



ALLIANCE CONSULTING ENGINEERS, INC.

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To:	Potential Bidders and Plan Holders	Project No. 19128-0029
Re:	Addendum No. 2	
Project:	Phase I and II Roadway Improvements to serve Project Dumping along MacMillan Park Drive near the Town of Fort Mill in unincorporated Lancaster County, South Carolina	
Date	July 2, 2020	
Bid Date:	July 9, 2020 at 2:00 P.M.	Page 1 of 28

This Addendum is issued pursuant to the Conditions of the Contract and is hereby made part of the Contract Documents and Technical Specifications for the Phase I and II Roadway Improvements to serve Project Dumping along MacMillan Park Drive near the Town of Fort Mill in unincorporated Lancaster County, South Carolina. The addendum serves to clarify, revise, and supersede information from Contract Documents and Specifications. The Bidder shall acknowledge receipt of this Addendum in the appropriate space on the Bid Form. All attachments, if any, are part of this document.

- 1. Advertisement For Bid (Section 00 11 13):** Addition of reference that bids will be received online via Lancaster County's "Open Solicitations" webpage (www.mylancaster.org) and the bid opening will be conducted virtually via Zoom. Added reference for how to receive invitation to virtual Bid Opening. Delete section in its entirety and replace.
- 2. Bid Form (Section 00 41 00):** Addition of Addendum No. 2 under Article 3 and removal of the Line Item for "Retiming of Traffic Signals" from the Base Bid. Delete section in its entirety and replace.
- 3. Cast In Place Concrete (Section 03 30 00):** Section 3.13.E.3 has been revised to include DRYLOK Powdered Masonry Waterproofer as an approved equal. Delete section in its entirety and replace.
- 4. Question:** There are 2 Base Bid Forms. Is one for MacMillan Park Drive and the other for SC Highway 160? Will they do one without the other?
 - Clarification:** The improvements are separated out into two (2) separate base bids due to the MacMillan Park Drive Improvements being funded by EDA Grant Funding and the SC Highway 160 Improvements being funded separately.
- 5. Question:** Please clarify who is supposed to pay for the Construction Materials Testing?
 - Clarification:** The Construction Materials Testing (CMT) will be paid for by the Owner. Please refer to Article 14 of the General Conditions (Section 00 70 00) for additional information on testing.

6. **Question:** Will all of the trees located down the road need to be removed and replanted?
- **Clarification:** All trees that are located within the Limits of Disturbance, as indicated on the Construction Plans, will need to be removed and replanted.
7. **Question: Is the Contractor responsible for relocating the signs (4 each)?**
- **Clarification:** Contractor is responsible for relocating the signs, as indicated on the Construction Plans.
8. **Question:** Is the Contractor responsible for relocation the existing light poles (3 each) or is that on the power company?
- **Clarification:** Contractor is responsible for relocating the existing light poles, as indicated on the Construction Plans.
9. **Question:** Is the Contractor responsible for relocating the communication pedestal/vaults/electrical vault/meters & transformer pad?
- **Clarification:** Contractor is responsible for demolition of the concrete transformer pad. Relocation of the communication pedestal/vaults and electrical vaults/meters will be the responsibility of the utility providers.
10. **Question:** Is the Contractor responsible for supplying the EDA sign and is there only one (1)?
- **Clarification:** Contractor is responsible for supplying the EDA sign and only one (1) sign will be required. Sign parameters are spelled out in Supplement to the General Conditions (Section 00 70 00) EDA Construction Site Sign Specifications.
11. **Question:** Are SCDOT Specifications to be used as well as EDA Specifications (Specifically, do we need stone backfill for pipe or can we use onsite soils)?
- **Clarification:** SCDOT Specifications are to be followed for the SC Highway 160 Improvements and for the MacMillan Park Drive Improvements the Project Specifications will be sufficient. The EDA Specifications that are required for this Project have been included in the Bid Documents.
12. **Question:** Who should be contacted regarding retiming of the traffic signals?
- **Clarification:** Retiming of traffic signals will not be included as part of the project scope and has been removed from the Bid Form.

Attachments:

- Advertisement For Bid (Section 00 11 13) – Two (2) Pages
- Bid Form (Section 00 41 00) – Seven (7) pages
- Cast In Place Concrete (Section 03 30 00) – Seventeen (17) pages

End of Addendum No. 2

SECTION 00 11 13

ADVERTISEMENT FOR BIDS

Owner: Lancaster County

Alliance Consulting Engineers, Inc. Project No.: 19128-0029

Separate sealed bids for construction of the **Roadway Improvements to Serve Project Dumping along MacMillan Park Drive and SC Highway 160 in unincorporated Lancaster County, South Carolina** for Lancaster County will be received online via Lancaster County's "Open Solicitations" webpage (www.mylancastersc.org) until **2:00PM** on **Thursday, July 9, 2020**, and then publicly opened and read aloud virtually via Zoom. Bidders should email Cathy McDaniel (CDMcDaniel@lancastersc.net) to receive an invitation to the virtual bid opening. Oral statements may not be relied upon and will not be binding or legally effective. The deadline for submitting questions is **July 2, 2020**.

Sealed BIDS may be mailed to:

Lancaster County Procurement Department
Post Office Box 1809
Lancaster, South Carolina 29720

Or, Sealed BIDS may be hand delivered to:

Lancaster County Procurement Department
101 N. Main Street
Lancaster, South Carolina 29720

This project consists of providing all required materials, equipment and labor necessary to complete the construction of **Roadway Improvements to Serve Project Dumping along MacMillan Park Drive and SC Highway 160 in unincorporated Lancaster County, South Carolina**. Generally, the project includes the construction of approximately 1,300 square yards (SY) of full depth asphalt, 3,500 SY of asphalt overlay, and 1,400 linear feet (LF) of concrete curb and gutter. Specific details are included within the Construction Plans and Technical Specifications.

The Instructions to Bidders, Bid Form, Contract, Plans, Specifications, Bid Bond, Performance Bond, Payment Bond and other Contract Documents may be examined at the following locations:

Lancaster County Procurement Department
101 N. Main Street
Lancaster, South Carolina 29720

HCAC and iSqFt Planroom Partnership: hcacarolinas@isqft.com
Dodge Plan Rooms: Dodge.Docs@construction.com

Engineers: Alliance Consulting Engineers, Inc., Post Office Box 8147, Columbia, SC 29202-8147

Drawings, Specifications, and Contract Documents may be obtained from the office of Alliance Consulting Engineers, Inc., Post Office Box 8147, Columbia, South Carolina 29202-8147 upon a non-refundable payment of **\$150** for each set. When requesting drawings, specifications or contract documents, provide the following information about your company: Mailing address; street (FedEx) address; telephone number; FAX number (if applicable) and email address.

Bidders should check Lancaster County's "Open Solicitations" web page for any addenda, updates, bid tab and award.

Bidders must deposit security with all bids. Security shall be in the form of a certified check or bid bond made payable to the Owner, and shall be for an amount equal to not less than five percent (5%) of the amount of the bid. Provisions of the security shall be as described in the Information for Bidders.

No bid will be considered unless the bidder is legally qualified under the provisions of the South Carolina Contractor's Licensing Law (SC Code of Laws as amended in 1999, Chapter 11, Sections 40-11-10 through 40-11-428). Contractors shall have current South Carolina and Lancaster County licensure and bond capacity prior to Bid Submission.

NOTICE TO BIDDERS: Each bidder shall fully acquaint themselves with the conditions relating to the scope and restrictions attending the execution of the work under the conditions of this Bid. The failure or omission of a bidder to acquaint themselves with existing conditions shall in no way relieve them of any obligation with respect to this Bid or to the contract. All amendments to and interpretations of this solicitation shall be in writing and issued by Alliance Consulting Engineers, Inc. Neither Lancaster County nor Alliance Consulting Engineers, Inc. shall be legally bound by any amendment or interpretation that is not in writing.

No bidder may withdraw the bid within sixty (60) days after the actual date of the opening and thereof.

The Owner reserves the right to waive any informality or to reject any or all bids. Lancaster County reserves the right to accept or reject any, all or any part of bids received as a result of this request, to waive any informalities or to cancel in part or in its entirety this request, if it is in its best interest to do so. Lancaster County will be sole judge as to whether bids submitted meet all requirements. All bids submitted shall become the property of Lancaster County. This solicitation does not commit Lancaster County to award a contract, to pay any cost incurred in the preparation of bids or to procure or contract for goods or services. Lancaster County is an Equal Opportunity Employer.

ENGINEERS

Alliance Consulting Engineers, Inc.
Post Office Box 8147
Columbia, South Carolina 29202-8147

OWNER

Lancaster County
101 N. Main Street
Lancaster, South Carolina 29720

The U.S. Department of Commerce Economic Development Administration is providing partial funding for this project (EDA Investment No. 04-01-07416).

**SECTION 00 41 00
BID FORM**

**Roadway Improvements to
Serve Project Dumping along MacMillan Park Drive and SC Highway 160
in unincorporated Lancaster County, South Carolina**

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ARTICLE 1 - BID RECIPIENT

1.01 This Bid is submitted to: By mail: In Person:

**Lancaster County Procurement Department
101 N. Main Street
Post Office Box 1809
Lancaster, South Carolina 29720**

1.02 The undersigned Bidder proposes and agrees, if this Bid is accepted, to enter into an Agreement with Owner in the form included in the Bidding Documents to perform all Work as specified or indicated in the Bidding Documents for the prices and within the times indicated in this Bid and in accordance with the other terms and conditions of the Bidding Documents.

ARTICLE 2 - BIDDER'S ACKNOWLEDGEMENTS

2.01 Bidder accepts all of the terms and conditions of the Instructions to Bidders, including without limitation those dealing with the disposition of Bid security. This Bid will remain subject to acceptance for sixty (60) days after the Bid opening, or for such longer period of time that Bidder may agree to in writing upon request of Owner.

ARTICLE 3 - BIDDER'S REPRESENTATIONS

3.01 In submitting this Bid, Bidder represents that:

A. Bidder has examined and carefully studied the Bidding Documents, the other related data identified in the Bidding Documents, and the following Addenda, receipt of which is hereby acknowledged.

<u>Addendum No.</u>	<u>Addendum Date</u>	<u>Initials</u>
<u>1</u>	<u>6/9/2020</u>	<u> </u>
<u>2</u>	<u>7/2/2020</u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>

B. Bidder has visited the Site and become familiar with and is satisfied as to the general, local and Site conditions that may affect cost, progress, and performance of the Work.

C. Bidder is familiar with and is satisfied as to all federal, state and local Laws and Regulations that may affect cost, progress and performance of the Work.

D. Bidder has carefully studied all: (1) reports of explorations and tests of subsurface conditions at or contiguous to the Site and all drawings of physical conditions in or relating to existing surface or subsurface structures at or contiguous to the Site (except Underground Facilities), which have been identified in Paragraph 4.02 of General Conditions, and (2) reports and drawings of Hazardous Environmental Conditions that have been identified in Paragraph 4.06 of General Conditions.

- E. Bidder has obtained and carefully studied (or accepts the consequences for not doing so) all additional or supplementary examinations, investigations, explorations, tests, studies and data concerning conditions (surface, subsurface and Underground Facilities) at or contiguous to the Site, which may affect cost, progress, or performance of the Work or which relate to any aspect of the means, methods, techniques, sequences, and procedures of construction to be employed by Bidder, including applying the specific means, methods, techniques, sequences, and procedures of construction expressly required by the Bidding Documents to be employed by Bidder, and safety precautions and programs incident thereto.
- F. Bidder does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for the determination of this Bid for performance of the Work at the price(s) bid and within the times and in accordance with the other terms and conditions of the Bidding Documents.
- G. Bidder is aware of the general nature of work to be performed by Owner and others at the Site that relates to the Work as indicated in the Bidding Documents.
- H. Bidder has correlated the information known to Bidder, information and observations obtained from visits to the Site, reports and drawings identified in the Bidding Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Bidding Documents.
- I. Bidder has given Owner and Engineer notice via posting on the Lexington County E-Procurement System Question and Answer Board of all conflicts, errors, ambiguities, or discrepancies that Bidder has discovered in the Bidding Documents, and that the public responses posted on the Lexington County E-Procurement System Question and Answer Board by the Owner or Engineer as resolution thereof are acceptable to Bidder.
- J. The Bidding Documents are generally sufficient to indicate and convey understanding of all terms and conditions for the performance of the Work for which this Bid is submitted.
- K. Bidder will submit written evidence of its authority to do business in the state where the Project is located not later than the date of its execution of the Agreement.

ARTICLE 4 - FURTHER REPRESENTATIONS

4.01 Bidder further represents that:

- A. This Bid is genuine and not made in the interest of or on behalf of any undisclosed individual or entity and is not submitted in conformity with any agreement or rules of any group, association, organization or corporation.
- B. Bidder has not directly or indirectly induced or solicited any other Bidder to submit a false or sham Bid.
- C. Bidder has not solicited or induced any individual or entity to refrain from bidding.
- D. Bidder has not sought by collusion to obtain for itself any advantage over any other Bidder or over Owner.

ARTICLE 5 – BASIS OF BID

Base Bid

5.01 Bidder will complete the Work in accordance with the Contract Documents for the following unit price(s):

Roadway Improvements to Serve Project Dumping along MacMillan Park Drive and SC Highway 160 in unincorporated Lancaster County, South Carolina (EDA Investment No. 04-01-07416 Scope Only)					
<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Bid Price</u>
1	Mobilization/Bonds	LS	1	\$	\$
2	Traffic Control	LS	1	\$	\$
3	Silt Fence	LF	1435	\$	\$
4	Construction Entrance/Exit	EA	1	\$	\$
5	Clearing and Grubbing	AC	2	\$	\$
6	Earthwork (Grading/Excavation/Backfill/Compaction)	LS	1	\$	\$
7	Demolition of Existing Curb and Gutter	LF	1500	\$	\$
8	Demolition of Existing Storm Drainage	LS	1	\$	\$
9	Convert Existing Catch Basin to Junction Box	LS	1	\$	\$
10	Remove & Relocate Existing Signage	LS	1	\$	\$
11	Remove & Relocate Existing Light Pole	LS	1	\$	\$
12	Remove & Relocate Existing Trees	LS	1	\$	\$
13	Concrete Curb and Gutter	LF	1500	\$	\$
14	8-Inch Aggregate Base Course (GABC)	SY	1100	\$	\$
15	4-Inch Asphalt Intermediate Binder Course (Type B)	SY	1100	\$	\$
16	2-Inch Asphalt Surface Course (Type B)	SY	4000	\$	\$
17	2-Inch Asphalt Milling	SY	2900	\$	\$
18	Asphalt Overlay Tack Coat	SY	2900	\$	\$
19	Striping/Signage	LS	1	\$	\$
20	Grassing	AC	1	\$	\$
21	Catch Basin	EA	2	\$	\$
22	Junction Box	EA	1	\$	\$
23	15-Inch RCP Storm Drainage	LF	20	\$	\$
24	24-Inch RCP Storm Drainage	LF	48	\$	\$
25	Flared End Section	EA	1	\$	\$
26	Inlet Protection	EA	3	\$	\$
27	Rip Rap Outlet Protection	SY	35	\$	\$
28	Rip Rap Check Dams	EA	7	\$	\$
29	Erosion Control Matting (North American Green SC-150)	SY	1100	\$	\$
30	Adjust Existing Wastewater Manhole Lid	LS	1	\$	\$

**Roadway Improvements to Serve Project Dumping along MacMillan Park Drive and SC Highway 160
in unincorporated Lancaster County, South Carolina**

<u>Item No.</u>	<u>Description</u>	<u>Unit</u>	<u>Estimated Quantity</u>	<u>Unit Price</u>	<u>Bid Price</u>
1	Mobilization/Bonds	LS	1	\$	\$
2	Traffic Control	LS	1	\$	\$
3	Silt Fence	LF	520	\$	\$
4	Construction Entrance/Exit	EA	1	\$	\$
5	Clearing and Grubbing	AC	1	\$	\$
6	Earthwork (Grading/Excavation/Backfill/Compaction)	LS	1	\$	\$
13	5-Inch (550 LBS/SY) Asphalt Aggregate Base Course (AABC) (Type B)	SY	320	\$	\$
14	2.27-Inch (250 LBS/SY) Asphalt Intermediate Binder Course (Type C)	SY	320	\$	\$
15	1.82-Inch (200 LBS/SY) Asphalt Surface Course (Type C)	SY	920		
16	2-Inch Asphalt Milling	SY	600	\$	\$
17	Asphalt Overlay Tack Coat	SY	600	\$	\$
18	Striping/Signage	LS	1	\$	\$
20	Grassing	AC	1	\$	\$
26	Rip Rap Check Dam	EA	7	\$	\$

Total Base Bid: \$

Dollars _____ Cents

(\$ _____)

Bidder acknowledges that estimated quantities are not guaranteed, and are solely for the purpose of comparison of Bids, and final payment for all Unit Price Bid items will be based on actual quantities, determined as provided in the Contract Documents.

ARTICLE 6 - TIME OF COMPLETION

6.01 Bidder agrees that the Work: Roadway Improvements to Serve Project Dumping along MacMillan Park Drive and SC Highway 160 in unincorporated Lancaster County, South Carolina is to be completed within one hundred eighty (180) calendar days for the Base Bid scope of work after the Notice to Proceed has been issued.

6.02 Bidder accepts the provisions of the Agreement as to liquidated damages in the event of failure to complete the Work within the Contract dates in the amount of \$1,500 per day for each calendar day required to complete the work in the manner and within the dates as stated in Paragraph 6.01 above.

ARTICLE 7 - ATTACHMENTS TO THIS BID

7.01 The following documents are attached to and made a condition of this Bid:

- A. Required Bid security in the form of five percent (5%) of the total bid amount.
- B. Power of Attorney.

ARTICLE 8 - DEFINED TERMS

8.01 The terms used in this Bid with initial capital letters have the meanings stated in the Instructions to Bidders and General Conditions.

ARTICLE 9 - BID SUBMITTAL

9.01 This Bid submitted by:

An Individual

Name (typed or printed): _____

By: _____ (SEAL)
(Individual's signature)

Title: _____

Doing business as: _____

A Partnership

Partnership Name: _____ (SEAL)

By: _____
(Signature of general partner -- attach evidence of authority to sign)

Title: _____

Name (typed or printed): _____

A Corporation

Corporation Name: _____ (SEAL)

State of Incorporation: _____

Type (General Business, Professional, Service, Limited Liability): _____

By: _____

(Signature -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____ (CORPORATE SEAL)

Attest _____

Date of Authorization to do business in [South Carolina] is ____ / ____ / ____.

A Joint Venture

Name of Joint Venture: _____

First Joint Venturer Name: _____ (SEAL)

By: _____

(Signature of first joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

Second Joint Venturer Name: _____ (SEAL)

By: _____

(Signature of second joint venture partner -- attach evidence of authority to sign)

Name (typed or printed): _____

Title: _____

(Each joint venturer must sign. The manner of signing for each individual, partnership, and corporation that is a party to the joint venture should be in the manner indicated above.)

Bidder's Business Address _____

Telephone No.: _____ Fax No.: _____

SUBMITTED on _____, 2020.

State Contractor License No. _____.

SECTION 03 30 00

CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SECTION INCLUDES

This section specifies cast-in place structural concrete.

1.02 RELATED SECTIONS

- A. Section 03 10 00 - Concrete Forms and Accessories

1.03 REFERENCES

- A. ACI 211.1 - Standard Practice for Selecting Proportions for Normal, Heavyweight, and Mass Concrete; American Concrete Institute International; 1991 (Reapproved 2009).
- B. ACI 211.2 - Standard Practice for Selecting Proportions for Structural Lightweight Concrete; American Concrete Institute International; 1998.
- C. ACI 301 - Specifications for Structural Concrete for Buildings; American Concrete Institute International; 2010.
- D. ACI 302.1R - Guide for Concrete Floor and Slab Construction; American Concrete Institute International; 1996.
- E. ACI 304R - Guide for Measuring, Mixing, Transporting, and Placing Concrete; American Concrete Institute International; 1989 (Reapproved 2000).
- F. ACI 305R - Hot Weather Concreting; American Concrete Institute International; 2010.
- G. ACI 306R - Cold Weather Concreting; American Concrete Institute International; 2010.
- H. ACI 308 - Standard Practice for Curing Concrete; American Concrete Institute International; 1992 (Reapproved 2008).
- I. ACI 318 - Building Code Requirements for Reinforced Concrete and Commentary; American Concrete Institute International; 2011.
- J. ACI 350R - Environmental Engineering Concrete Structures; American Concrete Institute International; 2006.
- K. ASTM A 185 - Standard Specification for Steel Welded Wire Fabric, Plain, for Concrete Reinforcement; 1997.
- L. ASTM A 497 - Standard Specification for Steel Welded Wire fabric, Deformed, for Concrete Reinforcement; 1997.
- M. ASTM A 615/A 615M - Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement; 1996a.
- N. ASTM C 33 - Standard Specification for Concrete Aggregates; 1999a.
- O. ASTM C 39/C 39M - Standard Test Method for Compressive Strength of Cylindrical

CAST-IN-PLACE CONCRETE

Concrete Specimens; 1999.

- P. ASTM C 94/C 94M - Standard Specification for Ready-Mixed Concrete; 2000.
- Q. ASTM C 150 - Standard Specification for Portland Cement; 1999a.
- R. ASTM C 171 - Standard Specification for Sheet Materials for Curing Concrete; 1997a.
- S. ASTM C 173 - Standard Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method; 1994a.
- T. ASTM C 260 - Standard Specification for Air-Entraining Admixtures for Concrete; 1998.
- U. ASTM C 309 - Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete; 1998a.
- V. ASTM C 494/C 494M - Standard Specification for Chemical Admixtures for Concrete; 1999a.
- W. ASTM C 618 - Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete; 1999.
- X. ASTM C 685 - Standard Specification for Concrete Made by Volumetric Batching and Continuous Mixing; 1998a.
- Y. ASTM C 881 - Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete; 1999.
- Z. ASTM C 1059 - Standard Specification for Latex Agents for Bonding Fresh to Hardened Concrete; 1999.
- AA. ASTM C 1107 - Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink); 1999.
- AB. ASTM E 1155 - Standard Test Method for Determining F(F) Floor Flatness and F(L) Floor Levelness Numbers; 1996.

1.04 SUBMITTALS

- A. Concrete mixture proportions shall be determined by the Contractor and submitted for review. The concrete mixture quantities of all ingredients per cubic meter yard and nominal maximum coarse aggregate size that will be used in the manufacture of each quality of concrete shall be stated. Proportions shall indicate the mass of cement, pozzolan and ground granulated blast-furnace (GGBF) slag when used, and water; the mass of aggregates in a saturated surface-dry condition; and the quantities of admixtures. The submission shall be accompanied by test reports from a laboratory complying with ASTM C 1077 which show that proportions thus selected will produce concrete of the qualities indicated. No substitution shall be made in the source or type of materials used in the work without additional tests to show the quality of the new material and concrete are satisfactory.
- B. The curing medium and methods to be used shall be submitted for review and approval.
- C. If concrete is to be placed under cold-weather conditions, the proposed materials, methods, and protection shall be submitted for approval.
- D. If concrete is to be placed under hot-weather conditions, the proposed material and methods shall be submitted for review and approval.

- E. Aggregate quality tests shall be submitted at least 30 days prior to start of concrete placement.
- F. The results of the initial mixer uniformity tests shall be submitted at least 5 days prior to the initiation of placing.
- G. Cementitious materials, including cement and pozzolan, (and Ground Granulated Blast Furnace Slag) will be accepted on the basis of the manufacturer's certification of compliance, accompanied by mill test reports that materials meet the requirements of the specification under which they are furnished. Certification and mill test reports shall be form samples taken from the particular lot furnished. No cementitious materials shall be used until notice of acceptance has been given by the Contracting Officer. Cementitious material will be subject to check testing from samples obtained at the source, at transfer points, or at the project site, as scheduled by the Contracting Officer, and such sampling will be by or under the supervision of the Owner at its expense. Material not meeting specifications shall be promptly removed from the site of work.
- H. Air-Entraining Admixture shall be certified for compliance with all specification requirements.
- I. Other chemical admixtures shall be certified for compliance with all specification requirements.
- J. Epoxy Resin and Latex Bonding Compound shall be certified for compliance with all specification requirements.
- K. Descriptive literature of the Non-shrink Grout proposed for use shall be furnished together with a certificate from the manufacturer stating that it is suitable for the application or exposure for which it is being considered.

1.05 PRE-CONCRETE CONFERENCE

- A. General: At least 15 days prior to submittal of design mixes, conduct a meeting to review proposed methods of concrete construction to achieve the required results.
- B. Agenda: Includes but is not limited to:
 - 1. Submittals.
 - 2. Coordination of work.
 - 3. Availability of material.
 - 4. Concrete mix design including admixtures.
 - 5. Methods of placing, finishing, and curing.
 - 6. Finish criteria required to obtain required flatness and levelness.
 - 7. Timing of floor finish measurements.
 - 8. Material inspection and testing.
- C. Attendees: Include but not limited to representatives of Contractor; subcontractors involved in supplying, conveying, placing, finishing, and curing concrete; Resident Engineer; and Consulting Engineer.
- D. Minutes of the meeting: Contractor shall take minutes and type and distribute the minutes to attendees within five days of the meeting.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Portland Cement: ASTM C150 Type I, I-P, or II.
- B. Fly Ash: ASTM C618, Class C or F including supplementary optional requirements relating to reactive aggregates and alkalis, and loss on ignition (LOI) not to exceed 5 percent.
- C. Coarse Aggregate: ASTM C33.
 - 1. Size #57
 - 2. Coarse aggregate for applied topping, encasement of steel columns, and metal pan stair fill shall be Size 789.
 - 3. Maximum size of coarse aggregates not more than one-fifth of narrowest dimension between sides of forms, one-third of depth of slabs, nor three-fourth of minimum clear spacing between reinforcing bars.
- D. Fine Aggregate: ASTM C33. Fine aggregate for applied concrete floor topping shall pass a No. 4 sieve, 10 percent maximum shall pass a No. 100 sieve.
- E. Mixing Water: Fresh, clean – potable or reclaimed.
- F. Admixtures:
 - 1. Water Reducing Admixture: ASTM C494, Type A and not contain more chloride ions than are present in municipal drinking water.
 - 2. Water Reducing, Retarding Admixture: ASTM C494, Type D and not contain more chloride ions than are present in municipal drinking water.
 - 3. High-Range Water-Reducing Admixture (Superplasticizer): ASTM C494, Type F or G, and not contain more chloride ions than are present in municipal drinking water.
 - 4. Non-Corrosive, Non-Chloride Accelerator: ASTM C494, Type C or E, and not contain more chloride ions than are present in municipal drinking water. Admixture manufacturer must have long-term non-corrosive test data from an independent testing laboratory of at least one year duration using an acceptable accelerated corrosion test method such as that using electrical potential measures.
 - 5. Air Entraining Admixture: ASTM C260.
 - 6. Calcium Nitrite corrosion inhibitor: ASTM C494 Type C.
 - 7. Concrete Waterproofing Admixture shall be included for the designated structures as specified in Section 07 16 16.
 - 8. Prohibited Admixtures: Calcium chloride, thiocyanate or admixtures containing more than 0.05 percent chloride ions are not permitted.
 - 9. Certification: Written conformance to the requirements above and the chloride ion content of the admixture prior to mix design review.
- R. Expansion Joint Filler: ASTM D1751.

- S. Sheet Materials for Curing Concrete: ASTM C171.
- T. Liquid Membrane-forming Compounds for Curing Concrete: ASTM C309, Type I, with fugitive dye. Compound shall be compatible with scheduled surface treatment, such as paint and resilient tile, and shall not discolor concrete surface.
- U. Non-Shrink Grout:
 - 1. ASTM C1107, pre-mixed, produce a compressive strength of at least 2500 psi at three days and 5000 psi at 28 days. Furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent bearing under a 4 foot by 4 foot base plate.
 - 2. Where high fluidity or increased placing time is required, furnish test data from an independent laboratory indicating that the grout when placed at a fluid consistency shall achieve 95 percent under an 18 inch by 36 inch base plate.

2.02 CONCRETE MIX DESIGN

- A. Mix Designs: Proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318. The concrete compressive strength F_c' shall be 4,000 psi unless otherwise indicated on the drawings.
 - 1. If trial mixes are used, make a set of at least 4 cylinders in accordance with ASTM C192 for test purposes from each trial mix; test two for compressive strength at 7 days and at 28 days.
 - 2. Submit a report of results of each test series, include a detailed listing of the proportions of trial mix or mixes, including cement, fly ash, admixtures, weight of fine and coarse aggregate per cubic yard measured dry rodded and damp loose, specific gravity, fineness modulus, percentage of moisture, air content, water-cement -fly ash ratio, and consistency of each cylinder in terms of slump. Include dry unit weight of lightweight structural concrete.
 - 3. Prepare a curve showing relationship between water-cement-fly ash ratio at 7-day and 28-day compressive strengths. Plot each curve using at least three specimens.
 - 4. If the field experience method is used, submit complete standard deviation analysis.
- B. After approval of mixes no substitution in material or change in proportions of approval mixes may be made without additional tests and approval of Resident Engineer or as specified. Making and testing of preliminary test cylinders may be carried on pending approval of cement and fly ash, providing Contractor and manufacturer certify that ingredients used in making test cylinders are the same. Resident Engineer may allow Contractor to proceed with depositing concrete for certain portions of work, pending final approval of cement and fly ash and approval of design mix.
- C. Cement Factor: Maintain minimum cement factors in Table I regardless of compressive strength developed above minimums. Fly ash may be substituted for up to 20 percent of the minimum cement factor at option of Contractor, except fly ash may not be used in concrete designated as architectural concrete.

TABLE I - CEMENT AND WATER FACTORS FOR CONCRETE

Concrete Strength	Water/Cement Ratio
Min. 28 Day Comp. Str. psi	Max. Water Cement Ratio
4000 ¹ .	0.45

1. If trial mixes are used, the proposed mix design shall achieve a compressive strength 1200 psi in excess of f_c .
- D. Maximum Slump: Maximum slump, as determined by ASTM C143 with tolerances as established by ASTM C94, for concrete to be vibrated shall be as shown in Table II.

TABLE II - MAXIMUM SLUMP, INCHES

Type of Construction	Normal Weight Concrete
Reinforced Footings and Substructure Walls	3 inches
Slabs, Beams, Reinforced Walls, and Building Columns	4 inches

- E. Slump may be increased by the use of the approved high-range water-reducing admixture (superplasticizer). Tolerances as established by ASTM C94. Concrete containing the high-range-water-reducing admixture may have a maximum slump of 9 inches. The concrete shall arrive at the job site at a slump of 2 inches to 3 inches. This should be verified, and then the high-range-water-reducing admixture added to increase the slump to the approved level.
- F. Air-Entrainment: Air-entrainment of normal weight concrete shall conform to Table III. Air-entrainment of lightweight structural concrete shall conform to Table IV. Determine air content by either ASTM C173 or ASTM C231.

TABLE III - TOTAL AIR CONTENT

Location	Air Content
Concrete Exposed to Weather	4.0% to 6.0%

- G. Concrete slabs placed at air temperatures below 50 degrees Fahrenheit use non-corrosive, non-chloride accelerator. Concrete required to be air entrained use approved air entraining admixture. Pumped concrete, synthetic fiber concrete, architectural concrete, concrete required to be watertight, and concrete with a water/cement ratio below 0.50 use high-range water-reducing admixture (superplasticizer).
- H. Durability: Use air entrainment for exterior exposed concrete subjected to freezing and thawing and other concrete shown or specified. Air content as shown in Table III.
- I. Enforcing Strength Requirements: Test as specified in Section 01 45 23, TESTING LABORATORY SERVICES, during the progress of the work. Seven-day tests may be used as indicators of 28-day strength. Average of any three 28-day consecutive strength tests of laboratory-cured specimens representing each type of concrete shall be equal to or greater than specified strength. No single test shall be more than 500 psi below specified strength. Interpret field test results in accordance with ACI 214. Should strengths shown by test specimens fall below required values, Resident Engineer may require any one or any combination of the following corrective actions, at no additional cost to the Owner:

1. Require changes in mix proportions by selecting one of the other appropriate trial mixes or changing proportions, including cement content, of approved trial mix.
2. Require additional curing and protection.
3. If five consecutive tests fall below 95 percent of minimum values given in Table I or if test results are so low as to raise a question as to the safety of the structure, Resident Engineer may direct Contractor to take cores from portions of the structure. Use results from cores tested by the Contractor retained testing agency to analyze structure.
4. If strength of core drilled specimens falls below 85 percent of minimum value given in Table I, Resident Engineer may order load tests, made by Contractor retained testing agency, on portions of building so affected. Load tests in accordance with ACI 318 and criteria of acceptability of concrete under test as given therein.
5. Concrete work, judged inadequate by structural analysis, by results of load test, or for any reason, shall be reinforced with additional construction or replaced, if directed by the Resident Engineer.

PART 3 EXECUTION

3.01 PREPARATION

A. Mixing

1. All concrete shall be ready-mixed concrete and shall be mixed and delivered in accordance with the requirements of "Specifications for Ready-Mixed Concrete", ASTM C94 and ACI 318 to produce concrete with the required strength, slump and air content.
2. The concrete producer shall furnish with each load of concrete a numbered delivery ticket showing name of Contractor, name and location of project, date and time batched, truck number, number of cubic yards in load, specified strength, slump, and mix design number.
3. In the event concrete is mixed at a central batching plant, the delivery shall be arranged so that intervals between batches are kept at a minimum, and in any event not more than thirty (30) minutes. Trucks shall be in first class condition and kept in constant rotation during delivery.
4. When concrete is delivered in a truck mixer or agitator, no water from the truck water system or elsewhere shall be added after the initial introduction of mixing water for the batch, except when on arrival at the job site the slump of the concrete is less than that specified. Such additional water to bring the slump within required limits shall be injected into the mixer, provided the maximum water-cement ratio specified is not exceeded. The drum or blades shall be turned an additional 30 revolutions or more at mixing speed until the concrete is within the proper slump limits.

- B.** Discharge of concrete after initial batching shall be completed within 90 minutes, or before the drum has revolved 300 revolutions, whichever comes first, after the introduction of the mixing water to the cement and aggregates. In hot weather (as defined by ACI) the discharge of the concrete shall be completed within 60 minutes.

- C. Maximum delivery temperature of concrete shall be 100°F. Minimum delivery temperature as follows:

Atmospheric Temperature	Minimum Concrete Temperature
30 degrees to 40 degrees F	60 degrees F
0 degrees to 30 degrees F	70 Degrees F

3.02 VAPOR BARRIER

- A. Except where membrane waterproofing is required, interior concrete slab on grade shall be placed on a continuous vapor barrier as specified in Section 07 19 00.
1. Vapor barrier joints lapped 6 inches and sealed with compatible waterproof pressure-sensitive tape.
 2. Patch punctures and tears.

3.03 CONSTRUCTION JOINTS

- A. Unless otherwise shown, location of construction joints to limit individual placement shall not exceed 95 feet in any horizontal direction, except slabs on grade which shall have construction joints shown. Allow 48 hours to elapse between pouring adjacent sections unless this requirement is waived by Resident Engineer.
- B. Locate construction joints in suspended floors near the quarter-point of spans for slabs, beams or girders, unless a beam intersects a girder at center, in which case joint in girder shall be offset a distance equal to twice width of beam. Provide keys and inclined dowels as shown. Provide longitudinal keys as shown.
- C. Place concrete for columns slowly and in one operation between joints. Install joints in concrete columns at underside of deepest beam or girder framing into column.
- D. Allow 2 hours to elapse after column is cast before concrete of supported beam, girder or slab is placed. Place girders, beams, grade beams, column capitals, brackets, and haunches at the same time as slab unless otherwise shown.
- E. Install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal. Waterstops selection shall be defined in specification section 03 10 00.

3.04 EXPANSION JOINTS

- A. Clean expansion joint surfaces before installing pre-molded filler and placing adjacent concrete.
- B. Where indicated install polyvinyl chloride or rubber water seals, as shown in accordance with manufacturer's instructions, to form continuous watertight seal and as specified in Section 03 10 00.

3.05 PLACING CONCRETE

- A. Preparation:
1. Remove hardened concrete, wood chips, shavings and other debris from forms.
 2. Remove hardened concrete and foreign materials from interior surfaces of mixing and conveying equipment.

3. Have forms and reinforcement inspected and approved by Resident Engineer before depositing concrete.
 4. Provide runways for wheeling equipment to convey concrete to point of deposit. Keep equipment on runways which are not supported by or bear on reinforcement. Provide similar runways for protection of vapor barrier on coarse fill.
- B. Bonding: Before depositing new concrete on or against concrete which has been set, thoroughly roughen and clean existing surfaces of laitance, foreign matter, and loose particles.
1. Preparing surface for applied topping:
 - a. Remove laitance, mortar, oil, grease, paint, or other foreign material by sand blasting. Clean with vacuum type equipment to remove sand and other loose material.
 - b. Broom clean and keep base slab wet for at least four hours before topping is applied.
 - c. Use a thin coat of one part Portland cement, 1.5 parts fine sand, bonding admixture; and water at a 50: 50 ratio and mix to achieve the consistency of thick paint. Apply to a damp base slab by scrubbing with a stiff fiber brush. New concrete shall be placed while the bonding grout is still tacky.
- C. Conveying Concrete: Convey concrete from mixer to final place of deposit by a method which will prevent segregation. Method of conveying concrete subject to approval of Resident Engineer.
- D. Placing: For special requirements see Paragraphs, HOT WEATHER and COLD WEATHER.
1. Do not place concrete when weather conditions prevent proper placement and consolidation, or when concrete has attained its initial set, or has contained its water or cement content more than 1 1/2 hours.
 2. Deposit concrete in forms as near as practicable in its final position. Prevent splashing of forms or reinforcement with concrete in advance of placing concrete.
 3. Do not drop concrete freely more than 10 feet for concrete containing the high-range water-reducing admixture (superplasticizer) or 5 feet for conventional concrete. Where greater drops are required, use a tremie or flexible spout (canvas elephant trunk), attached to a suitable hopper.
 4. Discharge contents of tremies or flexible spouts in horizontal layers not exceeding 20 inches in thickness, and space tremies such as to provide a minimum of lateral movement of concrete.
 5. Continuously place concrete until an entire unit between construction joints is placed. Rate and method of placing concrete shall be such that no concrete between construction joints will be deposited upon or against partly set concrete, after its initial set has taken place, or after 45 minutes of elapsed time during concrete placement.
 6. On bottom of members with severe congestion of reinforcement, deposit 1 inch layer of flowing concrete containing the specified high-range water-reducing admixture (superplasticizer). Successive concrete lifts may be a continuation of this concrete or concrete with a conventional slump.

7. Concrete on metal deck:
 - a. Concrete on metal deck shall be minimum thickness shown. Allow for deflection of steel beams and metal deck under the weight of wet concrete in calculating concrete quantities for slab.

E. Consolidation: Conform to ACI 309. Immediately after depositing, spade concrete next to forms, work around reinforcement and into angles of forms, tamp lightly by hand, and compact with mechanical vibrator applied directly into concrete at approximately 18 inch intervals. Mechanical vibrator shall be power driven, hand operated type with minimum frequency of 5000 cycles per minute having an intensity sufficient to cause flow or settlement of concrete into place. Vibrate concrete to produce thorough compaction, complete embedment of reinforcement and concrete of uniform and maximum density without segregation of mix. Do not transport concrete in forms by vibration.

1. Use of form vibration shall be approved only when concrete sections are too thin or too inaccessible for use of internal vibration.
2. Carry on vibration continuously with placing of concrete. Do not insert vibrator into concrete that has begun to set.

3.06 HOT WEATHER

A. Follow the recommendations of ACI 305 or as specified to prevent problems in the manufacturing, placing, and curing of concrete that can adversely affect the properties and serviceability of the hardened concrete. Methods proposed for cooling materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Resident Engineer.

3.07 COLD WEATHER

A. Follow the recommendations of ACI 306 or as specified to prevent freezing of concrete and to permit concrete to gain strength properly. Use only the specified non-corrosive, non-chloride accelerator. Do not use calcium chloride, thiocyanates or admixtures containing more than 0.05 percent chloride ions. Methods proposed for heating materials and arrangements for protecting concrete shall be made in advance of concrete placement and approved by Resident Engineer.

3.08 PROTECTION AND CURING

A. Conform to ACI 308: Initial curing shall immediately follow the finishing operation. Protect exposed surfaces of concrete from premature drying, wash by rain and running water, wind, mechanical injury, and excessively hot or cold temperatures. Keep concrete not covered with membrane or other curing material continuously wet for at least 7 days after placing, except wet curing period for high-early-strength concrete shall be not less than 3 days. Keep wood forms continuously wet to prevent moisture loss until forms are removed. Cure exposed concrete surfaces as described below. Other curing methods may be used if approved by Resident Engineer.

1. Liquid curing and sealing compounds: Apply by power-driven spray or roller in accordance with the manufacturer's instructions. Apply immediately after finishing. Maximum coverage 400 square feet per gallon on steel troweled surfaces and 300 square feet per gallon on floated or broomed surfaces for the curing/sealing compound.
2. Plastic sheets: Apply as soon as concrete has hardened sufficiently to prevent surface damage. Utilize widest practical width sheet and overlap adjacent sheets 2 inches. Tightly seal joints with tape.

3. Paper: Utilize widest practical width paper and overlap adjacent sheets 2 inches. Tightly seal joints with sand, wood planks, pressure-sensitive tape, mastic or glue.

3.09 REMOVAL OF FORMS

- A. Remove in a manner to assure complete safety of structure after the following conditions have been met.
 1. Where structure as a whole is supported on shores, forms for beams and girder sides, columns, and similar vertical structural members may be removed after 24 hours, provided concrete has hardened sufficiently to prevent surface damage and curing is continued without any lapse in time as specified for exposed surfaces.
 2. Take particular care in removing forms of Architectural exposed concrete to insure surfaces are not marred or gouged, and that corners and arises are true, sharp and unbroken.
- B. Control Test: Use to determine if the concrete has attained sufficient strength and curing to permit removal of supporting forms. Cylinders required for control tests taken in accordance with ASTM C172, molded in accordance with ASTM C31, and tested in accordance with ASTM C39. Control cylinders cured and protected in the same manner as the structure they represent. Supporting forms or shoring not removed until strength of control test cylinders have attained at least 70 percent of minimum 28-day compressive strength specified. For post-tensioned systems supporting forms and shoring not removed until stressing is completed. Exercise care to assure that newly unsupported portions of structure are not subjected to heavy construction or material loading.

3.10 CONCRETE SURFACE PREPARATION

- A. Metal Removal: Unnecessary metal items cut back flush with face of concrete members.
- B. Patching: Maintain curing and start patching as soon as forms are removed. Do not apply curing compounds to concrete surfaces requiring patching until patching is completed. Use cement mortar for patching of same composition as that used in concrete. Use white or gray Portland cement as necessary to obtain finish color matching surrounding concrete. Thoroughly clean areas to be patched. Cut out honeycombed or otherwise defective areas to solid concrete to a depth of not less than 1 inch. Cut edge perpendicular to surface of concrete. Saturate with water area to be patched, and at least 6 inches surrounding before placing patching mortar. Give area to be patched a brush coat of cement grout followed immediately by patching mortar. Cement grout composed of one part Portland cement, 1.5 parts fine sand, bonding admixture, and water at a 50:50 ratio, mix to achieve consistency of thick paint. Mix patching mortar approximately 1 hour before placing and remix occasionally during this period without addition of water. Compact mortar into place and screed slightly higher than surrounding surface. After initial shrinkage has occurred, finish to match color and texture of adjoining surfaces. Cure patches as specified for other concrete. Fill form tie holes which extend entirely through walls from unexposed face by means of a pressure gun or other suitable device to force mortar through wall. Wipe excess mortar off exposed face with a cloth.
- C. Upon removal of forms, clean vertical concrete surface that is to receive bonded applied cementitious application with wire brushes or by sand blasting to remove unset material, laitance, and loose particles to expose aggregates to provide a clean, firm, granular surface for bond of applied finish.

3.11 CONCRETE SLAB FINISHES

A. General

1. Finish slab concrete per the requirements of ACI 302.1R.
2. Use manual screeds, vibrating screeds, or roller compacting screeds to place concrete level and smooth.
3. Do not use "jitterbugs" or other special tools designed for purpose of forcing coarse aggregate away from surface and allowing layer of mortar, which will be weak and cause surface cracks or delamination, to accumulate.
4. Do not dust surfaces with dry materials.
5. Round off edges of slabs with steel edging tool, except where cove finish is shown. Steel edging tool radius shall be 1/4 inch for slabs subject to wheeled traffic.

B. Type S-1 (Bull Float Finish):

1. Finish slab to receive fill and mortar setting bed by screeding with straightedges to bring surface to required finish plane.
2. Wood float finish to compact and seal surface.
3. Remove laitance and leave surface clean.
4. Coordinate with other finish procedures.

C. Type S-2 (Steel Troweled Finish):

1. Finish by screeding and floating with straightedges to bring surfaces to required finish elevation. Use evaporation retardant.
2. While concrete is still green, but sufficiently hardened to bear a person's weight without deep imprint, wood float to true, even plane with no coarse aggregate visible.
3. Use sufficient pressure on wood floats to bring moisture to surface.
4. After surface moisture has disappeared, hand trowel concrete to produce smooth, impervious surface, free from trowel marks.
5. Burnish surface with an additional troweling. Final troweling shall produce ringing sound from trowel.
6. Do not use dry cement or additional water during troweling, nor will excessive troweling be permitted.
7. Power Finishing:
 - a. Approved power machine may be used in lieu of hand finishing in accordance with directions of machine manufacturer.
 - b. Do not use power machine when concrete has not attained necessary set to allow finishing without introducing high and low spots in slab.

D. Type S-4 (Broomed Finish):

1. Finish as specified for Type S-1 floor finish, except omit final troweling and finish surface by drawing fine-hair broom lightly across surface.
2. Broom in same direction and parallel to expansion joints, or, in the case of inclined slabs, perpendicular to slope, except for round roof slab, broom surface in radial direction.

3.12 CONCRETE SLAB TOLERANCES

- A. Concrete Thickness Tolerances shall be 3/8 inch greater or 1/4 inch less than specified as specified in ACI code section 117.
- B. Concrete Level Tolerances shall be F_r25 as defined in ACI code section 117 or 1/4 inch gap under an unlevelled 10 ft. straightedge.
- C. Slope slabs to floor drain and gutter, and shall adequately drain regardless of tolerances.

3.13 CONCRETE WALL FINISHES

A. Type W-1 (Ordinary Wall Finish):

1. Point & Patch tie holes.
2. Knock off projections.
3. Patch defective areas.

B. Type W-2 (Smooth Wall Finish):

1. Point & Patch tie holes.
2. Grind off projections, fins, and rough spots.
3. Patch defective areas and repair rough spots resulting from form release agent failure or other reasons to provide smooth uniform appearance.

C. Type W-4 (Smooth Rubbed Wall Finish):

1. Only water curing will be permitted on walls being rubbed.
2. Patch and repair defective areas as specified for Type W-2.
3. Perform rubbing while green concrete can be physically worked and smoothed without adding other materials, if structurally possible, the day following placement. Finish no later than 3 days after placement has been completed.
4. Remove forms at such a rate that all finishing, form tie filling, fin removal, and patching can be completed on same day forms are removed while curing wall.
5. After pointings have set sufficiently to permit working on surface, thoroughly saturate entire surface with water for period of 3 hours and rub until uniform surface is obtained.
6. Rub either by hand with carborundum stone of medium-coarse grade or abrasive of equal quality, or mechanically operated carborundum stone.

7. Mechanically operated carborundum stones shall be approved by Engineer before concrete finishing.
8. No cement grout, other than cement paste drawn from the concrete itself by the rubbing process shall be used.
9. Finish Paste Formed by Rubbing by Either Brushing or Floating as Follows:
 - a. Brushing:
 - i. Carefully strike with clean brush.
 - ii. Brush in long direction of surface being finished.
 - b. Floating:
 - i. Spread uniformly over surface and allow to reset.
 - ii. Finish by floating with canvas, carpet face, or cork float, or rub down with dry burlap.
9. Continue water curing of wall during finishing operation in areas not being rubbed.
10. Move water curing onto rubbed areas as soon as water will not erode rubbed surface.

E. Type W-5 (Cementitious water-proof coating)

1. Patch and repair defective areas as specified for Type W-2.
2. Substrate must be clean, sound, and free of surface contaminants. Remove dust, laitance, grease, oils, curing compounds, form release agents and all foreign particles by mechanical means. An open-textured, sandpaper-like substrate is ideal. Substrate shall be in accordance with ICRI Guideline No. 03732 for coatings and fall within CSP4. All surfaces must be saturated surface dry (SSD), with no standing water at time of application.
3. Apply cementitious water proof coating identified as Thoroseal by ChemRex, Inc., Sealcoat 1000 by Dayton Superior, SikaTop 144 by the Sika Corporation, or DRYLOK Basement & Masonry Waterproofer by UGL per the manufacturer's recommendations and as described below:
 - a. Thoroseal by ChemRex Inc.
 1. Prepare a mixing solution of 1 part Acryl 60 and 3 parts water.
 2. Mix one 50-pound bag of Thoroseal with 8 quarts of mixing solution from item 1 above.
 3. 1st coat shall be applied at a rate of 225 sq. feet per 50lb bag.
 4. 2nd coat shall be applied at a rate of 450 sq. feet per 50lb bag.
 - b. Sealcoat 1000 by Dayton Superior
 1. Prepare a mixing solution of 1 part Ad Bond (J-40) to 3 parts clean water.

2. Mix one 50lb bag of Sealcoat 1000 with 8 quarts of mixing solution from item 1 above.
 3. 1st coat shall be applied at a rate of 225 sq. feet per 50lb bag.
 4. 2nd coat shall be applied at a rate of 450 sq. feet per 50lb bag.
- c. Sikatop 144 by Sika Corporation
1. Mix components A and B at a 1:1.647 by weight ratio
 2. 1st coat 100 sq. feet per gallon
 3. 2nd coat 150 sq. feet per gallon
- d. DRYLOK Basement & Masonry Waterproofer by UGL
1. Add 2 pints of cold water for each 10 pounds (7 pints per 35 pound container) of DRYLOK Powdered Basement & Masonry Waterproofer
 2. Stir until mixture is free of lumps. Thin with an additional 2 pints (950 mL) of water for normal application or 1.5 pints (750 mL) of water for heavy applications.
 3. Wait for 15 minutes, restir and apply. Allow first coat to dry 12 to 24 hours drying time and repeat first coat procedures. Recommended film thickness per coat is a maximum of 15 wet mils per coat, 1.24 lbs/sq. yard.

3.14 CONCRETE WALL TOLERANCES

- A. Concrete Wall Tolerances shall be as defined in specification section "03 10 00 Concrete Forming and Accessories" and as indicated in ACI code section 301.

3.15 BEAM AND COLUMN FINISHES (B=Beam, C=Column)

- A. Type B-1: Match wall Type W-1.
- B. Type B-2: Match wall Type W-2.
- C. Type B-3: Match wall Type W-3
- D. Type B-4: Match wall Type W-4
- E. Type B-5: Match wall Type W-5
- F. Type C-1: Match wall Type W-1.
- G. Type C-2: Match wall Type W-2.
- H. Type C-3: Match wall Type W-3
- I. Type C-4: Match wall Type W-4
- J. Type C-5: Match wall Type W-5.

3.16 CONCRETE BEAM AND COLUMN TOLERANCES

- A. Concrete Beam and Column Tolerances shall be as defined in specification section "03 10 00 Concrete Forming and Accessories" and as indicated in ACI code section 301.

3.17 BACKFILL AGAINST WALLS

- A. Do not backfill against walls until concrete has obtained specified 28 day compressive strength.
- B. Place backfill simultaneously on both sides of wall, where required, to prevent differential pressures.

3.18 FIELD QUALITY CONTROL

- A. An independent testing agency will perform field quality control tests, as specified in Section 01 40 00.
- B. Provide free access to concrete operations at project site and cooperate with appointed firm.
- C. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of concrete operations.
- D. Tests of concrete and concrete materials may be performed at any time to ensure conformance with specified requirements.
- E. Compressive Strength Tests: ASTM C39/C39M. For each test, mold and cure three concrete test cylinders. Obtain test samples for every 100 cu yd or less of each class of concrete placed.
- F. Take one additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- G. Perform one slump test for each set of test cylinders taken, following procedures of ASTM C143/C143M.
- H. Concrete cylinder tests:
 - 1. During construction, prepare test cylinders for compressive strength testing, using 6-inch diameter by 12-inches long single use molds, complying with ASTM C31.
 - a. Make a set of three test cylinders from each pour of 50 cubic yards or less, plus one additional set of cylinders for each additional 50 cubic yards or fraction thereof.
 - b. Identify each and tag cylinder as to date of pour and location of concrete which it represents.
 - c. Deliver cylinders to testing lab selected by the Owner.
 - d. Cost for preparation and delivery of cylinders shall be borne by the Contractor. Cost for testing cylinders will be borne by the Owner.
 - 2. Should strengths shown by test cylinders fail to meet specified strengths for the concrete represented, then:
 - a. Engineer shall have the right to require changes in the mix proportions as he deems necessary on the remainder of the work.
 - b. Additional curing of those portions of the structure represented by the failed test cylinders shall be accomplished as directed by the Engineer.
 - c. Upon failure of the additional curing to bring the concrete up to specified strength requirements, strengthening or replacement of those portions of the structure shall be as directed by the Engineer.
 - d. The Engineer may require additional testing of concrete in question by either non-destructive methods such as the Swiss Hammer, Windsor Probe or Ultrasonics or by coring and testing the concrete in question in accordance with ASTM C42. Such testing shall be performed at no additional cost to the Owner.
- I. Other field concrete tests:
 - 1. Slump tests: Either the Engineer or a testing laboratory representative will make slump tests of concrete as it is discharged from the mixer.
 - a. Slump test may be made on any concrete batch at the discretion of the Engineer.

- b. Failure to meet specified slump requirements (prior to addition of any superplasticizers) will be cause for rejection of the concrete.
- 2. Temperature: The concrete temperature may be checked at the discretion of the Engineer.
- 3. Entrained air: Air content of the concrete will be checked by a representative of the testing laboratory at the discretion of the Engineer.
- J. Coordination of laboratory services: The Contractor shall be responsible for coordination of laboratory services.
 - 1. Maintain a log recording quantities of each type of concrete placed, date and location of pour.
 - 2. Inform the testing laboratory of locations and dates of concrete placement and other information as required to be identified in the laboratory's test reports.
- K. Tests required because of extensive honeycombing, poor consolidation of the concrete or any suspected deficiency in the concrete will be paid for by the Contractor.
- L. Dimensional tolerances:
 - 1. Dimensional tolerances for allowable variations from dimensions or locations of concrete work, including the locations of embedded items shall be as given in ACI 301.
 - 2. Where anchor bolts or other embedded items are required for equipment installation, comply with the manufacturer's tolerances if more stringent than those stated in ACI 301.
- M. Watertight concrete:
 - 1. All liquid containing structures, basements or pits below grade shall be watertight.
 - 2. Any visible leakage or seepage shall be repaired as instructed by the Engineer at no expense to the Owner.
 - 3. Where physical evidence of honeycombing, cold joints or other deficiencies which may impair the watertightness of a structure exists, the Engineer may at his discretion call for leak testing of the structure.
 - a. Fill the structure with water and allow to stand for not less than forty-eight (48) hours.
 - b. Make repairs on the structure until all visible leaks are sealed and the leakage rate of the water in the structure is less than 0.1-percent of the volume held in the structure per day.
 - c. The cost of testing and repairs shall be performed at no expense to the Owner.
- N. Concrete which fails to meet strength requirements, dimensional tolerances, watertightness criteria, or is otherwise deficient due to insufficient curing, improper consolidation or physical damage shall be replaced or repaired as instructed by the Engineer at no expense to the Owner.

3.19 DEFECTIVE CONCRETE

- A. Test Results: The testing agency shall report test results in writing to Owner and within twenty-four (24) hours of test.
- B. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
- C. Repair or replacement of defective concrete will be determined by the Engineer. The cost of additional testing shall be borne by Contractor when defective concrete is identified.
- D. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Engineer for each individual area.

3.20 MEASUREMENT AND PAYMENT

- A. The payment will be made at the unit price "cubic yard" as stated in the Bid Form for Cast-in-Place Concrete.

END OF SECTION