under any order of any court or other public

authority having jurisdiction, or as a result of any act of government, such as a declaration of a national emergency making materials unavailable, through no act or fault of the contract or a subcontractor or their agents or employees or other persons performing any of the Work under a contract with the contractor, then the contractor may, upon seven days' written notice to the Owner and the Architect, terminate the contract and recover from the Owner payment for all Work executed and for any proven loss sustained upon any materials, equipment, tools, construction equipment, and machinery, including reasonable profit and damages.

ARTICLE 15 - ADDITIONAL CONDITIONS

15.1 SUBSTITUTION OF MATERIALS AND EQUIPMENT

15.1.1 Whenever a material, article, or piece of equipment is identified on the Drawings or in the Specifications by reference to manufacturers' or vendors' names, trade names, catalog numbers, or the like, it is so identified for the purpose of establishing a standard, and any material, article, or piece of equipment of other manufacturers or vendors, which will perform adequately the duties imposed by the general design will be considered equally acceptable provided the material, article, or piece of equipment so proposed is, in the opinion of the Architect, of equal substance, appearance, and function. It shall not be purchased or installed by the Contractor without the Architect's written approval.

15.2 NON-DISCRIMINATION PROVISION AND WAGE AND HOUR ACT

15.2.1 During the performance of this contract, the Contractor agrees as follows:

15.2.1.1 The Contractor shall not discriminate against any employee or applicant for employment because of sex, race, creed, color, age, or national origin. The Contractor will take affirmative action to insure that applicants are employed, and that employees are treated during employment without regard to their sex, race, age, creed, color, or national origin.

15.2.1.2 Such action shall include but not be limited to, the following: employment; upgrading; demotion; or transfer; recruitment or recruitment advertising; layoff or terminations; rates of pay or other forms of compensation; and selection for training, including apprenticeship. The Contractor agrees to post in conspicuous places, available to employees and applicants for employment, notices to be provided setting forth the provisions of this non-discrimination clause.

15.2.1.3 The Contractor will, in all solicitations, or advertisements for employees, placed by or on behalf of the contractor, state that all qualified applicants will receive consideration for employment without regard to sex, race, creed, color, age or national origin.

15.2.1.4 The Contractor will send to each labor union or representative of workers with which he has a collective bargaining agreement or other contract or understanding, a notice advising the labor union or worker's representative of the Contractor's commitments under Section 202 of Executive Order No. 11246 of October 27, 1965, and shall post copies of the notice in conspicuous places available to employees and applicants for employment.

15.2.1.5 The Contractor will comply with all provisions of the Executive Order No. 11246 of October 27, 1965, and of the rules, regulations and relevant orders of the Secretary of Labor or other government agency or authority having jurisdiction.

15.2.1.6 The Contractor will furnish all information and reports required by Executive Order No. 11246 of October 27, 1965, and by the rules, regulations, and orders of the Secretary of Labor or other government agency or authority having jurisdiction, and will permit access to his books, records, and accounts by the administrative agency and the Secretary of Labor for the purposes of investigation to ascertain compliance with such rules, regulations and orders.

15.2.1.7 In the event of the Contractor's noncompliance with the non-discrimination clauses of this contract, or with any of the said rules, regulations, or orders, this Contract may be canceled, terminated or suspended in whole or in part, and the Contractor may be declared ineligible for further University contracts or federally-assisted contracts in accordance with procedure authorized in Executive

Order No. 11246 of October 27, 1965, or by rule, regulation, or order of the Secretary of Labor or other government agency or authority having jurisdiction.

15.2.1.8 The Contractor will include in the provisions of Subparagraph 15.2.1.1 through 15.2.1.8 in every subcontract or purchase order unless exempted by rules, regulations or orders of the President's Committee on Equal Employment Opportunity issued pursuant to Section 204 of Executive Order No. 11246 of September 14, 1965, so that provisions will be binding upon each subcontractor or vendor. The Contractor will take such action with respect to any subcontract or purchase order as the administering agency may direct as a means of enforcing such provisions including sanctions for noncompliance: Provided, however, that in the event the Contractor becomes involved as a result of such direction by the administering agency, the Contractor may request the United States to enter into such litigation to protect the interest of the United States.

15.3 COMPLIANCE WITH COPELAND ANTI-KICKBACK ACT AND REGULATIONS

15.3.1 The Contractor shall comply with the Copeland Anti-Kickback Act and Regulations of the Secretary of Labor (29CFR, Part 3) which are herein incorporated by reference.

15.4 PREVAILING WAGES

15.4.1 Contractors and subcontractors shall pay all mechanics and laborers, including apprentices and trainees, no less than the wage and fringe benefit rates prevailing in the locality in which the work is performed. Wage and fringe benefit rates are determined by the Federal Government Department of Labor.

15.4.2 Classifications not provided in the schedule shall be determined prior to the award of the contract and shall be no less than the wage and fringe benefit rates determined by the Federal Department of Labor.

15.4.3 Contractors and subcontractors shall adhere to the ratios of apprentices to journey workers as determined by the Federal Department of Labor.

15.4.4 Contractors and subcontractors shall keep a copy of the prescribed wage and benefit rates posted at the construction site in a conspicuous place.

15.4.5 Contractors and subcontractors shall keep an accurate record of the name, occupation, and the actual benefits paid to each mechanic or laborer for the contract. This record shall be made available for reasonable inspection by the Federal Department of Labor and the Owner.

DRAWINGS

The Technical Specifications dated **March 5, 2015** and the following List of Drawings represent the scope of work as defined in the Contract Documents from Article 4.

DRAWINGS

Drawing No.:	**Description**
Parking Structure 1 -	
R-001	General Notes, ISO, Legend and Work Item List
R-002	Temporary Shoring (W.I. 18.1)
R-003	Traffic Control & Phasing
R-003A	Traffic Control & Phasing
R-101	Permanent Shoring
R-201	Level 2 Plan View
R-202	Level 6 Plan View (Base Bid)
R-203	Level 6 Plan View (Alternates)
R-301	Existing Reinforcement
R-501	Repair Details
R-502	Repair Details
Parking Structure 2 & 5 –	
R-001	General Notes and Work Item List
R-201	Structure #2 Levels 1 & 2 Plan Views
R-202	Structure #2 Levels 3 & 4 Plan Views
R-203	Structure #2 Levels 5 & 6 Plan Views
R-204	Structure #5 Typical Level Plan View
R-501	Repair Details
R-502	Repair Details

GENERAL REQUIREMENTS

GENERAL

A. **CONTRACTOR'S RESPONSIBILITY**

It is not the responsibility of the Architect/Engineer or Owner's Representative to notify the Contractor or subcontractors when to commence, to cease, or to resume work; nor in any way to superintend so as to relieve the Contractor of responsibility or of any consequences of neglect or carelessness by him or his subordinates. All material and labor shall be furnished at times best suited for all Contractors and subcontractors concerned, so that the combined work of all shall be properly and fully completed on the date fixed by the Contract.

The Contractor shall be responsible for all items contained in both the specifications and on the drawings for all trades. He shall be responsible for the proper division of labor according to current labor union agreements regardless of the division of responsibility implied in the contract documents.

B. **CODES AND STANDARDS**

Reference to standard specifications for workmanship, apparatus, equipment and materials shall conform to the requirements of latest specifications of the organization referenced, i.e., American Society for Testing Materials (ASTM), Underwriters Laboratories, Inc. (UL), American National Standards Institute, Inc. (ANSI), and others so listed in the Technical Specifications.

C. **PERMITS, FEES AND NOTICES**

See Supplementary General Conditions.

D. **MEASUREMENTS**

Before proceeding with each Work Item, Contractor shall locate, mark and measure any quantity or each item and report quantities to Engineer. If measured quantities exceed Engineer's estimate, Contractor shall obtain written authorization to proceed from Owner before executing Work required for that Work Item.

Measurement of quantities for individual Work Items will be performed by Contractor and reviewed by Engineer. Coordinate measurements with inspection as required in Section "Coordination."

Cost of Work included in 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.

E. **CONTRACTOR'S MEASUREMENTS**

Before ordering material, preparing Shop Drawings, or doing any work, each Contractor shall verify, at the building, all dimensions which may affect his work. He assumes full responsibility for the accuracy of his figures. No allowance for additional compensation will be considered for minor discrepancies between dimensions on the drawings and actual field dimensions.

F. **CONTINUITY OF SERVICE *(Revised 3-26-2012)***

Continuity of all existing services in the building shall be maintained throughout the construction period. Where it is necessary to tie into the existing electrical service, water or waste systems, it shall be done as directed by the Architect/Engineer. This Contract shall also provide temporary lines or bypasses that may be required to maintain

continuous service in the building. All utility shutdowns must be approved by the Owners Representative / Project Manager, not less than **7 business days** prior to the event, so that proper notification can be posted.

G. **SUBMITTALS**

All submittals (except Shop Drawings) and samples required by the Specifications shall be submitted in triplicate unless otherwise specified for a particular item under an individual Specification Section.

Each sample shall be clearly identified on a tag attached, showing the name of the Project Consultant, the project number and title, the names of the Contractor, manufacturer (and supplier if same is not the manufacturer), the brand name or number identification, pattern, color, or finish designation and the location in the work.

Each submittal shall be covered by a transmittal letter, properly identified with the project title and number and a brief description of the item being submitted.

Contractor shall be responsible for all costs of packing, shipping and incidental expenses connected with delivery of the samples to the Project Consultant or other designated address.

If the initial sample is not approved, prepare and submit additional sets until approval is obtained.

Materials supplied or installed which do not conform to the appearance, quality, profile, texture or other determinant of the approval samples will be rejected, and shall be replaced with satisfactory materials at the Contractor's expense.

H. GENERAL/STANDARD ELECTRONIC EQUIPMENT AND INFRASTRUCTURE REQUIREMENTS *(Revised 11-2008)*

1. Compliance with WSU Standards for Communications Infrastructure

   A. All applicable work, products, materials and methods shall comply with the latest version of the "WSU Standards for Communications Infrastructure" except as where noted.

   B. This document is available at the following website/URL: **http://networks.wayne.edu/WSU-Communications-Standards.pdf**

2. Automation System Program Code

   A. All automation system uncompiled and compiled program codes, source codes, custom modules, graphical user interface screen shots and any other automation system programming data and material (Program Code) shall be provided to the UNIVERSITY in hard copy and on CD Rom in an unencrypted format acceptable to the UNIVERSITY.

   B. Copyright for the Program Code shall be assigned to the UNIVERSITY for purposes of system maintenance.

PROTECTION OF OCCUPANCY *(Revised 3-2006)*

A. **FIRE PRECAUTIONS**

Take necessary actions to eliminate possible fire hazards and to prevent damage to construction work, building materials, equipment, temporary field offices, storage sheds, and other property.
During the construction, provide the type and quantity of fire extinguishers and fire hose to meet safety and fire prevention practices by National Fire Protection Association (NFPA) Codes and Standards (available at http://www.nfpa.org/)

In the event that construction includes "hot work", the contractor shall provide the Owner's Representative with a copy of their hot work policy, procedures, or permit program. No hot work activity (temporary maintenance, renovation, or construction by operation of a gas or electrically powered equipment which produces

flames, sparks or heat that is sufficient to start a fire or ignite combustible materials) shall be performed until such documents are provided. During such operations, all highly combustible or flammable materials shall be removed from the immediate working area, and if removal is impossible, same shall be protected with flame retardant shield.

Not more than one-half day's supply of flammable liquids such as gasoline, spray paint and paint solvent shall be brought into the building at any one time. Flammable liquids having a flash point of 100 degrees F. or below which must be brought into the building shall be confined in an Underwriters Laboratories (UL) labeled safety cans. The bulk supply of flammables shall be stored at least 75 feet from the building and other combustible materials. Spigots on drums containing flammable liquids are prohibited on the project site. Drums shall be equipped with approved vented pumps, and be grounded and bonded.

Only a reasonable working supply of combustible building materials shall be located inside the building.

All oil-soaked rags, papers, and other similar combustible materials shall be removed from the building at the close of each day's work, or more often if necessary, and placed in metal containers, with self-closing lids.

Materials and equipment stored in cardboard cartons, wood crates or other combustible containers shall be stored in an orderly manner and accessibly located, fire-fighting equipment of approved types shall be placed in the immediate vicinity of any materials or equipment stored in this type of crate or carton.

No gasoline, benzene, or like flammable materials shall be poured into sewers, manholes, or traps.

All rubbish shall be removed from the site and legally disposed of. Burning of rubbish, waste materials or trash on the site shall not be permitted.

The contractor shall be responsible for the conduct of employees relative to smoking and all smoking shall be in the area designated by the Architect/Engineer.

B. **GENERAL SAFETY AND BUILDING PRECAUTIONS**

Provide and maintain in good repair barricades, railings, etc., as required by law for the protection of the Public. All exposed material shall be smoothly dressed.

At dangerous points throughout the work environment provide and maintain colored lights or flags in addition to above guardrails.

Isolate Owner's occupied areas from areas where demolition and alteration work will be done, with temporary, dustproof, weatherproof, and fireproof enclosures as conditions may require and as directed by the Architect/Engineer.

Cover and protect furniture, equipment and fixtures to remain from soiling, dust, dirt, or damage when demolition work is performed in rooms or areas from which such items have not been removed.

Protect openings made in the existing roofs, floors, and other construction with weatherproof coverings, barricades, and temporary fire rated partitions to prevent accidents.

Repair any damage done to existing work caused by the construction and removal of temporary partitions, coverings, and barricades.

The Contractor will be held responsible for all breakage or other damage to glass up to the time the work is completed.

Provide protection for existing buildings, interior and exterior, finishes, walls, drives, landscaping, lawns (see below), etc. All damages shall be restored to match existing conditions to the satisfaction of the Architect/Engineer.

The Contractor and Owner will define the anticipated area of lawn damage at the project Pre-Construction Meeting. Whether the lawn is sparse or fully developed, any lawn damaged due to the Contractor's work will be replaced with sod by the University. The University's unit cost of $10.00 per square yard and landscaping at a rate of 1.5

times the cost of the sod repairs, the full cost of which will be assessed against the Contractor. At the completion of the project, a deductive Change Order reflecting this cost will be issued.
The Contractor is to include an allowance in his bid for this corrective work.

C. **INTERFERENCE WITH OWNER'S OPERATIONS**

The Owner will be utilizing the Building Facilities to carry on his normal business operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation during construction. The Contractor shall schedule performance of the work necessary to complete the project in such a way as to interfere as little as possible with the operation of the Owner.

Work which will interfere with the Owner's occupancy, including interruptions to the Owner's mechanical and electrical services, and essentially noisy operations (such as jackhammering) shall be scheduled in advance. The schedule of alterations shall be approved by the Architect/Engineer and the work shall be done in accordance with the approved schedule.

It is understood that the work is to be carried through to completion with the utmost speed consistent with good workmanship and to meet the construction schedule.

The Contractor shall begin work under the Contract without delay upon receipt of the fully-executed contract and shall substantially complete the project ready for unobstructed occupancy and use of the Owner for the purposes intended within the completion time stated in the contract.

The Contractor shall, immediately upon award of contract, schedule his work and expedite deliveries of materials and performance of subcontractors to maintain the necessary pace to meet the construction schedule.

CONTRACTOR'S REPRESENTATION AND COORDINATION

A. **FIELD SUPERINTENDENT**

Contractor shall assign a full time project manager/superintendent for the duration of the project. This person shall be experienced and qualified in all phases of the work and shall be present at the site during Contractor's working hours. The project manager shall have Contractor's full authority to represent Contractor in all routine operations including payment, changes to the work, and scheduling. Contractor shall not re-assign this individual without prior written permission of the Owner.

B. **MEETINGS**

When directed by the Architect/Engineer, meetings shall be held for the purpose of coordinating and expediting the work. The invited contractors or subcontractors will be required to have qualified representatives at these meetings, empowered to act in their behalf.

C. **COORDINATION**

The Contractor shall also provide a staff adequate to coordinate and expedite the work properly and shall at all times maintain competent supervision of its own work and that of its subcontractors to insure compliance with contract requirements.

The Contractor shall be solely responsible for all construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the work under the Contractor.

D. **CONSTRUCTION SCHEDULE**

The Construction Schedule shall be prepared after the award of contract. Soon after, a pre-construction meeting is held with the Owner and the Architect/Engineer to determine the areas to which the Contractor will be allowed access at any one time.

The Contractor is alerted to the fact that areas in which he will be working will be occupied by students and employees of the University as well as the general public. The Contractor's access, to and from the project site, will be confined to limited areas so as not to unduly disrupt the normal activities of the University.

TEMPORARY FACILITIES

A. **GENERAL**

The following temporary facilities descriptions represent standard conditions. Verify accuracy with Architect/Engineer at time of bids.

B. **CONTRACTOR'S OFFICE**

Provide field offices as required. Locate temporary field offices on site where directed by Architect/Engineer.

Appearance and location of field offices shall be approved by the Architect/Engineer.

Provide for all other administrative facilities and storage off the Owner's property.

C. **STORAGE OF MATERIALS**

All materials shall be stored in areas designated by the Architect/Engineer. All stored materials shall be arranged for the minimum disruption to occupants and to allow full access to and throughout the building. Materials stored outdoors shall be neat and orderly and covered to prevent damage or vandalism.

D. **PARKING**

1. **GENERAL**

University parking regulations will be strictly enforced.

Maintain Owner's parking areas free of dirt and debris resulting from operations under the contract.

2. **STANDING AND UNLOADING/LOADING VEHICLES**

All Contractors are to call Wayne State University Public Safety at 577-2222, and give at least 24 hours advance notice that they have vehicles that must be at the job site.

Vehicles will be permitted at the project site only as long as the vehicles are needed for loading/unloading, and must be immediately moved upon completion.

All unauthorized and/or unattended standing vehicles will be subject to ticketing and removal by University Police. Towed vehicles may be reclaimed by calling 577-2222, and paying any assessed charges.

3. COMPLIMENTARY PARKING

There is no complimentary parking for Contractor's employee vehicles.

4. **WAYNE STATE UNIVERSITY PUBLIC/STUDENT PARKING AREAS**

Public Parking, on a first-come first-served basis is available. Contact the office of the One Card System, at 313.577.9513 for information on availability of parking on a contractual basis.

E. **TOILET FACILITIES**

The Owner's designated existing toilet facilities may be used by workers on the project. Contractor shall maintain such facilities in a neat and sanitary condition.

F. **TELEPHONE USE**

If required, the Contractor shall provide and pay for a temporary telephone within the building for his use and that of his subcontractors.

No use of the Owner's telephone (except pay telephones) will be permitted.

G. **ACCESS DEVICES**

The Contractor shall furnish and maintain temporary hoists, ladders, railings, scaffolds, runways, and the like as required for safe, normal access to the permanent construction until the permanent facilities are complete. Each trade shall furnish such additional means of access as may be required for the progress and completion of the work. Such temporary access devices shall meet all applicable local, state, and federal codes and regulations.

H. **HEAT AND VENTILATION**

Provide cold weather protection and temporary heat and ventilation as required during construction to protect the work from freezing and frost damage.

Provide adequate ventilation as required to maintain reasonable interior building air conditions and temperatures, to prevent accumulation of excess moisture, and to remove construction fumes.

Tarpaulins and other materials used for temporary enclosures. Coverings and protection shall be flameproofed.

I. **WATER SERVICE**

Sources of water are available at the site. The Owner will pay for reasonable amounts of water used for construction purposes.

The Contractor shall provide, at the earliest possible date, temporary connections to the water supply sources and maintain adequate distribution for all construction requirements. The Contractor shall protect sources against damage.

Methods of conveying this water shall be approved by the Architect/Engineer and shall not interfere with the Owner's operations.

J. **ELECTRICAL SERVICES**

All charges for reasonable amounts of electrical power energy used for temporary lighting and power required for this work will be paid by the Owner.

The Contractor shall provide and maintain any temporary electrical lighting and power required for this work. At the completion of the work, all such temporary electrical facilities shall be removed and disposed of by the Contractor.

Temporary lighting and power shall comply with the regulations and requirements of the National Electrical Code

INSPECTIONS AND TESTS

The Architect/Engineer shall at all times have access to the work wherever it is in preparation or in progress and the Contractor shall provide proper facilities for such access and for observation.

No failure of the Architect/Engineer, during the progress of the work, to discover or reject materials or work not in accordance with the Contract Specifications and Drawings shall be deemed an acceptance thereof nor a waiver of defects therein. Likewise, no acceptance or waiver shall be inferred or implied due to payments made to contractor or by partial or entire occupancy of the work, or installation of materials that are not strictly in accordance with the Contract Specifications and Drawings.

Where tests are specifically called for in the Specifications, the Owner shall pay all costs of such tests and engineering services unless otherwise stated in the contract.

Where tests are not specifically called for in the Specifications, but are required by the Architect/Engineer or Consultant, the Owner shall pay all costs of such tests and engineering services unless the tests reveal that the workmanship or materials used by the Contractor are not in conformity with the Drawings, Specifications, and/or approved shop drawings. In such event, the Contractor shall pay for the tests, shall remove all work and materials so failing to conform and replace with work and materials that are in full conformity.

CLEAN-UP

The Contractor shall at all times keep the Owner's premises and the adjoining premises, driveways and streets clean of rubbish caused by the Contractor's operations and at the completion of the work shall remove all the rubbish, all of his tools, equipment, temporary work and surplus materials, from and about the premises, and shall leave the work clean and ready for use. If the contractor does not attend to such cleaning immediately upon request, the Architect/Engineer may cause such cleaning to be done by others and charge the cost of same to the Contractor.

The Contractor will be responsible for all damage from fire that originates in, or is propagated by, accumulations of rubbish or debris.

All rubbish and debris shall be disposed of off the Owner's property in an approved sanitary landfill site. No open burning of debris or rubbish will be permitted. Job site shall be left neat and clean at the completion of each day's operation.

PROJECT CLOSE-OUT

A. **RECORD DRAWINGS**

At beginning of job, provide one copy of Working Drawings, and record changes, between Working Drawings and "As Builts", including changes made by Addenda, Change Orders, Shop Drawings, etc. These shall be kept up to date. Update to indicate make of all mechanical and electrical equipment and fixtures installed. Keep these Record Prints in good condition and available for inspection by the Architect/Engineer.

Upon completion of the job, turn over to the Architect/Engineer Record Prints of Working Drawings showing all job changes.

B. **OPERATING AND MAINTENANCE DATA**

Prepare and furnish to the Architect/Engineer three (3) bound copies of "Operating and Maintenance Manual" on all equipment installed under this Contract.

Manual shall include copies of all Manufacturers' "Operating and Service Instructions", including Parts List, Control Diagrams, Description of Control Systems, Operating, Electrical Wiring, and any other information needed to understand, operate and maintain the equipment. The names and addresses of all subcontractors shall be included. These instructions shall be custom-prepared for this job -- catalog cuts will **not** be accepted. Equipment shall be cross-referenced to Section of Specifications and to location shown and scheduled on drawings.

Include Test-Adjust-Balance Report in the Manual.

C. **FINAL INSPECTION**

Secure final inspections from the State of Michigan as soon as the work is completed and immediately submit such Certificates to the Architect/Engineer.

D. **GUARANTEES (See Sections 00510 and 01781)**

Guarantees on material and labor from the General Contractor and his subcontractors shall be as required in Sections 00510 and 01781.

E. **SWORN STATEMENT AND WAIVER OF LIENS *(revised 4-11-2012)***

Prior to final payment, the General Contractor shall provide a Contractor's Sworn Statement and Full Unconditional Waivers of Liens from all subcontractors for material and labor and from all suppliers who provide materials exceeding $1,000. Sworn Statements and signed waivers from all Subcontractors must accompany Pay Applications or they will be returned for such documentation prior to approval.

ASBESTOS HAZARD

A. The contractor shall not start any work in any area that has not been inspected for asbestos by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner and approval is given for work to be done. If asbestos is found, safety measures as recommended by the Owner's Industrial Hygiene Department, or a qualified representative of the Owner, shall be completed, or approval given for work to be done before work is started. The contractor shall not perform any asbestos removal or containment work under the contract.

KEYS

A. The Owner shall provide the contractor keys on loan to have access to the various spaces in order to complete the contract. Contractor will sign for and be responsible for each key on loan, returnable to Owner upon completion of the contract. In case of any lost keys, the Owner will backcharge the contract $250.00 for each core change. In the event that a Contractor wants access to a secured area, he shall give the Owner a minimum 48-hour notice.

SUMMARY OF WORK

SUMMARY OF WORK

PROJECT: 2015 Parking Structures 1, 2 & 5 Renovations 2015

WSU PROJECT NO.: 051-258269 PS-1, 056-258270 PS-2, 045-258271 PS-5

PROJECT MANAGER: Robert Jacobs

1. EXAMINATION

   The Contractor shall visit the site and become familiar with conditions under which he will be working. Also meet with the project manager and review site access, storage areas, etc.

2. Description of Work – Project includes **Work on Parking Structure 1 includes strip patch floor repairs at the east end of the roof and level 2. Work shall also include traffic coatings, paint markings, crack repairs, joint sealant installations and miscellaneous concrete column and ceiling repairs. Additional permanent steel shoring shall be required, along with LED lighting improvements. Parking Structure 2 includes concrete floor, beam, wall and Tee Stem repairs, sealants and paint markings as noted. Parking Structure 5 includes concrete floor and Tee Stem repairs and additional concrete removal and coatings work. Sealant and paint markings work as noted.** .

3. The building is located at

   Wayne State University
   PS-1 450 West Palmer, PS-2 5150 John C Lodge, PS-5 5501 Anthony Wayne
   Detroit, Michigan 48202

TABLE OF CONTENTS & LIST OF DRAWINGS

TECHNICAL SPECIFICATIONS

DIVISION 02 – EXISTING CONDITIONS

DIVISION 03 – CONCRETE

DIVISION 07 – THERMAL & MOISTURE PROTECTION

DIVISION 09 – FINISHES

LIST OF DRAWINGS

SECTION 020010 - WORK ITEMS

PART 1 - GENERAL

RELATED DOCUMENTS

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

A. Unit prices stated by Bidder for all Work Items shall include all materials and Work installed and completed in place in accordance with all applicable portions of the Drawings and Specifications, and shall include all costs associated with such items including, but not limited to: materials, labor, supervision, overhead, and profit for General Contractor and/or subcontractors, general conditions, permits, shoring, and other related items.

WI 1.0 GENERAL REQUIREMENTS

A. Scope of Work

1. Work consists of performing all tasks, specifically required and incidental, which are not identified under separate Work Item designation, but necessary to perform the work identified in this project. This work includes, but is not limited to:

WI 1.1 – Project Mobilization
WI 1.5 – Temporary Signage
WI 1.6 – Temporary Barriers
WI 1.7 – General Construction Allowance
WI 2.1 – Professional Surveying – Elevations

WI 1.1 PROJECT MOBILIZATION

B. Scope of Work

1. Work consists of coordinating, scheduling, obtaining, and assembling at construction site all equipment, materials, permits, supplies, manpower, and other essentials and incidentals necessary to perform Work defined in this Contract. Payment of lump sum amount for Mobilization shall be according to following schedule and shall be based on percentage of original Contract amount earned.

2. Contractor shall be responsible for obtaining all permits required to perform work as specified, per all authorities having jurisdiction, including for access of water through fire hydrants per City of Detroit requirements.

B. Materials (Not Applicable)

C. Execution

1. At execution of Agreement by all parties, payment of not more than 25% of Mobilization lump sum amount.
2. When amount earned is greater than 10% but less than 25% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 50% of Mobilization lump sum amount.
3. When amount earned is equal to or greater than 25% but less than 50% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 75% of Mobilization lump sum amount.
4. When amount earned is equal to or greater than 50% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 100% of Mobilization lump sum amount.

WI 1.5 TEMPORARY SIGNAGE

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, and supervision necessary to provide, install, maintain, and remove following completion of Project, all Temporary Signage as required for traffic control and user safety and information during construction and public safety/warning type signage, and as required by Owner/Engineer.
2. Temporary Signage shall be installed upon Award of Project, prior to start of any other Work.
3. Refer to Phasing Requirements on Drawings for further requirements.
4. Payment for this Work Item shall be lump sum to provide all required Temporary Signage to perform Base Bid and Alternate Work (if accepted). No extras will be allowed for providing or maintaining additional Temporary Signage to complete Alternate Work Items.

B. Materials

1. Temporary signage shall meet following minimum requirements:
   a. Minimum size: 2’ by 3’.
   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 and/or bases as required (incidental).
2. Minimum Temporary Signage provided shall be sufficient to inform public of ongoing construction Project, and direct pedestrians and vehicles around closed Work areas and throughout structure. General requirements include, but are not limited to:
   a. Signage at all pedestrian entrances to the structure informing public of ongoing construction Project, maintained for the duration of the Project.
   b. Signage at all vehicle entry/exits. At closed vehicle entry/exits, provide minimum signage and barricades as indicated on Phasing Drawings. At open vehicle entry/exits, signage shall notify public of ongoing construction Project and closed work areas, stair towers, elevators, etc.
   c. Signage in all stair and elevator towers on all levels, indicating which levels/areas are closed and which remain open.
   d. Signage at all work area perimeters on all levels where hydro-demolition is to be performed, clearly defining work area limits and explicitly prohibiting vehicle and pedestrian access, maintained for the duration of the repairs.
   e. Signage as necessary to maintain normal traffic flow throughout structure and around closed work areas, including access to all areas of the structure remaining open for public use during repairs. Provide signs indicating route to follow for additional areas of parking, and route to follow to exit structure, at all levels in (2) bays adjacent to work areas.
   f. Other signage as required by Owner/Engineer, and as needed throughout the Project.
   g. In addition to signage requirements listed above, provide specific signage indicated on Phasing Drawings.
3. **Contractor shall submit shop drawings detailing sign layout and locations, size, colors, and mounting schemes for approval prior to fabricating signs and mounting brackets. Obtain Owner/Engineer approval of proposed signage prior to start of Work.**
4. Required Signage shall be in place prior to closing any work areas, no exceptions.
5. 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.

WI 1.6 TEMPORARY BARRIERS

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install temporary dust, debris, water, and work area perimeter barriers, maintain them throughout Project and during demolition, and

other dust-, water-, and debris-related operations, and remove upon completion of Project. Barriers shall be required whenever demolition or other dust or flying-debris producing activities occur.

2. A critical component of this Work is providing protection around the hydro-demolition work areas on the roof level of the structure to contain all dust/debris/water within these work areas and not affect the nearby highway, roads, sidewalks, and all other areas adjacent to the structure. **Contractor shall submit their proposed roof level protection plan with their bid to be reviewed by Owner/Engineer prior to Award of Contract.** As a minimum, roof level protection shall comply with performance requirements in this Work Item.

   a. Contractor shall be responsible to continuously monitor hydro-demolition work and effectiveness of perimeter protection, particularly on roof level.
   b. Contain all debris within work area.

3. Temporary Barriers shall be installed prior to start of any Work.

4. See Drawings for further requirements.

5. Payment for this Work Item shall be lump sum to provide all required Temporary Barriers to perform Base Bid and Alternate Work (if accepted), on the roof level and all lower levels.

B. Materials

1. Barrier wall frame around lower levels shall be made from 2” x 4” material (wood), unless Contractor submits alternate in writing that is approved by Owner.
2. As a minimum, barrier membrane shall be 6-mil. reinforced polyethylene or canvas “tarp” material.
3. On levels 1-5, as a minimum, full-height floor-to-ceiling ½” plywood barriers shall be installed around entire perimeter where hydro-demolition is occurring (and all levels below), and as required to protect the public.
4. Minimum requirements on the roof level:

   a. 8-ft. high plywood barriers shall be installed around entire perimeter where hydro-demolition is occurring, and as required to protect the public. Secure adequately to withstand wind loading. Submit calculations from Engineer licensed in Michigan for record. (See Detail 3.1/R-501 for existing vehicle barrier that plywood barrier can be mounted to).
   b. Perimeter barriers shall be maintained until after concrete placement has been completed.
   c. Utilize additional protective shroud(s) around hydro-demolition equipment.
   d. Provide additional movable barriers as needed during hydro-demolition and high-pressure water blasting.

C. Execution

1. Contractor shall erect barriers full height, floor to ceiling, to completely separate all work areas from areas that will remain open to public use, prior to start of concrete removals. Barriers shall maintain their integrity as long as protection is required.

2. Plywood barriers shall be provided along the perimeter of the entire hydro-demolition work areas (W.I.'s 3.1 and 3.7) at the current work area and all levels below (see work area limits indicated on plans). Plywood barriers shall also be provided at the stair towers adjacent to the required hydro-demolition work to prevent pedestrian access to the work areas (all levels). See Drawings for specific requirements.
3. Roof level barriers and protection shall be sufficient to protect nearby highway, roads, sidewalks, and all areas adjacent to structure at all times throughout the entire project (particularly during hydro-demolition and conventional chipping, surface preparation, and high-pressure water blasting). All dust/debris/flying particles/water shall be contained within the work areas at all times. **Contractor to submit proposed roof level protection plan with Bid outlining the following:**

    a. Entire proposed hydro-demolition procedure including: removal, cleanup, surface preparation, and concrete placement process explaining method/types of protection to be utilized during each step of the repair process.
    b. Types of materials to be used (solid barriers/netting/machine enclosures/movable barriers/etc.).
    c. Proposed size/height of perimeter protection.
    d. Proposed method of installing/anchoring perimeter protection to structure.
    e. Any types of movable elements intended to be used to protect against flying debris/particles (particularly during hydro-demolition removals and high-pressure water-blasting surface preparation).
    f. Any other relevant information regarding contractor's proposed roof level protection plan.

4. Contractor shall remove all temporary barriers upon completion of Project and repair all damage caused by their installation.
5. Contractor shall remain responsible for prohibiting pedestrian and vehicle access to all closed work areas throughout duration of Project (incidental to this work).
6. Contractor shall be responsible for containing run-off water and debris from hydro-demolition work within work area boundaries (incidental to this work). Any run-off water or debris affecting locations outside of designated work areas shall be dealt with immediately by Contractor (incidental).
7. Contractor shall be responsible for preventing hydro-demolition run-off water and debris/slurry from entering the existing drainage system. As a minimum, filters shall be provided at all floor drains in and near the designated work areas prior to start of concrete removals (incidental).
8. Contractor shall be responsible for providing protection to prevent hydro-demolition run-off water and debris/slurry/dust from entering the elevator towers. All cleaning and/or repairs required to restore elevators to clean/functional condition shall be Contractor's responsibility.
9. Contractor shall also clean/repair existing drains and piping as needed at end of Project to ensure drainage system is in proper working condition at no extra cost to Owner.
10. Barriers (plywood/plastic sheeting) shall also be provided around localized areas while performing work outside of hydro-demolition work areas.

WI 1.7 GENERAL CONSTRUCTION ALLOWANCE

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to perform miscellaneous electrical, mechanical, and/or utility work; concrete repairs; and other work as directed by the Owner or Engineer.

B. Equipment (Not Applicable)

C. Execution

1. Special conditions, hidden conditions, and similar situations shall be brought to the attention of the Owner and Engineer.
2. Where above conditions warrant, or if Owner elects to add or delete work, contract modifications will be made in accordance Division 01 Sections. Contractor shall not bill, charge, invoice or in any other manner request payment against this work item unless specifically directed to do so by Owner/Engineer as indicated above.
3. Contractor shall not perform any Work that is to billed under this Allowance item without prior written approval from Owner.

WI 2.1 PROFESSIONAL SURVEYING – ELEVATIONS

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to perform elevation surveys as required in parking structure work areas to establish and document elevations prior to placing concrete to ensure proper drainage. Surveys shall be performed by a licensed and qualified professional surveying firm, subject to Engineer's approval.
2. Perform elevation surveys and set grades at all floor surfaces to receive overlay repair per W.I.'s 3.1 and 3.7 as shown on Drawings to ensure proper drainage will be achieved prior to placing concrete. Professional surveyor shall also be responsible for setting new drain elevations.
3. This Work Item shall be lump sum to perform all elevation survey work as specified in this Section and as required to perform W.I.'s 3.1 and 3.7.

B. Materials (NOT APPLICABLE)

C. Execution

1. Prior to start of Work, Contractor and Surveyor shall verify with Engineer minimum required elevation reference points and benchmarks. Benchmarks shall be clearly marked and protected throughout construction, to prevent damage or shifting.
2. Horizontal spacing for control points shall be as needed to ensure positive drainage and prevent ponding, but not more than 15-ft. apart in any direction.

3. Within the specified work area, Professional Surveyor shall be responsible to set/verify final elevations and slopes prior to concrete placement per W.I.'s 3.1 and 3.7. Deliverables to be submitted to Engineer include:
   a. Plan drawing of existing slab surface elevations prior to concrete removals.
      1) Professional surveyor required to obtain existing slab surface elevations at 10-ft. on center maximum spacing. Submit for record prior to performing concrete removals.
      2) In the event Contractor makes claim for payment under W.I. 3.11 "Floor Repair – Additional Depth", Professional Surveyor will be required to obtain and submit elevations of concrete removal surfaces after hydro-demolition and surface preparation have been completed (prior to placing concrete) and elevations of bottom layer of reinforcement in top mat. Elevations of removal surfaces and rebar shall be obtained at same locations as existing slab surface elevations (10-ft. on center spacing maximum), and shall be referenced to same benchmark(s).
   b. Plan drawing of elevations in overlay repair areas required to ensure proper drainage of repairs prior to placing concrete per W.I.'s 3.1 and 3.7.
   c. Plan drawing of actual elevations achieved, in same locations as initial survey(s), after concrete has been placed per W.I.'s 3.1 and 3.7.
4. Professional Surveyor shall be onsite to set and verify final elevations, grades, and slopes for all concrete pours per W.I.'s 3.1 and 3.7.
5. Elevations for screeds and pad for final floor elevations shall be set/verified prior to concrete placement and shall be placed and recorded as necessary to ensure proper drainage, but as a minimum, at all of the following locations in the work area:
   a. Top of all floor drains.
   b. All high points on drainage profile layout (10-ft. maximum spacing).
   c. At points between high points and drains not exceeding 10-ft. on center in east-west and north-south directions.

WI 3.0 CONCRETE FLOOR REPAIR

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 patching material to restore floor slab to original condition and appearance. Refer to Detail Series 3.0 for specific requirements.

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and on Drawings.
2. Epoxy-coated steel reinforcement shall be as specified in Section "Cast-in-Place Concrete".

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section “Surface Preparation for Patching”, Article “Inspection”.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section “Surface Preparation for Patching”, Article “Preparation”. Remove all unsound concrete within marked boundary prior to saw-cutting and preparation of patch edges.
3. Engineer shall inspect all cavities for condition according to Section “Surface Preparation for Patching”, Article “Inspection of Repair Preparation”.
4. All steel exposed within cavities shall be cleaned to bare metal by sand-blasting as specified in Section “Surface Preparation for Patching”, Article “Cleaning of Reinforcement within Delamination and Spall Cavities”, and damaged and defective reinforcement replaced as specified in Section “Surface Preparation for Patching”, Article “Reinforcement and Embedded Materials in Repair Areas”. Exposed steel shall be coated with an approved corrosion inhibitor as specified in Section “Cast-in-Place Concrete”.
5. Contractor shall prepare cavities for patch placement as specified in Section “Surface Preparation for Patching”, Article “Preparation of Cavity for Patch Placement”.
6. 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.

WI 3.1 FLOOR REPAIR – PARTIAL DEPTH OVERLAY (LEVEL 2 BAY 8 - 100% DEEP OVERLAY) - ALTERNATE #1

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove concrete by hydro-demolition to depth shown on Details, prepare surfaces to receive overlay, install concrete overlay to profiles that ensure positive drainage and to match existing grades at repair perimeters, and provide tooled control joints and install cove and control joint sealants. See Detail Series 3.1 for additional specific requirements.

2. Alternate #1 includes performing hydro-demolition overlay repairs in bay 8 on level 2 (entire area) instead of strip repairs per W.I. 3.7A. In Bid Form, state cost to perform hydro-demolition overlay repairs in bay 8 on level 2, independent of pricing provided for strip repairs in this area (W.I. 3.7A). Base Bid W.I. 3.7A will be deleted from Project upon acceptance of this Alternate Work Item, and will then <u>not</u> be eligible for billing.

3. Payment for this Alt. Work Item (if accepted) shall be lump sum to perform overlay repairs on level 2 in work area boundaries shown on Drawing R-201. For bidding purposes, the required Alternate overlay repair floor area shown in bay 8 on level 2 is approximately 15,900 S.F. Contractor is required to verify extent of repairs in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. Contractor is responsible to verify square footage prior to submitting Bid. No extras will be

allowed for discrepancy between this number and actual square footage of work performed, unless Contractor is specifically directed by Engineer to extend repairs outside of work area boundaries shown on Drawings.

a. Refer to Detail 3.1/R-501 for removal boundaries along perimeter edges where existing vehicle barrier system is present. 2' wide concrete strip along perimeter shall be placed separately, after temporary barriers have been removed.
b. W.I. 3.1 shall extend to edge of curbs along interior perimeters where vehicle barrier system is not present.

4. Protection of existing permanent shores and perimeter vehicle barrier system shall be incidental to this work. Removals shall be performed around base plates to not undermine vehicle barrier or permanent shore bases. Perform adjacent removals with conventional chipping hammers as required (incidental). Refer to Detail 3.1.4 for similar requirement.
5. Refer to Section "Hydro-demolition Surface Preparation" for water pressure metering requirements at the City hydrants.

B. Materials/Equipment

1. Concrete removals shall be performed by hydro-demolition (except for areas with limited access, such as around columns, walls, permanent shores, and vehicle barriers, which shall be performed using conventional chipping hammers, incidental). Refer to Section "Hydro-demolition Surface Preparation" for additional specific requirements.
2. Steel reinforcement and related materials shall be as specified in Section "Cast-in-Place Concrete".
3. Concrete material shall be as specified in Section "Cast-in-Place Concrete" and on Drawings.
4. Sealant material shall be as specified in Section "Concrete Joint Sealants".

C. Execution

1. Locate all work areas to receive new overlay as shown on the Drawings, and perform work in sequence as required by Drawings.
2. Perform Elevation Surveys as required by W.I. 2.1.
3. Install Temporary Shoring (minimum 2 levels) beneath the floor slabs prior to start of concrete removals per Drawings and W.I. 18.1.
4. Temporary shoring beneath the cantilevered edges shall bear on existing foundations at grade level. Verify in field with Engineer.
5. All required Signage, Temporary Barriers, and perimeter protection per requirements of W.I.'s 1.5 and 1.6 shall be in place prior to start of removals.
6. Remove concrete to required depth per W.I. 3.1 Series and Section "Hydro-demolition Surface Preparation". Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation". All steel exposed within cavities shall be cleaned to bare metal by hydro-demolition as specified in Section "Hydro-demolition Surface Preparation".

7. Remove concrete to required depths up to the face of walls, columns, and curbs. Note: Floor reinforcing steel is closely spaced near columns and may only have approximately 1-in. of clearance between bars. See Detail 5/R-301.
8. Removals and cleanup shall be performed to minimize damage to existing reinforcement. Remove only defective existing reinforcement that is no longer embedded in concrete. All other reinforcement shall be saved/protected. Do not cut any embedded reinforcing steel without Engineer approval on case-by-case basis.
9. Remove all hydro-demolition concrete debris through use of a vacuum truck suitable for this type of work (see Alternate W.I. 3.1A for alternatives).
10. Prepare final concrete surfaces by water-blasting per Section “Hydro-demolition Surface Preparation”. Provide protection per W.I. 1.6 throughout surface preparation process. Remove debris and laitance immediately and continuously after hydro-demolition is performed to prevent re-settling or re-adhesion to sound concrete which will interfere with bond of new concrete.
11. Receive Engineer approval of completed surface preparation one day prior to scheduled concrete pours, no exceptions.
12. Install supplemental epoxy-coated reinforcing as directed by Engineer per W.I. 3.9 to supplement/replace defective existing reinforcement. Do not cut or remove any reinforcement embedded in existing concrete unless specifically approved by Engineer on a case-by-case basis. Removal of defective reinforcement as required shall be incidental to this work.
13. Maintain existing height of top mat of reinforcement. In general, maintain existing thickness of slab, except as needed to provide proper drainage. Notify Engineer of proposed change(s) to slab thickness and verify drainage requirements prior to placing concrete. Provide 1% to 2% slope on new floor surfaces to drains.
14. Place concrete overlay per Section “Cast-in-Place Concrete”. Concrete overlay areas shall be consolidated using a vibratory screed. See Section “Cast-in-Place Concrete” for specific requirements. Install overlay to floor elevations necessary to provide positive drainage to floor drains (1% to 2%) with no ponding water. See W.I. 2.1 for additional requirements.
15. For large overlay areas, vibratory screed requirement may be eliminated only if Contractor provides minimum of (2) dedicated workers to vibrate and consolidate concrete with “stinger” type vibrators during placement.
16. Contractor shall completely protect existing light fixtures, exit lights, pull alarms, signs, conduit, security cameras, elevators, galvanized vehicle barriers and permanent shoring, and all other existing features within the structure from spray and damage from hydro-demolition and all other construction operations. Cleaning or repair/replacement of Contractor-caused damage to any existing features shall be replaced by Contractor at no additional cost to Owner. With prior approval from Owner/Engineer, some existing features may be removed and re-installed (at Contractor’s option). Submit plan for approval prior to start of Work.
17. Protect existing conduit runs that occur on underside of repair areas. Contractor shall verify extent of protection requirements prior to submitting Bid. Refer to W.I. 25.1.
18. Contractor shall verify and record condition of existing security system prior to start of Work (i.e. whether all elements of the security system are operational, and which, if any, are not functioning properly). Coordinate with Owner to

document functional and non-functional features of the existing security system (throughout the entire structure) to verify Contractor's responsibility for any damage caused during construction operations. Any non-functional light fixtures shall also be documented during this review. Perform similar review of all elevators prior to start of Work.

WI 3.1A CONCRETE REMOVAL METHOD (ALTERNATE)

A. On the Alternate Work Item Schedule in the Bid Form Section, state the deduct or add price if all concrete debris generated from hydro-demolition (W.I.'s 3.1 and 3.7) is allowed to be removed by a method other than the required vacuum method. Concrete demolition must still be performed by hydro-demolition. This Work Item only pertains to the removal method of debris after hydro-demolition is completed. Proposed method of removal shall not damage existing reinforcing steel.

WI 3.2 FLOOR REPAIR – PARTIAL DEPTH

A. Refer to Work Item "Concrete Floor Repair" for scope of work, materials, and procedure associated with this Work Item. Refer to Detail 3.2 for specific requirements.

B. This Work includes floor repairs at localized delaminated/spalled areas on supported levels (outside of overlay and strip repair areas) as located in field with Engineer.

C. Payment for this Work Item shall be per square foot of work actually performed, measured in field with Owner/Engineer.

WI 3.3 FLOOR REPAIR – PARTIAL DEPTH (STAIR TOWER LANDINGS) (ALTERNATE)

A. Refer to Work Item "Concrete Floor Repair" for similar scope of work, materials, and procedure associated with this Work Item. Refer to Detail 3.3 for similar requirements.

B. This Work includes floor repairs at localized delaminated/spalled areas at the stair tower landings as identified on Drawings and/or located in field with Engineer.

C. Payment for this Alternate Work Item (if accepted) shall be per square foot of work actually performed, measured in field with Owner/Engineer.

WI 3.4 FLOOR REPAIR – FULL DEPTH AT EXPANSION JOINT

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, install supplemental reinforcement, and install repair material to restore floor to original integrity and appearance. Refer to Detail 3.4 for specific requirements.

2. Removal of existing metal-edged expansion joint system is incidental (including embedded studs). Concrete removals for this Work shall be by hydro-demolition or chipping hammers (or both) as required at overlay repair areas.
3. Perform this Work in conjunction with W.I.'s 3.1, 3.7, and 10.3.
4. Payment for this Work Item shall be per square foot of work actually performed per requirements of Detail 3.4, measured in field with Owner/Engineer. Forming and placing expansion joint blockouts (per expansion joint manufacturer's requirements) is incidental to this Work.

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and on Drawings.
2. Epoxy-coated steel reinforcement shall be as specified in Section "Cast-in-Place Concrete".

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation". Remove all unsound concrete within marked boundaries prior to saw-cutting and preparation of patch edges. 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 sawcut or ground to depth of 0.5-in. Patches shall be as square- or rectangular-shaped as practical.
3. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
4. All steel exposed within cavities shall be cleaned to bare metal by hydro-demolition or sand-blasting as specified in Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor coating as specified in Section "Cast-in-Place Concrete".
5. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
6. Install supplemental reinforcement as shown on Detail 3.4 (incidental). Verify requirements in field with Engineer prior to placing concrete.
7. 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.

WI 3.5 FLOOR REPAIR – CURBS

A. Refer to Work Item 3.0 "Concrete Floor Repair" for scope of work, materials, and procedure associated with this Work Item. Refer to Detail 3.5 for specific

requirements. This work occurs at concrete curbs where Permanent Shoring is to be installed (see R-101 for Permanent Shoring locations). Actual locations shall be verified in field with Engineer.

B. All curb spalls/delaminations occurring at locations where permanent shoring is to be installed (per W.I. 22.1) shall be repaired and allowed to cure prior to shoring installation. See Drawing R-101 for location of new shores per W.I. 22.1. See Detail 3.12 for adjacent slab edge repairs.

C. Payment for this Work Item shall be per square foot of work actually performed, measured in field with Owner/Engineer.

WI 3.7 FLOOR REPAIR – OVERLAY STRIP PATCHING (BASE BID & ALTERNATES)

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to sound floors to locate and mark work boundaries, remove concrete partial depth by hydro-demolition, remove debris and prepare surfaces to receive overlay, install concrete overlay to grades and/or profiles required to provide positive drainage, provide tooled control joints, and install cove sealant and control joint sealants (incidental) as required. Concrete removals, concrete placement, terminations, joints, etc. shall be performed per the requirements of Work Item and Detail Series 3.1, payable under this Work Item only. Unlike Work Item 3.1 which involves complete concrete removal and overlay installation over the entire designated area, Work Item 3.7 involves localized floor repair patches (or strips) mainly around columns and along grid lines where there is a higher concentration of top reinforcing steel. General repair locations are shown on plans, verify actual locations in field with Engineer. See typical layout shown on Drawings R-201, R-202, and R-203. See Detail Series 3.1/3.7 for additional specific requirements.

2. Refer to Section “Hydro-demolition Surface Preparation” for water pressure metering requirements at the city hydrants and other specific requirements.

3. Protection of existing permanent shores and perimeter vehicle barrier system shall be incidental to this work. Removals shall be performed around base plates to not undermine vehicle barrier or permanent shore bases. Perform adjacent removals with conventional chipping hammers as required (incidental). Refer to Detail 3.1.4 for similar requirement.

4. <u>Base Bid – (Bays 7 & 8 on Roof Level)</u>: Payment for this Work Item shall be per square foot of repairs actually performed, as located in field with Engineer.

5. <u>Bay 6 on Roof Level – Part of Alternate #2</u>: Payment for this Alternate Work Item (if accepted) shall be per square foot of repairs actually performed, as located in field with Engineer.

6. <u>Bay 5 on Roof Level – Part of Alternate #3</u>: Payment for this Alternate Work Item (if accepted) shall be per square foot of repairs actually performed, as located in field with Engineer.

B. Materials/Equipment

1. Concrete removals shall be performed by hydro-demolition per Section “Hydro-demolition Surface Preparation”.
2. Concrete repair materials shall be as specified in Section “Cast-in-Place Concrete”.
3. Epoxy-coated steel reinforcement shall be as specified in Section “Cast-in-Place Concrete”.
4. Sealant material shall be as specified in Section “Concrete Joint Sealants”.

C. Execution

1. Locate all work areas to receive overlay strip patching as shown on Drawings by sounding floor slabs and marking deteriorated areas. Verify in field with Engineer. Perform work in sequence as required on Drawings. Refer to Drawings for specific phasing requirements.
2. Perform required Elevation Surveys per W.I. 2.1.
3. Install Temporary Shoring (2 levels) beneath the floor slabs prior to start of concrete removals per Drawings and W.I. 18.1. Phase/coordinate work accordingly.
4. Temporary shoring at the cantilevered edges shall bear on existing foundations at grade level. Verify in field with Engineer.
5. **Temporary Shoring per W.I. 18.1 shall be installed beneath the <u>entire</u> floor area of the bays where strip patching (W.I. 3.7) occurs, not just at the localized areas where the strip patching is performed.**
6. Signage and Temporary Barriers and perimeter protection per requirements of W.I.’s 1.5 and 1.6 shall be in place prior to start of removals.
7. Remove concrete to depth required per Detail Series 3.1 and Section “Hydro-demolition Surface Preparation”. Engineer shall inspect all cavities for condition according to Section “Surface Preparation for Patching”, Article “Inspection of Repair Preparation”. All steel exposed within cavities shall be cleaned to bare metal by hydro-demolition as specified in Section “Surface Preparation for Patching”, Article “Cleaning of Reinforcement within Delamination and Spall Cavities”, and damaged and defective reinforcement replaced as specified in Section “Surface Preparation for Patching”, Article “Reinforcement and Embedded Materials in Repair Areas”.
8. Remove all hydro-demolition concrete debris through use of a vacuum truck suitable for this type of work (see Alternate W.I. 3.1A for alternatives).
9. Removals and cleanup shall be performed to minimize damage to existing reinforcement. Remove only <u>defective</u> existing reinforcement that is no longer embedded in concrete. All other reinforcement shall be saved/protected.
10. Prepare final concrete removal surfaces by water-blasting per Section “Hydro-demolition Surface Preparation”. Remove debris and laitance soon enough after hydro-demolition to prevent re-settling or re-adhesion to sound concrete, which will interfere with bond of new concrete.
11. Receive Engineer approval of surface preparation one day prior to scheduled concrete pours, no exceptions.
12. Install supplemental epoxy-coated reinforcing as directed by Engineer per W.I. 3.9 to supplement/replace defective existing reinforcement. Do not cut or remove any reinforcement embedded in existing concrete unless specifically

approved by Engineer on a case-by-case basis. Removal of defective reinforcement as required shall be incidental.

13. Place concrete overlay per Section "Cast-in-Place Concrete". Vibratory screed requirement may be eliminated if Contractor provides dedicated workers to vibrate and consolidate concrete with "stinger" type vibrators during placement.
14. Contractor shall be responsible to match existing grades around perimeter of strip patches, and to provide positive drainage within and around repair patches. Provide 1% to 2% slope on repaired surfaces to nearest drains. Ponding water is not acceptable, and shall be repaired by Contractor to Engineer's satisfaction at no additional cost to Owner.
15. Contractor shall completely protect existing light fixtures, exit lights, pull alarms, signs, conduit, security cameras, elevators, galvanized vehicle barriers and permanent shores, and all other existing features within the structure from spray and damage from hydro-demolition and all other construction operations. Cleaning or repair/replacement of Contractor-caused damage to any existing features shall be performed by Contractor at no additional cost to Owner. With prior approval from Engineer, some existing features may be removed and re-installed (at Contractor's option). Submit plan for approval prior to start of Work.

WI 3.7A FLOOR REPAIR – OVERLAY STRIP PATCHING (BAY 8 ON LEVEL 2 – BASE BID)

A. Refer to Work Item 3.7 "Floor Repair – Overlay Strip Patching" for similar scope of work, materials, and procedure associated with this Work Item. Refer to Detail Series 3.1/3.7 for specific requirements. General locations where this Work occurs are shown on Drawings. Actual locations shall be verified in field with Engineer.

B. Payment for this Work shall be per square foot of repairs actually performed (in bay 8 on level 2), measured in field with Owner/Engineer.

C. If Alternate #1 (W.I. 3.1 – Level 2 Bay 8 - 100% Deep Overlay) is accepted, W.I. 3.7A shall be deleted from scope of Project, and will no longer be eligible for billing.

WI 3.8 FLOOR REPAIR – FULL DEPTH – ADDITIONAL REMOVALS

A. Refer to Work Item 3.4 "Floor Repair – Full Depth at Expansion Joint" for similar scope of work, materials, and procedure. Refer to Detail 3.8 for specific requirements.

B. This Work Item applies only to locations within the overlay repair areas (W.I.'s 3.1 and 3.7) that require full depth replacement due to slab deterioration. Payment for this Work Item is in addition to W.I. 3.1 and/or W.I. 3.7 as applicable at these full depth areas.

C. Additional concrete removals by chipping hammers may be required after hydro-demolition is performed, as directed by Engineer (incidental to this Work Item).

D. Payment for this Work Item shall be per square foot of work actually performed, measured in field with Owner/Engineer.

E. Upon removal of formwork, Contractor shall repair bugholes, honeycombing, and all other noticeable imperfections to satisfaction of Owner (incidental).

WI 3.9 SUPPLEMENTAL EPOXY-COATED STEEL

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to provide and install supplemental epoxy-coated reinforcing bars to replace/supplement defective existing reinforcing bars in concrete repair areas as directed by Engineer. Contractor shall verify condition of existing reinforcement with Engineer prior to placing repair material at all concrete repair areas.
2. This Work Item is applicable to all concrete repair items, and shall be used as needed and directed by Engineer. Contractor shall have 10% of bid quantity of reinforcement in the form of #6 bars (and #4 bars as needed), stockpiled on site prior to completion of slab demolition work. Lengths of stockpiled bars shall be no less than 20-ft. Contractor shall adjust quantities supplied to Project per work area to meet demands of the Project as work progresses. Verify with Engineer prior to ordering materials.
3. Supplemental reinforcement indicated as incidental to other Work Items shall NOT be applicable for payment under this Work Item.
4. Payment for this Work Item shall be per pound of supplemental reinforcement actually installed, verified in field with Owner/Engineer. Contractor shall submit actual material invoices upon request of Owner.

B. Materials

1. Conventional, epoxy-coated steel reinforcement shall be as specified in Section “Cast-in-Place Concrete”.

C. Execution

1. Engineer shall inspect existing reinforcement as specified in Section “Surface Preparation for Patching”, Article “Inspection of Repair Preparation”.
2. Contractor shall furnish and install supplemental epoxy-coated reinforcement to replace <u>defective</u> reinforcement as specified in Section “Surface Preparation for Patching”, Article “Reinforcement and Embedded Materials in Repair Areas”.
3. Replacement of existing reinforcement <u>damaged</u> due to Contractor’s removal operations shall be performed at no cost to Owner.
4. Supplemental reinforcement shall be of equal or greater diameter than the original diameter of the reinforcement being replaced. Verify in field with Engineer.

WI 3.11 FLOOR REPAIR – ADDITIONAL DEPTH

A. Scope of Work

1. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove concrete to depths beyond the deepest removal limits set in W.I.’s 3.1/3.7), and to replace this additional depth of concrete

removal with overlay concrete placed monolithic with overlay concrete specified in W.I.'s 3.1/3.7). See Detail Series 3.1/3.7 for additional information.

2. Unit price shall be per square foot of additional removals performed for each extra 1-in. depth of removal.

3. This Work Item applies to areas where existing reinforcing steel is significantly lower than expected, requiring deeper depths of removal to achieve ¾" clearance around bottom layer of top mat of reinforcing steel.

4. This Work Item does NOT apply to removals beyond ¾" below the bottom layer of the top mat of reinforcing steel, or the deepest removal limits established on Detail Series 3.1/3.7. Contractor is responsible for adjusting removal equipment to prevent excess removals beyond the established removal limits.

5. To be eligible for payment under this Work Item, the Contractor shall be responsible for providing acceptable documentation to Owner/Engineer of all areas of additional depth removals a minimum of 1-week prior to concrete placement. Perform Elevation Surveys per W.I. 2.1 (before and after concrete removals as required) and submit to Owner/Engineer as documentation of removal depths. See W.I. 2.1 for specific requirements.

   a. Contractor must provide elevation survey results taken both before and after concrete removals (at same locations) for this Work Item to be considered.

6. **Removal areas less than the deepest required removal depths may be used by Owner to offset this Work Item by an equivalent quantity**.

B. Materials

1. Refer to W.I. 3.1 for requirements.

C. Execution

1. Refer to W.I. 3.1 for requirements.

WI 3.12 FLOOR REPAIR – SLAB EDGE (ALTERNATE)

A. Refer to W.I.'s 4.1 and 6.1 for similar overhead and vertical surface concrete repair requirements. Refer to Detail 3.12 for specific requirements. Payment for this Alternate Work Item, if accepted, shall be per square foot of concrete removal/replacement on both overhead and vertical surface concrete repairs as shown on Detail 3.12. Verify repair areas in field with Engineer. See W.I. 3.5 for adjacent curb repairs.

WI 4.1 CEILING REPAIR – PARTIAL DEPTH

A. Scope of Work

1. 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 patching material to restore ceilings to original condition and appearance. Refer to Detail 4.1 for specific requirements.

2. This work occurs at localized areas throughout the structure as needed. Verify repair areas in field with Engineer prior to start of Work.

3. Payment for this Work Item shall be per square foot of repairs performed. Provide localized signage and barriers around work areas per W.I.'s 1.5 & 1.6. Install localized temporary shoring (as needed) per W.I. 18.2; verify in field with Engineer.

B. Materials

1. Refer to Section "Cast-in-Place Repair Mortar" and/or Section "Shotcrete" for approved repair materials and procedures.
2. Trowel-applied repair material not allowed.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. All live loads shall be removed from floor slab above and below repairs. Verify in field with Engineer.
3. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
4. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
5. All steel exposed within cavities shall be cleaned to bare metal by sand-blasting as specified in Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor coating as specified in Section "Cast-in-Place Concrete".
6. Contractor shall prepare cavities for patch placement in accordance with Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
7. 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.
8. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 4.2 RECESS LIGHT FIXTURES (ALTERNATE)

A. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate existing light fixtures that will not meet minimum height clearance requirements as shown on Drawings at overlay repair areas (W.I.'s 3.1/3.7),

remove the fixture and conduit as needed, sawcut perimeter and remove sound ceiling concrete, and re-install light fixture/conduit within the recessed concrete removal area to provide the minimum required height clearance. Electrical work shall be performed in accordance with all applicable codes and regulations. Refer to Detail 4.2 for specific requirements.

B. All exposed existing reinforcement shall be coated with an approved corrosion inhibitor, incidental to this Work.

C. Payment for this Alternate Work Item (if accepted) shall be per each light fixture recessed.

WI 4.3 RECESS SECURITY CAMERAS (ALTERNATE)

A. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate existing security cameras that will not meet minimum height clearance requirements as shown on Drawings at overlay repair areas (W.I.'s 3.1/3.7), remove the security camera and conduit as needed, sawcut perimeter and remove sound ceiling concrete, and reinstall camera/conduit within the recessed concrete removal area to provide the minimum required height clearance. Electrical work shall be performed in accordance with all applicable codes and regulations. Refer to Detail 4.2/4.3 for specific requirements.

B. All exposed existing reinforcement shall be coated with an approved corrosion inhibitor, incidental to this Work.

C. Payment for this Alternate Work Item (if accepted) shall be per each security camera recessed.

WI 6.0 CONCRETE COLUMN REPAIR

A. Scope of Work

1. 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 patching materials to restore concrete columns to original condition and appearance. Refer to Detail Series 6.0 for specific requirements.

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and/or Section "Cast-in-Place Repair Mortar".
2. Pressure applied concrete repair materials shall be as specified in Section "Shotcrete".
3. Trowel applied repair material not allowed.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. All live loads shall be removed from floor slab above and below repairs. Verify in field with Engineer.
3. Procedure for delaminated and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
4. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
5. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor as specified in Section "Cast-in-Place Concrete".
6. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
7. 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.
8. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 6.1 COLUMN REPAIR – PARTIAL DEPTH (ALTERNATE)

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

B. Payment for this Alternate Work Item (if accepted) shall be per square foot of repairs performed. Provide localized signage and barriers around work areas per W.I.’s 1.5 & 1.6. Install localized temporary shoring (as needed) per W.I. 18.2; verify in field with Engineer.

WI 6.2 COLUMN REPAIR – PARTIAL DEPTH AT EXPANSION JOINT

A. Refer to Work Item “Concrete Column Repair” for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 6.2 for specific requirements.

B. Payment for this Work Item shall be per square foot of repairs performed. Provide localized signage and barriers around work areas per W.I.’s 1.5 & 1.6. Install localized temporary shoring (as needed) per W.I. 18.2; verify in field with Engineer.

WI 10.3 EXPANSION JOINT – ELASTOMERIC CONCRETE EDGED

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove existing expansion joint systems, prepare concrete surfaces, and furnish and install new expansion joint system. Refer to Detail 10.3 for specific requirements.

2. Payment for this Work Item shall be per lineal foot of expansion joint systems installed. Concrete removals and replacement of blockouts shall be incidental to W.I.'s 3.1/3.4/3.7.

B. Materials

1. Expansion joint system materials shall be as specified in Section "Expansion Joint Assemblies", installed in strict accordance with manufacturer's recommendations.

C. Execution

1. Contractor shall remove existing expansion materials in manner that minimizes damage to adjacent concrete. Expansion joint blockout forming and placement required for installation of new expansion joint system shall be performed in accordance with Work Item Series 3.1/3.7 and Work Item 3.4, as applicable.
2. Joint materials and associated reference specifications are listed in Article "Materials" above. Joint installation procedures shall be in accordance with referenced specifications and manufacturer's recommendations.
3. In-place testing: Prior to opening to traffic, test joint seal for leaks. Repair leaks revealed by examination of seal underside. Repeat test and repairs until all leaks stopped.

WI 11.1 OVERLAY CONTROL JOINT SEALANT (INCIDENTAL)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to provide tooled joints in overlay concrete repair areas (W.I.'s 3.1/3.7) and install sealant as required on Drawings. Refer to Detail 11.1 for specific requirements. Refer to Detail 2/R-001 for typical joint layout.

2. This Work is incidental to W.I.'s 3.1/3.7 and is NOT a separate pay item.

B. Materials

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

C. Execution

1. Contractor shall locate and provide control joints at all column grid lines and at all existing control and construction joints. See Drawings for typical layout. Locate existing construction joints prior to performing concrete removals.
2. Joints shall be tooled in plastic concrete. Saw-cutting of joints in hardened concrete will NOT be allowed.
3. Tooled joints shall be of proper dimension in plastic concrete as shown on Detail 11.1.
4. Approved joint materials shall be installed as specified in Section “Concrete Joint Sealants”.
5. Sealant manufacturer shall verify that joint sealant type is compatible with traffic coating specified in Section “Traffic Coatings”.

WI 11.2 SEAL FLOOR CRACKS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to locate, prepare, and seal random cracks in concrete floors. Refer to Detail 11.2 for specific requirements.

2. Payment for this Work Item shall be per lineal foot of work actually performed, measured in field with Owner/Engineer.

3. Note: Sealing of control/construction joints at floor overlay repair areas is covered under W.I. 11.1 and is NOT eligible for payment under this Work Item.

B. Materials

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

C. Execution

1. Contractor shall thoroughly clean and inspect concrete slabs for cracks. Those identified as either greater than 0.03-inch wide or showing evidence of water 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 in area of repair by use of a pachometer. Determine depth of electrical conduit (if applicable). Do not exceed these depths 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 Owner.
2. Cracks 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 (per W.I. 11.1), but may be used on random cracks per this Work Item.

3. Cavities shall be thoroughly cleaned by either sand-blasting 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 associated reference specifications are listed in Article “Materials” above. Sealant installation procedures shall be in accordance with referenced specifications for selected material.
5. Sealant type shall be compatible with traffic coating specified in Section “Traffic Coatings”.

WI 11.7 COVE SEALANT (INCIDENTAL)

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.

2. This Work occurs at all applicable walls, curbs, and columns within the W.I. 3.1 work areas, and the entire bays where W.I. 3.7 is being performed. This Work is incidental to W.I.’s 3.1 and 3.7 and is NOT a separate pay item. Contractor is required to install new cove sealant along all walls, curbs, and columns within the designated work areas after concrete has properly cured.

B. Materials

1. Joint sealant materials shall be as specified in Section "Concrete Joint Sealants".
2. Joint sealant material shall be compatible with traffic coating materials specified in Section "Traffic Coatings".

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.
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 Article "Materials" above.

WI 16.0 TRAFFIC TOPPING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to prepare existing floor surface and install traffic topping as shown on Detail 16.1 and Drawings. Coating of all vertical surfaces within Work area (as required on Detail) shall be incidental to installation of traffic topping.

B. Materials

1. Approved materials for use in this Work are as specified in Section "Traffic Coatings".

2. Contractor shall submit samples of coating and obtain Owner/Engineer approval prior to start of Work. Approved sample shall be basis for acceptance criteria including, but not limited to: surface texture, color, amount of aggregate used, slip-resistance. Refer to Section “Traffic Coatings” for specific requirements.

C. Execution

1. Floor surface preparation shall be performed by coating system applicator or under its direct supervision. Shotblast surface preparation is required for floors.
2. Traffic topping shall be installed by licensed applicators in strict accordance with manufacturer's recommendations and referenced specification section listed in Article "Materials" above.
3. Coating system shall be thoroughly cured prior to Work areas being returned to service.

WI 16.1 TRAFFIC TOPPING – NEW SYSTEM (BASE BID & ALTERNATES)

A. Refer to Work Item “Traffic Topping” for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 16.1 for specific requirements.

B. Traffic topping shall be installed on all horizontal curb surfaces within required work areas (incidental).

C. Base Bid – (Bays 7 & 8 on Roof Level, and Bay 8 on Level 2): Payment for this Work shall be lump sum to install traffic topping in Bays 7 & 8 on level 6, and Bay 8 on level 2 in work areas shown on Drawings R-201 & R-202. For bidding purposes, the required traffic topping installation floor area shown on Drawings R-201 & R-202 is approximately 47,700 S.F. Contractor is required to verify extent of traffic topping installation in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of traffic topping installed, unless Contractor is specifically directed by Engineer to extend traffic topping installation outside of work areas shown on Drawings R-201 & R-202.

D. Bay 6 on Roof Level – Part of Alternate #2: Payment for this Alternate Work (if accepted) shall be lump sum to install traffic topping in Bay 6 on level 6 in work area shown on Drawing R-203. For bidding purposes, the required traffic topping installation floor area in Bay 6 shown on Drawing R-203 for this Work Item is approximately 15,900 S.F. Contractor is required to verify extent of traffic topping installation in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of traffic topping installed, unless Contractor is specifically directed by Engineer to extend traffic topping installation outside of work areas shown on Drawing R-203.

E. Bay 5 on Roof Level – Part of Alternate #3: Payment for this Alternate Work (if accepted) shall be lump sum to install traffic topping in Bay 5 on level 6 in work area shown on Drawing R-203. For bidding purposes, the required traffic topping installation floor area in Bay 5 shown on Drawing R-203 for this Work Item is approximately 15,900 S.F. Contractor is required to verify extent of traffic topping installation in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of traffic topping installed, unless Contractor is specifically directed by Engineer to extend traffic topping installation outside of work areas shown on Drawing R-203.

WI 16.1A TRAFFIC TOPPING – RECOAT (BASE BID & ALTERNATES)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to prepare and recoat the existing traffic topping in areas as described below.

2. Contractor shall recoat (or install complete coating system as needed) all previously coated areas in structure that are damaged during project, incidental to this Work.

3. Base Bid – (Bays 7 & 8 on Level 5): Payment for this Work Item shall be lump sum to recoat bays 7 & 8 on level 5. Upon completion of overlay repairs (W.I.'s 3.1 & 3.7) and removal of temporary shores/formwork/etc., Contractor shall recoat existing coating on entire floor surface in bays 7 and 8 on level 5. For bidding purposes, the required area to be recoated in Bays 7 & 8 on level 5 is approximately 31,800 S.F. Contractor is required to verify extent of area to be recoated in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of area to be recoated.

4. Bay 6 on Level 5 – Part of Alternate #2: Payment for this Alternate Work Item (if accepted) shall be lump sum to recoat bay 6 on level 5. Upon completion of overlay repairs (W.I.'s 3.1 & 3.7) and removal of temporary shores/formwork/etc., Contractor shall recoat existing coating on entire floor surface in bay 6 on level 5. For bidding purposes, the required area to be recoated in Bay 6 on level 5 is

approximately 15,900 S.F. Contractor is required to verify extent of area to be recoated in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of area to be recoated.

5. Bay 5 on Level 5 – Part of Alternate #3: Payment for this Alternate Work Item (if accepted) shall be lump sum to recoat bay 5 on level 5. Upon completion of overlay repairs (W.I.'s 3.1 & 3.7) and removal of temporary shores/formwork/etc., Contractor shall recoat existing coating on entire floor surface in bay 5 on level 5. For bidding purposes, the required area to be recoated in Bay 5 on level 5 is approximately 15,900 S.F. Contractor is required to verify extent of area to be recoated in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of area to be recoated.

6. Bay 7 on Level 2 – Individual Alternate: Payment for this Alternate Work Item (if accepted) shall be lump sum to recoat bay 7 on level 2. Upon completion of overlay repairs (W.I.'s 3.1 & 3.7) and removal of temporary shores/formwork/etc., Contractor shall recoat existing coating on entire floor surface in bay 7 on level 2 (except for slab-on-grade portion at south end). For bidding purposes, the required area to be recoated in Bay 7 on level 2 is approximately 13,200 S.F. Contractor is required to verify extent of area to be recoated in field prior to submitting Bid. This square footage number is provided for reference only and is based on original drawings. No extras will be allowed for discrepancy between this number and actual square footage of area to be recoated.

B. Materials

1. Approved materials for use in this Work are as specified in Section "Traffic Coatings". Traffic topping recoating material manufacturer shall verify compatibility with existing system.
2. Prior to start of Work, obtain written approval from traffic topping manufacturer that the existing surface is acceptable for application of proposed traffic topping and that the membrane is compatible with existing system.
3. Existing traffic topping membrane in designated work area shall be recoated with a minimum of one intermediate coat with aggregate and one top coat.

C. Execution

1. Preparation of existing traffic topping membrane shall be in strict accordance with manufacturer's recommendations and Section "Traffic Coatings". Floor surface preparation shall be performed by coating system applicator or under its direct supervision.
2. Traffic topping materials shall be installed by licensed applicators in strict accordance with manufacturer's recommendations and Section "Traffic Coatings". Cleaning and surface preparation is incidental to this Work Item.
3. Completely solvent-wash all existing traffic coating that is bonded to concrete slab.

4. All loose existing coating shall be removed and exposed concrete surfaces prepared in accordance with manufacturer's requirements. See Section "Traffic Coatings".
5. 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 shall be recoated.
6. Coating system shall be thoroughly cured and traffic marking completed prior to returning work areas to service.

WI 16.9 SCALED SURFACE REPAIR (EPOXY/SAND) (PART OF ALTERNATES #2 AND #3)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to scarify/shotblast and prepare surface of concrete slab and install epoxy/sand overlay on prepared concrete surface. Refer to Detail 16.9 for specific requirements.

2. Payment for this Alternate Work (if accepted) shall be per square foot of epoxy/sand repair material installed.

B. Materials

1. MasterSeal 350 with DynaGrip Aggregate #8, by BASF.
2. PolyCarb Mark 171 with Washington Stone, Dow Chemical Company.
3. Neogard Epoxy/sand system with #16 aluminum oxide.
4. Approved equivalent.
5. For any selected product:

   a. Sand shall be 12-20 size minimum (or equivalent) unless noted otherwise. Submit various sized samples for Owner/Engineer approval.
   b. Provide non-sag additive as required to prevent epoxy/sand from sagging. Seed stone until rejection.
   c. For the topcoat, provide 5-10 mil epoxy lock coat to lock in top sand layer.

C. Execution

1. Contractor shall locate scaled surface repair areas and verify with Engineer prior to start of Work. See Drawing R-203 for general locations.
2. Perform surface preparation as required on Detail 16.9 and per manufacturer’s requirements. Repair any spalls/delaminations per other Work Items.
3. Sand-blasting and/or water-blasting shall then be performed to remove all dust/debris/laitance. Additional surface preparation shall be performed as needed in strict accordance with manufacturer’s recommendations.
4. Install 10-ft.x10-ft. trial section of epoxy/sand system for Owner/Engineer approval, utilizing shot-blasting, sand-blasting, water-blasting, and other surface preparation as required. Do not proceed with further topping application until

trial sections accepted in writing by Owner. Remove and replace rejected trial sections until approval is obtained (incidental).

5. Install the epoxy/sand overlay per manufacturer's recommendations to minimum depth shown on Detail (may require multiple lifts; refer to manufacturer's written instructions).
6. Manufacturer's technical representative shall be onsite during surface preparation and epoxy/sand installation.
7. Provide 5-year warranty for labor and material for any material and adhesion/bonding failures.

WI 18.1 TEMPORARY SHORING/RESHORING (FOR W.I.'S 3.1 & 3.7) (BASE BID & ALTERNATES)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install temporary floor slab shoring and to maintain shores in place until restoration work requiring shores is completed and associated concrete has properly cured and achieved minimum compressive strength requirements. This Work Item is associated with Work Items 3.1 and 3.7. **Submit shop drawings for approval prior to start of Work detailing all pertinent information related to this Work including: materials, layout, installation, anchoring, etc.**

2. Payment for this Work shall be lump sum to install, maintain, and remove upon completion of Work, Temporary Shoring as required per this Work Item and on Drawing R-002, minimum (2) levels below all hydro-demolition Work areas (or to grade). Refer to Drawings R-201, R-202, and R-203 for locations where temporary shoring is required. Refer to Drawing R-002 for specific requirements.

3. Temporary Shoring per W.I. 18.1 shall be installed beneath the <u>entire</u> floor area of the bays where strip patching (W.I. 3.7) occurs, not just at the localized areas where the strip patching is performed.

4. Refer to Drawings R-201, R-202, and R-203 for locations where temporary shoring is required.

B. Materials

1. Shores shall be steel, rated at 6,000-lbs at extension height required.

C. Execution

1. For purposes of calculations, minimum construction load = 25 psf (may be more based on project conditions). Dead load = slab weight (based on concrete unit weight of 150 lbs per cubic foot). See Drawings for further information and requirements.
2. Shoring shall be provided to bear at supported levels and slab-on-grade.
3. If during construction, modifications are necessary to accommodate other trades, revise and submit erection plan to Engineer for review.

4. Review of erection plan by Engineer does not relieve Contractor of responsibility for stability and safety of structure during construction stage.
5. Contractor shall be responsible for protecting shores from vehicle impact. Barricade/fence shored areas to prevent pedestrian and vehicle traffic through work areas.
6. Temporary Shoring requirements specified on Drawings to perform W.I.'s 3.1 and 3.7 are a minimum. Contractor shall be responsible for providing shoring for materials, equipment, or other construction loads in addition to the minimum shoring requirements to ensure structural stability for the duration of the project.

WI 18.2 TEMPORARY SHORING (FOR FLOOR AND COLUMN REPAIRS NOT ASSOCIATED WITH W.I.'S 3.1 OR 3.7)

A. This Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to install, maintain for duration of Project, and remove upon completion of Work, temporary shoring as needed at localized floor, ceiling, and/or column repair areas.

1. Shores shall be steel, rated at 6,000-lbs at extension height required.

B. Payment for this Work Item shall be for each shore post installed at localized concrete repairs (not including W.I.'s 3.1/3.7). Duplicate payment for shores already in place per W.I. 18.1 are NOT eligible for payment under this Work Item.

C. If Contractor is unsure whether a particular repair requires temporary shoring (or how much shoring is required), verify in field with Engineer prior to concrete removals. Engineer shall approve of localized shoring procedures prior to start of Work. Contractor shall not be compensated for excessive use of shores per this Work Item.

D. To be eligible for payment under this Work Item, amount and location of temporary shoring must be approved by Engineer prior to installation.

WI 22.1 PERMANENT SHORING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to provide and install permanent shores at all locations shown on Drawing R-101.

2. Refer to Drawing R-101 for additional requirements (notes and details).

3. Payment for this Work Item shall be lump sum to provide and install permanent shores, and install anchors and grout as shown on Drawings. Total of (94) permanent shores of varying heights are required at locations shown on Drawing R-101.

4. Contractor shall be responsible to clean/prepare existing surfaces as needed to install shores.

B. Materials

1. All steel tubing and plates shall be ASTM A36 steel, hot-dipped galvanized AFTER fabrication and welding. See Detail 22.1 for sizing of base-plate.
2. Steel shores shall be HSS 6”x6”x1/4”.
3. Grout shall be NSNS grout, submitted to Engineer for approval.
4. Anchors shall be stainless steel threaded rod, epoxy-anchored with Hilti HIT-HY 200 Safe Set, or approved equivalent.

C. Execution

1. Contractor shall locate and mark all Work areas where permanent shores are to be installed as shown on Drawings.
2. Steel shoring assembly shall be hot-dipped galvanized (after welding) as required. No field-welding allowed.
3. See Drawing R-101 for additional requirements (notes and details).

WI 25.1 MECHANICAL / ELECTRICAL ALLOWANCE

A. Mechanical / Electrical Allowance shall be related utility work (drain lines, sprinkler lines, electrical conduit, junction boxes, etc.) associated with interruptions of these utilities to repair existing structural areas.

B. All utilities removed during Work shall be re-installed in accordance with latest edition of electrical and mechanical codes. Work **ineligible** for this Allowance includes Work covered by or incidental to other Work Items within this Specification or for Work required through Contractor’s negligence.

C. Repair, protection, or removal/reinstallation of utilities in overlay repair areas (W.I.’s 3.1 and 3.7) on level where hydro-demolition is being performed is incidental to those work items and is NOT eligible for payment under this Allowance.

D. This Allowance is only applicable for damage due to unexpected or unavoidable full-depth repairs in the overlay areas (W.I.’s 3.1 and 3.7) on the underside of the level where hydro-demolition is being performed.

E. Method of Payment:

1. Mechanical/Electrical Work, as approved in writing by Owner/Engineer prior to implementation, shall be paid for by Contractor. Contractor shall forward actual invoices from mechanical/electrical contractors and General Contractor’s markup to Engineer with each pay request. Contractor shall attach actual invoices to written authorization. At completion of Project, any variation between Mechanical/Electrical Allowance and actual payment receipts (including markup) will be reflected in an adjustment of Allowance amount.

2. Contractor shall not perform any work to be billed under this Allowance without prior written approval from Owner.

3. Contractor shall submit proposal for Owner approval for all work to be performed under this Allowance. Provide breakdown of work and costs as requested by Owner.

WI 25.2 MECHANICAL – REPLACEMENT FLOOR DRAINS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove concrete full-depth, disconnect and remove existing floor drain, install supplemental dowels, install new drain, place concrete, and install sealant around perimeter of drain. Refer to Detail 25.2 for specific requirements. Work Item 25.3 is directly related to this Work Item.

2. This Work primarily occurs in overlay repair areas (W.I.'s 3.1 and 3.7). Verify specific requirements in field prior to hydro-demolition.

3. Payment for this Work Item shall be per each replacement drain installed as required, including all associated work required in this Section and on Detail 25.2.

B. Materials

1. Approved materials for this Work are shown on Detail 25.2.
2. Sealant materials shall be as specified in Section "Concrete Joint Sealants".

C. Execution

1. Contractor shall locate and mark all areas where existing drains are to be removed and replacement floor drains are to be installed.
2. Concrete removals and replacement shall be as shown on Detail 25.2, and shall be incidental to this Work and not eligible for payment under any other Work Items.
3. Install and epoxy-anchor supplemental reinforcement as shown on Detail 25.2, incidental to this Work and not eligible for payment under any other Work Item.
4. Concrete removals required to install replacement drains and reinforcement shall be performed with conventional chipping hammers. Saw-cutting through slab NOT allowed. Do not cut existing reinforcement.
5. Drains shall be installed as shown on Detail 25.2.
6. Professional Surveyor per W.I. 2.1 shall set and verify all final drain elevations prior to placing concrete.

WI 25.3 MECHANICAL – PIPE & HANGERS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to connect new floor drains installed per W.I. 25.2 to existing drainage system. Refer to Detail 25.3 for specific requirements.

2. Payment for this Work Item shall be per lineal foot of piping installed as required, including all associated incidental work required on Detail 25.3.

B. Materials

1. Approved materials for this Work are as shown on Detail 25.3.
2. Match existing pipe sizes (verify in field prior to submitting Bid).

C. Execution

1. Contractor shall locate and mark all areas where floor drain piping and hangers are to be installed.
2. Pipes and hangers shall be installed as shown on Detail 25.3 and in accordance with all applicable codes and ordinances.

WI 25.3A MECHANICAL – PIPE & HANGERS (SUPPLEMENTAL DRAINS) (PART OF ALTERNATE #4)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision and incidentals necessary to connect new floor drains installed per W.I. 25.4 to existing drainage system. Refer to Detail 25.3 for similar requirements.

2. Payment for this Alternate Work Item (if accepted) shall be per lineal foot of piping installed as required, including all associated incidental work required on Detail 25.3.

3. This Work Item also requires coring through floor slabs to connect supplemental drains installed on level 6 to existing drainage system at lower levels. Contractor shall include (20) locations of coring through floor slab in Bid, incidental to this Work Item (Assume 20” thick slab at required coring locations, 6” diameter cores required to accommodate 4” diameter piping). Cores will occur near perimeter walls, at locations identified in field with Engineer.

B. Materials

1. Approved materials for this Work are as shown on Detail 25.3.
2. Match existing pipe sizes (verify in field prior to submitting Bid).

C. Execution

1. Contractor shall locate and mark all areas where supplemental floor drain piping and hangers are to be installed.
2. Pipes and hangers shall be installed as shown on Detail 25.3 and in accordance with all applicable codes and ordinances.
3. Locate cores through existing slab in field with Engineer. Provide localized signage and protection as required around coring locations to safely perform Work and contain dust/debris.

WI 25.4 MECHANICAL – SUPPLEMENTAL FLOOR DRAINS (PART OF ALTERNATE #4)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove concrete full-depth, install supplemental dowels, install new drain, place concrete, and install sealant around perimeter of drain. Refer to Detail 25.2 for specific requirements. Alternate Work Item 25.3A is directly related to this Work Item.

2. This Alternate Work (if accepted) primarily occurs around the perimeter of level 6 in Bays 5-8. Refer to Drawing R-203 for general locations. Verify specific requirements in field with Engineer.

3. Payment for this Alternate Work Item (if accepted) shall be per each supplemental drain installed as required, including all associated work required in this Section and on Detail 25.2.

4. Licensed surveyor shall perform localized elevation surveys to identify low points for installation of supplemental drains (incidental). Verify in field with Engineer.

B. Materials

1. Refer to Detail 25.2 for similar approved materials.
2. Sealant materials shall be as specified in Section “Concrete Joint Sealants”.

C. Execution

1. Contractor shall locate and mark all areas where supplemental drains are to be installed. Submit results of licensed surveyor’s elevation surveys locating low points for supplemental drain installation.
2. Concrete removals and replacement shall be as shown on Detail 25.2, and shall be incidental to this Work and not eligible for payment under any other Work Items.
3. Install and epoxy-anchor supplemental reinforcement as shown on Detail 25.2, incidental to this Work and not eligible for payment under any other Work Item.
4. Concrete removals required to install supplemental drains and reinforcement shall be performed with conventional chipping hammers. Saw-cutting through slab NOT allowed. Do not cut existing reinforcement.
5. Drains shall be installed as shown on Detail 25.2.
6. Professional Surveyor per W.I. 2.1 shall set and verify all final drain elevations prior to placing concrete.

WI 45.1 PAINT TRAFFIC MARKINGS

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 existing pavement markings upon completion of all repairs.

2. Payment for this Work Item shall be lump sum to perform traffic marking installation as described below.

3. Traffic markings shall match all existing markings and be provided at same locations. Contractor shall be responsible for verifying and recording existing traffic marking layout prior to start of Work.

4. Base Bid Work includes all traffic markings in bays 7 & 8 on all levels, and all other areas in the structure where markings are affected by the project including, but not limited to:

   a. Areas on level 1 used for contractor staging/storage/parking/access/etc.
   b. Contractor path of access in and out of structure and to/from work areas (all affected levels and bays).
   c. Areas where dust/debris have accumulated.
   d. All locations where existing Traffic markings are affected by project due to debris removal, cleanup procedures, equipment/material storage, construction traffic, deliveries, etc.

5. Alternate #2 Work includes traffic markings in bay 6 on all levels, in addition to Base Bid requirements.

6. Alternate #3 Work includes traffic markings in bay 5 on all levels, in addition to Base Bid and Alternate #2 requirements.

7. Perform this work to comply with parking space closure requirements as specified on Drawings. New traffic markings shall be installed in all work areas prior to re-opening for normal use.

8. Remove existing stripes in those locations where they conflict with new striping layout.

B. Materials

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

C. Execution

1. Contractor shall prepare drawing of existing parking and traffic marking 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 Owner/Engineer's approval.
3. Contractor shall match existing traffic marking layout, except as directed otherwise by Owner/Engineer.
4. Where existing pavement markings conflict with new striping layout, remove conflicting pavement markings as indicated in Division 9 Section “Pavement Marking.”
5. Engineer shall inspect all layout and surface preparation for conditions in accordance with Section "Pavement Marking."
6. All procedures shall be in accordance with Section “Pavement Marking”.

WI 50.1 INSTALL LED LIGHTS (PROVIDED BY WSU) (ALTERNATE)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove existing light fixtures and install and connect LED lights provided by Owner at locations described below.

2. Payment for this Alternate Work Item, if accepted, shall be per each light fixture replaced, including removal of existing lights. New light fixtures will be purchased by Owner. Contractor shall be required to replace (60) light fixtures in the following locations (Contractor to verify requirements in field prior to submitting Bid):

   a. Underside of level 6 in bays 7 & 8.
   b. Underside of level 3 in bays 7 & 8.
   c. Underside of level 2 in bay 8.

3. Contractor shall neatly place existing lights into on-site storage (incidental). Verify with Owner prior to start of Work.

B. Materials

1. LED light fixtures provided by Owner: Lumark, Quadcast QDCast1A LED Parking Garage Fixture.
2. Fixture mounting to match where this light fixture model has been installed at other locations in the parking structure; contractor to observe installation requirements prior to submitting Bid.

C. Execution

1. Owner will purchase and provide LED lights for Contractor installation.
2. New LED lights shall be installed at locations of existing lights, at one-to-one replacement.
3. All electrical work shall be performed per all applicable codes and ordinances.
4. Contractor shall verify all electrical and field-installation requirements prior to submitting Bid.

5. Removal of existing lights shall be incidental. Contractor shall place existing lights neatly into on-site storage to be retained by Owner. Verify with Owner prior to start of Work.

END OF SECTION 020010

SECTION 024110 - SELECTIVE STRUCTURE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Demolition and removal of selected portions of the structure or site elements. Refer to Drawings and Section 020010 for specific requirements.

1.3 DEFINITIONS

A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.

B. Remove and Salvage: Detach items from existing construction and deliver them to Owner, ready for reuse.

C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

B. Owner retains right of refusal for all existing items/elements on site that are to be removed (specifically mentioned on Drawings or not) prior to disposal. When in doubt, Contractor shall verify requirements with Owner prior to removal/disposal.

1.5 SUBMITTALS

A. Qualification Data: For firms and persons specified in "Quality Assurance" Article, to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of Engineers and Owners, and other information specified.

B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.

1. Comply with minimum requirements of W.I.'s 1.5 & 1.6.

C. Contractor shall provide Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
5. Locations of temporary partitions and means of egress.
6. Coordination of Owner's continuing occupancy of portions of existing structure and of Owner's partial occupancy of completed Work.

D. Pre-demolition Photographs or Videotape: Show existing conditions of adjoining/adjacent construction and site improvements, including finished surfaces, that might be misconstrued as damage caused by selective demolition operations. Submit before Work begins.

E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes, if applicable.

1.6 QUALITY ASSURANCE

A. Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project.

B. Professional Engineer Qualifications: Comply with Division 01 Sections.

C. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.

D. Standards: Comply with ANSI A10.6 and NFPA 241.

E. Pre-demolition Conference: Conduct conference at Project site prior to start of Work, with all parties involved in demolition work and cleanup present. Coordinate pre-

demolition conference with other scheduled meetings/site visits. Review methods and procedures related to selective demolition including, but not limited to:

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review temporary shoring requirements and load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.7 PROJECT CONDITIONS

A. Owner will occupy portions of structure immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations. Refer to phasing and work schedule requirements on Drawings.

B. Maintain access to existing walkways, corridors, and other adjacent occupied or used facilities.

1. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from authorities having jurisdiction.

C. Owner assumes no responsibility for condition of areas to be selectively demolished.

1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.

D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.

1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Engineer and Owner.

E. Storage or sale of removed items or materials on-site will not be permitted.

F. Utility Service: Maintain existing utilities to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

1.8 WARRANTY

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

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
2. Use materials whose installed performance equals or surpasses that of existing materials. Verify with Engineer.

B. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped (as applicable).

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and determine the nature and extent of conflict. Promptly report to Engineer.

E. Engage a professional engineer to survey condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective demolition operations.

F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

A. Existing Utilities: Maintain services to remain and protect them against damage during selective demolition operations.

B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in writing by Owner and authorities having jurisdiction. Provide temporary services during interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.

1. Provide at least 72 hours' notice to Owner if shutdown of service is required during changeover.
2. If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of structure.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
2. Erect temporary protection, such as walks, fences, railings, canopies, covered passageways, and vehicular barriers, where required by authorities having jurisdiction. Temporary barriers and controls shall meet the occupancy requirements of each side of the barrier.
3. Protect existing site improvements, appurtenances, and landscaping to remain.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
4. Cover and protect equipment and other features that have not been removed.

C. Temporary Enclosures: Provide temporary enclosures for protection of existing building and construction, in progress and completed, from exposure, foul weather, other construction operations, and similar activities. Provide temporary weather-tight enclosure for building exterior.

1. Where heating or cooling is needed and permanent enclosure is not complete, provide insulated temporary enclosures. Coordinate enclosure with ventilating and material drying or curing requirements to avoid dangerous conditions and effects.

D. Temporary Partitions: Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.

E. Temporary Shoring: Provide and maintain shoring, bracing, or structural support to preserve stability and prevent movement, settlement, or collapse of construction to remain, and to prevent unexpected or uncontrolled movement or collapse.

1. Strengthen or add new supports when required during progress of selective demolition.

3.4 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
2. Protect floor drains as required to ensure dust/debris does not enter drainage system.
3. Wet mop floors to eliminate trackable dirt and wipe down walls/doors/etc.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.5 SELECTIVE DEMOLITION

A. General: Demolish and remove existing construction only to the extent required and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically from higher to lower level (see phasing requirements on Drawings). Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent

surfaces. Temporarily cover openings to remain. **Do not cut existing embedded reinforcement.**

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Torches (if applicable): Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain fire watch and portable fire-suppression devices during flame-cutting operations. Maintain adequate ventilation when using cutting torches.
5. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, columns, or framing.
7. Dispose of demolished items and materials promptly.
8. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

B. Existing Facilities: Comply with Owner's requirements for using and protecting elevators, stairs, walkways, building entries, and other building facilities during selective demolition operations.

C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items: Comply with the following:

1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Engineer and Owner, items may be removed to a suitable, protected storage location during selective demolition, and cleaned and reinstalled in their original locations after selective demolition operations are complete.

F. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

3.6 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations. Proposed repair procedures shall be approved by Engineer prior to performing repairs.

B. Patching: Comply with applicable Division 02 and Division 03 Sections.

C. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

1. Completely fill holes and depressions in existing masonry walls with an approved masonry patching material applied according to manufacturer's written recommendations.

D. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

E. Floors and Walls: Where walls or partitions that are demolished extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

1. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications.
2. Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
3. Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

F. Ceilings: Patch or repair existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 SELECTIVE DEMOLITION SCHEDULE

A. Refer to Drawings and Specifications for specific work requirements, and corresponding phasing and schedule requirements.

END OF SECTION 024110

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 deg of perpendicular of finished surface.

C. **SPALLS:** Potholes, cavities, or voids in floor slabs, beams, columns, and walls. Usually result of delamination migrating to face of concrete member. When fracture finally reaches surface, concrete encompassed by delamination breaks away, resulting in spall.

D. **UNSOUND CONCRETE:** Concrete exhibiting one or more of:

1. Incipient fractures present beneath existing delaminated or spalled surfaces.
2. Honeycombing.
3. Friable or punky areas.
4. Deterioration from freeze-thaw action.

E. **SCALING:** Deterioration which attacks mortar fraction (paste) of concrete mix. First appears as minor flaking and disintegration of concrete surface. Scaling eventually progresses deeper into concrete, exposing aggregate which breaks away. Concrete scaling is caused by freeze-thaw action. If concrete is frozen in saturated state, excess water freezing in concrete causes high internal stresses.

F. **SHOTBLASTING:** Scarification of concrete surfaces using an abraded metal shot-rebound. See Corps of Engineer's Manual EM 1110-2-2002 and the National Cooperative Highway Research Program's Report #99 for a more detailed definition.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 025130

SECTION 025140 - SURFACE PREPARATION FOR PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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. "Guide for Repair of Concrete Bridge Superstructures" (ACI 546.1), American Concrete Institute.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. Floor Slabs:

1. Floor Slab Delaminations: Locate by sounding surface with hammer, rod, or chain drag.
2. When delaminated area is struck, distinct hollow sound is heard.
3. Contractor: Sound all designated floors for delaminations.
4. Certain structural systems that contain thin slab thicknesses with Welded Wire Reinforcement or other small diameter reinforcing, such as waffle slab or precast tees, may have significant deterioration without evidence of delaminations.

These structural systems require qualified personnel to provide additional inspections, primarily visual in nature, to define the extent of deterioration.

5. Contractor: Visually inspect thin slab thicknesses with small diameter reinforcing for deterioration.

B. Vertical and Overhead Surfaces:

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

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

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

E. Engineer will define and mark additional unsound concrete areas for removal with Contractor, as 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 and other embedded items in repair area and mark these locations for reference during concrete removal. Do **NOT** nick or cut any embeds unless approved by Engineer.

3.2 PREPARATION

A. **Temporary shoring, in addition to requirements of W.I. 18.1, may be required at localized concrete floor repair areas (outside of W.I. 3.1/3.7 work areas) and at any column repair. Contractor: Review all marked removal and preparation areas and request clarification by Engineer of shoring requirements in questionable areas. Provide additional shores at localized floor and column repairs as required by Engineer per W.I. 18.2. Shores shall be in place prior to concrete removal and cavity preparation in any area requiring shores**.

B. Delaminated, Spalled, and Unsound Concrete Floor Areas: Mark boundaries. All concrete shall be removed from within marked boundary to minimum depth of 0.75 in. using 15 to 30 lb chipping hammers equipped with chisel point bits. When directed by Engineer, chipping hammers less than 15 lb shall be used to minimize damage to sound concrete. If delaminations exist beyond minimum removal depth, chipping shall continue until all unsound and delaminated concrete has been removed from cavity.

C. Where embedded reinforcement 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 directs.

E. Sawcut to depth of 0.75 in. into floor slab, unless otherwise noted. 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 delamination boundary shall be dressed perpendicular to member face. It shall also be of uniform depth, for entire length of cut. Exercise extra caution during saw-cutting to avoid damaging existing embedded reinforcement and electrical conduit, and any other embedded items near surface of concrete. Any damage to existing reinforcement or other items during removals shall be repaired by Contractor with Engineer-approved methods at no additional cost to Owner.

3.3 INSPECTION OF REPAIR PREPARATION

A. After removals are complete, but prior to final cleaning, cavity and exposed reinforcement shall be inspected by Contractor and verified by Engineer for compliance with requirements of this Section. Where Engineer finds unsatisfactory cavity preparation, Engineer shall direct Contractor to perform additional removals. Engineer shall verify areas after additional removals.

B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer 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.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

A. All embedded reinforcement exposed during surface preparation that has lost more than 15% (10% if 2 or more consecutive parallel bars 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 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 Section "Cast-in-Place Concrete".

D. Loose and supplemental reinforcement exposed during surface preparation shall be securely anchored prior to patch 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 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.

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 patch placement to insure that base metal is not exposed to elements and further rusting for extended periods of time. Engineer may require 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 patch placement.

1. Installation of epoxy material not required in hydro-demolition repair areas.

3.6 PREPARATION OF CAVITY FOR PATCH PLACEMENT

A. Cavities will be examined prior to commencement of patching operations. Sounding surface shall be part of examination. Any delamination noted during sounding shall be removed as specified in this Section.

B. Cavities shall be sand-blasted. Air-blasting is required as final step to remove sand. All debris shall be removed from site prior to commencement of patching.

END OF SECTION 025140

SECTION 025160 – HYDRO DEMOLITION SURFACE PREPARATION

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, and supervision necessary to remove existing concrete surface (partial depth) as shown on Drawings and required by Specifications, using hydro-demolition, and preparation of exposed surfaces created by removal to receive overlay or strip patches including, but not limited to:

1. Removal of floor slab concrete (partial-depth) by means of hydro-demolition, including adjustment of removal equipment as needed to maintain acceptable removal depths throughout repair areas as Detailed.
2. Removal of concrete material inaccessible to hydro-demolition equipment within specified work areas by means of conventional chipping hammers (incidental).
3. Removal of concrete “shadows” beneath rebar.
4. Transportation, treatment, and disposal of hydro-demolition waste water, including all temporary drains, piping, pumps, filters, containment tanks, etc. for a complete and operational system to comply with City of Detroit requirements.
5. Preparation and cleaning of exposed surfaces created by the removals to receive concrete overlay.

1.3 SUBMITTALS

A. Submit proof of manufacturer’s certification for hydro-demolition operator(s), or provide information regarding operator(s) qualifications for Owner/Engineer approval.

B. Submit layout details for installation of temporary water supply piping and piping for containment and transportation of hydro-demolition waste water from work area to treatment facility for each phase of Work.

C. Submit layout for treatment facility for hydro-demolition waste water. Include all containment tank locations and sizes; filtering devices, sizes, and locations; pump size, location, and electrical requirements; valve locations, piping sizes, and layout.

D. Submit hydro-demolition equipment. Include robot size specification, supply water volume and pressure requirements, water consumption, exhaust location, and layout for high pressure pumps, high pressure supply hose specifications.

1.4 CALIBRATION AND TESTING OF HYDRODEMOLITION EQUIPMENT

A. Trial area shall be used to demonstrate that equipment, personnel, and methods of operation are capable of producing results satisfactory to Engineer. Trial area shall consist of 2 sections, approximately 200 S.F. each, one section deteriorated concrete and one section sound concrete, as determined by Engineer.

B. In deteriorated or sound concrete areas, adjust equipment to remove concrete to depth shown on Drawings. Multiple passes may be required.

C. After completion of above test sections, if sufficient result is obtained, parameters shall be used for production removal.

1.5 QUALITY CONTROL

A. Work shall be performed under the immediate control of a person experienced in this type of Work. The person identified with immediate control of the Work shall have supervised verifiable projects of similar magnitude and type acceptable to Owner/Engineer.

B. Person identified with immediate control of hydro-demolition Work shall be present on site during all operations.

C. The hydro-demolition system shall be operated by a competent, trained individual, having experience with the machinery used for the performance of the hydro-demolition acceptable to Owner/Engineer.

D. The Contractor shall perform and pay for testing of hydro-demolition waste water to ensure compliance with the City of Detroit water quality standards prior to depositing any waste water into the sanitary/storm system. **No waste water shall be deposited into sanitary/storm system that was not tested, or that does not comply with City of Detroit water quality standards.** Contractor shall be responsible to verify water quality standards with the City of Detroit prior to start of Work.

   1. Submit waste water testing results to Owner upon request.

E. The Owner, as part of its quality assurance efforts, reserves the right to perform and will pay for independent testing of hydro-demolition waste water to ensure compliance with the City of Detroit water quality standards. This additional testing may be performed at any time during the construction process. The Owner will notify the Contractor immediately prior to taking any water samples so the Contractor may witness the procedure. If testing performed by the Owner reveals that the water quality is not within the acceptable standards, the Contractor shall bear the cost of this additional water quality testing.

F. If any of the waste water quality test results are in non-compliance with specified water quality standards, the Contractor shall immediately cease the depositing of waste water into the sanitary/storm sewer system. Resumption of waste water removal through the use of the sanitary/storm sewer system will not be allowed to resume until the treatment system is modified to bring the waste water into compliance with the City of

Detroit water quality standards. The Contractor shall bear the cost of any system modifications and additional testing required to verify that the water quality has achieved acceptable standards.

G. Testing of the waste water for compliance with the City of Detroit water quality standards during hydro-demolition is the responsibility of the Contractor and shall be performed as required by the City of Detroit. The cost for this testing is incidental and shall be included as part of the Work.

1.6 ACCEPTABLE HYDRO-DEMOLITION CONTRACTORS

A. American Hydro; Baltimore, MD. 410.574.8470.

B. Rampart Hydro Services; Coraopolis, PA. 412.262.4511.

C. Prepcon; Baltimore, MD. 724.654.6100.

D. Great Lakes Hydro-demolition Services, Inc.; Bad Axe, MI. 989.213.3404

E. All other Hydro-demolition Contractors/Subcontractors: Submit qualifications along with Bid for Owner/Engineer review/approval.

1.7 PAYMENT

A. See Proposal Form. Contractor shall not be compensated for any un-authorized excess concrete removed below the removal depth shown on the Drawings. See Drawings and Section “Work Items” for provisions for additional depth removals.

B. Payment shall be full compensation for all Work, equipment, materials, and incidentals required to complete concrete removals and surface preparation, including furnishing and appropriate handling of water, conventional chipping work as required in areas inaccessible by hydro-demolition equipment or to remove “shadows” beneath rebar, and required cleanup and surface preparation work, all as required to complete Work Items.

PART 2 - PRODUCTS

2.1 HYDRODEMOLITION EQUIPMENT

A. Concrete removals shall be performed with approved water jet system utilizing high pressure water stream. Equipment shall be capable of removing concrete to depth specified on Drawings and shall be capable of removing all rust and laitance from exposed reinforcement designated to remain in place.

B. Concrete removals shall be performed using Owner/Engineer-approved hydro-demolition equipment.

C. Hydro-demolition Contractor: Supply necessary equipment and manpower to maintain pre-established production rate and assure adherence to specified construction schedule shown on Drawings.

D. Equipment shall be capable of performing bulk concrete removals down to depths shown on Drawings at average production rate capable of meeting specified Project schedule requirements, including required concrete placement dates and hydro-demolition completion date.

E. Hydro-demolition unit weight shall not exceed 8,000 lbs. See temporary shoring requirements for additional restrictions.

F. At specified rebar location, hydro-demolition equipment shall be capable of removing 0.75 in. of concrete directly below reinforcement without removing excessive concrete volume between reinforcement.

G. Hydro-demolition equipment and noise-producing operations shall only be performed within specified hours. Contractor shall be responsible to verify and comply with City of Detroit requirements, and to maintain compliance throughout entire Project. Contractor shall not be compensated for any additional work and/or extra provisions required to maintain noise level and working-hours compliance.

1. Demolition/Construction Activities: 7:00am thru 7:00pm, Monday thru Saturday.

2. Cleanup Only (no demolition/construction activities): 7:00pm thru 9:00pm, Monday thru Saturday.

a. Cleanup (non-noise activities) from 7:00pm thru 9:00pm, Monday thru Saturday, allowed only with Owner review/approval of sound levels to adjacent residences remaining within acceptable limits.

3. No Work of any kind allowed on Sundays, and 9:00pm thru 7:00am, Monday thru Saturday.

PART 3 - EXECUTION

3.1 LOCATION AND MARKING OF WORK AREAS

A. Boundaries of overlay repair areas (W.I. 3.1) shown on Drawings shall be marked by Contractor and verified in field with Engineer.

B. General repair locations for “strip repairs” (W.I. 3.7) are shown on plans. Contractor shall locate actual extent of repair locations by sounding entire floor surface within work areas. Verify in field with Engineer.

C. Floor Slabs:

a. Delaminations: Locate by sounding surface with hammer, rod, or chain drag.
b. When delaminated area is struck, distinct hollow sound is heard.
c. Contractor: Sound all floors within work areas for delaminations.

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

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

F. Engineer will define and mark additional unsound concrete areas for removal, if required.

G. Areas to be removed shall be as straight and rectangular as practical to encompass repair and provide neat patch. Saw-cutting and chipping is required at perimeter of removals, and at boundaries shown on Drawings.

3.2 PRE-REMOVAL SHORING

A. Temporary shoring is required at all concrete floor repair areas per W.I. 18.1 and Drawings and Specifications. Contractor: Review all marked removal and preparation areas and request clarification by Engineer of shoring requirements in questionable areas. Shores shall be in place and properly secured prior to concrete removal. Contractor: Provide positive means of adjustment of shores. See Drawings, Section "Work Items" and Section "Cast-in-Place Concrete" for shoring requirements.

3.3 OPERATION OF HYDRO-DEMOLITION EQUIPMENT

A. Once operating parameters of hydro-demolition equipment are defined and calibrated, they shall be monitored by Contractor as machine progresses across work areas, in order to prevent unnecessary removal of sound concrete below required minimum removal depth. Contractor shall exercise care to avoid removal of sound concrete below required depth.

B. Operation of hydro-demolition equipment shall be performed by and supervised by qualified experienced personnel, acceptable to Owner/Engineer.

C. All water used for hydro-demolition shall be potable. Stream or lake water prohibited. Contractor may <u>not</u> use available water supply within Parking Structure for hydro-demolition purposes. Contractor may obtain water supply from nearby City fire hydrants, in compliance with City requirements. Contractor shall be responsible for obtaining and paying for all City water connections including, but not limited to: metering, usage charges, and permits.

D. Contractor is responsible for supplying all equipment and tools necessary to tap into the water source.

E. Contractor shall install meters on hydrants to monitor and record obtained water pressures (in addition to any metering requirements imposed by the City of Detroit). Water pressure readings at the hydrants shall be recorded by the Contractor minimum 3 times daily (7-8am, 12-1pm, and 5-6pm) throughout the entire hydro-demolition process. If water pressure becomes too low for required production rates for typical industry standard hydro-demolition equipment, then Contractor shall record pressures

at hourly intervals until adequate pressure has resumed, and submit to Owner immediately. Contractor must also notify Owner and Engineer immediately and continually during periods of low water pressure from the hydrants.

F. Contractor is required to contact/notify City of Detroit immediately if service or repairs are required to maintain hydrants in serviceable condition.

G. Contractor shall provide and maintain booster pumps sized as needed to provide sufficient flow capacity to run hydro-demolition equipment at required production rates.

H. Contractor shall provide for proper filtering and disposal of runoff water generated by hydro-demolition process. Contractor shall obtain all required permits and shall comply with applicable regulations concerning such water disposal. Contractor shall make provision for control and safe handling of runoff water. All hydro-demolition waste water shall be treated and tested per the City of Detroit requirements prior to discharging into the sanitary/storm system.

I. Unfiltered water shall not be allowed to enter storm sewers, floor drains, or mix with other surface water.

J. All water from the hydro-demolition and cleaning process must be contained within the construction barrier limits of the work areas. The remaining portion of the parking facility outside of the specified work areas will be operating under normal conditions. If any water escapes the designated work areas, hydro-demolition must be shut down immediately and water removed from occupied areas without delay. The construction barriers shall then be resealed to eliminate the leak prior to re-starting hydro-demolition operations.

K. All waste water containment equipment required for the collection, clean up, and transfer of waste water from the work area to the sanitary/storm sewer system shall be provided and maintained by the Contractor. Equipment includes, but is not limited to:

1. Sediment tanks.
2. Piping.
3. Pumps.
4. Hoses.
5. Adjustment equipment for pH levels.

L. Protect existing drains to prevent hydro-demolition run-off water from entering the parking structure's drainage system. Contractor is responsible for cleaning of drain lines, sumps, etc. as part of final cleanup.

M. Contractor shall provide adequate temporary lighting as required to perform repairs.

N. Contractor shall maintain, on job site, inventory of common wear parts, replacement accessories, and tools required to assure hydro-demolition and waste water containment equipment repairs will be addressed in a timely manner and to assure that routine maintenance tasks can be performed readily.

O. Contractor shall adequately shield water-blasting area to ensure concrete projectiles, resulting from water-blasting operation, remain within work area barriers.

P. Immediately after discharge of the last hydro-demolition waste water into the sanitary/storm sewer system, Contractor shall flush the sewer with potable water to verify the flow through the sewer pipe has remained unrestricted.

3.4 CONCRETE REMOVAL

A. Install required barriers, perimeter protection, signage, and temporary shoring before beginning concrete removal work.

1. Hydro-demolition equipment shall be equipped with protective shroud(s) as needed to ensure all debris and flying projectiles are contained within the work areas.

B. Prior to the start of hydro-demolition in each work area of each phase, Contractor shall perform a survey of the existing slab conditions to determine existing elevations and the existing low points of the slab for installation of temporary drains as needed for containment of hydro-demolition waste water within the Work areas.

C. Contractor shall protect all features and surfaces from construction debris/slurry, and shall remove all debris/slurry on a regular basis. Any features or surfaces damaged during the hydro-demolition or cleaning process shall be repaired or replaced to the satisfaction of the Owner at no additional cost to the Owner.

D. All concrete within marked boundaries shall be removed to minimum depth shown on Drawings using hydro-demolition techniques. Concrete shall be removed to depth of 0.75 in. below lowest bars in top mat of reinforcement. Removals shall be performed in manner that avoids excessive concrete removals between reinforcement.

E. Provide vertical edge along all perimeters of repair areas and around perimeter of all columns. Care shall be exercised to avoid undermining columns at floor slab/column interfaces. Column cross section, as a minimum, shall be same as above and below floor slab at all times, throughout entire depth of slab.

F. If floor delaminations exist beyond minimum removal depth, removals shall continue until all unsound and delaminated concrete has been removed from cavity.

G. Any areas of prepared surface contaminated by oil or other materials detrimental to good bond as result of Contractor's operations shall require additional removals until clean surface is obtained, at no extra cost to Owner.

H. At all locations where exposed reinforcement is designated to remain in place, exercise extra caution to avoid damaging it during removal of concrete and debris. Any reinforcement damaged by Contractor's operations shall be repaired or replaced at no cost to Owner. Work Items 3.9 and 3.10 are included to supplement deteriorated reinforcement; replacement of reinforcement due to damage caused by Contractor is not applicable for payment.

I. Remove concrete debris immediately after hydro-demolition process, to prevent debris from resettling or re-adhering to surface of remaining sound concrete. If debris build-

up is observed, Contractor shall clean surface as directed by Engineer at no extra cost to Owner.

J. Continuously remove from the site all concrete debris, sludge, slurry, and other materials generated by the Work, and legally dispose of all waste materials.

K. Contractor: Protect drains to prevent buildup of debris in drain lines. Install filters on floor drains as a minimum, and provide other means of protection as necessary to prevent hydro-demolition debris/slurry from entering existing drainage system. Contractor is responsible for cleaning of drain lines, sumps, etc. as part of cleanup.

1. At Contractor's option and at no additional cost to Owner, Contractor may disconnect floor drains from existing piping system during repairs and reconnect prior to re-opening areas to parking. Verify with Engineer prior to start of Work.

L. Contractor: Install protection as required to prevent hydro-demolition debris/slurry and water/dust from entering elevator systems. Contractor is responsible for any cleaning and/or repairs required to the elevator systems.

1. If operation of elevators is affected by hydro-demolition work, Contractor shall pay for inspection of affected elevator by qualified personnel (WSU's approved elevator vendor), and any necessary repairs or cleaning required to restore elevator operation.

M. Removals in work area locations that are not accessible for hydro-demolition operations shall be performed using conventional methods as specified in Section "Surface Preparation for Patching". Inaccessible areas shall be brought to Engineer's attention before hydro-demolition begins.

3.5 INSPECTION OF EXPOSED SURFACES AND REINFORCEMENT

A. After removals are complete, but prior to final cleaning, all exposed concrete surfaces and all reinforcement designated to remain in place will be inspected by Engineer for compliance with requirements of Article "Reinforcement in Repair Areas". Where Engineer finds unsatisfactory surface preparation, Engineer will direct Contractor to perform additional removals. Engineer will re-inspect areas after additional removals.

B. <u>Obtain Engineer's approval of surface preparation minimum one day prior to concrete pours, no exceptions.</u>

C. Engineer will inspect all reinforcement designated to remain in place within cavity for defects due to corrosion or damage resulting from Contractor's removal operations. Replacement of defective or damaged reinforcement shall be performed according to Article "Reinforcement in Repair Areas" and as directed by Engineer.

D. After inspections are complete and all preparation accepted, Engineer and Contractor shall measure and document removal and replacement quantities for payment as applicable.

3.6 CLEANING OF REINFORCEMENT WITHIN REMOVAL AREAS

A. All exposed reinforcement designated to remain in place shall be cleaned of rust and laitance to bare metal by hydro-demolition process. If for any reason hydro-demolition cannot clean reinforcement to bare metal, Contractor shall clean reinforcement by sandblasting (incidental). Contractor shall insure that base metal is not exposed to elements and further rusting before completion of repairs.

3.7 REINFORCEMENT IN REPAIR AREAS

A. Do not cut any existing embedded reinforcement without Engineer's approval on case-by-case (individual bar) basis.

B. All exposed reinforcement designated to remain in place that have lost more than 15% (10% if 2 or more consecutive parallel bars 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.

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 reinforcing bars shall be ASTM A615 Grade 60 steel installed in accordance with Section "Cast-in-Place Concrete".

D. Loose reinforcement designated to remain in place shall be securely anchored to original surface prior to overlay placement. Loose reinforcement shall be adequately secured by wire ties to bonded reinforcement or shall have drilled-in anchors installed to existing concrete at 4-ft. intervals maximum. Engineer shall determine adequacy of wire ties and approve other anchoring devices prior to their use. **Tying loose reinforcement to bonded/embedded reinforcement and securing loose reinforcement with drilled anchors is incidental to surface preparation; <u>no extras</u> will be allowed for this Work.**

E. Concrete shall be removed to provide minimum of 0.75 in. clearance on all sides of exposed embedded reinforcement designated to be left in place. **Concrete "shadows" remaining underneath reinforcement shall be removed by conventional chipping hammers (incidental).** Minimum of 1.5 in. concrete cover shall be provided over all new and existing floor reinforcement.

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

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

3.8 FINAL PREPARATION OF SURFACES FOR OVERLAY OR STRIP PATCH PLACEMENT

A. In preparation for placement of new concrete, exposed concrete surface to be overlaid shall be water-blasted to remove **all** laitance, oil, grease, rust, debris, dust, or other foreign material. Water jet pressure of water-blasting equipment shall have minimum operating pressure of 8,000 psi with minimum flow rate of 18 gal/min working at 8 in. from concrete surface. Water-blasting shall be done sufficiently ahead of concrete placement to prevent areas of sitting water on surface.

B. Floor slab and cavity surfaces will be examined by Engineer prior to overlay and strip patch placement. Where Engineer finds unsatisfactory surface preparation, Engineer will direct Contractor to perform additional work to obtain satisfactory surface preparation.

END OF SECTION 025160

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture proportions, placement procedures, finishes, and other miscellaneous items related to cast-in-place concrete.

B. Cast-in-place concrete includes project requirements specified herein and on the Drawings and other applicable Specification Sections:

1. Water/cementitious materials ratio: See General Notes on Drawings.
2. Entrained air: See General Notes on Drawings.
3. Water Reducing Admixture: See Part 2 Article “Admixtures”.

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. Submittals and Resubmittals: Engineer will review each of Contractor’s shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer’s services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

B. Requests For Information

1. Engineer reserves the right to reject, any Request for Information (RFI) that the Engineer, at its sole discretion, deems frivolous.
2. Engineer reserves the right to reject, any RFI that the Engineer, at its sole discretion, deems already answered in the Contract Documents.

3. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the Contract Documents.

C. Submit Product data for concrete component materials and other concrete related items including, but not limited to:

1. Material Certificates: Signed by Manufacturer that each of the following items complies with requirements:

a. Cementitious materials and aggregates.
b. Admixtures.
c. Form materials and form-release agents.
d. Steel reinforcement and accessories.
e. Epoxy coating.
f. Fiber reinforcement.
g. Curing materials.
h. Repair materials.

2. Submit certification that curing compound or evaporation reducer, if used, is compatible with products specified in Division 07 Sections.
3. Submit certification that curing compound or evaporation reducer, if used, is compatible with pavement markings specified in Division 09 Section “Pavement Marking”.

D. Submit materials certificates in lieu of materials laboratory test reports when permitted by Engineer. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specified requirements.

E. Submit evidence of licensure in Michigan for professional engineer providing professional services as required for Contractor in order to carry out the Contractor’s responsibilities for construction means, methods, techniques, sequences, and procedures.

1. Contractor’s responsibilities include formwork, shoring and re-shoring procedures, and other work described in Article “Contractors Professional Design Services”, Article “Formwork”, and Article “Shores and Re-shores”.
2. Performance and design criteria are shown on the Drawings and in Article “Contractor’s Professional Services - Performance and Design Criteria”.
3. Contractor’s Professional Engineer shall furnish Owner a Certificate of Professional Liability Insurance in minimum amount of $1,000,000 per claim.
4. Submit calculations and dimensions for “Nominal Form Width” for linear gap at time of forming or erecting concrete elements bounding the expansion joints in accordance with Drawings and Specification “Expansion Joint Assemblies”.
5. Submit signed and sealed drawings, calculations, specifications, or other submittals to indicate compliance with the applicable performance and design criteria provided.

F. Submit concrete mixture proportions to Engineer for each concrete mixture. Submit alternate mixture proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Provide mixture proportions not less than four weeks before placing concrete and not less than one week before pre-installation conference (pre-concrete meeting).
2. Proportion mixtures as defined in ACI 301 Section 4 header “Proportioning”. Mixtures shall be proportioned by party other than Testing Agency responsible for testing Project concrete.
3. Proportion mixtures to minimize effects of thermal and drying shrinkage.
4. Use mixture proportions submission form at end of this Section for each concrete mixture, which identifies the following:

   a. Mixture Proportions Identification and use.
   b. Method used for documentation of required average compressive strength, (ACI 301 Section 4 – *Field test data* or *Trial mixtures*).
   c. Gradation of fine and coarse aggregates.
   d. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
   e. Water/cementitious materials ratio.
   f. Slump, ASTM C143.
   g. Certification of the chloride content of admixtures.
   h. Air Content:

      1) Of freshly mixed concrete by pressure method, ASTM C231, or volumetric method, ASTM C173.
      2) Of hardened concrete by microscopical determination, including parameters of air-void system, ASTM C457 (as applicable).

   i. Freeze-thaw resistance, ASTM C457 and C666. If super-plasticized concrete cannot meet hardened air content requirements of Part 2, ASTM C666 laboratory test result of specimens with concrete mixture proportions similar to proposed mixture for project shall be submitted for review by Engineer. Report air void parameters (spacing and specific surface area in accordance with ASTM C457) (at point of placement) of specimens tested. Test specimens shall contain specified air system (within plus or minus 1.5 percent) and high-range water-reducer (superplasticizer) used in concrete for project. Report relative durability factor of concrete for specimens tested in accordance with Procedure A of ASTM C666. Acceptable concrete durability factor greater than 90 percent (> 90%) at 300 test cycles. Relative durability factor of concrete containing superplasticizer greater than or equal to 80 percent ($\geq$ 80%) compared with reference.
   j. Density (Unit weight) of concrete: ASTM C138.
   k. Strength at 4, 7, and 28 days: ASTM C39. Contractor shall coordinate testing of additional cylinders with Testing Agency as necessary for early form removal.
   l. Water soluble chloride ion content of concrete: ASTM C 1218.
   m. Mill test report of silica fume: Provide report for each 400 cu. yd. or fraction thereof, of concrete placed on project. Provide to Owner from independent

testing lab showing chemical analysis in percent by weight of silica fume solids supplied and used.

n. Silica fume concrete admixture: Comply with ASTM C1240 and following additional requirements:

1) Silicon dioxide content: 90 percent (minimum).
2) Loss on ignition (LOI): 6 percent (maximum).
3) Surface area (nitrogen absorption): 15,000 m^2kg.
4) Crystallinity: Non-crystalline within limits of detection less than or equal to 0.5 percent ($\leq$ 0.5%) depending upon x-ray machine used by x-ray diffraction.
5) Oversize foreign materials (in fume): 5% maximum on 45 micron sieve (wet).

o. Certificate of Analysis of Coal Fly Ash or Processed Ultra-fine Fly Ash: Comply with ASTM C618, Class F only; Class C Fly Ash Prohibited.

G. Testing Agency: Promptly report all field concrete test results to Engineer, Contractor and Concrete Supplier. Include following information:

1. See Article “Quality Assurance”.
2. Density (unit weight) of concrete: ASTM C 138.
3. Slump: ASTM C 143.
4. Air content of freshly mixed concrete by pressure method: ASTM C 231 or volumetric method, ASTM C 173.
5. Air content and parameters of air-void system by microscopical determination, ASTM C 457 (as applicable).
6. Concrete Temperature at Placement Time. ASTM C 1064.
7. Air temperature at placement time.
8. Strength determined in accordance with ASTM C 39.
9. Calcium Nitrite Presence in Plastic Concrete: See Part 3 heading “Quality Control”.

H. Contractor: Submit grout temperature limitations with grout submittal.

I. Submit current certification of welders.

J. Submit shop drawings for steel reinforcement:

1. Prepare placing drawings that detail fabrication, bending, and placement of concrete reinforcement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Comply with ACI SP-66, “ACI Detailing Manual”. Include special reinforcement required for openings through concrete structures, elevations of all walls and columns with locations of all splices and couplers.

K. Submit samples of materials as requested by Engineer, including names, sources, and descriptions as follows:

1. Normal weight aggregates.
2. Fibrous reinforcement.

3. Reglets.

L. Submit laboratory test reports for concrete materials and mixtures.

M. Submit Minutes of concrete pre-installation conference.

1.5 CONTRACTOR'S PROFESSIONAL SERVICES - PERFORMANCE AND DESIGN CRITERIA

A. Provide professional services for temporary conditions during construction and portions of the Work required to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures. Specific requirements and criteria include, but are not limited to:

1. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 347 to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads. The Contractor is responsible for layout and design, reviews, approvals, and inspections.
2. Design formwork, shoring, bracing, and other conditions for structural requirements and stability during construction and until repair project is completed and accepted.

    a. Comply with ACI 347.2 for design, installation, and removal of shoring and reshoring.
    b. Superimposed loads to the concrete structure, slab-on-grade, and soil shall be less than original design loads.
    c. Check early-age strength of concrete members against anticipated construction loads. Reduce the load on concrete members at the critical concrete age or change the concrete mixture for accelerated strength gain to avoid distress of concrete members.
    d. In multi-story construction, extend shoring or reshoring over a sufficient number of stories to distribute loads such that no floor or member would be excessively loaded or would induce tensile stresses in concrete members.
    e. Plan sequence of removal of shores and reshores to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excess stress or deflection.

B. Design the "Nominal Form Width" for linear gap at time of forming or erecting concrete elements bounding the expansion joints in accordance with Drawings and Specification Section "Expansion Joint Assemblies".

1.6 QUALITY ASSURANCE

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

B. Manufacturer Qualification: An experienced supplier who is experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirement for production facilities and equipment. Manufacturer shall also be certified according to the National Ready Mixed Concrete Association's Certifications of Ready Mixed Concrete Production Facilities.

C. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301, "Specifications for Structural Concrete".
2. ACI 318, "Building Code Requirements for Structural Concrete and Commentary".
3. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials".
4. Concrete Reinforcing Steel Institute (CRSI), "Manual of Standard Practice".

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Michigan and who is experienced in providing professional engineering services of the kind indicated. See Article "Contractor's Professional Services - Performance and Design Criteria".

E. Materials and installed work may require re-testing at any time during progress of work. Tests, including re-testing of rejected materials for installed work, shall be done at Contractor's expense.

F. At least 35 days prior to scheduled start of concrete construction, contractor shall conduct meeting to review proposed mixture proportions and methods and procedures to achieve required concrete quality. Contractor shall send pre-concrete conference agenda to all attendees 20 days prior to scheduled date of conference indicating review requirements. Representatives of each entity directly concerned with cast-in-place concrete shall attend conference including, but not limited to:

1. Contractor's superintendent.
2. Agency (laboratory) responsible for concrete mixture proportions.
3. Agency (laboratory) responsible for field quality control.
4. Ready-mixed concrete producer.
5. Concrete subcontractor.
6. Primary admixture manufacturers.
7. Engineer and Owner's representative.
8. At the pre-concrete meeting the Contractor shall provide a summary of concrete procedures to protect fresh concrete from rain.

G. Welders and welding procedures shall conform to requirements or AWS D1.1.

H. Epoxy coated reinforcement, ASTM A775 and A884:

1. Coating applicator shall have quality control program to assure that coated reinforcement comply with requirements of Specifications.
2. Submit proof of current certification for rebar coating plant from Concrete Reinforcing Steel Institute.

I. 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.
2. Testing laboratory shall submit documented proof of ability to perform required tests.
3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 4, according to ACI CP-1 or an equivalent certification program.

J. 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 General Contractor's authorized on-site representative and to Owner's authorized on-site representative.

K. Proportioning, production, and finishing of silica fume and processed ultra-fine fly ash concrete shall be reviewed by and have approval of silica fume and processed ultra-fine fly ash manufacturers.

L. 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 data (quantity and type):

    a. Cement.
    b. Fine aggregates.
    c. Coarse aggregates.
    d. Water.
    e. Air entraining admixtures.
    f. High-range water-reducing admixture.
    g. Other admixtures, including supplementary cementitious materials.

12. Weather data:

    a. Air temperatures.
    b. Weather.
    c. Wind speed.

13. Field test data:

a. Date, time, and place of test.
b. Slump.
c. Concrete Temperature.
d. Air content.
e. Density (Unit weight).

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).

M. All concrete flatwork finishers on Project shall hold current ACI Concrete Flatwork Finisher certification. Submit certification for each concrete flatwork finisher at Concrete Pre-construction Conference and obtain Engineer's written acceptance.

N. Coal fly ash and processed ultra-fine fly ash supplier shall make available qualified individual, experienced in placement of fly ash concrete, to aid Contractor. Qualification of supplier's representative shall be acceptable to Owner. Representative shall attend pre-construction meeting, and shall be present for all trial placements, initial startup, and then as required by Owner.

O. At all times during high-evaporation conditions, maintain adequate supply of evaporation reducer at site. Do not use evaporation reducer as finishing aid. See Part 3.

P. Testing Agency: Identify those trucks of concrete supplier's which meet requirements of NRMCA Quality Control Manual. Permit only those trucks to deliver concrete to Project.

1.7 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO, "Standard Specifications for Highway Bridges".
2. AASHTO T 318, "Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying".

B. American Concrete Institute (ACI):

1. ACI 117, "Standard Specifications for Tolerances for Concrete Construction and Materials".
2. ACI 214R, "Evaluation of Strength Test Results of Concrete".
3. ACI 301, "Specifications for Structural Concrete".
4. ACI 302.1R, "Guide for Concrete Floor and Slab Construction".
5. ACI 305R, "Hot Weather Concreting".

6. ACI 306.1, “Cold Weather Concreting”.
7. ACI 308R, “Guide to Curing Concrete”.
8. ACI 308.1, “Standard Specifications for Curing Concrete”.
9. ACI 318, “Building Code Requirements for Structural Concrete & Commentary”.
10. ACI 347, “Guide to Formwork for Concrete”.
11. ACI 347.2 “Guide to Shoring/Reshoring of Concrete Multistory Buildings”.
12. ACI 362.1, “Guide for the Design of Durable Parking Structures”.
13. ACI SP15, “Field Reference Manual”.

C. American Iron and Steel Institute (AISI):

1. AISI, “Specification for the Design of Cold-Formed Steel Structural Members”.

D. 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 497, “Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete Reinforcement”.
4. ASTM A 615, “Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement”.
5. ASTM A 706, “Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement”.
6. ASTM A 775, “Standard Specification for Epoxy-Coated Steel Reinforcing Bars”.
7. ASTM A 884, “Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement”.
8. ASTM A 934/A 934M, “Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars”.
9. ASTM B 633, “Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel”.
10. ASTM C 31, “Standard Practice of Making and Curing Concrete Test Specimens in the Field”.
11. ASTM C 33, “Standard Specification for Concrete Aggregates”.
12. ASTM C 39, “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens”.
13. ASTM C 94, “Standard Specification for Ready-Mixed Concrete”.
14. ASTM C 109, “Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)”.
15. ASTM C 138, “Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete”.
16. ASTM C 143, “Standard Test Method for Slump of Hydraulic Cement Concrete”.
17. ASTM C 150, “Standard Specification for Portland Cement”.
18. ASTM C 157, “Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete”.
19. ASTM C 171, “Standard Specification for Sheet Materials for Curing Concrete”.
20. ASTM C 172, “Standard Practice for Sampling Freshly Mixed Concrete”.
21. ASTM C 173, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method”.
22. ASTM C 231, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method”.

23. ASTM C 260, “Standard Specification for Air-Entraining Admixtures for Concrete”.
24. ASTM C 309, “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete”.
25. ASTM C 311, “Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete”.
26. ASTM C 330, “Standard Specification for Lightweight Aggregates for Structural Concrete”.
27. ASTM C 457, “Standard Test Method for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete”.
28. ASTM C 494, “Standard Specifications for Chemical Admixtures for Concrete”.
29. ASTM C 567, “Standard Test Method for Determining the Density of Structural Lightweight Concrete”.
30. ASTM C 595, “Standard Specification for Blended Hydraulic Cements”.
31. ASTM C 618, “Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete”.
32. ASTM C 666, “Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing”.
33. ASTM C 672, “Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals”.
34. ASTM C 989, “Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars”.
35. ASTM C 1064/C 1064M “Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete”.
36. ASTM C 1077, “Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation”.
37. ASTM C 1116, “Standard Specification for Fiber-Reinforced Concrete and Shotcrete”.
38. ASTM C 1202, “Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration”.
39. ASTM C 1218, “Standard Test Method for Water Soluble Chloride Ion in Mortar and Concrete”.
40. ASTM C 1240, “Standard Specification for Silica Fume Used in Cementitious Mixtures”.
41. ASTM C 1260, “Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method)”.
42. ASTM C 1293, “Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction”.
43. ASTM C 1315, “Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete”.
44. ASTM C 1567, “Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerate Mortar Bar Method)”.
45. ASTM C 1602/C 1602M, “Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete”.
46. ASTM C 1610/C 1610M, “Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique”.
47. ASTM C 1611/C 1611M, “Standard Test Method for Slump Flow of Self-Consolidating Concrete”.

48. ASTM C 1621/C 1621M, “Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring”.
49. ASTM D 448, “Standard Classification for Sizes of Aggregate for Road and Bridge Construction”.
50. ASTM D 3963/D 3963M, “Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars”.
51. ASTM E 96/E 96M, “Standard Test Methods for Water Vapor Transmission of Materials”.
52. ASTM E 1643, “Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs”.
53. ASTM E 1745 “Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs”.
54. ASTM F1637 02, “Standard Practice for Safe Walking Surfaces”.

E. American Welding Society (AWS):

1. AWS D1.1, “Structural Welding Code-Steel”.
2. AWS D1.4, “Structural Welding Code-Reinforcing Steel”.

F. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI MSP, “Manual of Standard Practice”.

G. US Army Corps of Engineers (CE):

1. CE CRD-C 513 “Specifications for Rubber Waterstops”.
2. CE CRD-C 572 “Specifications for Polyvinyl Chloride Waterstops”.
3. CE CRD-C 662 “Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar Bar Method”.

H. Prestressed Concrete Institute (PCI):

1. PCI MNL 116, “Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products”.
2. PCI MNL 117, “Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products”.
3. PCI MNL 120, “Design Handbook Precast Prestressed Concrete”.
4. PCI MNL 122, “Architectural Precast Design Handbook”.
5. PCI MNL 129, “Parking Structures-Recommended Practice for Design and Construction”.
6. PCI MNL 135, “Tolerances for Precast and Prestressed Concrete Construction”.
7. PCI “Code of Standard Practice for Precast Concrete”.

I. Accessibility Requirements:

1. “Americans with Disabilities - Act Accessibility Guidelines for Buildings and Facilities”, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111, 1-800-872-2253, http://www.access-board.gov/adaag/ADAAG.pdf

J. International Conference on Building Officials (ICBO).

K. International Code Council (ICC):

1. IBC, “International Building Code 2006”.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store all formwork and formwork materials clear of ground, protected, to preclude damage.

B. Deliver reinforcement to Project site bundled, tagged, and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

C. Store concrete reinforcement materials at site to prevent damage and accumulation of dirt or excessive rust.

D. Avoid damaging coatings on epoxy coated reinforcement:

1. Contact areas of handling and hoisting systems shall be padded or be made of nylon or other acceptable material.
2. Use spreader bars to lift bundles of coated bars to prevent bar-to-bar abrasion.
3. Pad bundling bands or fabricate of nylon or other acceptable material.
4. Store coated bars on padded or wooden cribbing.
5. Do not drag coated bars.
6. After placement, restrict traffic on coated bars to prevent damage.
7. Repair damaged epoxy coatings according to ASTM D 3963.

E. Concrete transported by truck mixer or agitator shall be completely discharged within one and one half-hours (one hour for hot weather concreting) after water has been added to cement or cement has been added to aggregates. **For concrete with silica fume or processed ultra-fine fly ash, concrete shall be completely discharged within one hour after water has been added to cement or cement has been added to aggregates, in all weather conditions, hot or cold.** Schedule deliveries to allow for delays due to weather, traffic, etc.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.

B. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 grams/liter 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.

C. 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.

1. Provide ties that, when removed, will leave holes not larger than 1-inch diameter in concrete surface.

D. Chamfer strips: Wood, metal, PVC, or rubber strips. 0.75-in. by 0.75-in. minimum, unless noted otherwise.

2.2 STEEL REINFORCEMENT

A. Epoxy-Coated Fabricated Reinforcing Bars: ASTM A775, and as follows:

1. Steel Reinforcement: ASTM A 615, Grade 60, deformed bars.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

1. Welded Wire Reinforcement: Provide in mats only. Roll stock prohibited.

2.3 REINFORCEMENT ACCESSORIES

A. Bar supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from all plastic of greater compressive strength than concrete, and as follows:

1. In manner acceptable to Engineer solely, bar and welded wire reinforcement supports shall be color-coded to visually differentiate supports by height and shall be fabricated to resist overturning during construction operations.
2. For slabs on ground, use all-plastic supports with sand plates or horizontal runners where base materials will not support chair legs. All supports shall have sufficient surface area in contact with ground so that they shall not allow clearance loss when reinforcement installed or concrete placed.
3. For concrete surfaces exposed to view where bar supports contact forms, supports shall have minimal contact, shall not cause voids, and shall not cause damage to surrounding concrete. Use all-plastic supports conforming to CRSI Class 1 protection requirements.
4. Chairs shall be sized and spaced to prevent cover loss during construction operations.
5. For epoxy-coated reinforcement, use all-plastic bar supports.

6. Acceptable manufacturers:

   a. Aztec Concrete Accessories, Inc.
   b. General Technologies, Inc.
   c. Engineer-approved equivalent.

B. Epoxy Coating Materials for Reinforcement: ASTM A 775 and A 884:

1. Supplier shall be certified currently under CRSI Fusion Bonded Epoxy Coating Applicator Plant Certification Program.
2. Provide one of following epoxy coatings for reinforcement and steel accessories as noted on Drawings:

   a. “Scotchkote 413”, 3M Company.
   b. “Nap-Gard 7-2709”, DuPont Powder Coatings, USA, Inc.
   c. “Epoxiplate R346 or R349”, Armstrong Products Company.

3. Use patching material recommended by epoxy powder manufacturer, compatible with epoxy coating and inert in concrete. Acceptable:

   a. “Scotchkote 413 PC”, 3M Company.
   b. “Armatec 110”, Sika Corporation.
   c. “EMACO P22”, BASF Construction Chemicals, LLC.
   d. “Corr Bond” or “Duralprep AC”, The Euclid Chemical Company.

C. Epoxy Coating for Existing Exposed Non-prestressed Steel Reinforcement or Welded Wire Reinforcement:

1. Provide one of following epoxy coatings:

   a. “Sikadur 32 Hi-Mod”, Sika Chemical Corp.
   b. “Concresive Liquid LPL”, BASF Construction Chemicals, LLC.
   c. “Scotchkote 413 PC”, 3M Company.
   d. “Euco 452”, The Euclid Chemical Company.
   e. “Resi-Bond (J-58)”, Dayton Superior Corporation.

2.4 CONCRETE MATERIALS

A. Ready Mixed Concrete: Obtain concrete from plant with current certification from:

1. Concrete Materials Engineering Council.
2. Michigan Department of Transportation.
3. National Ready Mixed Concrete Association.
4. Prestressed Concrete Institute.

B. Portland Cement (ACI 301, Section 4 header “Cementitious Materials”):

1. Portland cement, Type I, ASTM C 150. Use one cement supplier throughout project. No change in brand or supplier without prior written acceptance from Engineer.

C. Coal Fly Ash:

1. ASTM C 618, Class F only. Class C Fly Ash Prohibited.
2. Testing: ASTM C311.
3. Percentage of fly ash in Mixture Proportion shall be by weight, not by volume. Water/cement ratio will be calculated as water/cementitious (total cement and fly ash) ratio.
4. Prohibited: Fly ash in same mix with Type IP blended cement.
5. If strength or air content varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
6. Submit all fly ash concrete Mixture Proportions per ACI 301.

D. Slag – (Ground Granulated Blast-Furnace Slag – GG-BFS):

1. ASTM C 989, Grade 100 or higher.
2. Percentage of GGBF slag in Mixture Proportion shall be by weight, not by volume. Water-cement ratio shall be calculated as water-cementitious (total portland cement + GGBF slag) ratio.
3. If strength or air content varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
4. Submit all GGBF slag concrete mixture proportions per ACI 301.

E. Normal Weight Aggregates (ACI 301, Section 4 header “Aggregates”):

1. Normal weight concrete aggregates:

   a. Coarse aggregate: Crushed and graded limestone or approved equivalent conforming to ASTM C33 except as noted here, minimum class designations as listed below:

      1) All concrete: Class 5S.

   b. No deleterious materials such as, but not limited to: chert or opaline.
   c. 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.
   d. Coarse Aggregate shall not contain crushed hydraulic-cement concrete.

2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.
3. Coarse aggregate: Nominal maximum sizes indicated below, conforming to ASTM C 33, Table 2:

   a. Repairs less than 3-inches thick in section: Size number 7 or 67.
   b. Repairs greater than 3-inches thick in section: Size number 57.

4. Chloride Ion Level: ASTM C 1218.

5. Chloride Ion Content of Cement, Aggregates, and all Other Ingredients: Tested by laboratory making trial mixes.

F. Water: Comply with ASTM C 1602.

G. Storage of Materials (ACI 301, Section 4 header “Materials Storage and Handling”).

2.5 ADMIXTURES

A. Use high-range-water-reducing admixture (superplasticizer) in concrete as required for placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F as required for schedule.

C. Use high-range water-reducing admixture (HRWR) in pumped concrete, and for concrete with water/cementitious ratio of less than or equal to 0.45.

D. Use air-entraining admixture in exterior exposed concrete as indicated.

E. Only admixture manufacturers listed acceptable. Do not submit alternate manufacturers.

F. Concrete supplier and manufacturer shall verify via trial mixes and certify compatibility (no adverse effect on workability, strength, durability, entrained air content, etc.) of all ingredients in each Mixture. Use admixtures in strict accordance with manufacturer’s recommendations.

G. Prohibited Admixtures: Calcium chloride or admixtures containing intentionally added chlorides shall not be used.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

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

a. “Catexol AE 260”, Axim Concrete Technologies.
b. “Air-Mix”, “Eucon Air-Series”, or “AEA-92”, Euclid Chemical Co.
c. “Daravair Series” or “Darex Series”, W.R. Grace & Co.
d. “Micro-Air”, “MB-VR”, or “MBAE-90”, BASF Construction Chemicals.
e. “Sika AEA Series” or “Sika AIR Series”, Sika Corporation.
f. “Polychem “VR”, “VRC”, or “AE””, General Resource Technology.
g. “RSA-10”, Russ Tech Admixtures, Inc.

I. High Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.

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

a. “Eucon 37”, “Eucon SP-Series”, or “Plastol Series”, Euclid Chemical Co.
b. “Daracem Series” or “ADVA Series”, W.R. Grace & Co.

c. “Rheobuild 1000”, “PS 1466”, or “Glenium Series”, BASF Construction Chemicals.
d. “Sikament Series” or “Sika ViscoCrete Series”, Sika Corporation.
e. “Catexol 1000 SP-MN”, Axim Concrete Technologies.
f. “Melchem Series”, General Resource Technology.
g. “Superflo 443” or “Superflo 2000 Series”, Russ Tech Admixtures, Inc.

J. High-Range Water-Reducing Retarding (superplasticizer): ASTM C 494 Type G:

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

a. “Eucon 537 or RD2”, Euclid Chemical Co.
b. “Daracem 100”, W.R. Grace & Co.
c. “Melchem”, General Resource Technology.

K. Corrosion Inhibiting Admixture capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

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

a. “Eucon CIA” or “Eucon BCN”, Euclid Chemical Company.
b. “DCI” or “DCI-S”, W.R. Grace.
c. “Rheocrete CNI”, BASF Construction Chemicals.
d. “Sika CNI”, Sika Corporation.
e. “Catexol 1000 CN-CI”, Axim Concrete Technologies.
f. “Polychem CI”, General Resource Technology.
g. “Russ Tech RCI”, Russ Tech Admixtures, Inc.

2. Add at rate of 3 gal/cu yd of concrete, which shall inhibit corrosion to 9.9 lb of chloride ions per cu. yd. of concrete. Calcium Nitrite based corrosion inhibitor shall have a concentration of 30 percent, plus or minus 2 percent of solids content.

2.6 CURING MATERIALS

A. Evaporation Reducer: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Evaporation Retarder:

a. “Cimfilm”, Axim Concrete Technologies.
b. “Aquafilm”, Conspec Marketing & Manufacturing Co., Inc.
c. “Eucobar”, Euclid Chemical Co.
d. “E-Con”, L&M Construction Chemicals, Inc.
e. “Confilm”, BASF Construction Chemicals, LLC.
f. “SikaFilm”, Sika Corporation.
g. “Sure-Film (J-74)”, Dayton Superior Corporation.
h. “EVRT”, Russ Tech Admixtures, Inc.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Curing Compound: Prohibited for concrete with water/cementitious materials ratio less than 0.45.

2.7 CONCRETE MIXTURES

A. Proportion mixtures determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
2. Provide different mixtures as the season warrants, as well as each type and strength of concrete or for different placing methods.

B. Use a qualified independent testing agency for preparing and reporting proposed Mixture Proportions for the laboratory trial mix basis.

C. Requirements for normal-weight concrete mix are shown on Drawings:

1. Compressive strength.
2. Slump.
3. Water-cementitious materials ratio.
4. Air content.

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

E. Supplementary Cementitious Materials: Maximum weight of fly ash, natural pozzolans, silica fume, processed ultra-fine fly ash, or slag included in concrete shall not exceed percentages of total weight (see footnotes for ACI 301 Part 4 Table “Requirements for Concrete Exposed to Deicing Chemicals”) of cementitious materials as follows:

1. Fly Ash or Other Pozzolans Conforming to ASTM C 618: 25 percent.
2. Slag Conforming to ASTM C 989: 50 percent.
3. Silica Fume Conforming to ASTM C 1240: 10 percent.
4. Processed Ultra-fine Fly Ash Conforming to ASTM C 618: 15 percent.
5. Total of Fly Ash or Other Pozzolans, Slag, and Silica Fume: 50 percent. Within the total, fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
6. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent. Within the total, fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Total of Fly Ash or Other Pozzolans and Processed Ultra-fine Fly Ash: 35 percent. Within the total, fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

F. 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.
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. Refer to Part 1 Article “Submittals”.

G. 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”). Test to determine chloride ion content shall conform to ASTM C 1218.
2. Concrete chloride ion content shall be determined by Testing Agency prior to placement. Cast samples from current production of concrete mix proposed for superstructure.
3. Concrete not meeting the requirements of paragraph “Water soluble chloride ion content of concrete…” above, shall contain appropriate amount of calcium nitrite. Concrete supplier shall provide laboratory test results showing the amount of excess chloride ion content in the concrete mixture contributed by the aggregates. For each pound of chloride ion in excess of the amount allowed, mix shall contain calcium nitrite (30 percent, plus or minus 2 percent, solids content) on one-to-one basis (one gallon of calcium nitrite for one lb of excess chloride ion). Calcium nitrate used to offset chloride ions is in addition to calcium nitrate used as a corrosion inhibitor. Maximum of 1.5 lb of chloride ion per cubic yard may be offset in this manner.

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

1. Consider using high-range water-reducing admixture (superplasticizers) as required, for placement, workability, finishing, and when required, increased flowability.
2. Use high-range water-reducing admixtures in concrete with a water-cementitious materials ratio of 0.45 or less.
3. Use corrosion-inhibiting admixture in concrete mixes as indicated.

I. 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 superplasticized 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 superplasticized 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.

J. 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.

K. 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.

2.8 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice".

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information. Truck-mixing prohibited. Mix at plant.

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.

2.10 TOOLS

A. Slab Jointing:

1. Concrete groovers: For tooled joints in concrete:

    a. For concrete not exceeding 4 in. thickness, use groover with 1 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
    b. For concrete exceeding 4 in. thickness, use groover with 1.5 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.

2. Saw Cut Joints: Prohibited.

    a. Joints shall be tooled in plastic concrete.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads and in accordance with Article 1.5 “Contractor’s Professional Services - Performance and Design Criteria”.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117, except as modified below:

1. Slabs:

    a. Variation in Thickness of Slabs: 12 in. or less: Plus 0.375 in., minus 0.25 in. Greater than 12 in.: Plus 0.5 in., minus 0.375 in.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Kerf wood inserts for easy removal.
3. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Re-tighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of columns and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork for slabs and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. 28-day design compressive strength.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.3 SHORES AND RESHORES

A. Comply with ACI 347.2, ACI 318 and ACI 301, for design, installation, and removal of shoring and reshoring and in accordance with Article 1.5 "Contractor's Professional Services - Performance and Design Criteria".

B. In multi-story construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain specified concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on continuous bar supports spaced at 2-ft. on center, maximum. Lap edges and ends of adjoining sheets per ACI 318 and as follows:

1. Length of overlap measured between outermost cross wires of each sheet shall not be less than one spacing of cross wires plus two inches nor less than one and one-half times the development length nor 6 in. minimum where development length is calculated per section 12.8 of ACI 318.
2. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.

1. Rest epoxy coated steel member supported from formwork on coated wire bar supports, or on bar supports made of dielectric material or other suitable material.
2. Coat wire bar supports with dielectric material for minimum distance of 2 in. from point of contact with coated steel member.
3. Fasten epoxy-coated steel members with nylon-, epoxy-, or plastic-coated tie wire, or other suitable material acceptable to Engineer.
4. Repair all damage to epoxy coating to bars, welded wire reinforcement, and all other epoxy coated items. Use a mirror to view undersides of all items for possible damage so it can be repaired.
5. Do not cut epoxy-coated steel unless permitted by Engineer. When cut, coat ends with material used for repair of coating damage.

G. 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.

3.5 JOINTS

A. Joints in Concrete (ACI 301, Section 5):

1. Construction, control, and isolation joints are located and detailed on Drawings:

   a. Tool joints at time of finishing. Tool: Part 2 Article “Tools”.
   b. Saw Cut Joints: Prohibited.

B. Place construction joints at mid-point between column strips. Continue reinforcement across construction joints.

C. Joint sealant material is specified in Division 07 Sections.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.

C. Before placing concrete, water may only be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.
2. Water may only be added onsite if water was with-held at plant (shown on plant batch ticket). Water added at site must not exceed amount with-held at plant.

D. Check air content after any site addition of admixtures to increase slump.

E. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

F. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use plastic or rubber-tipped vibrators when concrete reinforcement is epoxy-coated.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically (in thin slabs vibrator may be inserted at angle or horizontally to keep vibrator head completely immersed) inserted at uniformly spaced locations no farther than 1.5 times action radius so area visibly affected by vibrator overlaps adjacent previously vibrated area by 3-4 inches. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to

lose plasticity. At each insertion, limit duration (usually 5 to 15 seconds) of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge or motor driven vibrating screed and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using highway bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

H. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Use only the specified non-corrosive accelerator. Do not use calcium chloride, salt, or other materials containing anti-freeze agents or chemical accelerators, unless otherwise specified and approved in mixture proportions.

I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. As-Cast Finishes: As-cast concrete texture imparted by form-facing material in accordance with ACI 301 and as specified below in accordance with Class of Finish:

1. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding limits for class of surface specified.

    a. Provide Class A finish as described in ACI 347. Class A permits gradual or abrupt irregularities of 1/8 inch.

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 Parking and Drive Areas (BROOM Finish, ACI 301, Section 5 header "Broom 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 in Stair Towers and Parking Garage Floor Subject to Pedestrian Traffic:

1. Concrete surfaces at all walking areas subject to pedestrian traffic shall provide a smooth, slip-resistant walking surface for pedestrians with these minimum requirements:

    a. Shall provide walking surfaces in accordance with ASTM F 1637 "Standard Practice for Safe Walking Surfaces" and "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1.

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.
2) Changes in Level between ¼ inch and ½ inch in height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3.
3) Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp within minimum ADA guidelines.
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.

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 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still workable and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

3.10 CONCRETE PROTECTION AND CURING

A. General: Comply with ACI 308.1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Reducer: Apply evaporation reducer to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft./h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Do not finish immediately after evaporation reducer applied. Wait until after film disappears.

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

1. Tepid (within 20 deg F of concrete temperature) water.
2. Continuous water-fog spray.
3. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

D. 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. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

E. Curing Compound: Prohibited for concrete with water/cementitious materials ratio less than 0.45.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas only as approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins, and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with specified bonding agent. Fill and compact with specified patching material. Fill form-tie voids with specified repair materials.
2. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct low areas scheduled to remain exposed with a repair topping. Remove concrete at low areas to ensure a minimum repair topping depth of 1 inch to match adjacent floor elevations.

5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete or repair material. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾ inch clearance all around. Dampen concrete surfaces in contact with patching concrete. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair single holes 1 inch or less in diameter with patching mortar. Cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.

D. Perform structural repairs of concrete, subject to Engineer's approval.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.12 FIELD QUALITY CONTROL

A. Owner will employ a testing laboratory to perform tests and to submit test reports.

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.
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, C 173 and/or C 231 as applicable. One air content test required for each truck of ready-mix, air entrained concrete delivered to Project.
3. Summary of Air Content Testing Requirements:

   a. Minimum of one air content test at point of final placement (after pumping) for each ready-mix truck. Additional air content testing required if results are non-conforming (incidental).

b. Additional air content testing may be performed, at Contractor's option, at ready-mix trucks (before pumping) as needed to perform adjustments to maintain specified air content at point of final placement (after pumping).

1) At beginning of Project, air content testing shall be performed both at the ready-mix trucks (before pumping) and at point of placement (after pumping) to help with air content adjustments, if needed. Once Contractor shows that consistent air content results are being achieved at point of final placement, Contractor may (at Contractor's option) discontinue testing at ready-mix trucks (before pumping) only.

F. Concrete Compressive Strength:

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

a. Take minimum of eight cylinders for each 100 cu yd or fraction thereof, of each Mixture of concrete placed in any one day.
b. Additional cylinders shall be taken under conditions of cold weather concreting per Part 3 Heading "Concrete Curing and Protection".
c. Additional cylinders may be taken to verify concrete strength for early form removal. Contractor responsible to coordinate with Testing Agency.
d. Testing Agency: Provide and maintain site cure box for cylinders.

2. 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.

3. 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 deg 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.

4. Compression testing:

a. Test 2 cylinders at 4 days.
b. Test 2 cylinders at 7 days.
c. Test 2 cylinders at 28 days.
d. Hold 2 cylinders in reserve for 56 days for use as Engineer directs. Unless directed otherwise, cylinders may be discarded after 56 days.

G. Testing for the presence of the Calcium Nitrite admixture in the concrete shall conform to APPENDIX at end of this section for plastic concrete testing.

H. Report all non-conforming test results to Engineer and others on distribution lists via fax or email. Follow up with colored paper copies to flag the non-conformances.

I. Monthly, submit a graph showing distribution of compressive strength test results and air content test results. Include microwave test results for concrete with a water-cementitious materials ratio less than or equal to 0.40 concrete.

3.13 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Concrete compression testing will be evaluated by Engineer in accordance with ACI 301. If number of tests conducted is inadequate for evaluation of concrete or test results for any type of concrete fail to meet specified strength requirements, core tests may be required as directed by Engineer. Air content and parameters of air-void system shall meet requirements of this Section.

B. Core tests, when required, in accordance with ASTM C42 and ACI 301.

C. Should tested hardened concrete meet Specifications, Owner will pay for coring and testing of hardened concrete. Should tested hardened concrete not meet Specifications or should concrete have to be tested because Contractor did not conform to Project specifications, Contractor shall pay for coring and testing of hardened concrete and for any corrective action required for unaccepted concrete.

3.14 ACCEPTANCE OF STRUCTURE

A. Acceptance of completed concrete Work will be according to provisions of ACI 301.

B. Concrete rejected due to entrained air content below specified limit will be accepted if any of the following conditions are met:

1. ASTM C 457: Three concrete specimens tested in accordance with ASTM C 457 meet air void parameters of Part 2.
2. ASTM C 457: Three concrete specimens tested shall meet air void parameters of concrete reported and approved by Engineer in Part 1.
3. ASTM C 666, Test Procedure A: Test three concrete specimens removed from structure. Concrete specimens tested shall have durability characteristics similar to that reported in Part 1.

END OF SECTION 033000

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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

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

II. MIXTURE PROPORTIONING DATA:		
Proportioning Based on (Check only one): Standard Deviation Analysis: _____(see section VIII) or Trial Mix Test Data: _____ (see Section IX)		
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

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

III. MATERIALS:		
Aggregates: (size; type; source; gradation report; specification)		
Coarse:		
Fine:		
Other Materials:	Type	Product-Manufacturer (Source)
Cement:		
Fly ash, slag, other pozzolans:		
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)		
Fly ash, slag, other pozzolans:		
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.

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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		

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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 = _____ %	

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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 = _____ %	

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

X. OTHER REQUIRED TESTS		
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:

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

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

REQUIRED ATTACHMENTS	
	Coarse aggregate grading report
	Fine aggregate grading report
	Concrete compressive strength data used for calculation of required average strength and for calculation of standard deviation
	Chloride ion data and related calculations
	Admixture compatibility certification letter
	Shrinkage information per ASTM C157
	ASTM C 457
	Alkali Content Data and Calculations OR ASTM C1293, ASTM C1260, ASTM C 1567 or CE CRD-C662 Test report for each aggregate

SECTION 033713 - SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes shotcrete applied by the dry-mix or wet-mix process.

B. This Section includes the provision of all labor, materials, supervision, and incidentals necessary to install shotcrete to horizontal, vertical, and overhead surfaces to restore original surface condition and integrity.

1.3 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 SUBMITTALS

A. Product Data: For manufactured materials and products, including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

B. Shop Drawings: For details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.

C. Design Mixes: For each shotcrete mix.

D. Material Test Reports: For shotcrete materials.

E. Material Certificates: For each material item, signed by manufacturers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Shotcrete contractor shall have a minimum of three (3) years experience in the application performed. All Nozzlemen to perform work shall have a

current ACI / ASA Nozzlemen Certification. A qualified installer employing nozzle operators who attain mean core grades not exceeding 2.5, according to ACI 506.2, on pre-construction tests.

B. Testing Agency Qualifications: Independent and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548, and acceptable to authorities having jurisdiction.

C. Comply with provisions of the following, unless more stringent requirements are indicated:

1. ACI 301, "Specification for Structural Concrete".
2. ACI 506.2, "Specification for Shotcrete".
3. CRSI's "Manual of Standard Practice".

D. Pre-installation Conference: Conduct conference at Project site prior to start of Work. Coordinate with other scheduled meetings/site visits.

1.6 PROJECT CONDITIONS

A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
2. Do not use frozen materials or materials containing ice or snow.
3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
4. Do not use calcium chloride, salt, and other materials containing anti-freeze agents.

B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
2. Decrease temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

2.2 SHOTCRETE MATERIALS

A. Shotcrete Cement and Blended Cements

1. Portland Cement: ASTM C 150, Type I. Use only one brand and type of cement for Project. Select supplementary cementitious materials from subparagraphs below, if permitted. Blending of fly ash, slag, silica fume with Portland cement is done at ready-mix plant.
2. Fly Ash: ASTM C 618, Class F only. Class C Fly Ash Prohibited.
3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
4. Silica Fume: ASTM C 1240, amorphous silica.

B. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Aggregate Gradation: ACI 506R, Gradation No. 2 with 100 percent passing 1/2-inch (13-mm) sieve.
2. Coarse-Aggregate Class: 3S.

C. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored, water-reducing admixtures, free of carbon black; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: Match existing adjacent surfaces.

D. Water: Potable, complying with ASTM C 94, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1 mm in diameter.

2.3 CHEMICAL ADMIXTURES

A. General: ASTM C 1141, Class A or B, but limited to the following admixture materials. Provide admixtures for shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Air-Entraining Admixture: ASTM C 260.
2. Water-Reducing Admixture: ASTM C 494, Type A.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
6. Accelerating Admixture: ASTM C 494, Type C.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.5 SHOTCRETE MIXES, GENERAL

A. Prepare design mixes for each type and strength of shotcrete.

1. Limit use of fly ash, ground granulated blast-furnace slag, and silica fume to not exceed, in combination, 25 percent of portland cement by weight.

B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

C. Admixtures: When included in shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.

D. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.6 NORMAL-WEIGHT SHOTCRETE MIXES

A. Proportion dry mixes by field test data methods and wet mixes according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide normal-weight shotcrete with the following properties:

1. Compressive Strength (28 Days): 5,000 psi (34.5 MPa).
2. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight, wet-mix shotcrete having an air content before pumping of 7 percent with a tolerance of plus or minus 1-1/2 percent.

2.7 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with

manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.8 BATCHING AND MIXING

A. Dry-Mix Process: Measure mix proportions by weight batching according to ASTM C 94 or by volume batching complying with ASTM C 685 requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
2. Pre-packaged shotcrete materials may be used at Contractor's option. Pre-dampen pre-packaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94 and ASTM C 1116 and furnish batch ticket information if ready mix is used.

1. Comply with ASTM C 685 when shotcrete ingredients are delivered dry and proportioned and mixed on-site.
2. Pre-packaged shotcrete materials may be used at Contractor's option.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.

1. Abrasive blast or hydro-blast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

E. Place reinforcement to obtain minimum coverages for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.5 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after pre-dampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

   1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent build-up against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment control devices after shotcrete placement.

L. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.6 SURFACE FINISHES

A. Finish Coat: After screeding to natural rod finish, apply shotcrete finish coat, 1/4 to 1 inch (6 to 25 mm) thick, using ACI 506R, No. 1 gradation, fine-screened sand modified with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve and apply steel-trowel, smooth, hard finish.

3.7 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.

C. Curing Exposed Surfaces: Cure shotcrete by the following methods:

1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

   a. Apply curing compound to natural- or gun-finished shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.8 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 deg F (10 deg C) for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.9 FIELD QUALITY CONTROL

A. Owner may engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

3.10 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

3.11 CLEANING

A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 033713

SECTION 033761 – CAST IN PLACE 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 concrete repair mortar to formed horizontal, vertical, and overhead surfaces to restore original surface condition and integrity.

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 Owner 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.

E. Testing Agency shall submit the following information for Field Testing of Concrete unless modified in writing by Engineer:

1. Project name and location.
2. Contractor's name.
3. Testing Agency's name, address, and phone number.
4. Mortar manufacturer.
5. Date of report.
6. Testing Agency technician's name (sampling and testing).
7. Placement location within structure.
8. Weather data:

   a. Air temperatures.

b. Weather.
c. Wind speed.

9. Date, time, and place of test.
10. Compressive test data:

a. Cube number.
b. Age of mortar when tested.
c. Date and time of cube 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).

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”.

1.5 SUBMITTALS

A. Make submittals as specified in this Section and as required by Owner/Engineer. Provide (3) hard copies of submittals to Engineer. One copy with

response/comments will be returned to Contractor, one copy forwarded to Owner, and one copy retained by Engineer for record purposes.

B. Contractor: At pre-construction 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 MATERIALS

A. Prior to submitting bid, Contractor shall be responsible to verify that materials intended to be used from lists below correspond to repair methods that will be utilized (i.e., form and pour, form and pump, horizontal application), per manufacturer's written data sheets. The following listed materials are not acceptable for <u>all</u> types of repair methods.

B. Horizontal Repair Mortar: Shall be pre-packaged, silica-fume-modified, cementitious repair mortar containing integral corrosion inhibitor, capable of horizontal pour and screed, partial and full depth applications, achieving a minimum 5,000 psi compressive strength at 28 days per ASTM C39 extended with aggregate as certified by manufacturer.

1. Acceptable materials with corrosion inhibitor for this Work are as follows:

a. Silica fume modified:

1) "Emaco S66 CI" or Emaco R310 CI", by BASF Building Systems, Shakopee, MN.
2) "Eucocrete", by The Euclid Chemical Company, Cleveland, OH.
3) "Planitop 15" with "Planicrete AC" or "MAPECEM 202" by MAPEI Corporation, Deerfield Beach, FL.
4) "SikaTop 122 Plus," by Sika Corporation, Lyndhurst, NJ.

C. Form and Pour/Pump Repair Mortar: Flow-able, one-component, high strength silica-fume-modified repair mortar with 0.375 in. aggregate extendable, and containing an integral corrosion inhibitor. The product shall achieve minimum 3,000 psi compressive strength at 1 day and 8000 psi compressive strength at 28 days per ASTM C39 extended at a 9-inch slump.

1. Acceptable materials for this Work are as follows:

a. Polymer/Silica fume modified:

1) "Emaco S77 CI," by BASF Building Systems, Shakopee, MN.
2) "Eucocrete Supreme," or "Concrete Top Supreme" by The Euclid Chemical Company, Cleveland, OH.
3) "Planitop 18 ES" by MAPEI Corporation, Deerfield Beach, FL

2.2 MATERIAL ACCESSORIES

A. Bonding Grout (for horizontal, un-formed surfaces): Bonding grout shall consist of sand and cement in proportions similar to mortar in concrete with sufficient water to form stiff slurry to achieve consistency of "pancake batter". Apply with brush to surface of existing concrete in repair areas. Surface of existing concrete shall be SSD.

B. Extended Open Time Epoxy Bonding Agent (for formed overhead/vertical surfaces): Three component, water based, epoxy modified portland cement bonding agent and corrosion inhibitor coating providing the recommended Manufacturer's open time in which to apply repair mortar. Product shall be capable of achieving bond strength of 2,700 psi per ASTM C 882.

1. Acceptable materials for this Work are:

a. "Emaco P24," by BASF Building Systems, Shakopee, MN.
b. "Duralprep A.C.," by The Euclid Chemical Company, Cleveland, OH.
c. "Planibond 3-C" or Mapefer 1K," by Mapei Corporation, Deerfield Beach, FL.
d. "Sika Armatec 110 EpoCem", by Sika Corporation, Lyndhurst, NJ.

C. Epoxy Adhesive (for formed overhead/vertical surfaces): 2 or 3 component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Product shall be capable of achieving bond strength of 1,800 psi per ASTM C 882.

1. Acceptable materials for this Work are:

a. "Concresive Liquid LPL", by BASF Building Systems, Shakopee, MN. "Kemko 001 or 008", by ChemCo Systems, Inc., Redwood City, CA.
b. "Euco #452 Epoxy," or "Duralcrete", by The Euclid Chemical Company, Cleveland, OH.
c. "Planibond EBA" by Mapei Corporation, Deerfield Beach, FL.
d. "Sikadur 32 Hi-Mod LPL", by Sika Corporation, Lyndhurst, NJ.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Preparation of surfaces to receive repair mortar shall be in accordance with Section "Surface Preparation for Patching" and manufacturer's written instructions. All unsound concrete, dust, debris, laitance, etc. shall be

removed from repair cavities. Cavity surfaces shall be wet to saturated surface dry condition prior to placement of repair material.

3.2 INSTALLATION

A. Mortar Placement: Properly proportioned and mixed mortar material shall be placed to consolidate mortar so that no voids exist within new material and continuous contact with base concrete is achieved.

B. Form and Pour Repair Mortar Placement: Mix and apply in strict accordance with manufacturer's written instructions, to achieve a maximum 9" slump.

3.3 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. "Confilm", by BASF Building Systems, Shakopee, MN.
   c. "Aquafilm", by Conspec Marketing & Manufacturing Co., Inc.
   d. "Sure-Film (J-74)", by Dayton Superior Corporation.
   e. "Eucobar" or "Tamms Surface Retarder", by The Euclid Chemical Company, Cleveland, OH.
   f. "E-Con", by L&M Construction Chemicals, Inc.
   g. "EVRT", by Russ Tech Admixtures, Inc.
   h. "SikaFilm", by Sika Corporation, Lyndhurst, NJ.

C. Immediately 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.

4. During initial and final curing periods maintain concrete above 50 deg F.
5. Prevent rapid drying at end of curing period.

D. Horizontal concrete surfaces shall be cured with moisture curing or moisture-retaining cover only; curing compounds prohibited.

E. Dissipating Curing Compound, for overhead or vertical surfaces only, (VOC Compliant, less than 350 g/l): Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/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", "Kurez RC", or "Kurez RC Off", The Euclid Chemical Company.
   b. "RxCure WB", "RxCure VOC", or "W.B. Cure VOC", Conspec Marketing & Manufacturing.
   c. "Kure N Seal W" or "Kure N Seal WB", BASF Building Systems, LLC.
   d. "MAPECURE DR", by MAPEI Corporation, Deerfield Beach, FL.

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.
   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: For overhead and vertical surfaces only; prohibited on horizontal surfaces. 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.

3.4 FIELD QUALITY CONTROL OF AGGREGATE EXTENDED MATERIAL

A. Testing Agency: Owner 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.

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Determine strength at 3, 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.

3.5 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.

END OF SECTION 033761

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 waterproofing system, including all products specified in Division 07 Sections.

B. This Section includes Traffic Topping: Fluid-applied, waterproofing, traffic-bearing elastomeric membrane with integral wearing surface.

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

1.3 ADMINISTRATIVE REQUIREMENTS

A. Coordination: 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 topping performance. Require every party concerned with topping Work, or required to coordinate with it or protect it thereafter, to attend. Include manufacturer's technical representative and warranty officer. Coordinate with other scheduled meetings/site visits.

C. Submittals and Resubmittals: Engineer will review each of Contractor’s shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer’s services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.

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. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the Contract Documents.

1.4 ACTION SUBMITTALS

A. Product Data: For each system indicated at least 60 days prior to application.

1. Product description, technical data, appropriate applications, and limitations.
2. Primer type and application rate.
3. Material, and wet mils required to obtain specified dry thickness for each coat.
4. Type, gradation, and aggregate loading required within each coat.

B. Samples:

1. Two 4-in. by 4-in. samples showing finished product of complete coating system to be used as acceptance criteria for coating installation and finished product for entire project. Acceptance criteria that will be considered includes, but is not limited to: surface texture, color, amount of aggregate used, slip-resistance. **Obtain Owner/Engineer's approval of finished product sample prior to start of Work**.

2. One 4-in. by 4-in. stepped sample showing each component for each system indicated.

C. Sample Warranty: For each system indicated.

1.5 INFORMATION SUBMITTALS

A. Certificates:

1. Certification that products and installation comply with applicable federal, state of Michigan, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
2. Evidence of applicator's being certified by manufacturer. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.
3. Certification from the 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 topping.
4. Certification stating static coefficient of friction meets minimum requirements of Americans with Disabilities Act (ADA).
5. Certification stating materials have been tested and listed for UL 790 Class "A" rated materials/system by UL for traffic topping application specified on project. Containers shall bear UL labels.
6. Certification from manufacturer confirming compatibility with existing underlying coatings and/or substrate.

B. Manufacturer's Instructions: For each system indicated.

1. Crack treatment and surface preparation method and acceptance criteria.
2. Method of application of each coat.
3. Maximum and minimum allowable times between coats.
4. Final cure time before resumption of parking and/or paint striping.
5. Any other special instructions required to ensure proper installation.

C. Field Quality Control:

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

D. Qualification Statements:

1. Manufacturer's qualifications as defined in the "Quality Assurance" article.
2. Installer's qualifications as defined in the "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. Five copies of snow removal guidelines for areas covered by Warranty.

C. 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 Owner and acceptable to Engineer/Architect.

E. Certifications:

1. Traffic Topping shall satisfy the 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 of Michigan.
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.

C. At no time shall weight of stored material being placed on slab area exceed original design load of slab area.

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 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). The warranty shall provide that system will be free of defects, water penetration, and chemical damage related to system design, workmanship, or material deficiency, consisting of:

1. Any adhesive or cohesive failures.
2. Spalling surfaces.
3. Weathering.
4. Surface crazing (does not apply to traffic topping 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 topping 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 the following in the terms of the Warranty

1. Length of warranty.
2. Change in value of warranty – if any – based on length of remaining warranty period.
3. Transferability of warranty.
4. Responsibilities of each party.
5. Notification procedures.
6. Dispute resolution procedures.
7. Limitations of liability for direct and consequential damages.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: 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. Deneef Construction Chemicals (Deneef), Houston, TX.

4. Lymtal International Inc. (Lymtal), Lake Orion, MI.
5. Neogard Division of Jones-Blair Company (Neogard), Dallas, TX.
6. Pacific Polymers, Inc. a Division of ITW (Pacific Polymers), Garden Grove, CA
7. Poly-Carb Inc. (Poly-Carb), Solon, OH.
8. Polycoat Products Division of Amer. Polymers (Polycoat), Santa Fe Springs, CA.
9. Pecora Corporation (Pecora), Harleysville, PA
10. Sika Corporation (Sika), Lyndhurst, NJ.
11. Technical Barrier Systems, Inc. (TBS), Oakville, Ontario.
12. Tremco (Tremco), Cleveland, OH.

2.2 MATERIALS, TRAFFIC TOPPING

A. Acceptable toppings are listed below. Toppings shall be compatible with all other materials in this Section and related work.

1. Heavy Duty:

a. Autogard HD-48, Neogard.
b. Elasto-Deck 5000-HT, Pacific Polymers.
c. Iso-Flex 750U-HL HVT/760U-HL HVT Deck Coating System, LymTal.
d. Qualideck Heavy Vehicular (152/252/372/512), APT
e. Sikalastic 710/715, Sika.
f. Sonoguard Vehicular Deck System, BASF.
g. Vulkem 350/345/346/346 Deck Coating System, Tremco.
h. Pecora-Deck 800 Series/Carlisle CCW Deck Coating.
i. Kelmar TE Exposure 2 or 3, TBS.
j. Flexodeck Mark 170.2 Solvent Free Heavy Duty, Poly-Carb.
k. Poly-I-Gard 246HD, Polycoat.

B. Recoating: Provide all wearing course components specified for new heavy-duty applications.

C. Provide ultraviolet screening for all traffic topping placed on this project.

D. Finish top coat shall be colored grey.

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

2.3 MATERIALS, CRACK SEALER

A. Repair for isolated random horizontal cracks 0.01 in. to 0.06 in. wide. Acceptable products:

1. SikaPronto 19TF, Sika.
2. Degadeck, Crack Sealer Plus, BASF.
3. Denedeck Crack Sealer, Deneef.
4. Iso-Flex 609 Epoxy Crack Sealer, Lymtal.

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 the 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 toppings.

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. Shot-blast surfaces to be coated to remove all laitance and surface contaminants, including oil, grease and dirt. Prepare by sand-blasting all surfaces inaccessible to shotblast equipment.

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.

E. All cracks on concrete surface shall be prepared in accordance with manufacturer's recommendations.

F. 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.

G. Mask off adjoining surfaces not to receive traffic topping and mask off drains to prevent spillage and migration of liquid materials outside membrane area. Provide neat/straight lines at termination of traffic topping.

3.3 INSTALLATION/APPLICATION

A. 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.

B. A primer coat is required for all systems. No exception.

C. Do not apply traffic topping material until concrete has been air dried at temperatures at or above 40 deg F. for at least 30 days after curing period specified.

D. 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 deg F.

E. All adjacent vertical surfaces shall be coated with traffic topping 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.

F. Complete all Work under this Section before installation of pavement markings.

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

3.4 FIELD QUALITY CONTROL

A. Develop a quality control plan for assured specified uniform membrane thickness that utilizes grid system of sufficiently small size to designate coverage area of not more than 5 gallons at specified thickness. In addition, employ wet mil gauge to continuously monitor thickness during application. Average specified wet mil thickness shall be maintained within grid during application with minimum thickness of not less than 80% of average acceptable thickness. Immediately apply more material to any area not maintaining these standards.

B. Testing Agency employ wet mil gauge to periodically monitor thickness during application.

C. Install trial section of topping system. Do not proceed with further topping application until trial section accepted in writing by Engineer/Architect. Remove and replace rejected trial sections with acceptable application. Trial section shall also be tested for:

1. Wet mil thickness application.
2. Adhesion to concrete substrate and/or existing coating.
3. Overall dry mil thickness.

D. Use trial sections to determine adequacy of pre-application surface cleaning. Obtain Owner, Engineer/Architect and manufacturer acceptance of cleaning before proceeding with topping application.

E. Determine overall topping system mil thickness:

1. Contractor shall provide 6 in. by 6 in. bond breaker (topping coupon) on concrete surface for each 25,000 sq ft, or fraction thereof, of topping to be placed as directed by Engineer/Architect and manufacturer. Dimensionally locate coupon for easy removal.
2. Contractor shall assist Testing Agency in removing topping coupons from concrete surface at completion of manufacturer-specified cure period. Contractor shall repair coupon area per topping manufacturer's instructions.
3. Testing Agency shall determine dry mil thickness of completed Traffic Topping System, including bond breaker. Take 9 readings (minimum), 3 by 3 pattern at 2 in. on center. No reading shall be taken closer than 1 in. from coupon edge. Report individual readings and overall topping system average to Engineer/Architect. Readings shall be made with micrometer or optical comparator.

END OF SECTION 071800

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 waterproofing system, including all products specified in Division 07 Sections.

B. This Section includes the following:

1. Exterior joints in horizontal traffic bearing surfaces.
2. Exterior joints in vertical and horizontal non-traffic surfaces.

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.

B. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.

C. 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. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the Contract Documents.

1.4 ACTION SUBMITTALS

A. Product Data: For each system indicated at least 60 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. Three copies of System Maintenance Manual.

B. Five copies of snow removal guidelines for areas covered by Warranty.

C. 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.
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, 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 Michigan. 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 Owner and acceptable to Engineer.

E. Certifications:

1. Licensing/certification document from system manufacturer that confirms system installer is a licensed/certified applicator for the manufacturer.
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.

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.

C. At no time shall weight of stored material being placed on slab area exceed original design load of slab area.

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 and Contractor shall furnish Owner written single source performance guarantee that the joint sealant 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. 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 period 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:

1. Length of warranty.
2. Change in value of warranty – if any – based on length of remaining warranty period.
3. Transferability of warranty.
4. Responsibilities of each party.
5. Notification procedures.
6. Dispute resolution procedures.
7. Limitations of liability for direct and consequential damages.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: 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.
4. Pecora Corporation (Pecora), Harleysville, PA.
5. Sika Corporation (Sika), North Canton, OH.
6. Sonneborn, a Division of BASF Construction Chemicals (BASF).
7. 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. “Sonneborn Soft Type Backer Rod”, Sonneborn, Minneapolis, MN.

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. Sonolastic SL-2, BASF.
2. Iso-flex 880 GB, Lymtal.

3. Dynatrol II-SG or Urexpan NR 200, Pecora.
4. Sikaflex-2c SL, Sika.
5. THC-900/901, Vulkem 45SSL, or Vulkem 245, Tremco.

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

1. Sikaflex-2c NS, Sika.
2. Sonolastic NP-2, BASF.
3. Dymeric 240/240FC 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

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 sand-blast 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. Fill horizontal joints slightly recessed to avoid direct contact with wheel traffic.

1. Fill horizontal joints flush with adjacent surfaces where traffic topping occurs.

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

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 deg F.

3.4 FIELD QUALITY CONTROL

A. Testing Agency:

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

END OF SECTION 079233

SECTION 079500 – EXPANSION JOINT ASSEMBLIES

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. A single installer shall be responsible for providing complete waterproofing system, including all products specified in Division 07 Sections.

1.3 DEFINITIONS

A. Maximum Joint Width: Widest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

B. Minimum Joint Width: Narrowest linear gap a joint system tolerates and in which it performs its designed function without damaging its functional capabilities.

C. Movement Capability: Value obtained from the difference between widest and narrowest widths of a joint opening typically expressed in numerical values (mm or inches) or a percentage (plus or minus) of nominal value of joint width. Movement capability is to include anticipated movements from concrete shrinkage, concrete shortening and creep from post-tensioning or prestressing, cyclic thermal movements, and seismic movements.

D. Nominal Joint Width: Width of linear opening specified in practice and in which joint system is installed.

E. Nominal Form Width: Linear gap in joint system at time of forming or erection of structural elements bounding the expansion joint.

F. Service Load Level: Defined level of load under which joint assembly remains elastic and fully functional.

G. Fatigue Load Level: Defined level of load under which joint assembly remains elastic and fully functional, including all noise mitigation components, for the stated number of cycles.

H. Collapse Load Level: Defined level of load under which joint assembly remains capable of bridging the gap, although plates may yield and components may break.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination:

1. General:

a. Coordinate and furnish anchorages, setting drawings, and instructions for installing joint systems. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.
b. Coordinate requirements for transitions, tolerances, levelness, and plumbness to ensure the installed expansion joint system can perform with expected movement capabilities.
c. Coordinate and assign responsibility for preparation of concrete surfaces adjacent to expansion joints.
d. Expansion joint surface areas each side of joint gap shall have a vertical differential less than ¼" and meet requirements of expansion joint manufacturer.
e. Minor surface defects shall be repaired according to manufacturer's recommendations. Repair materials shall be compatible with intended system materials and shall be approved by the Engineer prior to surface preparation and installation.
f. Submit for approval repair products and procedures for all major defects. Repair description shall indicate materials, manufacturer's requirements, expected service life, and maintenance requirements. Take all precautions necessary to avoid damaging adjacent surfaces and embedded reinforcement. Contractor is responsible for any damages. Concrete repairs shall be of rectangular configuration, with no feather-edged surfaces. Final surface preparation of all repairs shall be sandblasting, or approved equivalent.
g. Coordinate layout of joint system and approval of methods for providing joints.

2. Joint Opening Width:

a. Use manufacturer's adjustment table to properly size joint gap at time of concrete pour and show that proposed joint system is capable of equal individual and combined movements in each direction.
b. Perform calculations showing joint is capable of movement within design temperature range (Criteria on Drawings) for "other" temperature, and that design and installation follow manufacturer's recommendations.
c. Expansion joint movement capability and the actual joint gap movement may not coincide. Construct actual joint gap in accordance with expansion design criteria.

3. Blockouts:

a. Float expansion joint blockouts to remove all air pockets, voids and spalls caused by form work.

b. Blockouts shall be plumb with maximum tolerance per Manufacturer or not more than 0.125 inches deviation in 12 inches. Noncompliant blockouts shall be considered major defects.
c. Blockouts shall be straight and true with maximum tolerance per Manufacturer or not more than 0.250 inches deviation in 10 lineal feet. Noncompliant blockouts shall be considered major defects.

B. Pre-installation Meetings: 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 expansion joint system performance. Require every party concerned with concrete formwork, blockout, concrete placement, or others required to coordinate or protect the Work thereafter, to attend. Include Engineer of Record and manufacturer's technical representative and warranty officer. Coordinate with other scheduled meetings/site visits.

C. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.

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. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the contract documents.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated:

1. Construction details, material descriptions, dimensions, and finishes.
2. Proposed method of preparation of concrete surface to receive expansion joint systems.
3. Proposed method and details for treatment of cracks, bugholes, or other potential concrete surface defects in areas to receive expansion joint systems.
4. Temperature adjustment table showing formed gap at the time of concrete placement calculated at 10°F increments and a calculation showing joint system is capable of movement within the design temperature range.

B. Shop Drawings: For each type of product indicated:

1. Placement Drawings: Show project conditions including, but not limited to, line diagrams showing plans, elevations, sections, details, splices, blockout requirement, and terminations. Provide isometric or clearly detailed drawings depicting how components interconnect. Include reviewed and approved details from others whose work is related. Other information required to define joint placement or installation.

C. Samples: For each type of joint system indicated.**INFORMATIONAL SUBMITTALS**

A. Certificates

1. Certification that products and installation comply with applicable federal, state of Michigan, and local EPA, OSHA and VOC requirements regarding health and safety hazards.
2. ADA Certification: Prior to installation, submit written certification from manufacturer indicating that expansion joints conform to Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1-800-872-2253.

   a. Submit test reports from accredited laboratory attesting to joint systems' movement capability and ADA compliance.

3. Signed statement from installer/applicator certifying that installer/applicator has read, understood, and shall comply with all requirements of this Section.
4. Signed statement from manufacturer's representative that they have read, understood, and shall comply with all requirements of this section.

B. Field Quality Control

1. Two copies each of manufacturer's technical representative's log for each visit.

C. Qualification Statements

1. Manufacturer's qualifications as defined in the "Quality Assurance" article within 60 days of project award.
2. Installer's qualifications as defined in the "Quality Assurance" article.
3. Evidence of manufacturer's certification of installer/applicator. Evidence shall include complete copy of manufacturer's licensing/certification document, spelling out repair responsibility for warranty claims.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Contracts: 3 copies of Maintenance Program contracts.

B. Operation and Maintenance Data:

1. Maintenance Manual: 3 copies of System Maintenance Manual.
2. Five copies of snow removal guidelines for areas covered by warranty.

C. Warranty Documentation: 3 executed copies of Labor and Material Warranty including all terms, conditions, and maintenance requirements.

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications: Owner/Engineer retain right to reject any manufacturer.

1. Evidence of compliance with Experience Record and Qualifications paragraph below.
2. Evidence of acceptable previous work on WALKER-designed projects. If none, so state.
3. Copy of sample warranty that meets the requirements of the “Warranty” article in Section 1.
4. Evidence of financial stability acceptable to Owner or Engineer.
5. Evidence of compliance with "Single Installer" requirement.
6. Acceptable field history consists of successful performance of five (5) installations in place over the previous five (5) years under similar project loads, traffic frequency, footprints, and joint sizes. Include sketches, photos, and references for each installation. Installations shall have experienced at least moderate levels of traffic.

B. Installer Qualifications: An employer of workers, including superintendent for this project, trained and approved by manufacturer.

C. Testing Agency: Independent testing laboratory employed by Owner and acceptable to Engineer.

D. Certifications:

1. Provide reports to Owner detailing maintenance activities have been performed in accordance with written maintenance agreement for expansion joints.
2. Materials shall be compatible with materials or related Work with which they come into contact and the related materials sections.
3. Manufacturer/Applicator: Review and approve all details before construction. Confirm in writing to Owner.

1.9 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.

1.10 WARRANTY

A. Warranty period shall be a 5 year labor and materials warranty commencing with date of acceptance of work.

B. Installation Requirements: Include a written plan of construction and coordination requirements, to allow joint system installation to proceed with specified warranty, that specifically addresses the following:

1. Block out acceptance criteria.
2. Surface preparation acceptance criteria.
3. Crack, surface defect, and detailing recommendations.
4. Method of protection of surrounding surfaces.
5. Method of expansion joint system installation description.
6. Primer type and application rate.
7. Method of preparation of all glands and reinforced membranes.
8. Temperature, humidity, and other weather constraints. Specify substrate moisture testing criteria, if any.
9. Final cure time before removal of protection, resumption of traffic, and/or paint striping.
10. Any other special instructions required to ensure proper installation.

C. Quality Service Requirements: Show evidence of licensed/approved installer. List of names, addresses and phone numbers, with copies of certification/approval agreement with each, satisfies requirement. Licensing/certification agreement shall include following information:

1. Installer’s financial responsibility for warranty burden under agreement terms.
2. Manufacturer’s financial responsibility for warranty burden under agreement terms.
3. Process for dispute settlement between manufacturer and installer in case of system failures where cause is not evident or cannot be assigned.
4. Authorized signatures for both Installer Company and Manufacturer.
5. Commencement date of agreement and expiration date (if applicable).
6. Provide copy of contractor’s field application quality control procedures.

D. Warranty shall be jointly executed by Manufacturer and Installer for labor and materials. Detail responsibilities of General Contractor, manufacturer and installer with regard to warranty requirements, as outlined in the Manufacturer’s warranty and related Licensing/Certification documents. Warranty shall provide that system shall be free of defects, water penetration, and chemical damage related to system design, workmanship, or material deficiency, consisting of:

1. Any water leakage through expansion joint system or leaking conditions of reinforced membrane, other waterproofing components, or glands.
2. Any adhesive or cohesive failures of the system.
3. Metal to non-metal vibration causing noises during use.
4. Tears, weathering, or degradation in gland from normal use.
5. Expansion joint glands are considered defective if they buckle upwards beyond the level of the floor surface after installation or downward in excess of ½ inch below the floor surface.

E. If expansion joint systems or components show any of defects listed above, supply labor and material to repair all defects at no cost to Owner.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. A single Installer shall be responsible for providing complete expansion joint system. Obtain all joint systems through one source from a single manufacturer.

B. Drawings indicate size, profiles, and dimensional requirements of joint systems and are schematic for systems indicated.

C. Do not modify intended aesthetic effects, as judged solely by Architect, except with Engineer's approval. If modifications are proposed, submit comprehensive explanatory data to Engineer for review.

2.2 PERFORMANCE REQUIREMENTS

A. Intent of this section is to insure that installed expansion joints allow pedestrian and vehicular traffic to pass in a smooth, quiet fashion with minimal maintenance required over a period of not less than 10 years. Expansion joints shall not only function as structural bridging elements, but must also accommodate structural expansions/contractions and minimize water leakage.

B. Expansion joint design shall meet or exceed all expected movements shown on drawings.

C. Nominal form width shown on the drawings shall be adjusted for the ambient temperature at time of concrete placement and designer shall verify that width of joint at installation shall meet minimum installation requirements.

D. Expansion joint systems shall be capable of resisting a differential vertical movement of ½ inch.

E. Materials shall be supplied in lengths to minimize or eliminate the need to splice waterproofing components.

1. Waterproofing materials directly exposed to vehicular traffic shall be supplied with no joints in vehicle drive aisles.
2. All mitered splices shall be performed at the factory and provide sufficient gland length for butt-splicing with field-splicing equipment.
3. All Santoprene butt-to-butt splices shall be heat-welded.
4. Butt-to-butt splices with other materials shall be per manufacturer's recommendations.

F. Design system for passenger vehicles traveling at speeds normally expected within a parking structure.

G. Walking Surfaces: Expansion joint assemblies at walking areas subject to pedestrian traffic shall provide a smooth, slip-resistant walking surface for pedestrians with these minimum requirements:

1. Shall provide walking surfaces in accordance with ASTM F 1637 "Standard Practice for Safe Walking Surfaces".
2. Shall be designed to comply with "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1. Americans with Disabilities Accessibility Guidelines for Buildings and Facilities, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111. 1-800-872-2253.
3. Adjoining walkway surfaces shall be flush and meet the following minimum requirements:

   a. Changes in level of less than ¼ inch in height may be without edge treatment as shown in ADA Figure 303.2.
   b. Changes in Level between ¼ inch and ½ inch in height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3.
   c. Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp within minimum ADA guidelines.
   d. 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.

2.3 MANUFACTURERS

A. Subject to compliance with requirements, provide products from one of following manufacturers (listed in alphabetical order), only where specifically named in product categories:

1. Balco Inc., Wichita, KS (Balco).

2. Construction Specialties, Inc., Muncy, PA (C/S).
3. Dow Corning Corp., Midland, MI (Dow Corning).
4. Emseal Joint Systems, Westborough, MA (Emseal).
5. Erie Metal Specialties, Inc., Akron, NY (EMS).
6. Lymtal International Inc. Lake Orion, MI (Lymtal).
7. MM Systems Corporation, Atlanta, GA (MM).
8. TechStar, Inc., Findlay, OH (TechStar).
9. Tremco, Cleveland, OH (Tremco).
10. Watson Bowman Acme Corporation, a Division of BASF Construction Chemicals NA, Amherst, NY (WBA).

2.4 PRODUCTS, STANDARD EXPANSION JOINT SYSTEMS

A. Elastomeric Concrete Edged, Extruded Rubber Expansion Joint System.

1. DuraFlex Chambered Wing Seal CS and DCS Seris, Balco.
2. Iso-Flex Winged Joint System J Series, LymTal.
3. Lokcrete Membrane System (LMS) Series, MM.
4. Polycrete/Membrane System, Type CR Series, EMS.
5. Thermaflex Membrane/Nosing System, Type TM and TCR Series, Emseal.
6. Vulkem WF series Vehicular Expansion Joint System, Tremco.
7. Wabo®Crete Membrane System ME Series, WBA.
8. ZB 200/400 Series, C/S.

B. Substitutions: None for this project. Contact Engineer for consideration for future projects.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces and blockouts where expansion joint systems will be installed for installation tolerances and other conditions affecting performance of Work.

B. Check elevations on each side of expansion joint gap to ensure flush slab-to-slab transition.

C. Check anticipated or actual minimum and maximum joint openings. Compare to manufacturer's movement specifications and make joint sizing recommendations.

D. Coordinate and verify that related Work meets following requirements:

1. Check adhesion to substrates and recommend appropriate preparatory measures.
2. Curing compounds used on concrete surfaces are compatible with Work to be installed.
3. Concrete surfaces have completed proper curing period for system selected.

4. Coordinate expansion joint system with other related Work before installation of expansion joint.
5. Verify expansion joints are compatible with Joint Sealants and traffic toppings.

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

F. Cease installation if expansion joint blockouts and/or openings exhibit cracked edges, voids or spalls. Repair with approved material prior to installation of expansion joint.

G. Correct unsatisfactory conditions in manner acceptable to Manufacturer and Engineer before installing joint system.

3.2 PREPARATION

A. Prepare for installation of expansion joint systems in accordance with manufacturer's recommendations

B. Surface Preparation:

1. Acid etching: Prohibited.
2. Prepare substrates according to joint system manufacturer's written instructions.
3. Clean joints thoroughly in accordance with manufacturer's instructions to remove all laitance, unsound concrete and curing compounds which may interfere with adhesion.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing joint assemblies and materials unless more stringent requirements are indicated.

B. Proceed with work only when existing and forecast weather and temperature of concrete substrate will permit work in accordance with manufacturer's recommendations.

C. Cease material installation under adverse weather conditions, or when temperatures are outside manufacturers recommended limitations for installation, or when temperature of work area or substrate are below 40ºF.

D. Terminate ends of expansion joints by extending beyond face of columns/walls and upturn 45 deg (incidental). Verify requirements in field with Engineer.

E. Seal all openings to occupied spaces 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.

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

3.4 FIELD QUALITY CONTROL

A. Field Tests and Inspections: Prior to opening to traffic, test joint seal for leaks by observing during rain event or maintaining continuously wet. Repair leaks revealed by examination of seal underside. Repeat test and repairs until all leaks stopped.

B. Manufacturer Services: Provide qualified manufacturer's technical representative for periodic inspection of Work at critical time of the installation, including but not limited to pre-concrete formwork and placement site meetings, block out inspection, surface defect repair, surface preparation, metal work, expansion gland installation, and waterproofing system installation.

3.5 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over joints. Re-install cover plates or seals prior to Substantial Completion of Work.

END OF SECTION 079500

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 pavement markings systems as required per Drawings and Section 020010.

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

C. Related Work:

1. Pavement Marking Contractor shall verify compatibility with sealers, joint sealants, coatings, and all other existing and new surface treatments.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Provide product data as follows:

1. Manufacturer's certification that the material complies with standards referenced within this Section.
2. Intended paint use.
3. Pigment type and content.
4. Vehicle type and content.

C. Submit list of similar projects (minimum of 5) where pavement-marking paint has been in use for a period of not less than 2 yrs.

1.4 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg 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 meet requirements of MPI #70.

1. All products shall have performance requirements of Type I and II of Federal Standard TT-P-1952E.
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 white paint 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. Color of yellow paint shall match federal color chip No. 33538. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to

magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

C. Color of blue paint 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. Color of green paint 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. Color of red paint 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. Color of black paint shall match federal color chip No. 37038. Black paint shall also meet Federal Specification TT-P-110.

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. Pavement markings shall not be placed until full cure of concrete slab and waterproofing materials.

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. Lay out all striping on each tier, using dimensions and details shown on Contract Drawings, before painting that tier. Report any discrepancies, interferences or changes in striping due to field conditions to Engineer prior to painting. Pavement Marking Contractor shall be required to remove paint, repair surface treatment and repaint stripes not applied in strict accordance with Contract Drawings.

F. 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 and cause as little damage as possible to surface texture of pavement. Methods, that can provide acceptable results, are grinding and air or shot blasting. Use of chemicals to remove pavement markings prohibited. Collect residue generated by removal of pavement markings and dispose of as required by all applicable laws and regulations. If grinding is used, lightly grind floor surface using wheel mounted floor grinder or similar equipment with positive elevation control of grinder head. For all removal techniques: On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.
2. Traffic Topping/Membrane Surfaces: Remove existing pavement markings by solvent-washing or high-pressure water washing. Submit letter from traffic topping/membrane manufacturer certifying that solvents and/or water pressures are acceptable for this use and will not damage material. On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.
3. Contractor shall not use paint, bituminous bond coat or other methods of covering markings to obliterate existing pavement markings.
4. Material deposited on existing surfaces 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.

G. 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.

H. Mixing:

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

I. 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. Minimum air shall be used to prevent overspray. Temperature during application shall be minimum of 40 deg F and rising, unless manufacturer requires higher minimum temperature. Maximum relative humidity shall be as required by manufacturer.

C. 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).

END OF SECTION 099120

TABLE OF CONTENTS & LIST OF DRAWINGS

TECHNICAL SPECIFICATIONS

LIST OF DRAWINGS

SECTION 020010 - WORK ITEMS

PART 1 - GENERAL

RELATED DOCUMENTS

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

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

A. Unit prices stated by Bidder for all Work Items shall include all materials and Work installed and completed in place in accordance with all applicable portions of the Drawings and Specifications, and shall include all costs associated with such items including, but not limited to: materials, labor, supervision, overhead, and profit for General Contractor and/or subcontractors, general conditions, permits, shoring, and other related items.

WI 1.0 GENERAL REQUIREMENTS

A. Scope of Work

1. Work consists of performing all tasks, specifically required and incidental, which are not identified under separate Work Item designation, but necessary to perform the work identified in this Project. This work includes, but is not limited to:

   WI 1.1 – Project Mobilization
   WI 1.5 – Temporary Signage & Barriers

WI 1.1 PROJECT MOBILIZATION

A. Scope of Work

1. Work consists of coordinating, scheduling, obtaining and assembling at construction site all equipment, materials, permits, supplies, manpower, and other essentials and incidentals necessary to perform Work defined in this Contract. Payment of lump sum amount for Mobilization shall be according to following schedule and shall be based on percentage of original Contract amount earned.

2. Contractor shall be responsible to obtain all permits required to perform work as specified, per all authorities having jurisdiction.

3. This Work Item applies to Parking Structures #2 and #5.

B. Materials

1. None

C. Execution

1. At execution of agreement by all parties, payment of not more than 25% of Mobilization lump sum amount.
2. When amount earned is greater than 10% but less than 25% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 50% of Mobilization lump sum amount.
3. When amount earned is equal to or greater than 25% but less than 50% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 75% of Mobilization lump sum amount.
4. When amount earned is equal to or greater than 50% of original Contract amount, an additional amount will be paid to bring total payment for Mobilization to 100% of Mobilization lump sum amount.

WI 1.5 TEMPORARY SIGNAGE & BARRIERS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to provide, install, and remove following completion of project, Temporary Signage and Barriers as required for protection, safety, dust control, site access, traffic control, user information, and as required by Owner/Engineer during the duration of the project. Temporary Signage and Barriers shall be installed prior to start of work, and shall remain in place until all work is completed.

2. Payment for this item is lump sum at each structure to install all required signage, barriers, and dust control, maintain throughout entire project at all work areas, and remove upon completion of work.

3. This Work Item applies to Parking Structures #2 and #5.

B. Materials

1. Temporary signage shall meet following minimum requirements:

   a. Minimum size: As required for proper visibility based on intended audience (pedestrian or vehicle).
   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.

2. Barriers shall meet following minimum requirements:

a. Provide positive separation between pedestrians/vehicles and the designated work areas.
b. Contain all construction-generated dust and debris within designated work areas.

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.
4. Temporary Signage shall be sufficient to ensure pedestrian and vehicle safety, provide clear and concise user information, and maintain traffic control throughout the entire structure, including:

a. Signage at <u>all</u> pedestrian entrances to the structure informing public of ongoing construction Project, maintained for the duration of the Project.
b. Signage at <u>all</u> vehicle entry/exits to notify public of ongoing construction Project and closed work areas, etc.
c. Signage in <u>all</u> stair and elevator towers on <u>all</u> levels, indicating which levels/areas are closed and which remain open.
d. Signage at all work area perimeters on all levels where Work is to be performed, clearly defining work area limits and explicitly prohibiting vehicle and pedestrian access, maintained for the duration of the repairs.
e. Signage as necessary to maintain normal traffic flow throughout structure and around closed work areas, including access to all areas of the structure remaining open for public use during repairs. Provide signs indicating route to follow for additional areas of parking, and route to follow to exit structure, at all levels and areas adjacent to work areas.
f. Other signage as required by Owner/Engineer, and as needed throughout the Project.

5. Temporary Barriers shall be sufficient to maintain a positive barrier around all work areas, prevent pedestrian and vehicle access into work areas, and contain all construction-generated dust and debris within the work areas.
6. Dust control measures shall ensure that all construction-generated dust & debris maintains confined within the work areas, including above and below repair areas. Elevators and stair towers shall be protected from dust, debris, and water at all times. Contractor shall be responsible for cleaning all construction-

generated dust and debris from structure upon completion of repairs, including stair towers and elevators.

7. Submit plan to Engineer for review prior to start of work.

WI 3.0 CONCRETE FLOOR REPAIR

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 patching material to restore floor slab to original condition and appearance. Refer to Detail Series 3.0 for specific requirements.

2. This Work applies to Parking Structures #2 and #5.

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and/or Section "Cast-in-Place Repair Mortar".
2. Steel reinforcement shall be as specified in Section "Cast-in-Place Concrete".

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation". Remove all unsound concrete within marked boundary prior to saw-cutting and preparation of patch edges.
3. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
4. All steel exposed within cavities shall be cleaned to bare metal by sandblasting as specified in Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor as specified in Section "Cast-in-Place Concrete".
5. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
6. 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.

WI 3.1 FLOOR REPAIR - PARTIAL DEPTH

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

B. This Work Item applies to Parking Structures #2 and #5.

C. At PS#2, the majority of this Work occurs in the Alternate Epoxy/Sand (W.I. 16.9) repair areas (if accepted), shown shaded on level 3. Intent is to repair all concrete floor deterioration in these areas prior to performing Alt. W.I. 16.9 (if accepted). Locate in field with Engineer.

D. Payment for this Work Item shall be per square foot of repair performed.

WI 3.2 FLOOR REPAIR – SLAB-ON-GRADE

A. Refer to Work Item "Concrete Floor Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 3.2 for specific requirements.

B. Payment for this Work Item shall be per square foot of repair performed.

C. This Work Item applies to Parking Structure #5.

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, install supplemental reinforcement, and install patching material to restore floor to original integrity and appearance. Refer to Detail 3.3 for specific requirements.

2. Installation of supplemental reinforcement required on Detail 3.3 shall be incidental to this Work and NOT payable under other Work Items.

3. This Work Item applies to Parking Structures #2 and #5.

B. Materials

1. Concrete repair materials shall be as specified in Section "Cast-in-Place Concrete" and/or Section “Cast-in-Place Repair Mortar”.
2. Steel reinforcement shall be as specified in Section "Cast-in-Place Concrete”.
3. Epoxy adhesive shall be Hilti HIT-HY 200 Safe Set.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
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", Article "Preparation".
4. Do not cut or damage any existing reinforcement.
5. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
6. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall receive corrosion inhibitor coating as specified in Section “Cast-in-Place Concrete”.
7. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
8. 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.

WI 4.9 REMOVE LOOSE CONCRETE & COAT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate and remove delaminated and loose overhead concrete, and coat resulting cavities with specified material. Removals shall include physically loose concrete, as well as visibly spalled, cracked, and/or delaminated areas; sound concrete is <u>not</u> to be removed.

2. Payment for this Work Item shall be lump sum to remove all sections of loose concrete on all overhead surfaces and entire exterior façade of the structure, on all levels.

3. Contractor shall verify overhead removal heights and general scope of removal requirements prior to submitting bid.

4. This Work Item applies to Parking Structure #5.

B. Equipment

1. Removals shall be performed using hand tools. If required, chipping hammers shall be 15-lbs or less, only as directed by Engineer.
2. Manlift or other means of access necessary to perform this Work shall be incidental. Any damage to existing items shall be repaired by Contractor at no cost to Owner.

C. Materials

1. Sika Armatec 110 EpoCem, or approved equivalent.

D. Execution

1. Contractor shall locate areas for concrete removal in field. Engineer will verify types of removals to be performed by Contractor prior to start of Work. Contractor is responsible for locating and performing all removals on all overhead surfaces (ceilings, beams, stems, walls, etc.) and entire exterior facade of structure. Engineer will perform punchlist review at end of Project to verify loose concrete removals have been performed sufficiently.
2. All steel exposed within loose concrete removal areas shall be cleaned to bare metal by sand-blasting or wire brush. Removal area shall be prepared per Section “Surface Preparation for Patching”.
3. Contractor shall coat entire removal area with specified epoxy-coating material (incidental).

WI 5.0 CONCRETE BEAM REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals including shoring necessary to locate existing spalls, locate and remove delaminated and unsound concrete, prepare cavities, install supplemental reinforcement, and install patching materials to restore concrete beams to original condition and appearance. Refer to Detail Series 5.0 for specific requirements.

2. Installation of supplemental reinforcement required on Detail Series 5.0 shall be incidental to this Work and NOT a separate pay item.

B. Materials

1. Repair materials shall be as specified in Sections “Cast-in-Place Concrete”, “Cast-in-Place Repair Mortar”, and/or "Shotcrete".
2. Trowel-applied repair materials not allowed.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection". Engineer shall verify critical repair area identification prior to start of repairs.
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
3. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
4. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor coating as specified in Section “Cast-in-Place Concrete”.
5. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
6. Shoring support shall be provided as necessary and in accordance with Detail Series 5.0 and Section “Cast-in-Place Concrete”.
7. Patch installation procedures shall be in accordance with referenced specifications for selected material.
8. Contractor shall take care to protect adjacent areas from overspray if Section "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 5.1 BEAM REPAIR - PARTIAL DEPTH (LEDGE)

A. Refer to Work Item "Concrete Beam Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 5.1 for supplemental reinforcement and other specific requirements.

B. At all locations where this Work occurs, Contractor shall provide 25-kip minimum capacity shoring (2 levels below) at both stems of affected double tee prior to start of concrete removals (incidental).

C. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per lineal foot of repair performed.

WI 5.2 BEAM REPAIR - PARTIAL DEPTH (SIDE)

A. Refer to Work Item "Concrete Beam Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 5.2 for specific requirements.

B. This Work may require concrete to be placed from the topside concurrent with full-depth floor repairs, based on field conditions. Verify in field.

C. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per square foot of repair performed.

WI 5.3 BEAM REPAIR - PARTIAL DEPTH (UNDERSIDE)

A. Refer to Work Item "Concrete Beam Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 5.3 for specific requirements.

B. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per square foot of repair performed.

C. Temporary Shoring required to perform this Work shall be payable under W.I. 18.1. Verify shoring requirements in field with Engineer.

WI 5.4 BEAM REPAIR – AT RAILINGS

A. Refer to Work Item "Concrete Beam Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 5.4 for specific requirements.

B. Remove existing railings to facilitate installation of temporary shoring (3 levels below repair area). Re-install upon completion of repairs (incidental).

C. Remove live load from parking stalls above and 3 levels below repair area prior to start of Work. Verify in field with Engineer.

D. Install 70-kip minimum capacity shoring (3) levels beneath spandrel beams prior to start of concrete removals. Provide spreader pads on slab-on-grade consisting of two layers of 4”x4” timbers for shores to bear on (incidental). Verify requirements in field with Engineer.

   1. Install shores as close as possible to repair area (maximum of 5-ft. from end of beam where repair occurs).

E. Include 20 S.F. of beam patching at each repair location.

F. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per each location to perform work as described and detailed.

WI 5.5 BEAM REPAIR - PARTIAL DEPTH (ALTERNATE)

A. Refer to Work Item "Concrete Beam Repair" for scope of Work, materials, and procedure associated with this Work Item. Refer to Detail 5.5 for specific requirements.

B. This Alternate Work Item applies to Parking Structure #5. Payment for this Alternate Work Item, if accepted, shall be per square foot of repair performed.

WI 6.1 COLUMN REPAIR – PARTIAL DEPTH

A. Scope of Work

1. 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 patching materials to restore concrete columns to original condition and appearance. Refer to Detail 6.1 for specific requirements.

2. This Work Item applies to Parking Structures #2 and #5. Payment for this Work Item shall be per square foot of repair performed.

B. Materials

1. Repair materials shall be as specified in Sections "Cast-in-Place Concrete", "Cast-in-Place Repair Mortar", and/or "Shotcrete".
2. Trowel applied repair materials not allowed.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. Review repair area with Engineer prior to start of removals to determine if temporary shoring is required.
3. Procedure for delaminated and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
4. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
5. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor as specified in Section "Cast-in-Place Concrete".
6. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
7. 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.
8. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 7.0 CONCRETE WALL REPAIR

A. Scope of Work

1. 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 place patching materials to restore concrete walls to original condition and appearance. Refer to Detail 7.1 for specific requirements.

2. This Work Item applies to Parking Structures #2 and #5.

B. Materials

1. Repair materials shall be as specified in Sections "Cast-in-Place Concrete", “Cast-in-Place Repair Mortar”, or “Shotcrete”.
2. Trowel applied repair materials not allowed.

C. Execution

1. Contractor shall locate and mark all Work areas as specified in Section "Surface Preparation for Patching", Article "Inspection".
2. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
3. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
4. All steel exposed within cavities shall be cleaned to bare metal by sandblasting according to Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged and defective reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with an approved corrosion inhibitor coating as specified in Section "Cast-in-Place Concrete".
5. Contractor shall prepare cavities for patch placement as specified in Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
6. 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.
7. Contractor shall take care to protect adjacent areas from overspray if "Shotcrete" is used. Area adjacent to repair shall be cleaned to Owner's satisfaction prior to leaving site.

WI 7.1 WALL REPAIR - PARTIAL DEPTH

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

B. At Parking Structure #2, repairs occur at cast-in-place concrete walls at grade level.

C. At Parking Structure #5, repairs occur at precast concrete shear walls at localized areas.

D. Payment for this Work Item shall be per square foot of repair performed.

WI 8.0 PRECAST TEE STEM REPAIR

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals including shoring necessary to locate, support, and repair damaged or deteriorated tee stems. Refer to Detail Series 8.0 for specific requirements.

2. This Work applies to Parking Structures #2 and #5.

B. Materials/Equipment

1. Repair materials shall be as specified in Sections “Cast-in-Place Concrete”, “Cast-in-Place Repair Mortar”, or "Shotcrete".
2. Trowel applied repair materials not allowed.
3. Chipping hammers shall be 15 lb or less unless approved by Engineer.

C. Execution

1. Contractor shall locate and mark tee stem repairs indicated on Drawings according to Section "Surface Preparation for Patching", Article "Inspection".
2. Contractor shall provide shoring as required on Details in accordance with Section "Cast-in-Place Concrete". Submit Shop Drawings and receive Engineer's approval prior to starting removal operations.
3. Procedure for delaminated, spalled, and unsound concrete removal shall be as specified in Section "Surface Preparation for Patching", Article "Preparation".
4. Engineer shall inspect all cavities for condition according to Section "Surface Preparation for Patching", Article "Inspection of Repair Preparation".
5. All steel exposed within cavities shall be cleaned to bare metal by sandblasting as specified in Section "Surface Preparation for Patching", Article "Cleaning of Reinforcement within Delamination and Spall Cavities", and damaged reinforcement replaced as specified in Section "Surface Preparation for Patching", Article "Reinforcement and Embedded Materials in Repair Areas". Exposed steel shall be coated with approved corrosion inhibitor coating as specified in Section “Cast-in-Place Concrete”.
6. Contractor shall prepare cavities for patch placement in accordance with Section "Surface Preparation for Patching", Article "Preparation of Cavity for Patch Placement".
7. 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.
8. Contractor shall maintain forms and shores in place until concrete has achieved at least 75% of 28-day strength.

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

WI 8.1 TEE STEM REPAIR - PARTIAL DEPTH

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

B. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per lineal foot of repair performed.

WI 8.3 TEE STEM REPAIR - ENCASEMENT

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate extensively cracked or spalled and delaminated tee stems, install temporary shoring, remove loose or deteriorated concrete, prepare cavity and install reinforced concrete tee stem encasement. Refer to Detail Series 8.3 for specific requirements.

2. This Work Item applies to Parking Structures #2 and #5. Payment for this Work Item shall be per each location of repair performed (required length of repair shown on Detail).

B. Materials/ Equipment

1. Repair materials shall be as specified in Sections "Cast-in-Place Concrete" and/or “Cast-in-Place Repair Mortar”.
2. Steel reinforcing shall be as specified in Section "Cast-in-Place Concrete".
3. Chipping hammers shall be 15 lb or less as directed by Engineer. Only sections of loose concrete shall be removed; do not remove sound concrete or expose embedded reinforcement without prior direction from Engineer.
4. Temporary Shoring: Adjustable-type, rated for 6,000 lbs at required extension.

C. Execution

1. Contractor shall locate and mark Work areas. General locations of tee stems requiring encasement repairs are shown on Drawings. Engineer shall verify Work areas with Contractor prior to start of repairs.
2. Both stems of double tee being repaired shall be shored as required on Detail Series 8.3 and in accordance with Section "Cast-in-Place Concrete".

   a. Install 25-kip minimum capacity temporary shoring (2 levels below) beneath both stems of affected double tee prior to start of concrete removals (incidental).

3. Existing location of pre-stressing strands shall be determined before Work commences.
4. Tee flange concrete shall be removed as needed to place repairs from above (incidental).
5. Cracked tee stem concrete shall remain in place. Do not completely remove concrete from around reinforcement. Verify concrete removal requirements with Engineer prior to start of Work.
6. Following necessary concrete removals, concrete stem surface shall be roughened to 0.25 in. amplitude.
7. Drill holes in stem for #4 bent bars. Exercise caution to avoid damage to pre-stressing strand and other reinforcement.
8. Install mild steel reinforcing in accordance with Section "Cast-in-Place Concrete" and Drawings.
9. Install formwork as required to conform to dimensions as shown on Details.
10. 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.
11. Shop drawings for Work shall be submitted and approved by Engineer prior to start of Work.

WI 11.1 ROUTE/SEAL CRACKS (ALTERNATE)

A. Scope of Work

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

2. This Work occurs mainly at Alternate Epoxy/Sand (W.I. 16.9) repair areas (if accepted). Intent is to seal all floor cracks prior to performing Alt. epoxy/sand repairs. Locate in field with Engineer.

3. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per lineal foot of repair performed.

B. Materials

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

C. Execution

1. Contractor shall thoroughly clean and inspect concrete slabs and/or topping for cracks. Those identified as either greater than 0.03 in. wide or showing evidence of water and/or salt staining on ceiling below shall be sealed. All cracks identified for repair shall be marked with chalk to aid in precision routing. Obtain depths to embedded reinforcement in area of repair by use of a pachometer. 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 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 associated reference specifications are listed in Article "Materials" above. Sealant installation procedures shall be in accordance with referenced specifications for selected material.
5. Traffic topping manufacturer shall specify joint sealant type compatible with traffic topping, as applicable.

WI 11.2 REPAIR CRACK/JOINT SEALANT (ALTERNATE)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to locate and mark failed joint sealant, remove existing sealant, prepare edges, and reseal joints and cracks. Refer to Detail 11.2 for specific requirements.

2. This Work occurs mainly at Alternate Epoxy/Sand (W.I. 16.9) repair areas (if accepted), shown shaded on level 3. Intent is to replace sealant at all tee-to-tee joints in Alternate epoxy/sand repair areas (if accepted).

3. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per lineal foot of repair performed.

B. Materials

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

C. Execution

1. Contractor shall locate failed crack/joint sealant by visual inspection.
2. Contractor shall remove existing sealant from joints and/or cracks.
3. When existing joint dimensions do not conform to Detail 11.2, joints shall be routed 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.
4. Cavities shall be thoroughly cleaned by either sandblasting or grinding to remove all remaining sealant and unsound concrete which may interfere with adhesion. Groove shall also be air blasted to remove remaining debris.

5. Install sealants in accordance with sealant manufacturer's instructions and Section "Concrete Joint Sealants".
6. Traffic topping manufacturer shall specify joint sealant type compatible with traffic topping, as applicable.

WI 11.4 TOOL AND SEAL CONTROL JOINTS (FOR REFERENCE ONLY)

A. Scope of Work

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

2. This Work is incidental to concrete floor repair items and is NOT a separate pay item.

3. This Work Item applies to Parking Structures #2 and #5.

B. Materials

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

C. Execution

1. Contractor shall locate and provide control joints to match existing joint configuration. Verify in field with Engineer prior to placing repairs.
2. Control joints shall be tooled and formed in plastic concrete. Saw-cutting 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 Article "Materials" above.

WI 11.7 COVE SEALANT

A. Scope of Work

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

2. At Parking Structure #2, this Work occurs mainly at Alternate Epoxy/Sand (W.I. 16.9) repair areas (if accepted), shown shaded on level 3. Intent is to replace all existing cove sealant in Alternate epoxy/sand repair areas (if accepted). Payment shall be per lineal foot of cove sealant replaced.

3. At Parking Structure #5, this Work shall be incidental to concrete floor repair items and is NOT a separate pay item. Provide cove sealant to match existing condition at all locations where cove sealant occurs within concrete repair areas.

B. Materials

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

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.
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 Article "Materials" above.

WI 16.9 SCALED SURFACE REPAIR (EPOXY/SAND) (ALTERNATE)

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to scarify, shotblast, and prepare surface of concrete topping and install epoxy/sand overlay on prepared concrete surface. Refer to Detail 16.9 for specific requirements.

2. This Alternate Work Item applies to Parking Structure #2. Payment for this Alternate Work Item, if accepted, shall be per square foot of repair performed. Refer to Drawings for location.

3. Complete concrete floor repairs per other W.I.’s prior to performing this Work. Replace cove and tee-to-tee sealants per other W.I.’s <u>after</u> installation of epoxy/sand repair material, per manufacturer’s requirements.

B. Materials

1. MasterSeal 350 with DynaGrip Aggregate #8, by BASF.
2. PolyCarb Mark 171 with Washington Stone, Dow Chemical Company.
3. Neogard Epoxy/sand system with #16 aluminum oxide.

4. For any selected product:
   a. Sand shall be 12-20 size minimum (or equivalent) unless noted otherwise. Submit samples of various sizes and colors for Owner/Engineer approval.
   b. Provide non-sag additive as required to prevent epoxy/sand from sagging. Seed stone until rejection.
   c. For the topcoat, provide 5-10 mil epoxy lock coat to lock in top sand layer (incidental).

C. Execution

1. Contractor shall locate scaled surface repair areas and verify with Engineer prior to start of Work. See Drawing R-202.
2. All loose/delaminated existing concrete shall be removed by scarifying to ½" amplitude.
3. After scarification, shotblast surface per manufacturer's recommendations. Sand-blasting and/or water-blasting shall then be performed to remove all dust/debris/laitance. Additional surface preparation shall be performed as needed in strict accordance with manufacturer's recommendations.
4. Install 10-ft.x10-ft. trial section of epoxy/sand system for Owner/Engineer approval, utilizing scarification, shot-blasting, sand-blasting, water-blasting, and other surface preparation as required. Do not proceed with further material application until trial sections accepted in writing by Owner. Remove and replace rejected trial sections until approval is obtained (incidental).
5. Install the epoxy/sand overlay per manufacturer's recommendations to minimum depth shown on Detail (in multiple lifts as required).
6. Manufacturer's technical representative shall be onsite during surface preparation and epoxy/sand installation.
7. Provide 5-year warranty for labor and material for any material and adhesion/bonding failures.

WI 18.1 TEMPORARY SHORING

A. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to provide, install, maintain for duration of Project, and remove upon completion of Work, Temporary Shores at localized concrete repair areas, and remove upon completion of Work.

B. Payment for this Work Item shall be per each post shore installed at repair areas as directed by Engineer.

C. Temporary shoring required on Details, and/or indicated as incidental to other Work Items NOT eligible for payment under this Item.

D. If Contractor is unsure whether a particular repair requires temporary shoring (or how much shoring is required), verify in field with Engineer prior to concrete removals. Engineer shall approve of localized shoring procedures prior to start of Work. Contractor shall not be compensated for excessive use of shores per this Work Item.

E. To be eligible for payment under this Work Item, amount and location of temporary shoring must be approved by Engineer prior to installation.

F. This Work Item applies to Parking Structure #2.

WI 25.1 MECHANICAL / ELECTRICAL – ALLOWANCE

A. Scope of Work

1. Mechanical and electrical allowance shall be all related utility work (drain lines, sprinkler lines, electrical conduit, junction boxes, etc.) associated with interruptions of these utilities to repair existing structural areas.

2. All utilities removed during Work shall be reinstalled in accordance with latest edition of electrical and mechanical codes in effect. Work ineligible for allowance includes Work covered by or incidental to Work Items within this Specification or for Work required through Contractor's negligence.

3. This Work Item applies to Parking Structure #2.

B. Method of Payment

1. Mechanical/electrical Work, as approved in writing by Owner prior to implementation, shall be paid for by Contractor. Contractor shall forward actual invoices from mechanical/electrical contractors and General Contractor's markup to Engineer with each pay request. Contractor shall attach actual invoices to written authorization. At completion of project, any variation between mechanical allowance and actual payment receipts will be reflected in an adjustment of allowance amount.

2. Contractor shall not perform any Work that is to be billed under this Allowance without prior written approval from Owner.

WI 25.3 MECHANICAL – RE-ROUTE PIPING

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove existing piping and install new sections of piping as needed to ensure downspout discharges runoff on south side of expansion joint.

2. Current Condition: Floor drain piping runs down column and discharges water on north side of expansion joint, which then runs down vehicle ramp as no drains are nearby. Repair: Re-route piping down same column, but to south side of expansion joint, which will allow water to run to nearby floor drain. Requires disconnecting piping from column, removing 2’ to 3’ section of piping, installing

new 90 deg elbow, re-installing existing piping and re-anchoring to concrete column.

3. This Work Item applies to Parking Structure #2. Payment shall be lump sum to perform Work as described above.

B. Materials

1. Match existing materials.

C. Execution

1. Contractor shall locate and mark repair location; verify in field with Engineer.

WI 25.4 MECHANICAL - PIPE AND HANGERS

A. Scope of Work

1. Work consists of furnishing all labor, materials, equipment, supervision, and incidentals necessary to remove and replace existing sections of piping, and re-connect to existing drainage system.

2. This Work Item applies to Parking Structure #2. Payment for this Work Item shall be per lineal foot of repair performed.

B. Materials

1. Cast iron “No Hub”, ASTM A 888. Diameter to match existing, contractor to verify in field.

C. Execution

1. Contractor shall locate and mark all areas where floor drain piping is to be installed or replaced.
2. Pipes and hangers shall be installed per all applicable codes and ordinances.

WI 45.1 PAINT TRAFFIC MARKINGS

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 existing pavement markings upon completion of all repairs.

2. Payment for this Work Item shall be lump sum to perform traffic marking installation in all areas of the structure where existing markings are affected by Project including, but not limited to:

   a. Concrete floor repair locations.
   b. Locations of sealant replacement.
   c. Epoxy/sand repair areas.
   d. Areas where dust/debris have accumulated.
   e. Contractor staging/storage/parking areas.
   f. Traffic markings affected by debris removal, cleanup procedures, equipment/material storage, construction traffic, deliveries, etc.

3. This Work Item applies to Parking Structures #2 and #5.

4. Traffic markings shall match all existing markings and be provided at same locations. Contractor shall be responsible for verifying and recording existing traffic marking layout prior to start of Work.

5. Perform this work during off-hours and/or on weekends (incidental) after all other repairs have been completed as necessary to not close additional parking spaces during normal daytime hours. Comply with parking space closure requirements as specified on Drawings.

6. New traffic markings shall be installed in all work areas prior to re-opening for normal use.

7. Remove existing stripes in those locations where they conflict with new striping layout.

8. Any traffic markings required due to Alternate Work, if accepted, shall be incidental and included in the unit price of the Alternate Work Items. No extras allowed.

B. Materials

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

C. Execution

1. Contractor shall prepare drawing of existing parking and traffic marking 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 traffic marking plan for Owner/Engineer's approval.
3. Contractor shall match existing traffic marking layout, except as directed otherwise by Owner/Engineer.
4. Where existing pavement markings conflict with new striping layout, remove conflicting pavement markings as indicated in Division 9 Section “Pavement Marking”.
5. Engineer shall inspect all layout and surface preparation for conditions in accordance with Section "Pavement Marking."

6. All procedures shall be in accordance with Section “Pavement Marking”.

END OF SECTION 020010

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 deg of perpendicular of finished surface.

C. **SPALLS:** Potholes, cavities, or voids in floor slabs, beams, columns, and walls. Usually result of delamination migrating to face of concrete member. When fracture finally reaches surface, concrete encompassed by delamination breaks away, resulting in spall.

D. **UNSOUND CONCRETE:** Concrete exhibiting one or more of:

1. Incipient fractures present beneath existing delaminated or spalled surfaces.
2. Honeycombing.
3. Friable or punky areas.
4. Deterioration from freeze-thaw action.

E. **SCALING:** Deterioration which attacks mortar fraction (paste) of concrete mix. First appears as minor flaking and disintegration of concrete surface. Scaling eventually progresses deeper into concrete, exposing aggregate which breaks away. Concrete scaling is caused by freeze-thaw action. If concrete is frozen in saturated state, excess water freezing in concrete causes high internal stresses.

F. **SHOTBLASTING:** Scarification of concrete surfaces using an abraded metal shot-rebound. See Corps of Engineer's Manual EM 1110-2-2002 and the National Cooperative Highway Research Program's Report #99 for a more detailed definition.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION (NOT APPLICABLE)

END OF SECTION 025130

SECTION 025140 - SURFACE PREPARATION FOR PATCHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

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

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. "Guide for Repair of Concrete Bridge Superstructures" (ACI 546.1), American Concrete Institute.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 INSPECTION

A. Floor Slabs:

1. Floor Slab Delaminations: Locate by sounding surface with hammer, rod, or chain drag.
2. When delaminated area is struck, distinct hollow sound is heard.
3. Contractor: Sound all designated floors for delaminations.
4. Certain structural systems that contain thin slab thicknesses with Welded Wire Reinforcement or other small diameter reinforcing, such as waffle slab or precast tees, may have significant deterioration without evidence of delaminations.

These structural systems require qualified personnel to provide additional inspections, primarily visual in nature, to define the extent of deterioration.

5. Contractor: Visually inspect thin slab thicknesses with small diameter reinforcing for deterioration.

B. Vertical and Overhead Surfaces:

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

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

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

E. Engineer 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 and ELECTRICAL CONDUIT in repair area and mark these locations for reference during concrete removal. Do **NOT** nick or cut any embeds.

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 of shoring requirements in questionable areas. Shores shall be in place prior to concrete removal and cavity preparation in any area requiring shores**.

B. Delaminated, spalled, and unsound concrete floor areas: Mark boundaries. All concrete shall be removed from within marked boundary to minimum depth of 0.75 in. using 15 to 30 lb chipping hammers equipped with chisel point bits. When directed by Engineer, chipping hammers less than 15 lb shall be used to minimize damage to sound concrete. If delaminations exist beyond minimum removal depth, chipping shall continue until all unsound and delaminated concrete has been removed from cavity.

C. Where embedded reinforcement 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 directs.

E. Sawcut to depth of 0.75 in. into floor slab, unless otherwise noted. 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 delamination boundary shall be dressed perpendicular to member face. It shall also be of uniform depth, for entire length of cut. Exercise extra caution during saw-cutting to avoid damaging existing reinforcement (ESPECIALLY PRE-STRESSED TENDONS) and electrical conduit and any other embedded items near surface of concrete. Any damage to existing reinforcement or electrical conduit during removals shall be repaired by Contractor with Engineer-approved methods at no additional cost to Owner.

3.3 INSPECTION OF REPAIR PREPARATION

A. After removals are complete, but prior to final cleaning, cavity and exposed reinforcement shall be inspected by Contractor and verified by Engineer for compliance with requirements of this Section. Where Engineer finds unsatisfactory cavity preparation, Engineer shall direct Contractor to perform additional removals. Engineer shall verify areas after additional removals.

B. Contractor shall inspect embedded reinforcement and conduits exposed within cavity for defects due to corrosion or damage resulting from removal operations. Contractor shall notify Engineer 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.

3.4 REINFORCEMENT AND EMBEDDED MATERIALS IN REPAIR AREAS

A. All embedded reinforcement exposed during surface preparation that has lost more than 15% (10% if 2 or more consecutive parallel bars and/or tendons are affected) of original cross-section due to corrosion shall be considered DEFECTIVE. All non-defective exposed reinforcement that has lost section to extent specified above as direct result of Contractor's removal operations shall be considered DAMAGED.

B. **Embedded materials** including, but not limited to, reinforcement and electrical conduit **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 Section "Cast-in-Place Concrete". 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 patch 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 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.

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 patch placement to insure that base metal is not exposed to elements and further rusting for extended periods of time. Engineer may require entire bar diameter be cleaned.

B. After all sand-blasting operations and cleanup are completed, paint all exposed steel with an approved epoxy. Protect prepared surfaces from damage prior to and during patch placement.

3.6 PREPARATION OF CAVITY FOR PATCH PLACEMENT

A. Cavities will be examined prior to commencement of patching operations. Sounding surface shall be part of examination. Any delamination noted during sounding shall be removed as specified in this Section.

B. Cavities shall be sandblasted. Air-blasting is required as final step to remove sand. All debris shall be removed from site prior to commencement of patching.

END OF SECTION 025140

SECTION 033000 – CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture proportions, placement procedures, finishes, and other miscellaneous items related to cast-in-place concrete.

B. Cast-in-place concrete includes project requirements specified herein and on the drawings:

1. Water/cementitious materials ratio: See General Notes on Drawings.
2. Entrained air: See General Notes on Drawings.
3. Water Reducing Admixtures: See Part 2 Article “Admixtures”.

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.

B. Self-Consolidating Concrete (SCC): Highly-flowable, non-segregating concrete that can spread into place, fill the formwork, and encapsulate the reinforcement without any mechanical consolidation.

1.4 SUBMITTALS

A. Submittals and Resubmittals: Engineer will review each of Contractor’s shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer’s services made necessary to review such additional resubmittals. Owner will in turn reimburse Engineer.

B. Requests For Information

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

C. Submit Product data for concrete component materials and other concrete related items including, but not limited to:

1. Material Certificates: Signed by Manufacturer that each of the following items complies with requirements:

   a. Cementitious materials and aggregates.
   b. Admixtures.
   c. Form materials and form-release agents.
   d. Steel reinforcement and accessories.
   e. Epoxy coating.
   f. Fiber reinforcement.
   g. Curing materials.
   h. Floor and slab treatments.
   i. Bonding agents.
   j. Repair materials.

2. Submit certification that curing compound or evaporation reducer, if used, is compatible with products specified in Division 07 Sections.

D. Submit materials certificates in lieu of materials laboratory test reports when permitted by Engineer. Materials certificates shall be signed by manufacturer and Contractor, certifying that each material item complies with or exceeds specified requirements. Provide certification from admixture manufacturers that chloride content complies with specification requirements.

E. Submit evidence of licensure in Michigan for professional engineer providing professional services as required for Contractor in order to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences, and procedures.

1. Contractor's responsibilities include formwork, shoring and re-shoring procedures, and other work described in Article "Contractors Professional Design Services", Article "Formwork", and Article "Shores and Re-shores".
2. Performance and design criteria are shown on the Drawings and in Article "Contractor's Professional Services - Performance and Design Criteria".
3. Contractor's Professional Engineer shall furnish Owner a Certificate of Professional Liability Insurance in minimum amount of $1,000,000 per claim.
4. Submit signed and sealed drawings, calculations, specifications, or other submittals to indicate compliance with the applicable performance and design criteria provided.

F. Submit concrete mixture proportions to Engineer for each concrete mixture. Submit alternate mixture proportions when characteristics of materials, project conditions, weather, test results, or other circumstances warrant adjustments.

1. Provide mixture proportions not less than four weeks before placing concrete and not less than one week before pre-installation conference (pre-concrete meeting).
2. Proportion mixtures as defined in ACI 301 Section 4 header “Proportioning”. Mixtures shall be proportioned by party other than Testing Agency responsible for testing Project concrete.
3. Proportion mixtures to minimize effects of thermal and drying shrinkage. See Part 2 heading “Concrete Mixtures” header “Shrinkage” for drying shrinkage limit.
4. Use mixture proportions submission form at end of this Section for each concrete mixture, which identifies the following:

    a. Mixture Proportions Identification and use.
    b. Method used for documentation of required average compressive strength, (ACI 301 Section 4 – *Field test data* or *Trial mixtures*).
    c. Gradation of fine and coarse aggregates.
    d. Proportions of all ingredients including all admixtures added either at time of batching or at job site.
    e. Water/cementitious materials ratio.
    f. Slump, ASTM C143.
    g. Certification of the chloride content of admixtures.
    h. Air Content:

        1) Of freshly mixed concrete by pressure method, ASTM C231, or volumetric method, ASTM C173.
        2) Of hardened concrete by microscopical determination (as applicable), including parameters of air-void system, ASTM C457.

    i. Freeze-thaw resistance, ASTM C457 and C666. If super-plasticized concrete cannot meet hardened air content requirements of Part 2, ASTM C666 laboratory test result of specimens with concrete mixture proportions similar to proposed mixture for project shall be submitted for review by Engineer. Report air void parameters (spacing and specific surface area in accordance with ASTM C457) (at point of placement) of specimens tested. Test specimens shall contain specified air system (within plus or minus 1.5 percent) and high-range water-reducer (superplasticizer) used in concrete for project. Report relative durability factor of concrete for specimens tested in accordance with Procedure A of ASTM C666. Acceptable concrete durability factor greater than 90 percent (> 90%) at 300 test cycles. Relative durability factor of concrete containing superplasticizer greater than or equal to 80 percent ($\geq$ 80%) compared with reference.
    j. Density (Unit weight) of concrete, ASTM C138.
    k. Strength at 4, 7, and 28 days, ASTM C39.
    l. Water soluble chloride ion content of concrete: ASTM C 1218.
    m. Mill test report of silica fume: Provide report for each 400 cu. yd. or fraction thereof, of concrete placed on project. Provide to Owner from independent

testing lab showing chemical analysis in percent by weight of silica fume solids supplied and used.

n. Silica fume concrete admixture: Comply with ASTM C1240 and following additional requirements:

1) Silicon dioxide content: 90 percent (minimum).
2) Loss on ignition (LOI): 6 percent (maximum).
3) Surface area (nitrogen absorption): 15,000 m^2kg.
4) Crystallinity: Non-crystalline within limits of detection less than or equal to 0.5 percent [$\leq$ 0.5%] depending upon x-ray machine used] by x-ray diffraction.
5) Oversize foreign materials (in fume): 5% maximum on 45 micron sieve (wet).

o. Certificate of analysis of coal fly ash or processed ultra-fine fly ash: Comply with ASTM C618, Class F only. Class C Fly Ash Prohibited.

G. Testing Agency: Promptly report all field concrete test results to Engineer, Contractor and Concrete Supplier. Include following information:

1. See Article “Quality Assurance.”
2. Density (unit weight) of concrete, ASTM C 138.
3. Slump, ASTM C 143.
4. Air content of freshly mixed concrete by pressure method, ASTM C 231 or volumetric method, ASTM C 173.
5. Air content and parameters of air-void system by microscopical determination, ASTM C 457 (as applicable).
6. Concrete temperature at placement time: ASTM C 1064.
7. Air temperature at placement time.
8. Strength determined in accordance with ASTM C 39.
9. Calcium Nitrite presence in plastic concrete: See Part 3 heading, “Quality Control.”

H. Submit current certification of welders (as applicable).

I. Submit shop drawings for steel reinforcement:

1. Prepare placing drawings that detail fabrication, bending, and placement of concrete reinforcement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement. Comply with ACI SP-66, “ACI Detailing Manual”. Include special reinforcement required for openings through concrete structures, elevations of all walls and columns with locations of all splices and couplers.

J. Submit samples of materials as requested by Engineer, including names, sources, and descriptions.

K. Submit laboratory test reports for concrete materials and mixtures.

L. Submit Minutes of concrete pre-installation conference.

1.5 CONTRACTOR'S PROFESSIONAL SERVICES - PERFORMANCE AND DESIGN CRITERIA

A. Provide professional services for temporary conditions during construction and portions of the Work required to carry out the Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. Specific requirements and criteria include, but are not limited to:

1. Design, erect, shore, brace, and maintain formwork, according to ACI 301 and ACI 347 to support vertical, lateral, static and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads. The contractor is responsible for layout and design, reviews, approvals, and inspections.
2. Design formwork, shoring, bracing, and other conditions for structural requirements and stability during construction and until final repairs are completed and accepted.

    a. Comply with ACI 347.2 for design, installation, and removal of shoring and reshoring.
    b. Superimposed loads to the concrete structure, slab-on-grade, and soil shall be less than the design loads as shown on Drawings.
    c. Check early-age strength of concrete members against anticipated construction loads. Reduce the load on concrete members at the critical concrete age or change the concrete mixture for accelerated strength gain to avoid distress of concrete members.
    d. In multi-story construction, extend shoring or reshoring over a sufficient number of stories to distribute loads such that no floor or member would be excessively loaded or would induce tensile stresses in concrete members.
    e. Plan sequence of removal of shores and reshores to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excess stress or deflection.

1.6 QUALITY ASSURANCE

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

B. Manufacturer Qualification: An experienced supplier who is experienced in manufacturing ready-mixed concrete products complying with ASTM C94 requirement for production facilities and equipment. Manufacturer shall also be certified according to the National Ready Mixed Concrete Association's Certifications of Ready Mixed Concrete Production Facilities.

C. Codes and Standards: Comply with provisions of following codes, specifications, and standards, except where more stringent requirements are shown or specified:

1. ACI 301, "Specifications for Structural Concrete".

2. ACI 318, “Building Code Requirements for Structural Concrete and Commentary”.
3. ACI 117, “Standard Specifications for Tolerances for Concrete Construction and Materials”.
4. Concrete Reinforcing Steel Institute (CRSI), “Manual of Standard Practice”.

D. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in Michigan and who is experienced in providing professional engineering services of the kind indicated. See Article “Contractor’s Professional Services - Performance and Design Criteria”.

E. Materials and installed work may require retesting at any time during progress of work. Tests, including re-testing of rejected materials for installed work, shall be done at Contractor’s expense.

F. In advance of scheduled start of concrete construction, Contractor shall conduct meeting to review proposed mixture proportions and methods and procedures to achieve required concrete quality. Coordinate with other scheduled meetings/site visits. Contractor shall send pre-concrete conference agenda to all attendees 20 days prior to scheduled date of conference indicating review requirements. Representatives of each entity directly concerned with cast-in-place concrete shall attend conference, including, but not limited to:

1. Contractor’s superintendent.
2. Agency (laboratory) responsible for concrete mixture proportions.
3. Agency (laboratory) responsible for field quality control.
4. Ready-mixed concrete producer.
5. Concrete subcontractor.
6. Primary admixture manufacturers.
7. Engineer or Owner’s representative.
8. At the pre-concrete meeting the contractor shall provide a summary of concrete procedures to protect fresh concrete from rain.

G. Welders and welding procedures shall conform to requirements of AWS D1.4. Welding of reinforcing steel is prohibited.

H. Submit steel producer’s certificates of mill analysis, tensile tests, and bend tests for reinforcing steel. Coordinate with welders and welding procedures.

I. Epoxy coated reinforcement, ASTM A775 and A884:

1. Coating applicator shall have quality control program to assure that coated reinforcement comply with requirements of Specifications.
2. Submit proof of current certification for rebar coating plant from Concrete Reinforcing Steel Institute.

J. 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.
2. Testing laboratory shall submit documented proof of ability to perform required tests.
3. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 4, according to ACI CP-1 or an equivalent certification program.

K. 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 General Contractor's authorized on-site representative and to Owner's authorized on-site representative.

L. Proportioning, production, and finishing of silica fume and processed ultra-fine fly ash concrete shall be reviewed by and have approval of silica fume and processed ultra-fine fly ash manufacturers.

M. 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 data (quantity and type):

    a. Cement.
    b. Fine aggregates.
    c. Coarse aggregates.
    d. Water.
    e. Air entraining admixtures.
    f. High-range water-reducing admixture.
    g. Other admixtures, including supplementary cementitious materials.

12. Weather data:

    a. Air temperatures.
    b. Weather.
    c. Wind speed.

13. Field test data:

a. Date, time and place of test.
b. Slump.
c. Concrete Temperature.
d. Air content.
e. Density (Unit weight).

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).

N. Provide certification that curing compound conforms to requirements of ASTM C 1315.

O. All concrete flatwork finishers on Project shall hold current ACI Concrete Flatwork Finisher certification. Submit certification for each concrete flatwork finisher at Concrete Pre-construction Conference and obtain Engineer's written acceptance.

P. Silica fume supplier shall make available qualified individual, experienced in placement of silica fume concrete, to aid Contractor. Qualification of supplier's representative shall be acceptable to Owner Representative, shall attend pre-construction meeting, and shall be present for all trial placements, initial startup and then as required by Owner.

Q. Coal fly ash and processed ultra-fine fly ash supplier shall make available qualified individual, experienced in placement of fly ash concrete, to aid Contractor. Qualification of supplier's representative shall be acceptable to Owner. Representative shall attend pre-construction meeting, and shall be present for all trial placements, initial startup and then as required by Owner.

R. At all times during high-evaporation conditions, maintain adequate supply of evaporation reducer at site. Do not use evaporation reducer as finishing aid. See Part 3.

S. Testing Agency: Identify those trucks of concrete supplier's which meet requirements of NRMCA Quality Control Manual. Permit only those trucks to deliver concrete to Project.

1.7 REFERENCES

A. American Association of State Highway and Transportation Officials (AASHTO):

1. AASHTO, "Standard Specifications for Highway Bridges".
2. AASHTO T 318, "Standard Method of Test for Water Content of Freshly Mixed Concrete Using Microwave Oven Drying".

B. American Concrete Institute (ACI):

1. ACI 117, “Standard Specifications for Tolerances for Concrete Construction and Materials”.
2. ACI 214R, “Evaluation of Strength Test Results of Concrete”.
3. ACI 301, “Specifications for Structural Concrete”.
4. ACI 302.1R, “Guide for Concrete Floor and Slab Construction”.
5. ACI 305R, “Hot Weather Concreting”.
6. ACI 306.1, “Cold Weather Concreting”.
7. ACI 308R, “Guide to Curing Concrete”.
8. ACI 308.1, “Standard Specifications for Curing Concrete”.
9. ACI 318, “Building Code Requirements for Structural Concrete & Commentary”.
10. ACI 347, “Guide to Formwork for Concrete”.
11. ACI 347.2 “Guide to Shoring/Reshoring of Concrete Multi-story Buildings”.
12. ACI 362.1, “Guide for the Design of Durable Parking Structures”.
13. ACI SP15, “Field Reference Manual”.

C. American Iron and Steel Institute (AISI):

1. AISI, “Specification for the Design of Cold-Formed Steel Structural Members”.

D. 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 497, “Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete Reinforcement”.
4. ASTM A 615, “Standard Specification for Deformed and Plain Carbon -Steel Bars for Concrete Reinforcement”.
5. ASTM A 706, “Standard Specification for Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement”.
6. ASTM A 775, “Standard Specification for Epoxy-Coated Steel Reinforcing Bars”.
7. ASTM A 884, “Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement for Reinforcement”.
8. ASTM A 934/A 934M, “Standard Specification for Epoxy-Coated Prefabricated Steel Reinforcing Bars”.
9. ASTM B 633, “Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel”.
10. ASTM C 31, “Standard Practice of Making and Curing Concrete Test Specimens in the Field”.
11. ASTM C 33, “Standard Specification for Concrete Aggregates”.
12. ASTM C 39, “Standard Test Method for Compressive Strength of Cylindrical Concrete Specimens”.
13. ASTM C 94, “Standard Specification for Ready-Mixed Concrete”.
14. ASTM C 109, “Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens)”.
15. ASTM C 138, “Standard Test Method for Unit Weight, Yield, and Air Content (Gravimetric) of Concrete”.
16. ASTM C 143, “Standard Test Method for Slump of Hydraulic Cement Concrete”.

17. ASTM C 150, “Standard Specification for Portland Cement”.
18. ASTM C 157, “Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete”.
19. ASTM C 171, “Standard Specification for Sheet Materials for Curing Concrete”.
20. ASTM C 172, “Standard Practice for Sampling Freshly Mixed Concrete”.
21. ASTM C 173, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method”.
22. ASTM C 231, “Standard Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method”.
23. ASTM C 260, “Standard Specification for Air-Entraining Admixtures for Concrete”.
24. ASTM C 309, “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete”.
25. ASTM C 311, “Standard Test Methods for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete”.
26. ASTM C 330, “Standard Specification for Lightweight Aggregates for Structural Concrete”.
27. ASTM C 457, “Standard Test Method for Microscopical Determination of Air-Void Content and Parameters of the Air-Void System in Hardened Concrete”.
28. ASTM C 494, “Standard Specifications for Chemical Admixtures for Concrete”.
29. ASTM C 567, “Standard Test Method for Determining the Density of Structural Lightweight Concrete”.
30. ASTM C 595, “Standard Specification for Blended Hydraulic Cements”.
31. ASTM C 618, “Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete”.
32. ASTM C 666, “Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing”.
33. ASTM C 672, “Standard Test Method for Scaling Resistance of Concrete Surfaces Exposed to Deicing Chemicals”.
34. ASTM C 989, “Standard Specification for Ground Granulated Blast-Furnace Slag for Use in Concrete and Mortars”.
35. ASTM C 1064/C 1064M “Standard Test Method for Temperature of Freshly Mixed Hydraulic-Cement Concrete”.
36. ASTM C 1077, “Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation”.
37. ASTM C 1116, “Standard Specification for Fiber-Reinforced Concrete and Shotcrete”.
38. ASTM C 1202, “Standard Test Method for Electrical Indication of Concrete’s Ability to Resist Chloride Ion Penetration”.
39. ASTM C 1218, “Standard Test Method for Water Soluble Chloride Ion in Mortar and Concrete”.
40. ASTM C 1240, “Standard Specification for Silica Fume Used in Cementitious Mixtures”.
41. ASTM C 1260, “Standard Test Method for Potential Alkali Reactivity of Aggregates (Mortar Bar Method)”.
42. ASTM C 1293, “Standard Test Method for Determination of Length Change of Concrete Due to Alkali-Silica Reaction”.
43. ASTM C 1315, “Standard Specification for Liquid Membrane-Forming Compounds Having Special Properties for Curing and Sealing Concrete”.

44. ASTM C 1567, “Standard Test Method for Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials and Aggregate (Accelerate Mortar Bar Method)”.
45. ASTM C 1602/C 1602M, “Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete”.
46. ASTM C 1610/C 1610M, “Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique”.
47. ASTM C 1611/C 1611M, “Standard Test Method for Slump Flow of Self-Consolidating Concrete”.
48. ASTM C 1621/C 1621M, “Standard Test Method for Passing Ability of Self-Consolidating Concrete by J-Ring”.
49. ASTM D 448, “Standard Classification for Sizes of Aggregate for Road and Bridge Construction”.
50. ASTM D 3963/D 3963M, “Standard Specification for Fabrication and Jobsite Handling of Epoxy-Coated Steel Reinforcing Bars”.
51. ASTM E 96/E 96M, “Standard Test Methods for Water Vapor Transmission of Materials”.
52. ASTM E 1643, “Standard Practice for Installation of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs”.
53. ASTM E 1745 “Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs”.
54. ASTM F1637 02, “Standard Practice for Safe Walking Surfaces”.

E. American Welding Society (AWS):

1. AWS D1.1, “Structural Welding Code-Steel”.
2. AWS D1.4, “Structural Welding Code-Reinforcing Steel”.

F. Concrete Reinforcing Steel Institute (CRSI):

1. CRSI MSP, “Manual of Standard Practice”.

G. US Army Corps of Engineers (CE):

1. CE CRD-C 513 “Specifications for Rubber Waterstops”.
2. CE CRD-C 572 “Specifications for Polyvinyl Chloride Waterstops”.
3. CE CRD-C 662 “Determining the Potential Alkali-Silica Reactivity of Combinations of Cementitious Materials, Lithium Nitrate Admixture and Aggregate (Accelerated Mortar Bar Method”.

H. Prestressed Concrete Institute (PCI):

1. PCI MNL 116, “Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products”.
2. PCI MNL 117, “Manual for Quality Control for Plants and Production of Architectural Precast Concrete Products”.
3. PCI MNL 120, “Design Handbook Precast Prestressed Concrete".
4. PCI MNL 122, “Architectural Precast Design Handbook”.
5. PCI MNL 129, “Parking Structures-Recommended Practice for Design and Construction”.

6. PCI MNL 135, “Tolerances for Precast and Prestressed Concrete Construction”.
7. PCI “Code of Standard Practice for Precast Concrete”.

I. Contractor shall have following ACI publications at Project construction site:

1. ACI SP-15, “Field Reference Manual: Standard Specifications for Structural Concrete ACI 301 with selected ACI References”.
2. ACI 302.1R, “Guide for Concrete Floor and Slab Construction”.
3. ACI 305R, “Hot Weather Concreting”.
4. ACI 306.1, “Cold Weather Concreting”.

J. Accessibility Requirements:

1. “Americans with Disabilities - Act Accessibility Guidelines for Buildings and Facilities”, as published by U.S. Architectural & Transportation Barriers Compliance Board, 1331 F Street, N.W., Suite 1000, Washington, DC 20004-1111, 1-800-872-2253, http://www.access-board.gov/adaag/ADAAG.pdf

K. International Conference on Building Officials (ICBO):

1. ICBO, “Uniform Building Code”.
2. ICBO, “Uniform Building Code Standards”.

L. International Code Council (ICC):

1. IBC, “International Building Code 2006”.
2. IPMC, “International Property Maintenance Code”.
3. IFC, “International Fire Code”.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store all formwork and formwork materials clear of ground, protected, to preclude damage.

B. Deliver reinforcement to Project site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

C. Store concrete reinforcement materials at site to prevent damage and accumulation of dirt or excessive rust.

D. Avoid damaging coatings on epoxy coated reinforcement:

1. Contact areas of handling and hoisting systems shall be padded or be made of nylon or other acceptable material.
2. Use spreader bars to lift bundles of coated bars to prevent bar-to-bar abrasion.
3. Pad bundling bands or fabricate of nylon or other acceptable material.
4. Store coated bars on padded or wooden cribbing.
5. Do not drag coated bars.

6. After placement, restrict traffic on coated bars to prevent damage.
7. Repair damaged epoxy coatings according to ASTM D 3963.

E. Concrete transported by truck mixer or agitator shall be completely discharged within one and one half-hours (one hour for hot weather concreting) after water has been added to cement or cement has been added to aggregates. **For concrete with silica fume or processed ultra-fine fly ash, concrete shall be completely discharged within one hour after water has been added to cement or cement has been added to aggregates, in all weather conditions, hot or cold.** Schedule deliveries to allow for delays due to weather, traffic, etc.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.

1. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1, and as follows:

a. High-density overlay, Class 1 or better.

B. Form Coatings: Provide commercial formulation form-coating compounds with a maximum VOC of 350 grams/liter 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.

C. 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.

1. Provide ties that, when removed, will leave holes not larger than 1 in. diameter in concrete surface.

D. Chamfer strips: Wood, metal, PVC, or rubber strips. 0.75 in. by 0.75 in. min. unless noted otherwise.

2.2 STEEL REINFORCEMENT

A. Epoxy-Coated Fabricated Reinforcing Bars: ASTM A775, and as follows:

1. Steel Reinforcement: ASTM A 615, Grade 60, deformed bars.

B. Plain-Steel Welded Wire Reinforcement: ASTM A 185, fabricated from as-drawn steel wire into flat sheets.

1. Welded Wire Reinforcement: Provide in mats only. Roll stock prohibited.

2.3 REINFORCEMENT ACCESSORIES

A. Bar supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from all plastic of greater compressive strength than concrete, and as follows:

1. In manner acceptable to Engineer solely, bar and welded wire reinforcement supports shall be color-coded to visually differentiate supports by height and shall be fabricated to resist overturning during construction operations.
2. For slabs on ground, use all-plastic supports with sand plates or horizontal runners where base materials will not support chair legs. All supports shall have sufficient surface area in contact with ground so that they shall not allow clearance loss when reinforcement installed or concrete placed.
3. For concrete surfaces exposed to view where bar supports contact forms, supports shall have minimal contact, shall not cause voids and shall not cause damage to surrounding concrete. Use all-plastic supports conforming to CRSI Class 1 protection requirements.
4. Chairs shall be sized and spaced to prevent cover loss during construction operations.
5. For epoxy-coated reinforcement, use all-plastic bar supports.
6. Acceptable manufacturers:

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

7. For welded wire reinforcement, provide continuous bar supports spaced at 2 feet o.c., maximum.

B. Epoxy Coating Materials for Reinforcement: ASTM A 775 and A 884:

1. Supplier shall be certified currently under CRSI Fusion Bonded Epoxy Coating Applicator Plant Certification Program.
2. Provide one of following epoxy coatings for reinforcement and steel accessories as noted on Drawings:

   a. "Scotchkote 413", 3M Company.
   b. "Nap-Gard 7-2709", DuPont Powder Coatings, USA, Inc.
   c. "Epoxiplate R346 or R349", Armstrong Products Company.

3. Use patching material recommended by epoxy powder manufacturer, compatible with epoxy coating and inert in concrete. Acceptable:

   a. "Scotchkote 413 PC", 3M Company.
   b. "Armatec 110", Sika Corporation.
   c. "EMACO P22", BASF Construction Chemicals, LLC.

d. “Corr Bond, or Duralprep AC”, The Euclid Chemical Company.

C. Epoxy Coating for Existing Exposed Non-prestressed Steel Reinforcement or Welded Wire Reinforcement:

1. Provide one of following epoxy coatings:

a. “Sikadur 32 Hi-Mod”, Sika Chemical Corp.
b. “Concresive Liquid LPL”, BASF Construction Chemicals, LLC.
c. “Scotchkote 413 PC”, 3M Company.
d. “Euco 452”, The Euclid Chemical Company.
e. “Resi-Bond (J-58)”, Dayton Superior Corporation.

2.4 CONCRETE MATERIALS

A. Ready Mixed Concrete: Obtain concrete from plant with current certification from:

1. Concrete Materials Engineering Council.
2. Michigan Department of Transportation.
3. National Ready Mixed Concrete Association.
4. Prestressed Concrete Institute.

B. Portland Cement (ACI 301, Section 4 header “Cementitious Materials”):

1. Portland cement, Type I, ASTM C 150. Use one cement supplier throughout project. No change in brand or supplier without prior written acceptance from Engineer.

C. Coal Fly Ash:

1. ASTM C 618, Class F only. Class C Fly Ash Prohibited.
2. Testing: ASTM C311.
3. Percentage of fly ash in Mixture Proportion shall be by weight, not by volume. Water/cement ratio will be calculated as water/cementitious (total cement and fly ash) ratio.
4. Prohibited: Fly ash in same mix with Type IP blended cement.
5. If strength or air content varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
6. Submit all fly ash concrete Mixture Proportions per ACI 301.

D. Slag – (Ground Granulated Blast-Furnace Slag – GG-BFS):

1. ASTM C 989, Grade 100 or higher.
2. Percentage of GGBF slag in Mixture Proportion shall be by weight, not by volume. Water-cement ratio shall be calculated as water-cementitious (total portland cement + GGBF slag) ratio.
3. If strength or air content varies from value specified by more than specified tolerances, Engineer or designated representative shall reject that concrete.
4. Submit all GGBF slag concrete mixture proportions per ACI 301.

E. Normal Weight Aggregates (ACI 301, Section 4 header “Aggregates”):

1. Normal weight concrete aggregates:

a. Coarse aggregate: Crushed and graded limestone or approved equivalent conforming to ASTM C33 except as noted here, minimum class designations as listed below:

1) All concrete: Class 5S.

b. No deleterious materials such as, but not limited to: chert or opaline.
c. 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.
d. Coarse Aggregate shall not contain crushed hydraulic-cement concrete.

2. Combined Aggregate Gradation: Well graded from coarsest to finest with not more than 18 percent and not less than 8 percent retained on an individual sieve, except that less than 8 percent may be retained on coarsest sieve and on No. 50 sieve, and less than 8 percent may be retained on sieves finer than No. 50.
3. Coarse aggregate: Nominal maximum sizes indicated below, conforming to ASTM C 33, Table 2:

a. Repairs less than 3-inches thick in section: Size number 67.
b. Repairs greater than 3-inches thick in section: Size number 57.

4. Chloride Ion Level: ASTM C 1218. Chloride ion content of cement, aggregates and all other ingredients: tested by laboratory making trial mixes.

F. Water: Comply with ASTM C 1602.

G. Storage of Materials (ACI 301, Section 4 header “Materials Storage and Handling”).

2.5 ADMIXTURES

A. Use high-range water-reducing admixture (superplasticizer) in concrete as required for placement and workability.

B. Use non-chloride accelerating admixture in concrete slabs placed at ambient temperatures below 50 deg F as required for schedule.

C. Use high-range water-reducing admixture (HRWR) in pumped concrete, and for concrete with water/cementitious ratio less than or equal to 0.45.

D. Use air-entraining admixture in exterior exposed concrete as indicated. Add air-entraining admixture at manufacturer’s prescribed rate to result in concrete at point of placement having total air content with a tolerance of plus or minus 1.5 percent within limits shown on Drawings.

E. Only admixture manufacturers listed acceptable. Do not submit alternate manufacturers.

F. Concrete supplier and manufacturer shall verify via trial mixes and certify compatibility (no adverse effect on workability, strength, durability, entrained air content, etc.) of all ingredients in each Mixture. Use admixtures in strict accordance with manufacturer's recommendations.

G. Prohibited Admixtures: Calcium chloride or admixtures containing intentionally added chlorides shall not be used.

H. Air-Entraining Admixture: ASTM C 260, certified by manufacturer to be compatible with other required admixtures.

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

a. "Catexol AE 260", Axim Concrete Technologies.
b. "Air-Mix", "Eucon Air-Series", or "AEA-92", Euclid Chemical Co.
c. "Daravair Series" or "Darex Series", W.R. Grace & Co.
d. "Micro-Air", "MB-VR", or "MBAE-90", BASF Construction Chemicals.
e. "Sika AEA Series" or "Sika AIR Series", Sika Corporation.
f. "Polychem "VR", "VRC", or "Polychem AE", General Resource Technology.
g. "RSA-10", Russ Tech Admixtures, Inc.

I. High Range Water-Reducing Admixture (Superplasticizer): ASTM C 494, Type F.

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

a. "Eucon 37", "Eucon SP-Series", or "Plastol Series", Euclid Chemical Co.
b. "Daracem Series" or "ADVA Series", W.R. Grace & Co.
c. "Rheobuild 1000", "PS 1466", or "Glenium Series", BASF Construction Chemicals.
d. "Sikament Series" or "Sika ViscoCrete Series", Sika Corporation.
e. "Catexol 1000 SP-MN", Axim Concrete Technologies.
f. "Melchem Series", General Resource Technology.
g. "Superflo 443" or "Superflo 2000 Series", Russ Tech Admixtures, Inc.

J. High Range water reducing retarding (superplasticizer), ASTM C 494 Type G:

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

a. "Eucon 537 or RD2", Euclid Chemical Co.
b. "Daracem 100", W.R. Grace & Co.
c. "Melchem", General Resource Technology.

K. Corrosion Inhibiting Admixture capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

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

a. “Eucon CIA” or “Eucon BCN”, Euclid Chemical Company.
b. “DCI” or “DCI-S”, W.R. Grace.
c. “Rheocrete CNI”, BASF Construction Chemicals.
d. “Sika CNI”, Sika Corporation.
e. “Catexol 1000 CN-CI”, Axim Concrete Technologies.
f. “Polychem CI”, General Resource Technology.
g. “Russ Tech RCI”, Russ Tech Admixtures, Inc.

2. Add at rate of 3 gal/cu yd of concrete, which shall inhibit corrosion to 9.9 lb of chloride ions per cu. yd. of concrete. Calcium Nitrite based corrosion inhibitor shall have a concentration of 30 percent, plus or minus 2 percent of solids content.

L. Silica Fume ASTM C 1240:

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

a. “Eucon MSA”, Euclid Chemical Co.
b. “Force 10,000 D”, W.R. Grace & Co.
c. “Rheomac SF 100”, BASF Construction Chemicals.
d. “Sikacrete 950 DP”, Sika Corporation.
e. “Polychem CI”, General Resource Technology.
f. “EMS 970DA (Elkem Materials) Dry Compacted Silica Fume”, General Resource Technology.
g. “Russ Tech CSF”, Russ Tech Admixtures, Inc.

2.6 CURING MATERIALS

A. Evaporation Reducer: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Evaporation Retarder:

a. “Cimfilm”, Axim Concrete Technologies.
b. “Aquafilm”, Conspec Marketing & Manufacturing Co., Inc.
c. “Eucobar”, Euclid Chemical Co.
d. “E-Con”, L&M Construction Chemicals, Inc.
e. “Confilm”, BASF Construction Chemicals, LLC.
f. “SikaFilm”, Sika Corporation.
g. “Sure-Film (J-74)”, Dayton Superior Corporation.
h. “EVRT”, Russ Tech Admixtures, Inc.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Curing Compound: Prohibited for concrete with water/cementitious materials ratio less than 0.45.

2.7 RELATED MATERIALS

A. Bonding Grout: Bonding grout shall consist of sand and cement in proportions similar to mortar in concrete with sufficient water to form stiff slurry to achieve consistency of "pancake batter". Apply with brush to surface of existing concrete in repair areas. Surface of existing concrete shall be SSD.

2.8 CONCRETE MIXTURES

A. Proportion mixtures determined by either laboratory trial mix or field test data bases, as follows:

1. Proportion normal-weight concrete according to ACI 211.1 and ACI 301.
2. Provide different mixtures as the season warrants, as well as each type and strength of concrete or for different placing methods.

B. Use a qualified independent testing agency for preparing and reporting proposed Mixture Proportions for the laboratory trial mix basis.

C. Requirements for normal-weight concrete mix are shown on Drawings:

1. Compressive strength.
2. Slump.
3. Water-cementitious materials ratio.
4. Air content.

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

E. Supplementary Cementitious Materials: Maximum weight of fly ash, natural pozzolans, silica fume, processed ultra-fine fly ash or slag included in concrete shall not exceed percentages of total weight (see footnotes for ACI 301 Part 4 Table "Requirements for Concrete Exposed to Deicing Chemicals") of cementitious materials as follows:

1. Fly Ash or other pozzolans conforming to ASTM C 618: 25 percent.
2. Slag conforming to ASTM C 989: 50 percent.
3. Silica fume conforming to ASTM C 1240: 10 percent.
4. Processed ultra-fine fly ash conforming to ASTM C 618: 15 percent.
5. Total of fly ash or other pozzolans, slag and silica fume: 50 percent. Within the total, Fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.
6. Total of fly ash or other pozzolans and silica fume: 35 percent. Within the total, Fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

7. Total of fly ash or other pozzolans and processed ultra-fine fly ash: 35 percent. Within the total, Fly ash or pozzolans not exceeding 25 percent and silica fume not exceeding 10 percent.

F. 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.
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. Refer to Part 1 Article “Submittals”.

G. 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”). Test to determine chloride ion content shall conform to ASTM C 1218.
2. Concrete chloride ion content shall be determined by Testing Agency prior to placement. Cast samples from current production of concrete mix proposed for superstructure.
3. Concrete not meeting the requirements of paragraph “Water soluble chloride ion content of concrete…” above, shall contain appropriate amount of calcium nitrite. Concrete supplier shall provide laboratory test results showing the amount of excess chloride ion content in the concrete mixture contributed by the aggregates. For each pound of chloride ion in excess of the amount allowed, mix shall contain calcium nitrite (30 percent, plus or minus 2 percent, solids content) on one-to-one basis (one gallon of calcium nitrite for one lb of excess chloride ion). Calcium nitrate used to offset chloride ions is in addition to calcium nitrate used as a corrosion inhibitor. Maximum of 1.5 lb of chloride ion per cubic yard may be offset in this manner.

H. Alkali-Aggregate Reactivity Resistance:

1. Total equivalent alkali content of mixture less than 5 lb/cu. yd.

I. Admixtures: Use admixtures according to manufacturer’s written instructions.

1. Consider using high-range water-reducing admixture (Superplasticizers) as required for placement, workability, and finishing.
2. Consider using retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use high range water-reducing admixture in pumped concrete and concrete with a water-cementitious materials ratio of 0.45 or less.

4. Use corrosion-inhibiting admixture in concrete mixes as indicated.

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 superplasticized 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 superplasticized 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 shall be cause for concrete rejection.
   d. Segregation or rapid slump loss (superplasticizer life) due to incompatibility or under-dosing shall be cause for concrete rejection.

K. 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.

L. 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.

2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI’s “Manual of Standard Practice.”

2.10 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94, and furnish batch ticket information. Truck mixing prohibited. Mix at plant.

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.

2.11 TOOLS

A. Slab Jointing:

1. Concrete groovers: For tooled joints in concrete:

   a. For concrete not exceeding 4 in. thickness, use groover with 1 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.
   b. For concrete exceeding 4 in. thickness, use groover with 1.5 in. deep v-cut bit, 0.5 in. surface width and 3/16 in. to 1/4 in. edge radius.

2. Saw Cut Joints: Prohibited.

   a. Joints shall be tooled in plastic concrete.

PART 3 - EXECUTION

3.1 FORMWORK

A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until concrete structure can support such loads and in accordance with Article 1.5 “Contractor’s Professional Services – Performance and Design Criteria”.

B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117, except as modified below:

1. Columns, Walls, Beams, and Slabs:

   a. Variation in cross-sectional dimensions of beams and columns and in thickness of walls and slabs: 12 in. or less: Plus 0.375 in., minus 0.25 in. Greater than 12 in.: Plus 0.5 in., minus 0.375 in.

C. Construct forms tight enough to prevent loss of concrete mortar.

D. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.

1. Install keyways, reglets, recesses, and the like, for easy removal.
2. Kerf wood inserts for easy removal.
3. Do not use rust-stained steel form-facing material.

E. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.

F. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.

G. Chamfer exterior corners and edges of permanently exposed concrete.

H. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.

I. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

J. Re-tighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

K. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 REMOVING AND REUSING FORMS

A. General: Formwork, for sides of beams, walls, columns, and similar parts of the Work, that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete provided concrete is hard enough to not be damaged by form-removal operations and provided curing and protection operations are maintained.

B. Leave formwork, for beam soffits, stems, slabs, and other structural elements, that supports weight of concrete in place until concrete has achieved the following:

1. 28-day design compressive strength.

C. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

D. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Engineer.

3.3 SHORES AND RESHORES

A. Comply with ACI 347.2, ACI 318, and ACI 301 for design, installation, and removal of shoring and reshoring and in accordance with Article 1.5 “Contractor’s Professional Services – Performance and Design Criteria”.

B. In multi-story construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.

C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.4 STEEL REINFORCEMENT

A. General: Comply with CRSI’s “Manual of Standard Practice” for placing reinforcement.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials.

C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain specified concrete cover. Do not tack weld crossing reinforcing bars.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on continuous bar supports spaced at 2 ft o.c., maximum. Lap edges and ends of adjoining sheets per ACI 318 and as follows:

1. Length of overlap measured between outermost cross wires of each sheet shall not be less than one spacing of cross wires plus two inches nor less than one and one-half times the development length nor 6 in. minimum where development length is calculated per section 12.8 of ACI 318.
2. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.

F. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D 3963.

1. Rest epoxy coated steel member supported from formwork on coated wire bar supports, or on bar supports made of dielectric material or other suitable material.
2. Coat wire bar supports with dielectric material for minimum distance of 2 in. from point of contact with coated steel member.
3. Fasten epoxy-coated steel members with nylon-, epoxy-, or plastic-coated tie wire, or other suitable material acceptable to Engineer.

4. Repair all damage to epoxy coating to bars, welded wire reinforcement and all other epoxy coated items. Use a mirror to view undersides of all items for possible damage so it can be repaired.
5. Do not cut epoxy-coated steel unless permitted by Engineer. When cut, coat ends with material used for repair of coating damage.

G. 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.

3.5 JOINTS

A. Joints in Concrete (ACI 301, Section 5):

1. Tool joints at time of finishing. Tool: Part 2 Article “Tools”.
2. Sawcut Joints: Prohibited.
3. All joints subject to acceptance by sealant manufacturer and installer. Rework rejected joints until acceptable to sealant manufacturer and installer.

B. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints except as otherwise indicated. Verify location of construction joints in field with Engineer prior to concrete placement.

C. Use bonding grout, containing the specified bonding admixture, on existing concrete surfaces that will be joined with fresh concrete.

D. Joint sealant material is specified in Division 07 Sections.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.

B. Do not add water to concrete during delivery, at Project site, or during placement, unless approved by Engineer.

C. Before placing concrete, water may be added at Project site, subject to limitations of ACI 301.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mix.

D. Check air content after any site addition of admixtures to increase slump.

E. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of

weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation.

F. Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Place each layer while preceding layer is still plastic, to avoid cold joints.

1. Consolidate placed concrete with mechanical vibrating equipment. Use plastic or rubber-tipped vibrators when concrete reinforcement is epoxy-coated.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically (in thin slabs vibrator may be inserted at angle or horizontally to keep vibrator head completely immersed) inserted at uniformly spaced locations no farther than 1.5 times action radius so area visibly affected by vibrator overlaps adjacent previously vibrated area by 3-4 inches. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration (usually 5 to 15 seconds) of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

G. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
2. Maintain reinforcement in position on chairs during concrete placement.
3. Screed slab surfaces with a straightedge or motor driven vibrating screed and strike off to correct elevations.
4. Slope surfaces uniformly to drains where required.
5. Begin initial floating using highway bull floats or darbies to form a uniform and open-textured surface plane, free of humps or hollows, before excess moisture or bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.

H. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.

1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
3. Use only the specified non-corrosive accelerator. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators, unless otherwise specified and approved in mixture proportions.

I. Hot-Weather Placement: Place concrete according to recommendations in ACI 305R and as follows, when hot-weather conditions exist:

1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover steel reinforcement with water-soaked burlap so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

3.7 FINISHING FORMED SURFACES

A. As-Cast Finishes: As-cast concrete texture imparted by form-facing material in accordance with ACI 301 and as specified below in accordance with Class of Finish:

1. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defective areas. Remove fins and other projections exceeding limits for class of surface specified.

a. Provide Class A finish as described in ACI 347. Class A permits gradual or abrupt irregularities of 1/8 inch.

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 Parking and Drive Areas (BROOM Finish, ACI 301, Section 5 header "Broom 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.

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.

B. Flatwork in Stair Towers and Parking Garage floor subject to pedestrian traffic:

1. Concrete surfaces at all walking areas subject to pedestrian traffic shall provide a smooth, slip-resistant walking surface for pedestrians with these minimum requirements:

a. Shall provide walking surfaces in accordance with ASTM – F 1637 Standard Practice for Safe Walking Surfaces and "Americans with Disabilities Act (ADA), Accessibility Guidelines (ADAAG)" and ICC A117.1.
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.
2) Changes in Level between ¼ inch and ½ inch in height shall be beveled with a slope no greater than 1:2 as shown in ADA Figure 303.3.
3) Changes in level greater than ½ inch in height are not permitted unless they can be transitioned by means of a ramp within minimum ADA guidelines.
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.

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 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete Work.

3.10 CONCRETE PROTECTION AND CURING

A. General: Comply with ACI 308.1. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-

weather protection and with recommendations in ACI 305R for hot-weather protection during curing.

B. Evaporation Reducer: Apply evaporation reducer to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft./h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing. Do not finish immediately after evaporation reducer applied. Wait until after film disappears.

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

1. Tepid (within 20 deg F of concrete temperature) water.
2. Continuous water-fog spray.
3. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

D. 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. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.

E. Curing Compound: Prohibited for concrete with water/cementitious materials ratio less than 0.45.

3.11 CONCRETE SURFACE REPAIRS

A. Defective Concrete: Repair and patch defective areas, as approved by Engineer. Remove and replace concrete that cannot be repaired and patched to Engineer's approval.

B. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than ½ inch in any dimension in solid concrete but not less than 1 inch in depth. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with specified bonding agent. Fill and compact with specified patching material. Fill form-tie voids with specified patching material.
2. Repair defects on surfaces exposed to view by blending white Portland cement and standard Portland cement so that, when dry, patching material will match surrounding color. Patch a test area on mockup, or if none, at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact patching material in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Engineer.
4. Repair isolated random cracks that have little movement and single holes not over 1 in. in diameter in accordance with procedures and materials specified in Division 7 Section "Concrete Joint Sealants". Receive Engineer's written acceptance of methods and materials selected prior to application.

C. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

1. Repair finished surfaces containing defects. Surface defects include spalls, pop-outs, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
2. After concrete has cured at least 14 days, correct high areas by grinding.
3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
4. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping to produce a smooth, uniform, plane, and level surface.
5. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete or patching material as approved by the Engineer. Remove defective areas with clean, square cuts and expose steel reinforcement with at least ¾ inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mix as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
6. Repair single holes 1 inch or less in diameter with patching mortar. Cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
7. Repair isolated random cracks that have little movement and single holes not over 1-inch in diameter in accordance with procedures and materials specified in Division 07 Section "Concrete Joint Sealants". Receive Engineer's written acceptance of methods and materials selected prior to application.

D. Perform structural repairs of concrete, subject to Engineer's approval, using materials as approved by the Engineer.

E. Repair materials and installation not specified above may be used, subject to Engineer's approval.

3.12 FIELD QUALITY CONTROL

A. Owner will employ a testing laboratory to perform tests and to submit test reports.

B. Sample concrete in accordance with ASTM C 172.

C. Epoxy Coated Material:

1. Perform field inspection of installed epoxy coated material.
2. Repair all epoxy coating damage due to fabrication and handling, using a mirror to find any damage on undersides.
3. Repair all damaged areas using manufacturer's recommended patching material and method.
4. No damaged area shall be left uncorrected.

D. 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.

E. Slump Test:

1. Conduct one slump test in accordance with ASTM C 143/C 143M per each truck of ready-mixed concrete delivered to Project.
2. When high-range water-reducing admixture (superplasticizer) is used, initial slump must be verified by Testing Agency.

F. 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, C 173, or C 231 as applicable. Conduct one air content test for every truck of ready-mix, air entrained concrete delivered to Project. Conduct additional air content tests as needed due to non-conforming results.

G. Concrete Compressive Strength:

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

   a. Take minimum of eight cylinders for each 100 cu yd or fraction thereof, of each Mixture of concrete placed in any one day.
   b. Additional cylinders shall be taken under conditions of cold weather concreting per Part 3 Heading "Concrete Curing and Protection."
   c. Additional cylinders may be taken to verify concrete strength prior to form removal. Contractor responsible to coordinate with Testing Agency prior to date of scheduled pour.
   d. Testing Agency: Provide and maintain site cure box for cylinders.

2. 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.

3. 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.

4. Compression test for non-prestressed concrete:

   a. Test 2 cylinders at 4 days.
   b. Test 2 cylinders at 7 days.
   c. Test 2 cylinders at 28 days.
   d. Hold 2 cylinders in reserve for 56 days for use as Engineer directs. Unless directed otherwise, cylinders may be discarded after 56 days.

H. Report all non-conforming test results to Engineer and others on distribution lists via fax or email. Follow up with colored paper copies to flag the non-conformances.

I. Monthly, submit a graph showing distribution of compressive strength test results and air content test results. Include microwave test results for concretes with a water cementitious ratio less than or equal to 0.40 concrete.

3.13 EVALUATION AND ACCEPTANCE OF CONCRETE

A. Concrete Compression test will be evaluated by Engineer in accordance with ACI 301. If number of tests conducted is inadequate for evaluation of concrete or test results for any type of concrete fail to meet specified strength requirements, core tests may be required as directed by Engineer. Air content and parameters of air-void system shall meet requirements of this Section.

B. Core tests, when required, in accordance with ASTM C42 and ACI 301.

C. Should tested hardened concrete meet Specifications, Owner will pay for coring and testing of hardened concrete. Should tested hardened concrete not meet Specifications or should concrete have to be tested because Contractor did not

conform to Project specifications, Contractor shall pay for coring and testing of hardened concrete and for any corrective action required for unaccepted concrete.

3.14 ACCEPTANCE OF STRUCTURE

A. Acceptance of completed concrete Work will be according to provisions of ACI 301.

B. Concrete rejected due to entrained air content below specified limit will be accepted if any of following conditions are met:

1. ASTM C 457: Three concrete specimens tested in accordance with ASTM C 457 meet air void parameters of Part 2.
2. ASTM C 457: Three concrete specimens tested shall meet air void parameters of concrete reported and approved by Engineer in Part 1.
3. ASTM C 666, Test Procedure A: Test three concrete specimens removed from structure Concrete specimens tested shall have durability characteristics similar to that reported in Part 1.

END OF SECTION 033000

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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

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

II. MIXTURE PROPORTIONING DATA:		
Proportioning Based on (Check only one): Standard Deviation Analysis: _____(see section VIII) or Trial Mix Test Data: _____ (see Section IX)		
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

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

III. MATERIALS:		
Aggregates: (size; type; source; gradation report; specification)		
Coarse:		
Fine:		
Other Materials:	Type	Product-Manufacturer (Source)
Cement:		
Fly ash, slag, other pozzolans:		
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)		
Fly ash, slag, other pozzolans:		
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.

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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		

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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 = _____ %	

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

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 = _____ %	

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

X. OTHER REQUIRED TESTS		
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:

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

CONCRETE MIXTURE PROPORTIONS SUBMITTAL FORM

Mixture #
Project Name:

REQUIRED ATTACHMENTS	
	Coarse aggregate grading report
	Fine aggregate grading report
	Concrete compressive strength data used for calculation of required average strength and for calculation of standard deviation
	Chloride ion data and related calculations
	Admixture compatibility certification letter
	Shrinkage information per ASTM C157
	ASTM C 457
	Alkali Content Data and Calculations OR ASTM C1293, ASTM C1260, ASTM C 1567 or CE CRD-C662 Test report for each aggregate

SECTION 033713 - SHOTCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes shotcrete applied by the dry-mix or wet-mix process.

B. This Section includes the provision of all labor, materials, supervision and incidentals necessary to install shotcrete to horizontal, vertical and overhead surfaces to restore original surface condition and integrity.

1.3 DEFINITIONS

A. Shotcrete: Mortar or concrete pneumatically projected onto a surface at high velocity.

B. Dry-Mix Shotcrete: Shotcrete with most of the water added at nozzle.

C. Wet-Mix Shotcrete: Shotcrete with ingredients, including mixing water, mixed before introduction into delivery hose.

1.4 SUBMITTALS

A. Product Data: For manufactured materials and products including reinforcement and forming accessories, shotcrete materials, admixtures, and curing compounds.

B. Shop Drawings: For details of fabricating, bending, and placing reinforcement. Include support and anchor details, number and location of splices, and special reinforcement required for openings through shotcrete structures.

C. Design Mixes: For each shotcrete mix.

D. Material Test Reports: For shotcrete materials.

E. Material Certificates: For each material item, signed by manufacturers.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Shotcrete contractor shall have a minimum of three (3) years experience in the application performed. All Nozzlemen to perform work shall have a current ACI / ASA Nozzlemen Certification. A qualified installer employing nozzle operators who attain mean core grades not exceeding 2.5, according to ACI 506.2, on preconstruction tests.

B. Testing Agency Qualifications: Independent and qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548, and acceptable to authorities having jurisdiction.

C. Comply with provisions of the following, unless more stringent requirements are indicated:

1. ACI 301, "Specification for Structural Concrete".
2. ACI 506.2, "Specification for Shotcrete".
3. CRSI's "Manual of Standard Practice".

D. Pre-installation Conference: Conduct conference at Project site prior to start of Work. Coordinate with other scheduled meetings/site visits.

1.6 PROJECT CONDITIONS

A. Cold-Weather Shotcreting: Protect shotcrete work from physical damage or reduced strength caused by frost, freezing, or low temperatures according to ACI 306.1 and as follows:

1. Discontinue shotcreting when ambient temperature is 40 deg F (4.4 deg C) and falling. Uniformly heat water and aggregates before mixing to obtain a shotcrete shooting temperature of not less than 50 deg F (10 deg C) and not more than 90 deg F (32 deg C).
2. Do not use frozen materials or materials containing ice or snow.
3. Do not place shotcrete on frozen surfaces or surfaces containing frozen materials.
4. Do not use calcium chloride, salt, and other materials containing antifreeze agents.

B. Hot-Weather Shotcreting: Mix, place, and protect shotcrete according to ACI 305R when hot-weather conditions and high temperatures would seriously impair quality and strength of shotcrete, and as follows:

1. Cool ingredients before mixing to maintain shotcrete temperature at time of placement below 100 deg F (38 deg C) for dry mix or 90 deg F (32 deg C) for wet mix.
2. Decrease temperature of reinforcing steel and receiving surfaces below 100 deg F (38 deg C) before shotcreting.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

A. Forms: Form-facing panels that will provide continuous, straight, smooth, concrete surfaces. Furnish panels in largest practicable sizes to minimize number of joints.

2.2 SHOTCRETE MATERIALS

A. Shotcrete Cement and Blended Cements

1. Portland Cement: ASTM C 150, Type I. Use only one brand and type of cement for Project. Select supplementary cementing materials from subparagraphs below, if permitted. Blending of fly ash, slag, silica fume with Portland cement is done at ready-mix plant.
2. Fly Ash: ASTM C 618, Class F only. Class C Fly Ash Prohibited.
3. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
4. Silica Fume: ASTM C 1240, amorphous silica.

B. Normal-Weight Aggregates: ASTM C 33, from a single source, and as follows:

1. Aggregate Gradation: ACI 506R, Gradation No. 2 with 100 percent passing 1/2-inch (13-mm) sieve.
2. Coarse-Aggregate Class: 3S.

C. Coloring Agent: ASTM C 979, synthetic mineral-oxide pigments or colored, water-reducing admixtures, free of carbon black; color stable, nonfading, and resistant to lime and other alkalis.

1. Color: Match existing adjacent surfaces.

D. Water: Potable, complying with ASTM C 94, free from deleterious materials that may affect color stability, setting, or strength of shotcrete.

E. Ground Wire: High-strength steel wire, 0.8 to 1 mm in diameter.

2.3 CHEMICAL ADMIXTURES

A. General: ASTM C 1141, Class A or B, but limited to the following admixture materials. Provide admixtures for shotcrete that contains not more than 0.1 percent chloride ions. Certify compatibility of admixtures with each other and with other cementitious materials.

1. Air-Entraining Admixture: ASTM C 260.
2. Water-Reducing Admixture: ASTM C 494, Type A.
3. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
4. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.

5. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
6. Accelerating Admixture: ASTM C 494, Type C.

2.4 CURING MATERIALS

A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. (305 g/sq. m) dry.

B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

C. Water: Potable.

D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B.

2.5 SHOTCRETE MIXES, GENERAL

A. Prepare design mixes for each type and strength of shotcrete.

1. Limit use of fly ash, ground granulated blast-furnace slag, and silica fume to not exceed, in combination, 25 percent of portland cement by weight.

B. Limit water-soluble chloride ions to maximum percentage by weight of cement or cementitious materials permitted by ACI 301.

C. Admixtures: When included in shotcrete design mixes, use admixtures and retarding admixtures according to manufacturer's written instructions.

D. Design-Mix Adjustments: Subject to compliance with requirements, shotcrete design-mix adjustments may be proposed when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant.

2.6 NORMAL-WEIGHT SHOTCRETE MIXES

A. Proportion dry mixes by field test data methods and wet mixes according to ACI 211.1 and ACI 301, using materials to be used on Project, to provide normal-weight shotcrete with the following properties:

1. Compressive Strength (28 Days): 5,000 psi (34.5 MPa).
2. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight, wet-mix shotcrete having an air content before pumping of 7 percent with a tolerance of plus or minus 1-1/2 percent.

2.7 SHOTCRETE EQUIPMENT

A. Mixing Equipment: Capable of thoroughly mixing shotcrete materials in sufficient quantities to maintain continuous placement.

B. Dry-Mix Delivery Equipment: Capable of discharging aggregate-cement mixture into delivery hose under close control and maintaining continuous stream of uniformly mixed materials at required velocity to discharge nozzle. Equip discharge nozzle with manually operated water-injection system for directing even distribution of water to aggregate-cement mixture.

1. Provide uniform, steady supply of clean, compressed air to maintain constant nozzle velocity while simultaneously operating blow pipe for cleaning away rebound.
2. Provide water supply with uniform pressure at discharge nozzle to ensure uniform mixing with aggregate-cement mix. Provide water pump to system if line water pressure is inadequate.

C. Wet-Mix Delivery Equipment: Capable of discharging aggregate-cement-water mixture accurately, uniformly, and continuously.

2.8 BATCHING AND MIXING

A. Dry-Mix Process: Measure mix proportions by weight batching according to ASTM C 94 or by volume batching complying with ASTM C 685 requirements.

1. In volume batching, adjust fine-aggregate volume for bulking. Test fine-aggregate moisture content at least once daily to determine extent of bulking.
2. Pre-packaged shotcrete materials may be used at Contractor's option. Pre-dampen pre-packaged shotcrete materials and mix before use.

B. Wet-Mix Process: Measure, batch, mix, and deliver shotcrete according to ASTM C 94 and ASTM C 1116 and furnish batch ticket information if ready mix is used.

1. Comply with ASTM C 685 when shotcrete ingredients are delivered dry and proportioned and mixed on-site.

2. Pre-packaged shotcrete materials may be used at Contractor's option.

PART 3 - EXECUTION

3.1 PREPARATION

A. Concrete or Masonry: Before applying shotcrete, remove unsound or loose materials and contaminants that may inhibit shotcrete bonding. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2

inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces before shotcreting.

1. Abrasive blast or hydro-blast existing surfaces that do not require chipping to remove paint, oil, grease, or other contaminants and to provide roughened surface for proper shotcrete bonding.

3.2 FORMS

A. General: Design, erect, support, brace, and maintain forms, according to ACI 301, to support shotcrete and construction loads and to facilitate shotcreting. Construct forms so shotcrete members and structures are secured to prevent excessive vibration or deflection during shotcreting.

1. Fabricate forms to be readily removable without impact, shock, or damage to shotcrete surfaces and adjacent materials.
2. Construct forms to required sizes, shapes, lines, and dimensions using ground wires and depth gages to obtain accurate alignment, location, and grades in finished structures. Construct forms to prevent mortar leakage but permit escape of air and rebound during shotcreting. Provide for openings, offsets, blocking, screeds, anchorages, inserts, and other features required in the Work.

B. Form openings, chases, recesses, bulkheads, keyways, and screeds in formwork. Determine sizes and locations from trades providing such items. Accurately place and securely support items built into forms.

3.3 STEEL REINFORCEMENT

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

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other materials that weaken shotcrete bonding.

C. Securely embed reinforcing anchors into existing substrates, located as required.

D. Accurately position, support, and rigidly secure reinforcement against displacement by formwork, construction, or shotcreting. Locate and support reinforcement by metal chairs, runners, bolsters, spacers, and hangers, as required.

E. Place reinforcement to obtain minimum coverages for shotcrete protection. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during shotcreting. Set wire ties with ends directed into shotcrete, not toward exposed shotcrete surfaces.

F. Install welded wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 ALIGNMENT CONTROL

A. Ground Wires: Install ground wires to establish thickness and planes of shotcrete surfaces. Install ground wires at corners and offsets not established by forms. Pull ground wires taut and position adjustment devices to permit additional tightening.

3.5 APPLICATION

A. Apply temporary protective coverings and protect adjacent surfaces against deposit of rebound and overspray or impact from nozzle stream.

B. Moisten wood forms immediately before placing shotcrete where form coatings are not used.

C. Apply shotcrete according to ACI 506.2.

D. Apply dry-mix shotcrete materials within 45 minutes after pre-dampening and wet-mix shotcrete materials within 90 minutes after batching.

E. Deposit shotcrete continuously in multiple passes, to required thickness, without cold joints and laminations developing. Place shotcrete with nozzle held perpendicular to receiving surface. Begin shotcreting in corners and recesses.

   1. Remove and dispose of rebound and overspray materials during shotcreting to maintain clean surfaces and to prevent rebound entrapment.

F. Maintain reinforcement in position during shotcreting. Place shotcrete to completely encase reinforcement and other embedded items. Maintain steel reinforcement free of overspray and prevent build-up against front face during shotcreting.

G. Do not place subsequent lifts until previous lift of shotcrete is capable of supporting new shotcrete.

H. Do not permit shotcrete to sag, slough, or dislodge.

I. Remove hardened overspray, rebound, and laitance from shotcrete surfaces to receive additional layers of shotcrete; dampen surfaces before shotcreting.

J. Do not disturb shotcrete surfaces before beginning finishing operations.

K. Remove ground wires or other alignment control devices after shotcrete placement.

L. Installation Tolerances: Place shotcrete without exceeding installation tolerances permitted by ACI 117R, increased by a factor of 2.

3.6 SURFACE FINISHES

A. Finish Coat: After screeding to natural rod finish, apply shotcrete finish coat, 1/4 to 1 inch (6 to 25 mm) thick, using ACI 506R, No. 1 gradation, fine-screened sand modified

with maximum aggregate size not exceeding No. 4 (4.75-mm) sieve and apply steel-trowel, smooth, hard finish.

3.7 CURING

A. Protect freshly placed shotcrete from premature drying and excessive cold or hot temperatures.

B. Start initial curing as soon as free water has disappeared from shotcrete surface after placing and finishing.

C. Curing Exposed Surfaces: Cure shotcrete by the following methods:

1. Moisture Curing: Keep surfaces continuously moist for at least seven days with water, continuous water-fog spray, water-saturated absorptive covers, or moisture-retaining covers. Lap and seal sides and ends of covers.
2. Curing Compound: Apply curing compound uniformly in continuous operation by power spray according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.

    a. Apply curing compound to natural- or gun-finished shotcrete at rate of 1 gal./100 sq. ft. (1 L/2.5 sq. m).

D. Curing Formed Surfaces: Cure formed shotcrete surfaces by moist curing with forms in place for full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

3.8 FORM REMOVAL

A. Forms not supporting weight of shotcrete may be removed after curing at not less than 50 deg F (10 deg C) for 24 consecutive hours after gunning, provided shotcrete is hard enough not to be damaged by form-removal operations and provided curing and protecting operations are maintained.

1. Leave forms supporting weight of shotcrete in place until shotcrete has attained design compressive strength. Determine compressive strength of in-place shotcrete by testing representative field-cured specimens of shotcrete.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing materials are unacceptable for exposed surfaces. Apply new form-coating compound as specified for new formwork.

3.9 FIELD QUALITY CONTROL

A. Owner may engage a qualified independent testing agency to sample materials, visually grade cores, perform tests, and submit reports during shotcreting.

3.10 REPAIRS

A. Remove and replace shotcrete that is delaminated or exhibits laminations, voids, or sand/rock pockets exceeding limits for specified core grade of shotcrete.

1. Remove unsound or loose materials and contaminants that may inhibit bond of shotcrete repairs. Chip or scarify areas to be repaired to extent necessary to provide sound substrate. Cut edges square and 1/2 inch (13 mm) deep at perimeter of work, tapering remaining shoulder at 1:1 slope into cavity to eliminate square shoulders. Dampen surfaces and apply new shotcrete.

B. Repair core holes from in-place testing according to repair provisions in ACI 301 and match adjacent finish, texture, and color.

3.11 CLEANING

A. Remove and dispose of rebound and overspray materials from final shotcrete surfaces and areas not intended for shotcrete placement.

END OF SECTION 033713

SECTION 033761 – CAST IN PLACE 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 concrete repair mortar to horizontal surfaces and formed vertical and overhead surfaces to restore original surface condition and integrity.

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 Owner 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.

E. Testing Agency shall submit the following information for Field Testing of Concrete unless modified in writing by Engineer:

1. Project name and location.
2. Contractor's name.
3. Testing Agency's name, address, and phone number.
4. Mortar manufacturer.
5. Date of report.
6. Testing Agency technician's name (sampling and testing).
7. Placement location within structure.
8. Weather data:

a. Air temperatures.
b. Weather.
c. Wind speed.

9. Date, time, and place of test.
10. Compressive test data:

a. Cube number.
b. Age of mortar when tested.
c. Date and time of cube 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).

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”.

1.5 SUBMITTALS

A. Make submittals as specified in this Section and as required by Owner/Engineer. Provide (3) hard copies of submittals to Engineer. One copy with response/comments will be returned to Contractor, one copy forwarded to Owner, and one copy retained by Engineer for record purposes.

B. Contractor: At pre-construction 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 MATERIALS

A. Prior to submitting bid, Contractor shall be responsible to verify that materials intended to be used from lists below correspond to repair methods that will be utilized (i.e., form and pour, form and pump, horizontal application), per manufacturer's written data sheets. The following listed materials are not acceptable for <u>all</u> types of repair methods.

B. Horizontal Repair Mortar: Shall be pre-packaged, silica-fume-modified, cementitious repair mortar containing integral corrosion inhibitor, capable of horizontal pour and screed, partial and full depth applications, achieving a minimum 5,000 psi compressive strength at 28 days per ASTM C39 extended with aggregate as certified by manufacturer.

1. Acceptable materials with corrosion inhibitor for this Work are as follows:

a. Silica fume modified:

1) "Emaco S66 CI" or "Emaco R310 CI", by BASF Building Systems, Shakopee, MN.
2) "Eucocrete", by The Euclid Chemical Company, Cleveland, OH.
3) "Planitop 15" with "Planicrete AC" or "MAPECEM 202", by MAPEI Corporation, Deerfield Beach, FL.
4) "SikaTop 122 Plus", by Sika Corporation, Lyndhurst, NJ.

C. Form and Pour/Pump Repair Mortar: Flow-able, one-component, high strength silica-fume-modified repair mortar with 0.375 in. aggregate extendable, and containing an integral corrosion inhibitor. The product shall achieve minimum 3,000 psi compressive strength at 1 day and 8,000 psi compressive strength at 28 days per ASTM C39 extended at a 9-inch slump.

1. Acceptable materials for this Work are as follows:

a. Polymer/Silica fume modified:

1) "Emaco S77 CI", by BASF Building Systems, Shakopee, MN.

2) "Eucocrete Supreme" or "Concrete Top Supreme", by The Euclid Chemical Company, Cleveland, OH.
3) "Planitop 18 ES", by MAPEI Corporation, Deerfield Beach, FL

2.2 MATERIAL ACCESSORIES

A. Bonding Grout (for horizontal, un-formed surfaces): Bonding grout shall consist of sand and cement in proportions similar to mortar in concrete with sufficient water to form stiff slurry to achieve consistency of "pancake batter". Apply with brush to surface of existing concrete in repair areas. Surface of existing concrete shall be SSD.

B. Extended Open Time Epoxy Bonding Agent (for formed overhead/vertical surfaces): Three component, water based, epoxy modified portland cement bonding agent and corrosion inhibitor coating providing the recommended Manufacturer's open time in which to apply repair mortar. Product shall be capable of achieving bond strength of 2,700 psi per ASTM C 882.

1. Acceptable materials for this Work are:

a. "Emaco P24", by BASF Building Systems, Shakopee, MN.
b. "Duralprep A.C.", by The Euclid Chemical Company, Cleveland, OH.
c. "Planibond 3-C" or "Mapefer 1K", by Mapei Corporation, Deerfield Beach, FL.
d. "Sika Armatec 110 EpoCem", by Sika Corporation, Lyndhurst, NJ.

C. Epoxy Adhesive (for formed overhead/vertical surfaces): 2 or 3 component, 100 percent solids, 100 percent reactive compound suitable for use on dry or damp surfaces. Product shall be capable of achieving bond strength of 1,800 psi per ASTM C 882.

1. Acceptable materials for this Work are:

a. "Concresive Liquid LPL", by BASF Building Systems, Shakopee, MN.
b. "Kemko 001 or 008", by ChemCo Systems, Inc., Redwood City, CA.
c. "Euco #452 Epoxy" or "Duralcrete", by The Euclid Chemical Company, Cleveland, OH.
d. "Planibond EBA", by Mapei Corporation, Deerfield Beach, FL.
e. "Sikadur 32 Hi-Mod LPL", by Sika Corporation, Lyndhurst, NJ.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Preparation of surfaces to receive repair mortar shall be in accordance with Section "Surface Preparation for Patching" and manufacturer's written instructions. All unsound concrete, dust, debris, laitance, etc. shall be

removed from repair cavities. Cavity surfaces shall be wet to saturated surface dry condition prior to placement of repair material.

3.2 INSTALLATION

A. Mortar Placement: Properly proportioned and mixed mortar material shall be placed to consolidate mortar so that no voids exist within new material and continuous contact with base concrete is achieved.

B. Form and Pour Repair Mortar Placement: Mix and apply in strict accordance with manufacturer's written instructions, to achieve a maximum 9" slump.

3.3 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. "Confilm", by BASF Building Systems, Shakopee, MN.
   c. "Aquafilm", by Conspec Marketing & Manufacturing Co., Inc.
   d. "Sure-Film (J-74)", by Dayton Superior Corporation.
   e. "Eucobar" or "Tamms Surface Retarder", by The Euclid Chemical Company, Cleveland, OH.
   f. "E-Con", by L&M Construction Chemicals, Inc.
   g. "EVRT", by Russ Tech Admixtures, Inc.
   h. "SikaFilm", by Sika Corporation, Lyndhurst, NJ.

C. Immediately 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.
4. During initial and final curing periods maintain concrete above 50 deg F.
5. Prevent rapid drying at end of curing period.

D. Horizontal concrete surfaces shall be cured with moisture curing or moisture-retaining cover only; curing compounds prohibited.

E. Dissipating Curing Compound (for overhead or vertical surfaces only), (VOC Compliant, less than 350 g/l): Comply with ASTM C 309, Type 1, Class A or B. Moisture loss shall be not more than 0.55 kg/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", "Kurez RC", or "Kurez RC Off", The Euclid Chemical Company.
b. "RxCure WB", "RxCure VOC", or "W.B. Cure VOC", Conspec Marketing & Manufacturing.
c. "Kure N Seal W" or "Kure N Seal WB", BASF Building Systems, LLC.
d. "MAPECURE DR", by MAPEI Corporation, Deerfield Beach, FL.

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.
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: For overhead and vertical surfaces only; prohibited on horizontal surfaces. 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.

3.4 FIELD QUALITY CONTROL OF AGGREGATE EXTENDED MATERIAL

A. Testing Agency: Owner 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.

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mix exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
2. Determine strength at 3, 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.

3.5 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.

END OF SECTION 033761

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 waterproofing system, including all products specified in applicable Division 07 Sections.

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 slab-on-grade and supported slabs.

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.

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.

B. Submittals and Resubmittals: Engineer will review each of Contractor's shop drawings and/or submittal data the initial time and, should resubmittal be required, one additional time to verify that reasons for resubmittal have been addressed by Contractor and corrections made. Resubmittal changes/revisions/corrections shall be circled. Engineer will review only circled items and will not be responsible for non-circled changes/revisions/corrections and additions. Should additional resubmittals be required, Contractor shall reimburse Owner for all costs incurred, including the cost of Engineer's services made necessary to review such additional resubmittals. Owner shall in turn reimburse Engineer.

C. 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. RFI process shall not be used for requesting substitutions. Procedures for substitutions are clearly specified elsewhere in the Contract Documents.

1.4 ACTION SUBMITTALS

A. Product Data: For each system indicated at least 60 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. Three copies of System Maintenance Manual.

B. Five copies of snow removal guidelines for areas covered by Warranty.

C. 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.
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, 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 Michigan. 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 Owner and acceptable to Engineer.

E. Certifications:

1. Licensing/certification document from system manufacturer that confirms system installer is a licensed/certified applicator for the manufacturer.
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.

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.

C. At no time shall weight of stored material being placed on slab exceed total original design loads.

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 and Contractor shall furnish Owner written single source performance guarantee that the joint sealant 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. 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 period commencing with date of Substantial Completion.

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

E. Address the following in the terms of the Warranty:

1. Length of warranty.

2. Change in value of warranty – if any – based on length of remaining warranty period.
3. Transferability of warranty.
4. Responsibilities of each party.
5. Notification procedures.
6. Dispute resolution procedures.
7. 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.
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. MasterSeal SL-2 or MasterSeal SL-2 SG, BASF.
2. Iso-flex 880 GB or Iso-flex 881, Lymtal.
3. Dynatrol II-SG or Urexpan NR 200, Pecora.
4. Sikaflex-2c SL or Sikaflex-2c NS TG, Sika.
5. 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 for consideration for future projects.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to receive Work and report immediately in writing to Engineer any deficiencies in surface which render it unsuitable for proper execution of Work.

B. Coordinate and verify that related Work meets following requirements 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 sand-blast 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. Fill horizontal joints slightly recessed to avoid direct contact with wheel traffic.

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

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 deg F.

3.4 FIELD QUALITY CONTROL

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

1. Contractor, at Engineer's direction, shall cut out 15 lineal ft. of joint sealant at isolated/random locations for Engineer and Manufacturer's Representative inspection of sealant profile.
2. Contractor, at Engineer's direction, shall install 3 trial joint sections of 5 ft each. Contractor shall cut out joint sections, as selected by Engineer, for Engineer and Manufacturer's Representative inspection. Additional isolated/random removals may be required where sealant appears deficient.

B. Repair all joint sealant "cut out" sections.

C. Testing Agency:

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

END OF SECTION 079233

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 pavement markings systems as required per Drawings and Section 020010.

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

C. Related Work:

1. Pavement Marking Contractor shall verify compatibility with sealers, joint sealants, coatings, and all other existing and new surface treatments.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Provide product data as follows:

1. Manufacturer's certification that the material complies with standards referenced within this Section.
2. Intended paint use.
3. Pigment type and content.
4. Vehicle type and content.

C. Submit list of similar projects (minimum of 5) where pavement-marking paint has been in use for a period of not less than 2 yrs.

1.4 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg 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 markings 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 meet requirements of MPI #70.

1. All products shall have performance requirements of Type I and II of Federal Standard TT-P-1952E.
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 white paint 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. Color of yellow paint shall match federal color chip No. 33538. Color shall have daylight directional reflectance (without glass beads) of not less than 50% (relative to magnesium oxide) when tested in accordance with Federal Test Method Standard 141, Method 6121.

C. Color of blue paint 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. Color of green paint 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. Color of red paint 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. Color of black paint shall match federal color chip No. 37038. Black paint shall also meet Federal Specification TT-P-110.

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. Pavement markings shall not be placed until full cure of concrete slab and waterproofing materials.

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. Lay out all striping in each work area on each tier, using dimensions and details to match existing layout. Report any discrepancies, interferences or changes in striping due to field conditions to Engineer prior to painting. Pavement Marking Contractor shall be required to remove paint, repair surface treatment and repaint stripes not applied in strict accordance with Contract Drawings.

F. Where existing painted pavement markings and/or stripes conflict with new striping layout or must be removed due to installation which does not conform to contract requirements, remove existing paint markings, using care to avoid scarring substrate surface.

1. Concrete and Asphalt surfaces: Material shall be removed by methods acceptable to Engineer/Architect and cause as little damage as possible to surface texture of pavement. Methods, that can provide acceptable results, are grinding and air or shot blasting. Use of chemicals to remove pavement markings prohibited. Collect residue generated by removal of pavement markings and dispose of as required by all applicable laws and regulations. If grinding is used, lightly grind floor surface using wheel-mounted floor grinder or similar equipment with positive elevation control of grinder head. For all removal techniques: On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.
2. Traffic Topping/Membrane surfaces: Remove existing pavement markings by solvent washing or high-pressure water washing. Submit letter from traffic topping/membrane manufacturer certifying that solvents and/or water pressures are acceptable for this use and will not damage material. On test area, demonstrate to Owner acceptable removal of paint material and control of paint removal equipment to prevent substrate scarring.
3. Contractor shall not use paint, bituminous bond coat or other methods of covering markings to obliterate existing pavement markings.
4. Material deposited on existing surfaces 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.

G. 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.

H. Mixing:

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

I. 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. Minimum air shall be used to prevent overspray. Temperature during application shall be minimum of 40 deg F and rising, unless manufacturer requires higher minimum temperature. Maximum relative humidity shall be as required by manufacturer.

C. 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).

END OF SECTION 099120