

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT			1. Contract Number	Page of Pages 1 1	
2. Amendment/Modification Number DCFB-2011-B-0167-006		3. Effective Date 18-Oct-11		4. Requisition/Purchase Request No.	
5. Solicitation Caption Complete Renovation and Modernization of Engine Co. 28 and Engine Co. 29					
6. Issued By: Department of General Services Contracting and Procurement Division 2000 14th Street N.W., Suite 500 Washington, D.C. 20009			Code 03B	7. Administered By (If other than line 6) Department of General Services Contracting and Procurement Division 2000 14th Street N.W., Suite 500 Washington, D.C. 20009	
8. Name and Address of Contractor (No. Street, city, country, state and ZIP Code)				(X)	9A. Amendment of Solicitation No. DCFB-2011-B-0167
					9B. Dated (See Item 11) 24-Aug-11
					10A. Modification of Contract/Order No.
					10B. Dated (See Item 13)
Code	Facility				
11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS					
<input checked="" type="checkbox"/> The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers <input checked="" type="checkbox"/> is extended, <input type="checkbox"/> is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning <u>1</u> copy of the amendment; (b) By acknowledging receipt of this amendment on each copy of the offer submitted; or (c) By separate letter or fax which includes a reference to the solicitation and amendment number. FAILURE OF YOUR ACKNOWLEDGEMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by letter or fax, provided each letter or telegram makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.					
12. Accounting and Appropriation Data (If Required)					
13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14					
A. This change order is issued pursuant to: (Specify Authority)					
The changes set forth in Item 14 are made in the contract/order no. in item 10A.					
B. The above numbered contract/order is modified to reflect the administrative changes (such as changes in paying office, appropriation data, etc.) set forth in item 14, pursuant to the authority of 27 DCMR, Chapter 36, Section 3601.2.					
C. This supplemental agreement is entered into pursuant to authority of:					
D. Other (Specify type of modification and authority)					
E. IMPORTANT: Contractor <input type="checkbox"/> is not, <input checked="" type="checkbox"/> is required to sign this document and return <u>1</u> copy to the issuing office.					
14. Description of amendment/modification (Organized by UCF Section headings, including solicitation/contract subject matter where feasible.)					
The solicitation is hereby amended as follows:					
1. To provide specifications and drawings for the addition of a parking structure at Engine Company #28 - Attachment #1.					
2. To provide an addendum to the specifications for Engine Company #29 - Attachment #2.					
3. To provide answers to questions raised by prospective bidders -Attachment #3.					
4. To add Special Responsibility Standards to Section L. 23 - Attachment #4.					
ALL OTHER TERMS AND CONDITIONS REMAIN THE SAME					
Except as provided herein, all terms and conditions of the document referenced in Item (9A or 10A) remain unchanged and in full force and effect					
15A. Name and Title of Signer (Type or print)			16A. Name of Contracting Officer JW Lanum		
15B. Name of Contractor		15C. Date Signed	16B. District of Columbia		16C. Date Signed
(Signature of person authorized to sign)					11/4/11
			(Signature of Contracting Officer)		

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15B. Name of Contractor		15C. Date Signed	16B. District of Columbia		16C. Date Signed
(Signature of person authorized to sign)					11/4/11
			(Signature of Contracting Officer)		

ATTACHMENT #1 TO AMENDMENT NO. 6 TO DCFC-2011-B-0167

SPECIFICATIONS AND DRAWINGS FOR ADDITION OF PARKING STRUCTURE AT ENGINE COMPANY #28

ADDENDUM
for
Engine Company 28 (LEED)
DC Fire & EMS

Addendum date: 09-12-2011

GENERAL:

- A. This Addendum shall become part of the Contract Documents and modify the bidding documents including past addenda as indicated below.
- B. Where drawings are provided, revised drawings have been clouded and noted with the symbol Delta 1 for the ease of recognition.
- C. Acknowledge the receipt of these Addendum documents in writing.

DESCRIPTION FOR EC 28:

A. Drawings:

(Following is a description of the changes made to the drawings by this Addendum)

Civil:

- C 1.04** Added parking Structure on the site plan.
This drawing replaces the previously issued C 1.04)
- C 1.05** Showed Parking Structure on the layout.
Relocated the Fiberglass water storage tank
This drawing replaces previously issued drawing C 1.05

Architectural:

- CS-2** Revised Index of Drawings
- PS-1** Added this drawing to show demolitions of various site elements
- AS-1** Added Parking Structure to the site layout.
Added new Concrete Exterior Stair.
This drawing replaces previously issued drawing AS-1.

Structural:

- S 0.1A** Added Structural notes related to parking Structure Addition
This drawing does not replace any of the previously issued drawings
- S 1.1A** Added Parking Structure Foundation details
Added miscellaneous repair details. Fire dampers added various locations.
This drawing does not replace any of the previously issued drawings

MEP

Electrical:

E-1 Revised Panel Schedule
This drawing replaces previously issued drawing E 3.1

E-6 Relocated Generator
This drawing replaces previously issued drawing E 3.1

Specifications:

Issued Specifications for Parking Structure Addition with following Sections:

DIVISION 3 - CONCRETE

03301 CAST-IN-PLACE CONCRETE

DIVISION 4 - MASONRY

04720 CAST STONE
04810 UNIT MASONRY ASSEMBLY
04901 MASONRY RESTORATION

DIVISION 5 - METALS

05511 METAL RAILS

DIVISION 14 - CONVEYING SYSTEMS

14100 AUTOMATED PARKING STRUCTURE

DESCRIPTION FOR EC 29:

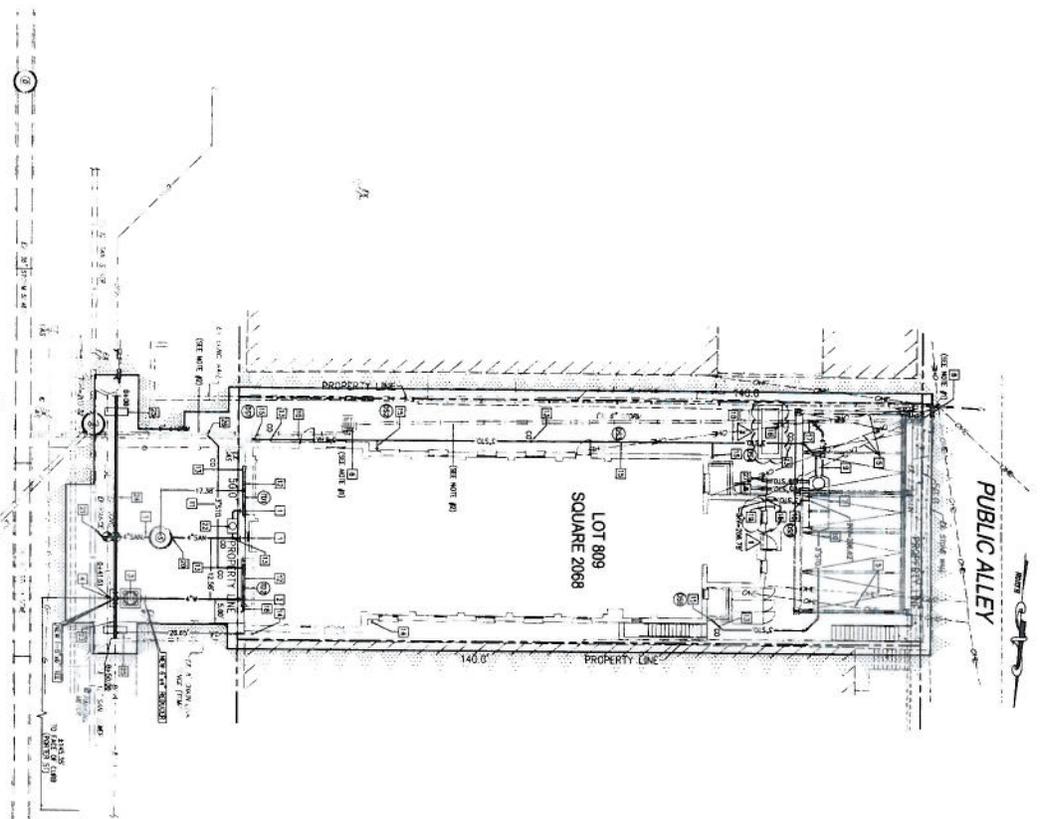
A. Drawings:

(Following is a description of the changes made to the drawings by this Addendum)

Architectural:

SK-1 Revised Bay Door 'G' and 'H' elevations.

END OF ADDENDUM DESCRIPTION

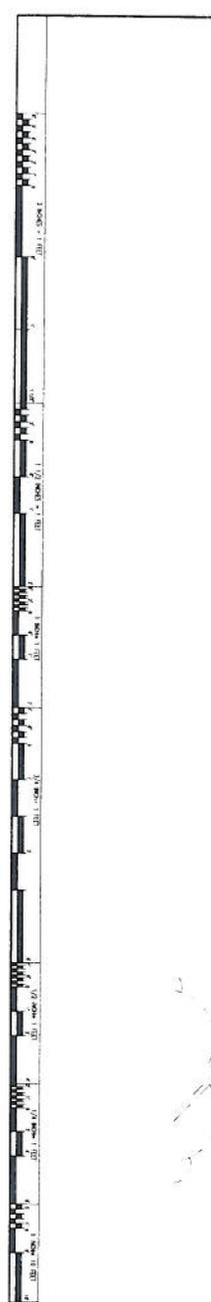


CONNECTICUT AVENUE, N.W.
(130' R.O.W. 60' WIDE)

PUBLIC ALLEY

LOT 809
SQUARE 2068

PROPERTY LINE



UTILITY REMARKS:

1. ALL EXISTING UTILITY LINES TO BE MAINTAINED AND PROTECTED.
2. NEW UTILITY LINES TO BE INSTALLED AS SHOWN ON THIS PLAN.
3. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 18" BELOW GRADE.
4. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 12" FROM FOUNDATION WALLS.
5. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 6" FROM CURBS.
6. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 3" FROM OTHER UTILITY LINES.
7. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 18" FROM EXISTING FOUNDATION WALLS.
8. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 12" FROM EXISTING FOUNDATION WALLS.
9. ALL UTILITY LINES TO BE INSTALLED AT A MINIMUM 6" FROM EXISTING FOUNDATION WALLS.
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NOTES:

SCALE	1" = 8'
DESIGNED BY	ASST. ARCHT.
CHECKED BY	SENIOR ARCHT.
CHECKED DATE	8/18/18
DATE	8/18/18
ARCHITECT	FAVORITE ENGINEERING
DATE	8/18/18
PROJECT NO.	2018-001
CLIENT	GOVERNMENT OF THE DISTRICT OF COLUMBIA
PROJECT NO.	DC PER 1878
DATE	8/18/18
BY	JAP
CHECKED	ASST. ARCHT.
DATE	8/18/18
PROJECT NO.	2018-001
CLIENT	GOVERNMENT OF THE DISTRICT OF COLUMBIA
PROJECT NO.	DC PER 1878
DATE	8/18/18

COMPLETE RENOVATION & MODERNIZATION OF
ENGINE COMPANY #28
3922 CONNECTICUT AVENUE, WASHINGTON, D.C.

UTILITY PLAN

C1.05

PROJECT DATA

PROJECT TITLE: LEED SILVER RENOVATION OF DISTRICT OF COLUMBIA...
CLIENT: ZINC VENTURES AMERICA
ARCHITECT: HOK

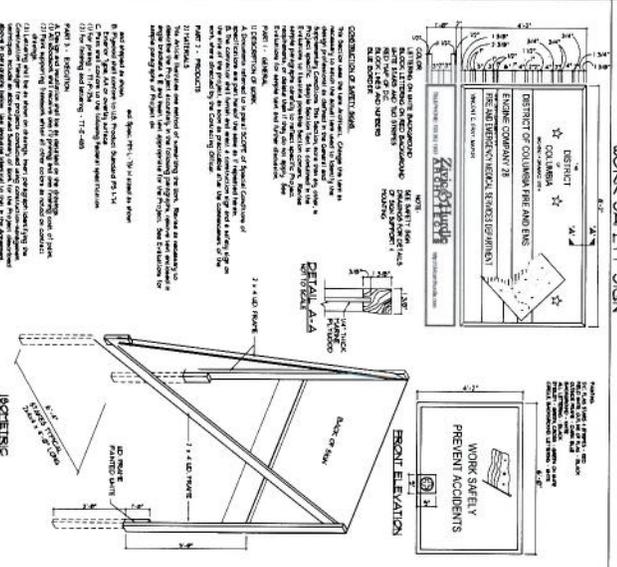
ABBREVIATIONS

Table with 3 columns: Abbreviation, Full Name, and Description. Includes terms like AC, AD, AE, AF, AG, AH, AI, AJ, AK, AL, AM, AN, AO, AP, AQ, AR, AS, AT, AU, AV, AW, AX, AY, AZ, BA, BB, BC, BD, BE, BF, BG, BH, BI, BJ, BK, BL, BM, BN, BO, BP, BQ, BR, BS, BT, BU, BV, BW, BX, BY, BZ, CA, CB, CC, CD, CE, CF, CG, CH, CI, CJ, CK, CL, CM, CN, CO, CP, CQ, CR, CS, CT, CU, CV, CW, CX, CY, CZ, DA, DB, DC, DD, DE, DF, DG, DH, DI, DJ, DK, DL, DM, DN, DO, DP, DQ, DR, DS, DT, DU, DV, DW, DX, DY, DZ, EA, EB, EC, ED, EE, EF, EG, EH, EI, EJ, EK, EL, EM, EN, EO, EP, EQ, ER, ES, ET, EU, EV, EW, EX, EY, EZ, FA, FB, FC, FD, FE, FF, FG, FH, FI, FJ, FK, FL, FM, FN, FO, FP, FQ, FR, FS, FT, FU, FV, FW, FX, FY, FZ, GA, GB, GC, GD, GE, GF, GG, GH, GI, GJ, GK, GL, GM, GN, GO, GP, GQ, GR, GS, GT, GU, GV, GW, GX, GY, GZ, HA, HB, HC, HD, HE, HF, HG, HH, HI, HJ, HK, HL, HM, HN, HO, HP, HQ, HR, HS, HT, HU, HV, HW, HX, HY, HZ, IA, IB, IC, ID, IE, IF, IG, IH, II, IJ, IK, IL, IM, IN, IO, IP, IQ, IR, IS, IT, IU, IV, IW, IX, IY, IZ, JA, JB, JC, JD, JE, JF, JG, JH, JI, JJ, JK, JL, JM, JN, JO, JP, JQ, JR, JS, JT, JU, JV, JW, JX, JY, JZ, KA, KB, KC, KD, KE, KF, KG, KH, KI, KJ, KK, KL, KM, KN, KO, KP, KQ, KR, KS, KT, KU, KV, KW, KX, KY, KZ, LA, LB, LC, LD, LE, LF, LG, LH, LI, LJ, LK, LM, LN, LO, LP, LQ, LR, LS, LT, LU, LV, LW, LX, LY, LZ, MA, MB, MC, MD, ME, MF, MG, MH, MI, MJ, MK, ML, MM, MN, MO, MP, MQ, MR, MS, MT, MU, MV, MW, MX, MY, MZ, NA, NB, NC, ND, NE, NF, NG, NH, NI, NJ, NK, NL, NM, NO, NP, NQ, NR, NS, NT, NU, NV, NW, NX, NY, NZ, OA, OB, OC, OD, OE, OF, OG, OH, OI, OJ, OK, OL, OM, ON, OO, OP, OQ, OR, OS, OT, OU, OV, OW, OX, OY, OZ, PA, PB, PC, PD, PE, PF, PG, PH, PI, PJ, PK, PL, PM, PN, PO, PP, PQ, PR, PS, PT, PU, PV, PW, PX, PY, PZ, QA, QB, QC, QD, QE, QF, QG, QH, QI, QJ, QK, QL, QM, QN, QO, QP, QQ, QR, QS, QT, QU, QV, QW, QX, QY, QZ, RA, RB, RC, RD, RE, RF, RG, RH, RI, RJ, RK, RL, RM, RN, RO, RP, RQ, RR, RS, RT, RU, RV, RW, RX, RY, RZ, SA, SB, SC, SD, SE, SF, SG, SH, SI, SJ, SK, SL, SM, SN, SO, SP, SQ, SR, SS, ST, SU, SV, SW, SX, SY, SZ, TA, TB, TC, TD, TE, TF, TG, TH, TI, TJ, TK, TL, TM, TN, TO, TP, TQ, TR, TS, TT, TU, TV, TW, TX, TY, TZ, UA, UB, UC, UD, UE, UF, UG, UH, UI, UJ, UK, UL, UM, UN, UO, UP, UQ, UR, US, UT, UU, UV, UW, UX, UY, UZ, VA, VB, VC, VD, VE, VF, VG, VH, VI, VJ, VK, VL, VM, VN, VO, VP, VQ, VR, VS, VT, VU, VV, VW, VX, VY, VZ, WA, WB, WC, WD, WE, WF, WG, WH, WI, WJ, WK, WL, WM, WN, WO, WP, WQ, WR, WS, WT, WU, WV, WW, WX, WY, WZ, XA, XB, XC, XD, XE, XF, XG, XH, XI, XJ, XK, XL, XM, XN, XO, XP, XQ, XR, XS, XT, XU, XV, XW, XX, XY, XZ, YA, YB, YC, YD, YE, YF, YG, YH, YI, YJ, YK, YL, YM, YN, YO, YP, YQ, YR, YS, YT, YU, YV, YW, YX, YY, YZ, ZA, ZB, ZC, ZD, ZE, ZF, ZG, ZH, ZI, ZJ, ZK, ZL, ZM, ZN, ZO, ZP, ZQ, ZR, ZS, ZT, ZU, ZV, ZW, ZX, ZY, ZZ.

DRAWING INDEX

Table listing drawing numbers and titles. Includes sections like CODE ANALYSIS, DESIGN NOTES, and various technical drawings.

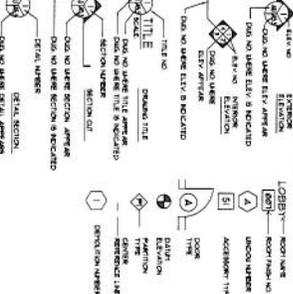
WORK SAFETY SIGN



MATERIALS

Table listing materials with columns for material name, quantity, and notes. Includes items like concrete, steel, and insulation.

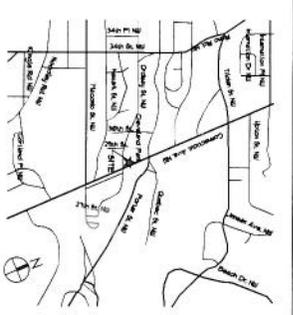
SYMBOLS



CODE ANALYSIS & DESIGN NOTES

Text providing code analysis and design notes for the project, including references to building codes and standards.

VICINITY MAP



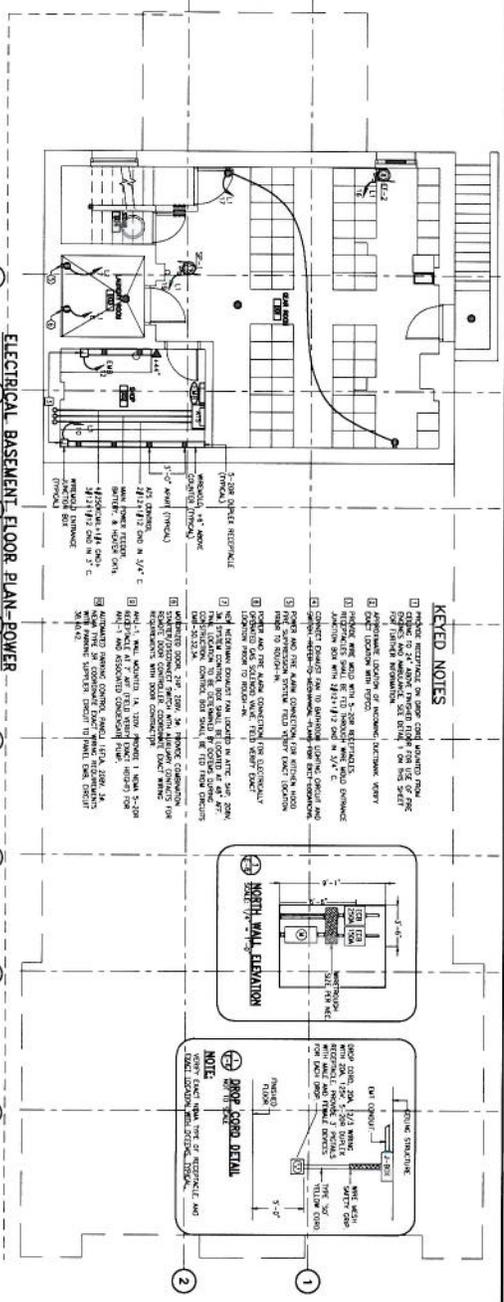
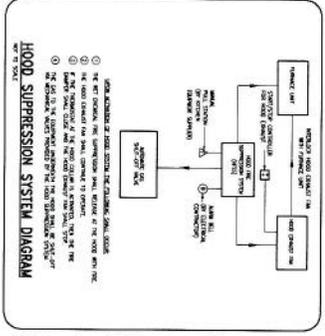
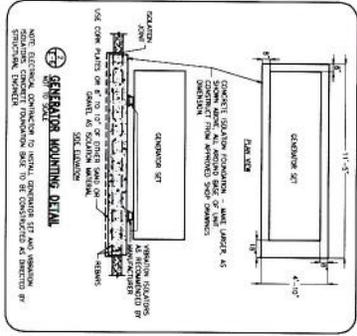
LOCATION PLAN



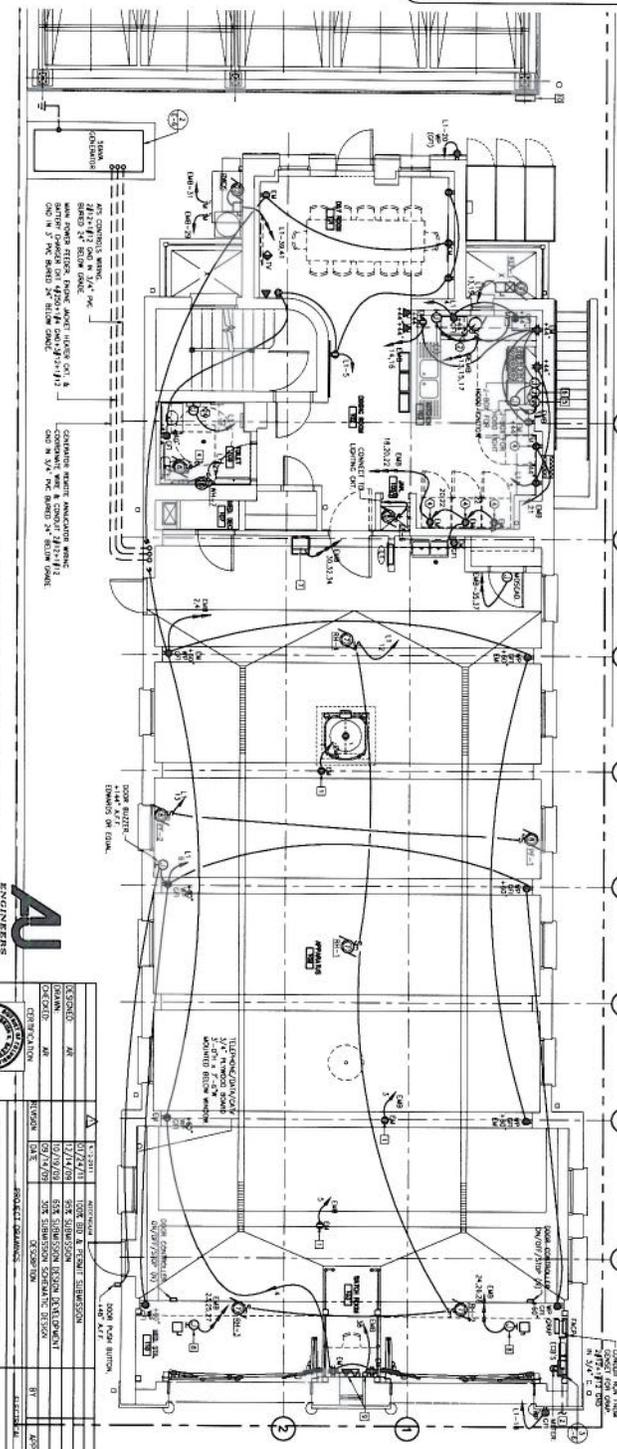
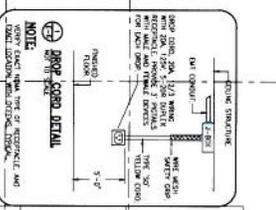
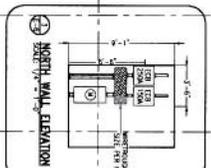
BUILDING INSULATION SCHEDULE

Table detailing the building insulation schedule, including R-values and material specifications for different parts of the building.

Administrative and project information block containing logos for ZINC VENTURES AMERICA and HOK, project name 'COMPLETE RENOVATION & MODERNIZATION OF ENGINE COMPANY #28 - LEED SILVER', and various submission and distribution dates.



- KEYED NOTES**
- 1) PROVIDE REVISIONS TO THIS PLAN AS SHOWN ON SHEET E-6.
 - 2) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:
 - 3) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:
 - 4) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:
 - 5) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:
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 - 9) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:
 - 10) PROVIDE 1/2" DIA. RIGID CONDUIT FOR USE OF THE FOLLOWING EQUIPMENT:



ELECTRICAL 1ST FLOOR PLAN-POWER

SCALE: 1/4" = 1'-0"

NOTES:

- SEE CONTRACTOR SCHEDULE FOR DIMENSIONS OF THE ABOVE EQUIPMENT.

ENGINEERS

LEAD SILVER

REGISTERED PROFESSIONAL ENGINEER

NO. 12345

STATE OF MARYLAND

PROJECT INFORMATION

PROJECT NO. 101-17

DATE: 07-01-04

CLIENT

CONTRACT NO. 101-17

DATE: 07-01-04

DESIGNER

CONTRACT NO. 101-17

DATE: 07-01-04

GOVERNMENT OF THE DISTRICT OF COLUMBIA

TITLE PAGE SPECIFICATIONS

ISSUING OFFICE

Request for clarification of interpretation of Bid Documents prior to date of Bid Opening:

ADDRESS TO:

“See *Standard Contract Provisions Booklet* for the District of Columbia Government Construction Projects, and the amendments thereto, incorporated herein by reference. Copies of these booklets may be obtained without cost from the issuing office.

TABLE OF CONTENTS

SECTION #	SECTION TITLE	PAGES PER SECTION
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Following are to be used as supplemental specifications for the addition of a parking structure to the Engine Company 28 LEED Project. Contractor to use specifications from the base bid package for any sections not included in this addendum package.

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SECTION 03300 - 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 work of this section.

1.2 SUMMARY

- A. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all cast-in-place concrete work shown or herein specified. The work includes all concrete poured in placed with the required reinforcement called for on the drawings, concrete forms and forming, concrete over metal decking, pads under mechanical and electrical equipment and special pads as shown and noted on drawings. Coordinate concrete work with other trades and ensure the insertion of all cast-in-place items at the proper time.
- B. Supported Slabs on Steel Beams or Joists: The steel beams and joist have been designed to industry deflection standards. Account for steel beam and joist deflection in the estimating of the concrete quantities and the placement of concrete.

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 QUALITY ASSURANCE

- A. Contractor Qualifications: A company who specializes in the placement of formwork, reinforcing steel, and concrete with a minimum of 3 years experience on projects of a similar size and scope.
- B. Specialty Engineer Qualifications: Professional Engineer registered in the State of the proposed project whose specialty includes the structural design of concrete formwork.
 - 1. The Specialty Engineer will be required to perform periodic site observations to confirm the formwork construction meets the requirements of the formwork drawings.

- C. Codes and Standards: Comply with provisions of following codes, specifications and standards, except where more stringent requirements are shown or specified. ACI 301 'Specifications for Structural Concrete for Buildings'; ACI 117 'Specifications for Tolerance for Concrete Construction and Materials, and CRSI Concrete Reinforcing Steel Institute, 'Manual of Standard Practice'.
- D. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by Architect.
- E. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork. Design and engineering of formwork are Contractor's responsibility.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and installing and removing reshoring.
- F. Pre-Construction Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings" and the following.
 - 1. At least 10 days prior to submittal of design mixes, conduct a meeting to review detailed requirements for preparing concrete design mixes and to determine procedures for satisfactory concrete operations. Review requirements for submittals, status of coordinating work, and availability of materials. Establish preliminary work progress schedule and procedures for materials inspection, testing, and certifications. Request that representatives of each entity directly concerned with cast-in-place concrete attend conference, including, but not limited to, the following:

Contractor's superintendent and project manager; Laboratory responsible for field quality control; Ready-mix concrete producer; Concrete subcontractor; Primary admixture manufacturers; Architect or Owner's representative; Structural engineer.
- G. Materials and Installed work may require testing and retesting, as directed by Architect, at anytime during progress of work. Allow free access to material stockpiles and facilities. Tests, not specifically indicated to be done at Owner's expense, including retesting of rejected materials and installed work, shall be done at Contractor's expense.
- H. Protection of Footings against Freezing: Cover completed work at footing level with sufficient temporary or permanent cover as required to protect footings and adjacent subgrade against possibility of freezing; maintain cover for time period as necessary.
- I. Protect adjacent finish materials against spatter during concrete placement.

1.5 SUBMITTALS

- A. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures" showing bar schedules, stirrup spacing, diagrams of bent bars, and arrangement of concrete reinforcement. Include special reinforcement required at openings through concrete structures and construction joints. Show wall reinforcing in elevations, in addition to section.
1. Structural design drawings shall not be reproduced or used as base sheets for shop drawings.
 2. CAD files of the structural drawings are available for use by the contractor for a standard processing fee. If files are desired, contact Ehlert/Bryan, Inc. at 703-827-9552.
- B. Shop Drawings - Formwork: Submit shop drawings signed and sealed by a Specialty Engineer as indicated. Show general construction of forms including jointing, special form joint or reveals.
1. The formwork Specialty Engineer shall submit written field observation reports to the Architect/Engineer within 7 days of each visit.
 2. The formwork Specialty Engineer shall submit to the Architect/Engineer certification verifying liability insurance coverage with the first submission of formwork shop drawings.
 3. Review is for general architectural applications and features only. Design of formwork for structural stability and efficiency is Contractor's responsibility.
- C. Samples: Upon request, submit samples of chairs, spacers, waterstops, joint materials, and other materials as requested by Architect, including names, sources and descriptions.
- D. Mix Design: Submit mix designs for all classes of concrete including aggregate gradation and actual properties.
- E. Mill Test: Upon request, submit certified mill test reports for specified cement, reinforcement and welded wire fabric.
- F. Pour Sequence Plan: Submit plan showing approximate locations of concrete pour construction joints. Generally place construction joints in supported concrete construction at 1/3 points of the beam and slab spans.
- G. Certification for Admixture: Provide material certification, signed by manufacturer and contractor, certifying that each admixture complies with, or exceeds, specified requirements. Chloride ion content must be included.
- H. Related Materials: Upon request, submit cut sheets and product information on curing compounds, patching and bonding materials, sealers, minutes of preconstruction conference, and other items.

- I. LEED - Product Data for Credit MR 4: For products having recycled content, provide documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
- J. LEED – Regional Materials for Credit MR 5: Document manufacturing plant location and determine if the manufacturer is within 500 miles of the project. Submit documentation.
- K. LEED – Design Mixtures for Credit ID1.1: For each concrete mixture containing fly ash as a replacement for Portland cement or other potential replacements and for equivalent concrete mixtures that do not contain Portland cement replacements.

PART 2 - PRODUCTS

2.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces. Furnish in largest practicable sizes to minimize number of joints and to conform to joint system shown on drawings. Provide form material with sufficient thickness to withstand pressure of newly-placed concrete without bow or deflection.
- B. Forms for Unexposed Finish Concrete: Form concrete surfaces which will be unexposed in finished structure with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- C. Form Coatings: Provide commercial formulation form-coating compounds that will not bond with, stain nor adversely affect concrete surfaces, and will be compatible with and not impair subsequent treatments of concrete surfaces, such as sealants or dampproofing.
- D. Form Ties: Steel wire snap ties with positive breakbacks which will leave no metal closer than 1" from formed surface of concrete, leaving a cone-shaped recess.
- E. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch minimum.

2.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A615 615M, Grade 60 (Grade 420) deformed.
- B. Epoxy Coated Reinforcing Bars: ASTM A775/A 775M, Grade 60 deformed steel.
- C. Welded Wire Fabric: ASTM A185, welded steel wire fabric.

- D. LEED - Recycled Content: Reinforcing steel shall contain a minimum of [25% for MR 4.1] [50% for MR 4.2] content of recycled materials based on the material cost by weight.

2.3 REINFORCING ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire fabric in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete or fiber-reinforced concrete of greater compressive strength than concrete, and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- B. Joint Dowel Bars: Plain-steel bars, ASTM A 615/A 615M, Grade 60 (Grade 420). Saw (do not shear) bars true to length with ends square and free of burrs.
- C. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating; compatible with epoxy coating on reinforcement and complying with ASTM A 775/A 755M.

2.4 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I. Use one brand of cement throughout project.
- B. Blended Hydraulic Cement: ASTM C595M, Type 1S or 1P.
- C. Fly Ash: ASTM C618, Class C or F.
- D. Granulated Blast Furnace Slag: ASTM C989 Grade 120
- E. Normal Weight Aggregates: ASTM C33, and as herein specified. Maximum aggregate size 1" for all concrete.
 - 1. Local aggregates not complying with ASTM C 33 but which have shown by special test or actual service to produce concrete adequate strength and durability may be used when acceptable to the Architect.
- F. Water: Potable and complying with ASTM C 94.
- G. LEED – Recycled Content: Concrete materials (recycled concrete aggregates, fly ash, etc.) shall contain a minimum of [25% for MR4.1] [50% for MR 4.2] content of recycled materials based on the material cost by weight.

2.5 ADMIXTURES

- A. General: Admixtures certified by manufacturer to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material and to be compatible with other admixtures and cementitious materials. Do not use admixtures containing calcium chloride.
- B. Corrosion Inhibitor: ASTM C 494, Type C. Add a corrosion inhibiting admixture to the mix where indicated on the drawings to add "DCI" and at the rates as indicated on the drawings. The admixture shall be DCI as manufactured by Grace Construction Products.
- C. Air-Entraining Admixture: ASTM C 260.
- D. Water-Reducing Admixture: ASTM C 494, Type A.
- E. High-Range, Water-Reducing Admixture: ASTM C 494, Type F.
- F. Water-Reducing and Accelerating Admixture: ASTM C 494, Type E.
- G. Water-Reducing and Retarding Admixture: ASTM C 494, Type D.
- H. Calcium Chloride: Calcium chloride, thiocyanates or admixtures containing more than 0.10% water soluble chloride ions by weight of total cementitious materials are not permitted. The use of calcium chloride in concrete is prohibited.

2.6 RELATED MATERIALS

- A. Steel Wire Component Properties
 - a. Tensile Strength: 140-180 KSI
 - b. Fiber Length: 1.5
 - c. Aspect Ratio: 34
 - d. Deformation: Continuously deformed circular segment
- B. Vapor Barrier: Provide moisture barrier cover over prepared base material. Use only materials which are resistant to decay when tested in accordance with ASTM E 154. Polyethylene sheet not less than 10 mils thick.
- C. Non-Shrink Grout: The grout shall conform to CRD-C 621-83, "Corps of Engineers Specification for Non-Shrink Grout". Acceptable products " Masterflow 713"; Master Builders, "Euco-NS Grout"; Euclid Chemical Company, "Five Star Grout"; US Grout Corporation.
- D. Membrane-Forming Curing and Sealing Compound: ASTM C309. The compound shall be an acrylic emulsion blend, high solids (15% solids content minimum), low VOC (700 g/ maximum) type curing and sealing compound. (Sodium Silicate

Compounds are prohibited.) Acceptable products or approved equal. "Super Aqua-Cure VOX"; Euclid Chemical Company, "Cure and Seal 309 WB"; Symons Corporation, "Kure-N-Seal WB"; Sonneborn Building Products.

- E. Dissipating Resin Curing Compound: ASTM 209. The compound shall be a liquid membrane forming curing compound formulated from hydrocarbon resins that breaks down quickly to allow the subsequent application of floor coverings. Acceptable products or approved equal. "Kurez DR VOX"; Euclid Chemical Company,
- F. Waterproof Sheet Curing Material: The compound shall conform to ASTM C-171.
- G. Bonding Compound: Polyvinyl acetate or acrylic base, rewettable type, for use only in areas not subject to moisture. Acceptable products or approved equal "Euroweld"; Euclid Chemical Company. "Weldcrete"; By the Lamson Company.
- H. Epoxy Adhesive: ASTM C881, two component material suitable for use on dry or damp surfaces. Acceptable products or approved equal; "Sikadur Hi-Mod"; Sika Chemical Corp., "Euco Epoxy #452 or #620"; Euclid Chemical Company.
- I. Patching Mortar: Free-flowing, polymer-modified cementitious coating. Acceptable products, or approved equal, "Euco Thin Coat"; Euclid Chemical Company, "Sika Top 121"; Sika Chemical Corp.
- J. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- K. Epoxy Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Shore A hardness of 80 per ASTM D 2240.
- L. Waterstop: CE CRD-C 572 polyvinylchloride plastic dumb-bell or ribbed type extruded water stop for all construction joints in concrete foundation walls and wherever noted on plans to prevent passage of fluid through joint. Factory fabricate corners, intersections and directional changes.
- M. Self-Expanding Strip Waterstop: Bentonite waterproofing compound specifically formulated to be used as self-healing rectangular strip joint water system.

2.7 PROPORTIONING AND DESIGN OF MIXES

- A. Mix Designs: Prepare mix designs for each type of strength of concrete. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
- B. Limit use of fly ash to not exceed 25 percent of total cementitious material content by weight.

- C. Limit use of blast furnace slag to 50 percent of total cementitious material content by weight. Use of ground blast furnace slag in interior slabs is not permitted.
- D. Contractor is cautioned to carefully consider the use of Blended Hydraulic Cements during cold weather due to its tendency to retard concrete curing. The Contractor and the concrete supplier are responsible for selecting the concrete design mix to prevent problems with curing and finishing during cold weather.
- E. Submit written reports to the Architect of each proposed mix for each class of concrete at least 30 days prior to start of work. Do not begin concrete production until mixes have been reviewed by the Architect. Reports shall include organic content, sieve analysis, specific gravity of aggregates; proportion of all materials; brand of cement; admixtures; slump; water/cement ratios; percentage of air, and results of 7-day and 28-day compression tests.
- F. Strength: Concrete shall have compressive strengths at 28 days as shown on structural drawings.
- G. Water/Cement Ratio: All concrete shall have a water/cement ratio not to exceed 0.58, except concrete for garages, exterior plazas, and concrete exposed to freezing and thawing shall have a water/cement ratio not exceeding 0.40.
- H. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 5 to 7%.
- I. Admixture Usage: All concrete shall contain the specified water reducing admixture and/or the specified high range water reducing admixture (superplasticizer). All concrete required to be air entrained shall contain an approved air entraining admixture. All pumped concrete, concrete for industrial slabs, architectural concrete, concrete required to be watertight and concrete with a water/cement ratio below 0.50 shall contain the specified HRWR (superplasticizer).
- J. Limit water soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- K. Concrete Topping Mix: For toppings less than 2" in thickness, the concrete mix shall achieve a compressive strength of 4000 psi at 28 days with a maximum water/cement ratio of 0.50 and a maximum size of coarse aggregate of 3/8". The mix design shall be proportioned in accordance with Section 5.3 of ACI 318.
- L. Adjustment to Concrete Mixes: Mix design and adjustments may be requested by Contractor when characteristics of materials, job conditions, weather, test results, or other circumstances warrant; at no additional cost to Owner and as accepted by Architect. Laboratory test data for revised mix design and strength results must be submitted to and reviewed by the Architect prior to use.
- M. Slump Limits: All concrete shall have a maximum slump of 5 inches (4 inches +/- 1 inch), except concrete containing HRWR admixture (super plasticizer) which shall have

a slump not more than 8 inches after addition of HRWR to site-verified 2-3 inch slump concrete.

2.8 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with the requirements of ASTM C94, and as herein specified. Furnish batch ticket information.
 - 1. During hot weather, or under conditions contributing to rapid setting of concrete, a shorter mixing time than specified in ASTM C94 may be required. When the air temperature is above 85 degrees F., reduce the mixing and delivery time from 90 to 60 minutes.
 - 2. For concrete materials arriving at site with insufficient slump, the one time limited addition of water is permitted. Add up to 10 gallons of water per 9 yard truck to increase slump to specified limits. Such additions shall be clearly noted on the delivery ticket.

PART 3 - EXECUTION

3.1 FORMS

- A. Design, erect, support, brace and maintain formwork according to ACI 301 to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.
- B. Design formwork to be readily removable without impact, shock or damage to cast-in-place concrete surfaces and adjacent materials.
- C. Construct forms complying with ACI 117, to sizes, shapes, lines and dimensions shown, and to obtain accurate alignment, location, grades, level and plumb work in finished structures. Provide for openings, offsets, sinkages, keyways, recesses, moldings, rustications, reglets, chamfers, blocking, screeds, bulkheads, anchorages and inserts, and other features required in work. Use selected materials to obtain required finishes. Solidly butt joints and provide backup at joints to prevent leakage of cement paste.
- D. Provide temporary openings where interior area of formwork is inaccessible for cleanout for inspection before concrete placement, and for placement of concrete.
- E. Chamfer exposed corners and edges using wood, metal, PVC or rubber chamfer strips fabricated to produce uniform smooth lines and tight edge joints.
- F. Precaution: Do not build sleeves, conduits, outlet boxes, pipes into forms for joists or beams without prior approval of the Architect.

- G. Form Ties: Install ties to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
- H. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades. Determine size and location of openings, recesses and chases from trades providing such items. Accurately place and securely support items built into forms.
- I. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt or other debris just before concrete is placed. Retighten forms and bracing after concrete placement if required to eliminate mortar leaks and maintain proper alignment.
- J. Coat contact surfaces of forms with a form coating compound before reinforcement is placed.

3.2 PLACING REINFORCEMENT

- A. Comply with specified codes and standards, and comply with Concrete Reinforcing Steel Institute's Manual of Standard Practice for placing reinforcements.
- B. Clean reinforcement of loose rust and mill scale, earth, ice and other materials, which reduce or destroy bond with concrete.
- C. Accurately position, support and secure reinforcement against displacement by formwork, construction, or concrete placement operations before concrete is placed. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, and hangers, as required. "Wet" placement of rebar is prohibited.
- D. Place reinforcement to obtain at least minimum coverages for concrete protection. Arrange, space and securely tie bars and bar supports to hold reinforcement in position during concrete placement operations. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- E. Concrete cover: Protect reinforcing by thickness of concrete indicated on drawings. Where not otherwise shown thickness over reinforcement shall be as follows:

Provide clear distance to outermost reinforcing as follows:

Concrete Cast Against Earth..... 3 inches

Concrete Exposed to Earth or Weather:

#5 or smaller1-1/2 inches

#6 or Larger..... 2 inches

Other Concrete:

Slabs & Walls3/4 inches

- 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/D 3963M.
- G. In Slabs-on-Grade: Place reinforcing in top 1/3 of depth unless otherwise noted.
- H. Install welded wire fabric in as long lengths as practicable. Lap adjoining pieces at least one full mesh and lace splices with wire. Offset end laps in adjacent widths to prevent continuous laps in either direction.
- I. At construction joints, no reinforcing steel shall terminate within 60 diameters of joint; provide additional reinforcement as shown on drawings.
- J. Splice Limitations: Make no splices in reinforcement, except as shown on drawings or authorized by Structural Engineer. Lap approved splices in continuous reinforcing minimum of 30 diameters, unless noted otherwise. In slabs, beams, and girders, do not splice reinforcement at points of maximum stress. At slabs and walls where bars lap or splice, stagger splices in adjacent bars. Lap splices in columns, piers, struts, sufficiently to transfer full stress by concrete bond.

3.3 JOINTS

- A. Construction Joints - Supported Concrete: Locate and install construction joints as indicated or, if not indicated, so as not to impair strength and appearance of the structure, as acceptable to Architect. Generally, construction joints shall be placed at 1/3 span for concrete slabs and beams.
- B. Construction and Control Joints - Walls and Slab on Grade: Locate and install as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable by the Architect.
- C. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or inserts 1/4 inch wide by 1/4 of slab depth, unless otherwise indicated. Saw cutting of joints shall be made as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- D. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- E. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings.

3.4 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.
- B. Edge Forms and Screed Strips for Slabs: Set edge forms or bulkheads and intermediate screed strips for slabs to obtain required elevations and contours in finished slab surface. Provide and secure units sufficiently strong to support types of screed strips by use of strike-off templates or accepted compacting type screeds.
- C. Dovetail Slots: Install dovetail slots vertically for anchoring masonry facing. Build dovetail slots into forms for embedment in concrete that is to be faced or abutted with another material. Space vertically at 24" for beams and walls. Install slots on vertical surfaces over 16" high to be faced. Provide vertical slot in concrete wall or column for each abutting masonry partition.

3.5 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel and items to be embedded or cast-in. Notify other crafts to permit the installation of their work; cooperate with other trades in setting such work, as required. Clean all formwork of excess water and miscellaneous debris. Thoroughly wet wood form immediately before placing concrete as required where form coatings are not used.
- B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304 and as herein specified.
- D. Deposit concrete continuously or in layers of such thickness that no concrete will be placed on concrete which has hardened sufficiently to cause the formation of seams or planes of weakness within the section. If a section cannot be placed continuously, provide construction joints as herein specified. Deposit concrete as nearly as practicable to its final location to avoid segregation due to rehandling or flowing.
- E. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- F. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spacing, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI, to suit the type of concrete and project conditions.

- G. Do not use vibrators to transport concrete inside of forms. Insert and withdraw vibrators vertically at uniformly spaced locations not farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate the placed layer of concrete and at least 6" into the preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit the duration of vibration to the time necessary to consolidate the concrete and complete embedment of reinforcement and other embedded items without causing segregation of the mix.
- H. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
- I. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- J. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
- K. Maintain reinforcing in the proper position during concrete placement operations.
- L. Cold Weather Placing: Protect concrete work from physical damage or reduced strength which could be caused by frost, freezing actions, or low temperatures, in compliance with ACI 306 and as herein specified. When air temperature has fallen to or is expected to fall below 40 degrees F, uniformly heat all water and aggregates before mixing as required to obtain a concrete mixture temperature of not less than 50 degrees F and not more than 80 degrees F at point of placement.
- M. Hot Weather Placing: When hot weather conditions exist that would seriously impair the quality and strength of concrete, place concrete in compliance with ACI 305 and as herein specified. Cool ingredients before mixing to maintain concrete temperature at time of placement below 90 degrees F. Mixing water may be chilled, or chopped ice may be used to control the concrete temperature provided the water equivalent of the ice is calculated to the total amount of mixing water. Cover reinforcing steel with water-soaked burlap if it becomes too hot, so that the steel temperature will not exceed the ambient air temperatures immediately before embedment in concrete. Wet forms thoroughly before placing concrete. Do not use retarding admixtures unless accepted in mix designs.

3.6 FINISH OF FORMED SURFACES

- A. Rough Form Finish: For formed concrete surfaces not exposed- to-view in the finish work or by other construction unless otherwise indicated. This is the concrete surface having the texture imparted by the form facing material used, with tie holes and defective areas repaired and patched and fins and other projections exceeding 1/4" in height rubbed down or chipped off.

- B. Smooth Form Finish: For formed concrete surfaces exposed-to- view, or that are to be covered with a coating or covering material applied directly to the concrete, or a covering material applied directly to the concrete, such as waterproofing, damp proofing, painting or other similar system. This is the as-cast concrete surface as obtained with selected form facing material, arranged orderly and symmetrically with a minimum of seams. Repair and patch defective areas with all fins or other projections completely removed and smoothed.
- C. Related Unformed Surfaces: At top of walls, horizontal offsets and similar unformed surfaces occurring 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 shown.

3.7 MONOLITHIC SLAB FINISHES

- A. General: Comply with recommendations in ACI 302.1R for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo and as otherwise indicated.
 - 1. After screeding and consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating using float blades or float shoes only when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power- driven floats, or by hand-floating if area is small or inaccessible to power units. Cut down high spots and fill low spots. Uniformly slope surfaces to drain, if applicable. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- C. Trowel Finish: Apply trowel to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
 - 1. After floating begin first trowel finish operation using a power-driven trowel. Begin final trowelling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance.
- D. Trowel and Fine Broom Finish: Where ceramic or stone is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated. Immediately after trowel finishing, slightly

roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

- F. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- G. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.
- H. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel-finish concrete surfaces.

3.8 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI 301 procedures. Avoid rapid drying at end of curing period.
- B. Curing shall be by application of the specified membrane-forming curing and sealing compound, the specified dissipating resin curing compound or by application of waterproof sheet materials conforming to ASTM C 171-80.
- C. Liquid membrane-forming curing and sealing compounds shall be applied in accordance with the manufacturer's recommendations. Interior slabs with resilient tile, carpet or left exposed and all exterior slabs, sidewalks, curbs, etc. shall be cured with the specified membrane-forming curing and sealing compound.
- D. Any membrane-forming curing and sealing compound used in floor slabs receiving applied finish flooring shall be guaranteed by the manufacturer, in writing, not to impair bonding of adhesive.
- E. For slabs, which are to receive terrazzo, bonded cementitious materials, epoxy or urethane coatings, liquid floor hardener, or waterproofing, use a curing treatment of moisture-retaining covers or the specified dissipating resin curing compound.
- F. The curing compounds must be applied immediately after final finishing. For curing by the waterproof sheet material, the concrete must be continually moist-cured for a minimum of 7 days. The curing process must begin immediately after final finishing.

- G. Provide Moisture-Cover Curing As Follows: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width with sides and ends lapped at least 3" and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
- H. Provide Membrane Curing to Slabs As Follows: Apply membrane-forming curing and sealing compound or dissipating resin curing compound to concrete surfaces within 2 hours of final finishing operations. Apply uniformly in continuous operation by power-spray or roller in accordance with manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain continuity of coating and repair damage during curing period.
- I. Curing Formed Surfaces: Cure formed concrete surfaces, including undersides of beams, supported slabs and other similar 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.
- J. Sealer and Dustproofer: Apply a second coat of specified membrane-forming curing and sealing compound only to surface indicated to receive sealer-dustproofer finish.

3.9 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provide curing and protection operations are maintained.

3.10 MISCELLANEOUS

- A. Filling-In: Fill in holes and openings left in concrete structures for passage of work by other trades, unless otherwise shown or directed, after work of other trades is in place. Mix, place and cure concrete as herein specified, to blend with in-place construction. Provide other miscellaneous concrete filling shown or required to complete work.
- B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.
- C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates of manufacturer furnishing machines and equipment.

3.11 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.
- B. Cut out honeycomb, rock pockets, voids over 1/2" in any dimension, and holes left by tie rods and bolts, down to solid concrete but in no case to a depth of less than 1". Make edges of cuts perpendicular to the concrete surface. Thoroughly clean, dampen with water and brush-coat the area to be patched with specified bonding agent. Place patching mortar after bonding compound has dried.
- C. Repair of Formed Surfaces: Remove and replace concrete having defective surfaces if defect cannot be repaired to satisfaction of Architect. Surface defects as such include color and texture irregularities, cracks, spalls, air bubbles, honeycomb, rock pockets; fins and other projections on surface; and stains and other discolorations that cannot be removed by cleaning. Flush out form tie holes, fill with dry pack mortar.
- D. Repair of Unformed Surfaces: Test unformed surfaces, such as monolithic slabs, for smoothness and verify surface plane to tolerances specified for each surface and finish.
- E. Repair defective area, except random cracks and single holes not exceeding 1" diameter, by cutting out and replacing with fresh concrete. Remove defective areas to sound concrete with clean, square cuts and expose reinforcing steel with at least 3/4" clearance all around. Dampen concrete surfaces in concrete with patching concrete and apply bonding compound. Mix patching concrete of same materials to provide concrete of same type or class as original concrete. Place, compact and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- F. Repair isolated random cracks and single holes not over 1" in diameter by dry-pack method. Groove top of cracks and cut out holes to sound concrete and clean of dust, dirt and loose particles. Dampen cleaned concrete surfaces and apply bonding compound. Mix dry-pack, consisting of one part Portland cement to 2-1/2 parts fine aggregate passing a No. 16 mesh sieve, using only enough water as required for handling and placing. Place dry pack after bonding compound has dried. Compact dry-pack mixture in place and finish to match adjacent concrete. Keep patched area continuously moist for not less than 72 hours.

PART 4 - QUALITY CONTROL

4.1 TESTING DURING CONSTRUCTION

- A. The Owner will employ a testing laboratory to perform tests and to submit test results.
- B. Sampling and testing for quality control during placement of concrete shall include the following.
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.

2. Slump: ASTM C143; up to one test for each concrete load at point of discharge; and one test for each set of compressive strength test specimens.
 3. Air Content: ASTM C173, volumetric method for normal weight concrete; ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.
 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F and below, and when 80 degrees F and above; and each time a set of compression test specimens made.
 5. Compression Test Specimen: ASTM C31, one set of 6 standard cylinders for each strength test, minimum.
 6. Compressive Strength Tests: ASTM C39, one set for each 75 cu. yds. or fraction thereof, of each concrete class placed in any one day or for each 5,000 sq. ft. of surface area placed; two specimens tested at 7 days, two specimens at 28 days and two specimens retained in reserve for later testing if required. Additional cylinders shall be formed as required for early stripping by the Contractor.
- C. C. Test Results will be reported in writing to Architect, Structural Engineer and Contractor within three working days that tests are made. Reports of compressive strength tests shall contain the project identification, date of concrete placement, name of concrete testing service, concrete type and class, location of concrete batch in structure, design compressive strength at 28 days, concrete mix proportions and materials; compressive breaking strength and type of break for both 7-day and 28- day tests.
- D. D. Additional Tests: The testing service will make additional tests of in-place concrete when test results indicate specified concrete strengths and other characteristics have not been attained in the structure, as directed by Architect. Testing service may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42, or by other methods as directed. Contractor shall pay for such tests conducted, any other additional testing as may be required, and extra engineering and architectural services related to evaluating the problem and developing an acceptable solution.
- E. E. The contractor shall be responsible for scheduling with the testing laboratory, and shall provide free access for its personnel and labor required in helping to obtain and handle samples of concrete.

END OF SECTION 03300

PART 1 SECTION 03301 - CAST-IN-PLACE CONCRETE

PART 2 GENERAL

2.1 RELATED DOCUMENTS

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

2.2 DESCRIPTION

- A. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all cast-in-place concrete work shown or herein specified.
- B. Support Slabs on Steel Beams or Joists: The steel beams and joist have been designed to industry deflection standards. Account for steel beam and joist deflection in the estimating of the concrete quantities and the placement of concrete.

2.3 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.

2.4 QUALITY ASSURANCE

- A. Contractor Qualifications: A company who specializes in the placement of formwork, reinforcing steel, and concrete with a minimum of 3 years experience on projects of a similar size and scope.
- B. 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 for Buildings'
 - 2. ACI 117, 'Specifications for Tolerances for Concrete Construction and Materials.'
- C. Workmanship: The Contractor is responsible for correction of concrete work which does not conform to the specified requirements, including strength, tolerances and finishes. Correct deficient concrete as directed by Architect.
- D. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

2.5 SUBMITTALS

- A. Shop Drawings - Reinforcement: Submit shop drawings for fabrication, bending, and placement of concrete reinforcement.
 1. Structural contract drawings shall not be reproduced or used as base sheets for shop drawings.
- B. Mix Design: Submit mix designs for all classes of concrete including aggregate gradation and actual properties.
- C. LEED - Product Data for Credit MR 4: For products having recycled content, provide documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.

PART 3 PRODUCTS

3.1 FORM MATERIALS

- A. Forms for Exposed Finish Concrete: Unless otherwise indicated, construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced or other acceptable panel-type materials, to provide continuous, straight, smooth, exposed surfaces.
- B. Use plywood complying with U.S. Product Standard PS-1 "B-B (Concrete Form) Plywood", Class I, Exterior Grade or better, mill-oiled and edge-sealed, with each piece bearing legible trademark of an approved inspection agency.
- C. Forms for Unexposed Finish Concrete: Form with plywood, lumber, metal or other acceptable material. Provide lumber dressed on at least 2 edges and one side for tight fit.
- D. Form Ties: Steel wire snap ties with positive breakbacks which will leave no metal closer than 1" (25.4 mm) from formed surface of concrete, leaving a cone-shaped recess.

3.2 REINFORCING MATERIALS

- A. Reinforcing Bars: ASTM A 615/A, Grade 60 deformed.

- B. Welded Wire Fabric: ASTM A185, welded steel wire fabric.

3.3 CONCRETE MATERIALS

- A. Portland Cement: ASTM C150, Type I. Use one brand of cement throughout project.
- B. Blended Hydraulic Cement: ASTM C 595M, Type 15. Portland blast-furnace cement slag.
- C. Fly Ash: ASTM C618, Class C or Type F.
- D. Normal Weight Aggregates: ASTM C33, and as herein specified. Maximum aggregate size 1" (25.4 mm) for all concrete.
- E. Water: Drinkable.
- F. Air Entraining Mixture: ASTM C260, certified by manufacturer to be compatible with other required admixtures.
- G. Water Reducing Admixture: ASTM C494, Type A.
- H. Calcium Chloride: Calcium chloride, thiocyanates or admixtures containing more than 0.10% water soluble chloride ions percent by weight of total cementitious materials are not permitted. The use of calcium chloride in concrete is prohibited.

3.4 RELATED MATERIALS

- A. Vapor Barrier: Provide moisture barrier cover over prepared base material. Use only materials which are resistant to decay when tested in accordance with ASTM E 154. Polyethylene sheet not less than 6 mils (.1524 mm) thick.
- B. Granular Base: Evenly grade mixture of fine and coarse aggregates to provide, when compacted, a smooth and even surface below slabs on grade. Thickness as shown on drawings.
- C. Non-Shrink Grout: The grout shall conform to CRD-C 621-83, "Corps of Engineers Specification for Non-Shrink Grout". Acceptable products " Masterflow 713"; Master Builders, "Euco-NS Grout"; Euclid Chemical Company, "Five Star Grout"; US Grout Corporation.
- D. Curing and Sealing Compound: The compound shall be a clear styrene acrylate type, 18% solids content minimum. Acceptable products or approved equal. "Super Rez

Seal"; Euclid Chemical Company, "Masterkure"; Master Builders, "Kure-N-Seal"; Sonneborn Building Products.

- E. Joint Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber, or ASTM D 1752, cork or self-expanding cork.
- F. Waterstop: CE CRD-C 572 polyvinylchloride plastic dumb-bell or ribbed type extruded water stop for all construction joints in concrete foundation walls and wherever noted on plans to prevent passage of fluid through joint. Factory fabricate corners, intersections and directional changes.
- G. Self-Expanding Strip Waterstop: Bentonite waterproofing compound specifically formulated to be used as self-healing rectangular strip joint water system.

3.5 PROPORTIONING AND DESIGN OF MIXES

- A. Mix Designs: Prepare mix designs for each type of strength of concrete. All mix designs shall be proportioned in accordance with Section 5.3, "Proportioning on the Basis of Field Experience and/or Trial Mixtures" of ACI 318.
- B. Strength: Concrete shall have compressive strengths at 28 days as shown on structural drawings.
- C. Water/Cement Ratio: All concrete shall have a water/cement ratio not to exceed 0.58, except concrete for apparatus bay slabs, exterior plazas, and concrete exposed to freezing and thawing shall have a water/cement ratio not exceeding 0.50.
- D. Air Content: All concrete exposed to freezing and thawing and/or required to be watertight shall have an air content of 5 to 7 %.
- E. Admixture Usage: Use per manufacturer's directions.
- F. Slump Limits: Maximum slump of 4 inches (101.6 mm).

PART 4 EXECUTION

4.1 FORMS

- A. Design, erect, support, brace and maintain formwork to support vertical and lateral loads that might be applied until such loads can be supported by concrete structure. Construct formwork so concrete members and structures are of correct size, shape, alignment, elevation and position.

- B. Form Ties: Install ties to prevent form deflection, and to prevent spalling concrete surfaces upon removal.
- C. Provisions for Other Trades: Provide openings in concrete formwork to accommodate work of other trades.

4.2 PREPARATION OF FORM SURFACES

- A. Coat contact surfaces of forms with a form coating compound before reinforcement is placed.

4.3 PLACING REINFORCEMENT

- A. Comply with specified codes and standards, and comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars", for details and methods of reinforcement placement and supports, and as herein specified.

- 1. Provide clear distance to outermost reinforcing as follows:
 - a. Concrete Cast Against Earth.....3 inches (76.2 mm)
 - b. Concrete Exposed to Earth or Weather:
 - 1. #5 or smaller.....1-1/2 inches (38.1 mm)
 - 2. #6 or Larger.....2 inches (50.08 mm)
 - c. Other Concrete:
 - 1. Slabs & Walls.....3/4 inches (19.05 mm)
 - 2. Beams & Columns.....1-1/2 inches (38.1 mm)

- B. Construction and Control Joints - Walls and Slab on Grade: Locate and install as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable by the Architect.
- C. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown or if not shown a minimum of 25 feet (7.625 m) on center. Use saw cuts 1/8 inch (3.175 mm) wide by 1/4 inch (6.35 mm) slab depth or inserts 1/4 inch (6.35 mm) wide by 1/4 inch (6.35 mm) of slab depth. Saw cutting of joints shall be made as soon as possible after slab finishing as may be safely done without dislodging aggregate.

4.4 JOINTS

- A. Construction and Control Joints - Walls and Slab on Grade: Locate and install as indicated or, if not indicated, so as not to impair the strength and appearance of the structure, as acceptable by the Architect.

- B. Contraction (Control) Joints in Slabs-on-Ground: Construct contraction joints in slabs-on-ground to form panels of patterns as shown. Use saw cuts 1/8 inch wide by 1/4 slab depth or inserts 1/4 inch wide by 1/4 of slab depth, unless otherwise indicated. Saw cutting of joints shall be made as soon as possible after slab finishing as may be safely done without dislodging aggregate.
- C. Place construction joints perpendicular to the main reinforcement. Continue reinforcement across construction joints.
- D. Provide keyways at least 1-1/2" deep in construction joints in walls, slabs and between walls and footings.

4.5 INSTALLATION OF EMBEDDED ITEMS

- A. General: Set and build into work anchorage devices and other embedded items required for other work that is attached to, or supported by, cast-in-place concrete. Use setting drawings, diagrams, instructions and directions provided by suppliers of items to be attached thereto.

4.6 CONCRETE MIXING

- A. Ready-Mix Concrete: Comply with the requirements of ASTM C94, and as herein specified.

4.7 CONCRETE PLACEMENT

- A. Preplacement Inspection: Before placing concrete, inspect and complete the formwork installation, reinforcing steel and items to be embedded or cast-in.
- B. Coordinate the installation of joint materials and moisture barriers with placement of forms and reinforcing steel.
- C. General: Comply with ACI 304 and as herein specified.
- D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24" (.61 m) and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.
- E. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand-spacing, rodding or tamping. Use equipment and procedures for consolidation of concrete in accordance with the recommended practices of ACI, to suit the type of concrete and project conditions.

- F. Placing Concrete Slabs: Deposit and consolidate concrete slabs in a continuous operation, within the limits of construction joints, until the placing of a panel or section is completed.
- G. Consolidate concrete during placing operations so that concrete is thoroughly worked around reinforcement and other embedded items and into corners.
- H. Bring slab surfaces to the correct level with a straightedge and strikeoff. Use bull floats or darbies to smooth the surface, leaving it free of humps or hollows. Do not sprinkle water on the plastic surface. Do not disturb the slab surfaces prior to beginning finishing operations.
- I. Maintain reinforcing in the proper position during concrete placement operations.
- J. Cold Weather Placing: Comply with ACI 306.
- K. Hot Weather Placing: Comply with ACI 305.

4.8 MONOLITHIC SLAB FINISHES

- A. Float Finish: Apply float finish to monolithic slab surfaces that are to receive trowel finish and other finishes as hereinafter specified and slab surfaces which are to be covered with membrane or elastic waterproofing, membrane or elastic roofing, or sand-bed terrazzo and as otherwise indicated.
 - 1. After screeding and consolidating and leveling concrete slabs, do not work surface until ready for floating. Begin floating using float blades or float shoes only when surface water has disappeared or when concrete has stiffened sufficiently to permit operation of power driven floats, or both. Consolidate surface with power- driven floats, or by hand-floating if area is small or inaccessible to power units. Check and level surface plane so that depressions between high spots do not exceed 1/8" (3.175 mm) under a 10' (3.02 m) straightedge. Cut down high spots and fill low spots. Uniformly slope surfaces to drain, if applicable. Immediately after leveling, refloat surface to a uniform, smooth, granular texture.
- B. Trowel Finish: Apply trowel to monolithic slab surfaces to be exposed-to-view, and slab surfaces to be covered with resilient flooring, carpet, ceramic or quarry tile, paint or other thin film finish coating system.
 - 1. After floating begin first trowel finish operation using a power-driven trowel. Begin final trowelling when surface produces a ringing sound as trowel is moved over surface. Consolidate concrete surface by final hand-troweling operation, free of trowel marks, uniform in texture and appearance and with surface leveled so that depressions between high spots do not exceed 1/8" (3.175 mm) under a 10'

(3.02 m) straightedge. Grind smooth surface defects which would telegraph through applied floor covering system.

- C. Trowel and Fine Broom Finish: Where ceramic or stone is to be installed with thin-set mortar, apply trowel finish as specified, then immediately follow with slightly scarifying surface by fine brooming.
- D. Non Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, steps and ramps and elsewhere as indicated.
- E. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

4.9 CONCRETE CURING AND PROTECTION

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for a period of time necessary for hydration of cement and proper hardening. Start curing as soon as free water has disappeared from concrete surface after placing and finishing. Continue curing for at least 7 days in accordance with ACI 301 procedures.
- B. Curing shall be by application of the specified curing and sealing compound.
- C. Liquid membrane-forming curing and sealing compounds shall be applied in accordance with the manufacturer's recommendations.
- D. Sealer and Dustproofer: Apply a second coat of specified curing and sealing compound only to surface indicated to receive sealer-dustproofer finish.

4.10 REMOVAL OF FORMS

- A. Formwork not supporting weight of concrete, such as sides of beams, walls, columns, and similar parts of the work, may be removed after cumulatively curing at not less than 50 degrees F (10 degrees C) for 24 hours after placing concrete, provided concrete is sufficiently hard to not be damaged by form removal operations, and provide curing and protection operations are maintained.
- B. Formwork supporting weight of concrete, such as beam soffits, joists, slabs, and other structural elements may not be removed until the concrete has reached its design strength.

4.11 CONCRETE SURFACE REPAIRS

- A. Patching Defective Areas: Repair and patch defective areas with cement mortar immediately after removal of forms, when acceptable to Architect.

PART 5 QUALITY CONTROL TESTING DURING CONSTRUCTION

5.1 GENERAL

- A. The Owner will employ a testing laboratory to perform tests and to submit test results.
- B. Sampling and testing for quality control during placement of concrete shall include the following:
 - 1. Sampling Fresh Concrete: ASTM C172, except modified for slump to comply with ASTM C94.
 - 2. Slump: ASTM C143 and one test for each set of compressive strength test specimens.
 - 3. Air Content: ASTM C173, volumetric method for lightweight or normal weight concrete; ASTM C231 pressure for normal weight concrete; one for each set of compressive strength test specimens.
 - 4. Concrete Temperature: Test hourly when air temperature is 40 degrees F (4.5 degrees C) and below, and when 80 degrees F (26.7 degrees C) and above; and each time a set of compression test specimens made.
 - 5. Compression Test Specimen: ASTM C31, one set of 5 standard cylinders for each strength test, minimum.
 - 6. Compressive Strength Tests: ASTM C39, one set for each 75 cubic yards (57.38 cubic meters) or fraction thereof, of each concrete class placed in any one day or for each 5,000 square feet (4,180 square meters) of surface area placed; two specimens tested at 7 days, two specimens at 28 days and one specimen retained in reserve for later testing if required. Additional cylinders shall be formed as required for early stripping by the Contractor.

PART 6 END OF SECTION 03301

SECTION 04720 – CAST STONE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Cast stone trim including the following:
 - a. Pre-cast stone coping

- B. Related Sections:

- 1. Division 3 Section "Plant-Precast Architectural Concrete."
- 2. Division 4 Section "Unit Masonry Assemblies" for installing cast stone units in unit masonry.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

- 1. For cast stone units, include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

- B. LEED Submittals:

- 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.

- C. Shop Drawings: Show fabrication and installation details for cast stone units. Include dimensions, details of reinforcement and anchorages if any, and indication of finished faces.
 - 1. Include building elevations showing layout of units and locations of joints and anchors.
- D. Samples for Initial Selection: For colored mortar.
- E. Samples for Verification:
 - 1. For each color and texture of cast stone required, 10 inches (250 mm) square in size.
 - 2. For colored mortar. Make Samples using same sand and mortar ingredients to be used on Project. Label Samples to indicated types and amounts of pigments used.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
 - 1. Include copies of material test reports for completed projects, indicating compliance of cast stone with ASTM C 1364.

1.5 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A qualified manufacturer of cast stone units similar to those indicated for this Project, that has sufficient production capacity to manufacture required units, and is a plant certified by the Cast Stone Institute the Architectural Precast Association or the Precast/Prestressed Concrete Institute for Group A, Category AT.
- B. Source Limitations for Cast Stone: Obtain cast stone units through single source from single manufacturer.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- D. Mockups: Furnish cast stone for installation in mockups specified in Division 4 Section "Unit Masonry Assemblies."
- E. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
 - 1. Build mockup of typical wall area as shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Coordinate delivery of cast stone with unit masonry work to avoid delaying the Work and to minimize the need for on-site storage.
- B. Pack, handle, and ship cast stone units in suitable packs or pallets.
 - 1. Lift with wide-belt slings; do not use wire rope or ropes that might cause staining. Move cast stone units, if required, using dollies with wood supports.
 - 2. Store cast stone units on wood skids or pallets with nonstaining, waterproof covers, securely tied. Arrange to distribute weight evenly and to prevent damage to units. Ventilate under covers to prevent condensation.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store mortar aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

1.7 PROJECT CONDITIONS

- A. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** and above and will remain so until cast stone has dried, but no fewer than seven days after completing cleaning.
- B. Hot-Weather Requirements: Comply with hot-weather construction requirements in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 CAST STONE UNITS

- A. Regional Materials: Cast stone units shall be manufactured within **500 miles (800 km)** of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- B. Provide cast stone units complying with ASTM C 1364 using either the vibrant dry tamp or wet-cast method.

1. Provide units that are resistant to freezing and thawing as determined by laboratory testing according to ASTM C 666/C 666M, Procedure A, as modified by ASTM C 1364.
- C. Fabricate units with sharp arris and accurately reproduced details, with indicated texture on all exposed surfaces unless otherwise indicated.
1. Slope exposed horizontal surfaces 1:12 to drain unless otherwise indicated.
 2. Provide raised fillets at backs of sills and at ends indicated to be built into jambs.
 3. Provide drips on projecting elements unless otherwise indicated.
- D. Fabrication Tolerances:
1. Variation in Cross Section: Do not vary from indicated dimensions by more than **1/8 inch (3 mm)**.
 2. Variation in Length: Do not vary from indicated dimensions by more than 1/360 of the length of unit or **1/8 inch (3 mm)**, whichever is greater, but in no case by more than **1/4 inch (6 mm)**.
 3. Warp, Bow, and Twist: Not to exceed 1/360 of the length of unit or **1/8 inch (3 mm)**, whichever is greater.
 4. Location of Grooves, False Joints, Holes, Anchorages, and Similar Features: Do not vary from indicated position by more than **1/8 inch (3 mm)** on formed surfaces of units and **3/8 inch (10 mm)** on unformed surfaces.
- E. Cure units as follows:
1. Cure units in enclosed moist curing room at 95 to 100 percent relative humidity and temperature of **100 deg F (38 deg C)** for 12 hours or **70 deg F (21 deg C)** for 16 hours.
 2. Keep units damp and continue curing to comply with one of the following:
 - a. No fewer than five days at mean daily temperature of **70 deg F (21 deg C)** or above.
 - b. No fewer than six days at mean daily temperature of **60 deg F (16 deg C)** or above.
 - c. No fewer than seven days at mean daily temperature of **50 deg F (10 deg C)** or above.
 - d. No fewer than eight days at mean daily temperature of **45 deg F (7 deg C)** or above.
- F. Acid etch units after curing to remove cement film from surfaces to be exposed to view.
- G. Colors and Textures: As selected by Architect from manufacturer's full range.

2.2 MORTAR MATERIALS

- A. Regional Materials: Aggregate for mortar, cement, and lime shall be manufactured within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Davis Colors; True Tone Mortar Colors.
 - b. Lanxess Corporation; Bayferrox Iron Oxide Pigments.
 - c. Solomon Colors, Inc.; SGS Mortar Colors.
- F. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch (6 mm) thick, use aggregate graded with 100 percent passing the No. 16 (1.18-mm) sieve.
 - 3. White-Mortar Aggregates: Natural white sand or crushed white stone.
 - 4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- G. Water: Potable.

2.3 ACCESSORIES

- A. Anchors: Type and size indicated, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.
- B. Dowels: 1/2-inch- (12-mm-) diameter, round bars, fabricated from Type 304 stainless steel complying with ASTM A 240/A 240M, ASTM A 276, or ASTM A 666.

2.4 MORTAR MIXES

- A. Do not use admixtures including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.
 - 1. Do not use calcium chloride in mortar or grout.
 - 2. Use portland cement-lime mortar unless otherwise indicated.
- B. Comply with ASTM C 270, Proportion Specification.
 - 1. For setting mortar, use Type S Type N.
 - 2. For pointing mortar, use Type N Type O.
- C. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
 - 1. Pigments shall not exceed 10 percent of portland cement by weight.
 - 2. Pigments shall not exceed 5 percent of masonry cement or mortar cement by weight.
 - 3. Mix to match Architect's sample.
 - 4. Application: Use pigmented mortar for exposed mortar joints.
- D. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
 - 1. Mix to match Architect's sample.
 - 2. Application: Use colored aggregate mortar for exposed mortar joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 SETTING CAST STONE IN MORTAR

- A. Set cast stone as indicated on Drawings. Set units accurately in locations indicated with edges and faces aligned according to established relationships and indicated tolerances.

1. Install anchors, supports, fasteners, and other attachments indicated or necessary to secure units in place.
 2. Coordinate installation of cast stone with installation of flashing specified in other Sections.
- B. Wet joint surfaces thoroughly before applying mortar or setting in mortar.
- C. Set units in full bed of mortar with full head joints unless otherwise indicated.
1. Set units with joints **1/4 to 3/8 inch (6 to 10 mm)** wide unless otherwise indicated.
 2. Build anchors and ties into mortar joints as units are set.
 3. Fill dowel holes and anchor slots with mortar.
 4. Fill collar joints solid as units are set.
 5. Build concealed flashing into mortar joints as units are set.
 6. Keep head joints in coping and other units with exposed horizontal surfaces open to receive sealant.
 7. Keep joints at shelf angles open to receive sealant.
- D. Rake out joints for pointing with mortar to depths of not less than **3/4 inch (19 mm)**. Rake joints to uniform depths with square bottoms and clean sides. Scrub faces of units to remove excess mortar as joints are raked.
- E. Point mortar joints by placing and compacting mortar in layers not greater than **3/8 inch (10 mm)**. Compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
- F. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- G. Provide sealant joints at copings and other horizontal surfaces, at expansion, control, and pressure-relieving joints, and at locations indicated.
1. Keep joints free of mortar and other rigid materials.
 2. Build in compressible foam-plastic joint fillers where indicated.
 3. Form joint of width indicated, but not less than **3/8 inch (10 mm)**.
 4. Prime cast stone surfaces to receive sealant and install compressible backer rod in joints before applying sealant unless otherwise indicated.
 5. Prepare and apply sealant of type and at locations indicated to comply with applicable requirements in Division 7 Section "Joint Sealants."

3.3 INSTALLATION TOLERANCES

- A. Variation from Plumb: Do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.

- B. Variation from Level: Do not exceed **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
- C. Variation in Joint Width: Do not vary joint thickness more than **1/8 inch in 36 inches (3 mm in 900 mm)** or one-fourth of nominal joint width, whichever is less.
- D. Variation in Plane between Adjacent Surfaces (Lipping): Do not vary from flush alignment with adjacent units or adjacent surfaces indicated to be flush with units by more than **1/16 inch (1.5 mm)**, except where variation is due to warpage of units within tolerances specified.

3.4 ADJUSTING AND CLEANING

- A. Remove and replace stained and otherwise damaged units and units not matching approved Samples. Cast stone may be repaired if methods and results are approved by Architect.
- B. Replace units in a manner that results in cast stone matching approved Samples, complying with other requirements, and showing no evidence of replacement.
- C. In-Progress Cleaning: Clean cast stone as work progresses.
 - 1. Remove mortar fins and smears before tooling joints.
 - 2. Remove excess sealant immediately, including spills, smears, and spatter.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed cast stone as follows:
 - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 - 2. Test cleaning methods on sample; leave one sample uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of cast stone.
 - 3. Protect adjacent surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet surfaces with water before applying cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 - 5. Clean cast stone by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.

END OF SECTION 04720

SECTION 05120 - STRUCTURAL STEEL

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 work of this section.

1.2 DESCRIPTION

- A. Extent of structural steel work is shown on drawings, including schedules, notes and details to show size and location of members, typical connections, and type of steel required.
- B. Section includes structural steel as defined by the AISC Code of Standard Practice.
- C. Products furnished but not installed under this section:
 - 1. Steel anchorages cast in concrete or installed in masonry.
 - 2. Loose lintels in masonry walls.
 - 3. Anchor bolts and leveling plates.
- D. General: Unless otherwise specifically approved in writing, furnish exact section, weights, and kinds of material specified, using details and dimensions shown.
- E. Details shown are typical; similar details apply to similar conditions, unless otherwise indicated.
- F. Substitution of other shapes of equivalent or greater strength and no greater dimension may be allowed by the Architect, but only under normal substitution procedures.

1.3 QUALITY ASSURANCE

- A. Welding Procedures: Establish that joint welding procedures are prequalified or test in accordance with AWS D1.1 qualification procedures.
- B. Welder Qualifications: Welders must be currently certified under American Welding Society qualification procedures. If recertification is required, retesting will be the Contractor's responsibility.
- C. Regulatory Requirements: Unless other requirements of governing authorities or particular requirements of this specification are more stringent, comply with provisions of the following:

1. AISC "Code of Standard Practice for Steel Buildings and Bridges"
 - a. AISC "Specification for Structural Steel Buildings--Allowable Stress Design and Plastic Design," with Commentary and Supplements
 - b. AISC "Load and Resistance Factor Design (LRFD) Specification for Structural Steel Buildings"
 - c. ASTM A6 "Specification for General Requirements for Rolled Steel Plate, Shapes, Sheet Piling and Bars for Structural Use"
 - d. Research Council on Structural Connections (RCSC) "Specification for Structural Joints Using ASTM A325 or A490 Bolts"
 - e. ANSI/AWS D1.1, "Structural Welding Code - Steel"
 - f. ASTM A 123 -- Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. CRD - C 621 -- Corps of Engineers Specification for Nonshrink Grout; U.S. Army Corps of Engineers.

1.4 SUBMITTALS

- A. Product Data: Submit producer's or manufacturer's data for products as follows, including sufficient data to show compliance with specified requirements:
 1. Structural steel primer.
 2. Expansion bolts.
 3. Headed Studs.
- B. Mill test reports for each type of structural steel furnished.
- C. Mill test reports for high-strength bolts, nuts, and washers, including chemical analysis, tensile strength tests, and hardness tests.
- D. Shop Drawings: Submit complete shop drawings at 1/8 inch (1:100 mm) scale minimum for structural steel, including information on location, type, and size of all bolts, and welds, distinguishing between those made in the shop and those made in the field. (Reproduced contract drawings are not acceptable for use as erection plans.)
 1. Structural steel piece drawings shall denote the gravity load used to select the connection.
 2. Include cambers, splices, holes and other pertinent data.
- E. Indicate weld lengths and sizes, using standard AWS welding symbols. Distinguish between shop and field welds.
- F. Include setting drawings and templates for anchorages to be installed as work of other sections.

- G. The Contractor shall verify all existing conditions and dimensions prior to submitting of shop drawings. Shop drawings shall not be submitted until all field checking of dimensions have been shown on the shop drawings.
- H. Test Reports: The owner's testing and inspection agency will submit test reports for all specified tests of connections.
- I. Welder Qualifications: Submit evidence that welders employed in the work are currently certified under AWS qualification procedures.
- J. Surveys: Submit copies of specified surveys, showing locations and elevations of all critical elements. Indicate discrepancies between field data and information shown on contract documents.
- K. LEED - Product Data for Credit MR 4: For products having recycled content, provide documentation indicating percentages by weight of post-consumer and pre-consumer recycled content. Include statement indicating cost for each product having recycled content.
- L. LEED – Laboratory Test Reports for Credit IEQ 4: For primers, provide documentation indicating that products comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers”.

PART 2 PRODUCTS

2.1 STEEL MATERIALS

- A. Metal Surfaces, General: For fabrication of work which will be exposed to view, use only materials which are smooth and free of surface blemishes including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness. Remove such blemishes by grinding, or by welding and grinding, prior to cleaning, treating and application of surface finishes.
- B. Structural Steel Angles, Channels, Plates, and Bars: ASTM A 36.
- C. Structural Steel Wide Flange Shapes: High-Strength, Low-Alloy Columbium-Vanadium Steels: ASTM A 572, Grade 50.
- D. Structural Tubing, Cold-Formed: ASTM A 500, Grade B.
- E. Steel Pipe: ASTM A 53. Type E or S, Grade B.

- F. Anchor Bolts: ASTM A 36
- G. Shear Connectors: Headed stud type, ASTM A 108, Grade 1015 or 1020, cold-finished carbon steel, with dimensions complying with AISC specifications.
- H. High-Strength Threaded Fasteners: Heavy hexagon structural bolts, heavy hexagon nuts, and hardened washers, quenched and tempered medium-carbon steel, complying with ASTM A 325 unless otherwise indicated, Provide galvanized bolts for all galvanized steel, and where indicated.
- I. Electrodes for Welding: Comply with AWS Code, use E70XX Series.
- J. Standard Primer Paint: High solids, low VOC, rust inhibitive, all-purpose shop primer which is free of lead, chromates, and other heavy metals, complying with the performance requirements of FSTT-P-664. Acceptable products, or equivalent:
 - 1. Structural Steel Primer (B5ONV12 Red, B5OAV11 Gray) by Sherwin Williams Company, Cleveland, OH.
 - 2. Duraclad High Solids Shop Coat Metal Primer (33-082 Red, 33-083 Gray) by Duron Paints and Wall Coverings, Beltsville, MD
 - 3. Devoe Rustgard 4140 Quick Drying Shop Primer (4140-7100 Red, 4140-6120 Gray) by ICI Dulux Paints, Louisville, KY.
- K. Channel Slot Receivers for Masonry Anchors: 16 gage (1.372 mm) hot dipped galvanized, Heckmann No. 130 (8" long) [203.2 mm] or No. 133 (continuous) or approved equal.
- L. Non-shrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining product containing selected silica sands, portland cement, shrinkage compensating agents, plasticizing and water reducing agents, complying with CRD-C621. Products: Masterflow 713; Master Builders. Five Star Grout; U.S. Grout Corp or approved equal.
- M. Expansion Bolts: Zinc plated steel bolts as specified on Drawings. "HSL heavy-duty expansion anchors" and "Kwik-Bolts" as manufactured by Hilti, Inc. or approved equal.
- N. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds and repair painting galvanized steel, with dry film containing not less than 93 percent zinc dust by weight, and complying with DOD-P-21025A or SSPC-Paint 20.

2.2 FABRICATION

- A. Shop Fabrication and Assembly: Fabricate and assemble structural assemblies in the shop to greatest extent possible. Fabricate items of structural steel in accordance with AISC Specifications and as indicated on final shop drawings. Provide camber in structural members where indicated.

- B. Properly mark and match-mark materials for field assembly. Fabricate for delivery sequence, which will expedite erection and minimize field handling of materials.
- C. Where finishing is required, complete assembly, including welding of units, before start of finishing operations. Provide finish surfaces of members exposed in final structure free of markings, burrs and other defects.
- D. Fabricate architecturally exposed structural steel with exposed surfaces smooth, square, and free of surface blemishes, including pitting, rust and scale seam marks, roller marks, rolled trade names and roughness.
 - 1. Remove blemishes by filling, grinding, or by welding and grinding, prior to cleaning, treating and shop priming.
 - 2. Comply with fabrication requirements, including tolerance limits, of AISC's "Code of Standard Practice for Steel Building and Bridges" for architecturally exposed structural steel.
- E. Provide high-strength threaded fasteners for all bolted connections, except where unfinished bolts are shown.
- F. High-Strength Bolted Construction: Install high-strength threaded fasteners in accordance with AISC "Specifications for Structural Joints using ASTM A 325 or A 490 Bolts."
- G. Bolts need only to be tightened to a snug tight condition in accordance with the RCSC specification for shear/bearing bolts except for those identified as slip critical bolts. Slip critical connections are defined as follows:
 - 1. All connections at braced bays including bracing, beams and columns.
 - 2. All connections noted as such on the plans.
- H. Welded Construction: Comply with AWS Code for procedures, appearance, and quality of welds, and methods used in correcting welding work.
- I. Assemble and weld built-up sections by methods, which will produce true alignment of axes without warp.
- J. Holes for other Work: Provide holes required for securing other work to structural steel framing, and for the passage of other work through steel framing members as shown on the final shop drawings. Provide threaded nuts welded to framing, and other specialty items as shown to receive other work.

- K. Cut drill or punch holes perpendicular to metal surfaces. Do not flame cut holes or enlarge holes by burning. Drill holes in bearing plates.
- L. Accessories: Provide accessories for masonry as follows:
 - 1. Shop welded strap anchors on beams where indicated.
 - 2. Continuous channel slot receivers on all columns adjacent to masonry walls.
 - 3. Vertically applied channel slot receivers at 32 inches (800 mm) on center on all beams adjacent to masonry walls.
- M. Galvanizing: Provide a zinc coating for those items indicated or specified to be galvanized, as follows: ASTM A 153 for galvanizing iron and steel hardware. ASTM A 123 for galvanizing rolled, pressed and forged steel shapes, plates, bars and strip 1/8 (3.175 mm): thick and heavier. ASTM A 386 for galvanizing assembled steel products.

2.3 SHOP PAINTING

- A. General: Shop paint structural steel, except those members or portions of members to be embedded in concrete, mortar or those members to be fire-proofed. Paint embedded steel, which is partially exposed on exposed portions and initial 2" (50.8 mm) of embedded areas only.
- B. Surface Preparation: After inspection, clean steel work to be painted. Remove loose rust, loose mill scale, and spatter, slag or flux deposits. Clean steel in accordance with Steel Structures Painting Council (SSPC) as follows: SSPC - SP-3 "Power Tool Clean" for concealed steel and SSPC-SP-10 "Near-White Blast Cleaning" for Architecturally Exposed Structural Steel.
- C. Painting: Immediately after surface preparation, apply structural steel primer paint in accordance with manufacturer's instructions and at a rate to provide dry film thickness of not less than 1.5 mils (0.038 mm). Use a painting method, which results in full coverage of joints, corners, edges and exposed surfaces. Apply two coats of paint to those surfaces, which are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Erector must examine the areas and conditions under which structural steel work is to be installed and notify the Contractor, in writing, of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Erector.

- B. Erector must survey as-built anchor bolt, bearing plate and embedded plates used for beam connection layouts prior to setting structural steel. If structural steel is set prior to surveying, erector is responsible for all modifications necessitated by improperly located bolts or plates.
- C. Erector must inform the Architect when the erection of steel deviates from the approved shop drawings due to fabrication errors, misalignment of embeds and any additional type of deviation. The erector must submit, for review, a report of the deviation condition in writing, including cause and possible solution. A written acceptance of all deviations must be maintained at the jobsite for review by the Owner's testing laboratory.
- D. Temporary Support: Provide temporary guys, braces, falsework, cribbing, or other elements required to secure the steel framing against loads equal in intensity to design loads. Remove such temporary support only when permanent connections have been made and the steel framing is fully capable of supporting design loads, including any temporary constructions loads.

3.2 DELIVERY, STORAGE, AND HANDLING

- A. Shipping: Deliver steel in timely fashion, to permit the most efficient and economical flow of work. Deliver steel members properly marked for field assembly and erection.
- B. Deliver lintels, anchor bolts, washers, and other anchorage devices to be built into other work in time to avoid delays and permit their proper installation.
- C. Identification: Specially mark high-strength steel in accordance with requirements of ASTM A 6 and maintain markings until steel has been placed in final position.
- D. Storage: Protect steel and other materials of this section from damage and corrosion. If temporary storage at the project site is required, keep steel members off the ground, using platforms or pallets, in location easily accessible for inspection.

3.3 ERECTION

- A. General: Erect structural steel in compliance with AISC Code and Specifications.
- B. Set structural frames accurately to the lines and elevations indicated. Align and adjust the various members forming a part of a complete frame or structure before permanently fastening. Clean bearing surfaces and other surfaces, which will be in permanent contact before assembly. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
- C. Level and plumb individual members of the structure within specified AISC tolerances.

- D. Establish required leveling and plumbing measurements on the mean operating temperature of the structure. Make allowances for the difference between temperature at time of erection and the mean temperature at which the structure will be when completed and in service.
- E. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of base and bearing plates.
- F. Set loose and attached base plates and bearing plates for structural members on wedges or other adjusting devices.
- G. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims, but if protruding, cut off flush with edge of base or bearing plate prior to packing with grout.
- H. Pack grout solidly between bearing surfaces and bases or plates to ensure that no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure. For proprietary grout materials, comply with manufacturer's instructions.
- I. Splice members only where indicated and accepted on final shop drawings.
- J. Erection Bolts: On exposed welded construction, remove erection bolts, fill holes with plug welds and grind smooth at exposed surfaces.
- K. Comply with AISC specifications for bearing, adequacy for temporary connections, alignment and the removal of paint on surfaces adjacent to field welds.
- L. Do not enlarge unfair holes in members by burning or by the use of drift pins, except in secondary bracing members. Ream holes must be enlarged to admit bolts.
- M. Gas Cutting: Do not use gas cutting torches in the field for correcting fabrication errors in primary structural framing. Cutting will be permitted only on secondary members, which are not under stress, as acceptable to the Architect. Finish gas-cut sections equal to a sheared appearance when permitted.
- N. Expansion Bolts: Install in accordance with manufacturer's instructions using only acceptable masonry carbide bits for drilling. Provide bolts with a minimum embedment of 5" unless otherwise noted on drawings.
- O. Expansion Bolts to Masonry: Anchor only to masonry grouted solid. If masonry is not grouted at the time of anchor installation, immediately notify General Contractor of condition. Do not proceed until condition is corrected by grouting solid & cured for a minimum of three days.

- P. Touch-up Painting: After erection, wire brush clean and paint scarred areas, welds, rust spots on steel, using same type of shop paint used on adjacent surfaces. Use galvanized repair paint on galvanized surfaces.

3.4 FIELD QUALITY CONTROL

- A. Owner will engage an independent testing and inspection agency to inspect high-strength bolted connections and welded connections and to perform tests and prepare test reports for all field inspections.
- B. The testing agency shall visit the fabricator's plant and verify that the fabricator's detailed fabrication and quality control procedures are in place and conform to industry standards. If the fabricator can demonstrate that they currently comply with the AISC quality certification program category I, the testing agency's plant inspection may be omitted.
- C. The testing agency will conduct tests in accordance with industry standards and the Special Inspections requirements of the building code. The testing agency shall prepare a report for each visit. Each report will state whether or not the tests comply with the requirements and specifically state any deviations.
- D. Deficiencies that were listed in the inspections and laboratory test reports need to be corrected at the Contractor's expense. Perform any additional tests to reconfirm if there is any more non-compliances of the original work and show compliance of corrected work.
- E. Beam Cambers: Testing agency shall verify that the cambers of the in-place beams conform to the documents and the AISC tolerances.
- F. Shop Bolted Connections: Inspect in accordance with AISC specifications.
- G. Shop Welding: Inspect and test during fabrication of structural steel assemblies, as follows:
 - 1. Verify welders' certifications and conduct inspections and tests as required. Record types and locations of defects found in the work. Record work required and performed to correct deficiencies.
 - 2. Perform visual inspection of all welds.
 - 3. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.
 - 4. Perform additional testing at the testing agency's option using ASTM E165, ASTM E704, ASTM E94 or ASTM E142.
- H. Field Bolted Connections: Inspect in accordance with AISC specifications.

- I. Field Welding: Inspect and test during erection of structural steel as follows:
 - 1. Perform visual inspection of all field welds.
 - 2. Test all full penetration welds. Test ultrasonic inspection of all full penetration welds to comply with ASTM E 164.
 - 3. All expansion bolts shall be inspected in accordance with manufacturer's requirements.

- J. Shear Connectors: Perform visual inspection and bend tests.

PART 4 END OF SECTION 05120

SECTION 06100 - ROUGH CARPENTRY

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. Provide labor, materials, equipment and services necessary for and reasonably incidental to the completion of all rough carpentry work shown on the drawings or herein specified.

1.3 SUBMITTALS

- A. Submit product data for the following products: Engineered wood products. Metal framing anchors, hangers, connectors and miscellaneous hardware.
- B. Material certificates for dimensional lumber specified to comply with minimum allowable unit stresses. Indicate species and grade selected for each use as well as design values approved by the Board of Review of American Lumber Standards Committee.
- C. Wood treatment data for each type of treatment. Include chemical treatment manufacturer's instructions for handling, storing, installation, and finishing of treated material.
- D. LEED – Certificates for Credit [MR-6] and [MR-7]: Submit chain-of-custody certificates indicating that products specified to be made from certified wood comply with forest certification requirements. Include documentation that manufacturer is certified for chain of custody by an FSC-accredited certification body. Include statement indicating cost for each certified wood product.
- E. LEED – Product Data for Credit IEQ-4.1: For adhesives, submit documentation including printed statement of VOC content.
- F. LEED – Product Data for Credit IEQ-4.4: For composite wood products, submit documentation indicating that product contains no urea formaldehyde.
- G. LEED – Laboratory Test Reports for Credit IEQ 4: For adhesives and composite wood products, provide documentation indicating that products comply with the testing and product requirements of the California Department of Health Services “Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers”

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Engineered Wood Products: Obtain each type of engineered wood products from one source from a single manufacturer.
- B. Construct all work using new materials. Correct defects in workmanship so as not to delay the production schedule.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Storage: Keep materials under cover and dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber as well as plywood and other panels; provide for air circulation within and around stacks and under temporary coverings including polyethylene and similar materials.
- B. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.
- C. Maintain materials in an orderly fashion in the work and storage areas in such a manner to reduce risk of injury as well as minimize above, reject and waste.

PART 2 PRODUCTS

2.1 LUMBER, GENERAL

- A. LEED – Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, “FSC Principals and Criteria for Forest Stewardship” for the following:
 - 1. Dimensional Lumber Framing
 - 2. Timber
 - 3. Laminated-veneer Lumber
 - 4. Parallel-strand Lumber
 - 5. Prefabricated Wood I-joists
 - 6. Rim boards
 - 7. Miscellaneous Lumber
- B. Lumber Standards: Furnish lumber manufactured to comply with PS 20 "American Softwood Lumber Standard" and with applicable grading rules of inspection agencies certified by American Lumber Standards Committee's (ALSC) Board of Review.
- C. Inspection Agencies: Inspection agencies and the abbreviations used to reference them with lumber grades and species include the following:
 - 1. SPIB - Southern Pine Inspection Bureau.
 - 2. WCLIB - West Coast Lumber Inspection Bureau.

3. WWPA - Western Wood Products Association.
- D. Grade Stamps: Provide lumber with each piece factory-marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
- E. Nominal sizes are indicated, except as shown by detail dimensions. Provide actual sizes as required by PS 20, for moisture content specified for each use.
 1. Provide dressed lumber, S4S, unless otherwise indicated.
 2. Provide seasoned lumber with 19 percent maximum moisture content at time of dressing and shipment for sizes 2 inches or less in nominal thickness, unless otherwise indicated.

2.2 DIMENSION LUMBER

- A. For stud framing (2 to 4 inches thick, 2 to 6 inches wide) provide the following grade and species as designated on the drawings. If not designated provide:
 1. Southern Pine, 'Stud Grade' graded under SPIB rules.
 2. Spruce-Pine-Fir, 'Stud Grade' graded under NLGA rules.
- B. For structural framing (2 to 4 inches thick, 5 inches and wider), provide the following grade and species as designated on the drawings. If not designated provide:
 1. Hem-Fir, 'No. 2' graded under WWPA rules.
 2. Southern Pine, 'No. 2' graded under SPIB rules.
 3. Spruce-Pine-Fir, 'No. 2' graded under NLGA rules. Spruce-Pine-Fir (South) is not allowed.

2.3 MISCELLANEOUS LUMBER

- A. General: Provide lumber for support or attachment of other construction including rooftop equipment curbs and support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.

2.4 ENGINEERED WOOD PRODUCTS (Wood I Joists)

- A. General: Provide engineered wood products for which current model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance for the application indicated with specified requirements and the building code in effect for this Project.
- B. Prefabricated Wood I Joists: Units manufactured by bonding stress-graded lumber or LVR flanges to APA-Performance-Rated panel webs with exterior-type adhesives complying with ASTM D 2559, to produce I-shaped joists complying with the following requirements.
 - 1. Flange Material: Laminated veneer lumber or stress –graded limber
 - 2. Web Material: Oriented strand board or plywood.
 - 3. Allowable Design Stresses: As published by manufacturer, determined according to ASTM D 5055, and demonstrated by comprehensive testing performed by a qualified independent testing laboratory.
 - 4. Sizes: Depths and member designations indicated, with flanges not less than 1-1/2 inches wide.
 - 5. Products: Subject to compliance with requirements, provide one of the following:
 - a. Prefabricated Wood I Joists:
 - 1. "Alpine Structures I-Beams and Headers," Wood Products Division, Alpine Engineered Wood Products, Inc.
 - 2. "Wood I-Beam Prefabricated Wooden I Joists and Headers," Georgia Pacific Corp.
 - 3. "TJI Joists," Truss Joist Corporation.
 - 6. Signed & Sealed design drawings and calculations, if required, will be designated in structural notes.
 - 7. Provide wood I hangers as required for joist supports.

2.5 CONSTRUCTION PANELS, GENERAL

- A. Construction Panel Standards: Comply with PS 1 "U.S. Product Standard for Construction and Industrial Plywood" for plywood construction panels and, for products not manufactured under PS 1 provisions, with APA PRP-108.
- B. Trademark: Furnish construction panels that are each factory-marked with APA trademark evidencing compliance with grade requirements.

2.6 CONCEALED PERFORMANCE-RATED CONSTRUCTION PANELS

- A. General: Where construction panels are indicated for the following concealed types of applications, provide APA Performance-Rated Panels complying with requirements designated under each application for grade designation, span rating, exposure durability classification, edge detail (where applicable), and thickness.
- B. Roof Sheathing: APA RATED SHEATHING.

1. Exposure Durability Classification: EXTERIOR.
2. Span Rating and Thickness: As indicated on drawings or, if not indicated, as required to suit rafter or truss spacing indicated.

2.7 CONSTRUCTION PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade designation, APA C-D PLUGGED EXPOSURE 1, in thickness indicated, or, if not otherwise indicated, not less than 15/32 inch.

2.8 FASTENERS

- A. General: Provide fasteners of size and type indicated or as required for proper installation that comply with requirements specified in this article for material and manufacture.
 1. Where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity, provide fasteners with a hot-dip zinc coating per ASTM A 153 or of AISI Type 304 stainless steel.
 2. All fasteners for pressure treated or fire- retardant lumber to be hot – dip zinc coated or stainless steel.
- B. Nails, Wire, Brads, and Staples: FS FF-N-105.
- C. Power Driven Fasteners: National Evaluation Report NER-272.
- D. Wood Screws: ANSI B18.6.1.
- E. Lag Bolts: ANSI B18.2.1.
- F. Bolts: Steel bolts complying with ASTM A 307, Grade A; with ASTM A 563 hex nuts and where indicated, flat washers.

2.9 METAL FRAMING ANCHORS

- A. General: Provide metal framing anchors of type, size, metal, and finish indicated that comply with requirements specified including the following:
 1. Current Evaluation/Research Reports: Provide products for which model code evaluation/research reports exist that are acceptable to authorities having jurisdiction and that evidence compliance of metal framing anchors for application indicated with the building code in effect for this Project.
 2. Allowable Design Loads: Provide products for which manufacturer publishes allowable design loads that are determined from empirical data or by rational

engineering analysis and that are demonstrated by comprehensive testing performed by a qualified independent testing laboratory.

- B. Galvanized Steel Sheet: Steel sheet zinc-coated by hot-dip process on continuous lines prior to fabrication to comply with ASTM A 525 for Coating Designation G60 and with ASTM A 446, Grade A (structural quality); ASTM A 526 (commercial quality); or ASTM A 527 (lock-forming quality); as standard with manufacturer for type of anchor indicated.
- C. Use hot-dipped galvanized steel framing anchors for rough carpentry exposed to weather, in ground contact, or in area of high relative humidity, and where indicated.
- D. Hangers and connectors designated for special nails shall be furnished with the fasteners included.

2.10 MISCELLANEOUS MATERIALS

- A. Adhesives for Field Gluing Panels to Framing: Formulation complying with APA AFG-01 that is approved for use with type of construction panel indicated by both adhesive and panel manufacturer.
- B. Water Repellent Preservative: NWWDA-tested and -accepted formulation containing 3-iodo-2-propynyl butyl carbonate (IPBC) as its active ingredient.
- C. LEED – Adhesives for Gluing: Provide formulation complying with ASTM D 3498 that is approved for the use indicated by the adhesive manufacturer:
 - 1. Adhesives shall have a VOC content [70] [insert value] g/L or less when calculated according to 40 CFR59, Subpart D (EPA Method 24)

2.11 PRESERVATIVE WOOD TREATMENT BY PRESSURE PROCESS

- A. General: Where lumber or plywood is indicated as preservative-treated wood or is specified herein to be treated, comply with applicable requirements of AWWA Standards C2 (Lumber) and C9 (Plywood). Mark each treated item with the AWPB or SPIB Quality Mark Requirements.
- B. Pressure-treat above-ground items with water-borne preservatives to a minimum retention of 0.25 pcf. For interior uses, after treatment, kiln-dry lumber and plywood to a maximum moisture content, respectively, of 19 percent and 15 percent. Treat indicated items and the following:
 - 1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 - 2. Wood sills, sleepers, blocking, ledgers, furring, stripping, and similar members in contact with masonry or concrete.

3. Wood framing members less or plywood than 18 inches above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Pressure-treat wood members in contact with the ground or fresh water with water-borne preservatives to a minimum retention of 0.40 pcf.
- D. If cut after treatment, coat cut surfaces to comply with AWWA M4. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.

PART 3 EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry construction and that are too small to use in fabricating rough carpentry with minimum joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb and true to line and cut and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated.
- E. Countersink nail heads on exposed carpentry work and fill holes.
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting of wood; predrill as required.
- G. Layout work carefully, Cut and set material to fit accurately. Align, level, plumb and brace work in proper position. Level joists, beams and girders on masonry or concrete with either steel or slate shims. Do not use shims on wood or metal bearings.
- H. Frame openings for passage of ducts and pipes and to accommodate work of other trades. Provide blocking for finishes, accessories, grab bars and all other equipment and to support ends and edges of full square-edges plywood subfloors and roof sheathing.

3.2 NAILERS, BLOCKING, AND SLEEPERS

- A. Install nailers, blocking, and sleepers where shown and where required for screeding or attachment of other work. Form to shapes as shown and cut as required for true line and level of work to be attached. Coordinate location with other work involved.
- B. Attach to substrates as required to support applied loading. Countersink bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work. Where possible, anchor to formwork before concrete placement.
- C. Install permanent grounds of dressed, preservative treated, key-bevelled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material involved. Remove temporary grounds when no longer required.

3.3 WOOD FRAMING, GENERAL

- A. Framing Standard: Comply with N.F.P.A. "Manual for Wood Frame Construction," unless otherwise indicated.
- B. Framing with Engineered Wood Products: Install framing composed of engineered wood products to comply with manufacturer's directions.
- C. Install framing members of size and spacing indicated.
- D. Anchor and nail as shown, and to comply with the following:
 - 1. National Evaluation Report No. NER-272 for pneumatic or mechanical driven staples, P-Nails, and allied fasteners.
 - 2. Published requirements of manufacturer of metal framing anchors.
 - 3. "Recommended Nailing Schedule" of referenced framing standard and with N.F.P.A. "National Design Specifications for Wood Construction."
 - 4. "Appendix C - Recommended Nailing Schedule" of the BOCA National Building Code.
- E. Do not splice structural members between supports.
- F. Firestop concealed spaces of wood framed walls and partitions at each floor level and at the ceiling line of the top story. Where firestops are not automatically provided by the framing system used, use closely fitted wood blocks of nominal 2-inch-thick lumber of the same width as framing members.

3.4 JOIST FRAMING

- A. General: Install joists with crown edge up and support ends of each member with not less than 1-1/2 inches of bearing on wood or metal, or 3 inches on masonry or concrete. Attach joists as follows:

1. To wood bearing members by toe nailing or metal framing anchors.
 2. To wood supporting members with wood ledgers as shown, or if not shown, with metal joist hangers.
- B. Frame openings with headers and trimmers supported by metal joist hangers; double headers and trimmers where span of header exceeds 4 feet.
- C. Do not notch in middle third of joists; limit notches to 1/6-depth of joist, 1/3 at ends. Do not bore holes larger than 1/3-depth of joist or locate closer than 2 inches from top or bottom. Install solid blocking (2 inches thick by depth of joist) at ends of joists unless nailed to header or bearing member.
- D. Lap members framing from opposite sides of beams, girders or partitions not less than 4 inches or securely tie opposing members together. Install solid blocking (2 inches thick by depth of joist) over supports.
- E. Under jamb studs at openings, install solid blocking in joist space between decking and top plate. Match size and number of jamb studs.
- F. Coordinate layout of floor joists to accommodate other trades. Add joists as required.

3.5 INSTALLATION OF CONSTRUCTION PANELS

- A. General: Comply with applicable recommendations contained in Form No. E30, "APA Design/Construction Guide - Residential & Commercial," for types of construction panels and applications indicated.
- B. Fastening Methods: Fasten panels as indicated on structural drawings, or if not indicated per BOCA – National Building Code requirements:
- C. Combination Subflooring-Underlayment: Glue and nail to framing throughout.

END OF SECTION 06100

SECTION 07270 - FIRESTOPPING

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:

1. Firestopping for penetrations through fire-resistance-rated floor construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Firestopping for penetrations through fire-resistance-rated walls and partitions including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
3. Firestopping for sealant joints in fire-resistance-rated construction.

B. Related Documents:

1. Documents referred to in para.1 SCOPE of Special Conditions are part hereof the same as if repeated herein.
2. Related Sections:
 - a. Section 07900 - Joint Sealers: For non-fire-resistive-rated joint sealants.
 - b. Division 15 Sections specifying ducts and piping penetrations.
 - c. Division 16 Sections specifying cable and conduit penetrations.

1.2 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide firestopping systems that are produced and installed to resist the spread of fire, according to requirements indicated, and the passage of smoke and other gases.
- B. F-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, as determined per ASTM E 814, but not less than that equaling or exceeding the fire-resistance rating of the constructions penetrated.
- C. T-Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with T ratings, in addition to F ratings, as determined per ASTM E 814, where indicated and where systems protect penetrating items exposed to contact with adjacent materials in occupiable floor areas. T-rated assemblies are required where the following conditions exist:
 1. Where firestop systems protect penetrations located outside of wall cavities.
 2. Where firestop systems protect penetrations located outside fire-resistive shaft enclosures.
 3. Where firestop systems protect penetrations located in construction containing doors required to have a temperature-rise rating.

4. Where firestop systems protect penetrating items larger than a 4 inch (100 mm) diameter nominal pipe or 16 sq. in. (100 sq. cm) in overall cross-sectional area.
- D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E 119, but not less than that equaling or exceeding the fire-resistance rating of the construction in which the joint occurs.
- E. For firestopping exposed to view, traffic, moisture, and physical damage, provide products that do not deteriorate when exposed to these conditions.
 1. For piping penetrations for plumbing and wet-pipe sprinkler systems, provide moisture-resistant through-penetration firestop systems.
 2. For floor penetrations with annular spaces exceeding 4 inches (100 mm) or more in width and exposed to possible loading and traffic, provide firestop systems capable of supporting the floor loads involved either by installing floor plates or by other means.
 3. For penetrations involving insulated piping, provide through-penetration firestop systems not requiring removal of insulation.
- F. For firestopping exposed to view, provide products with flame-spread values of less than 25 and smoke-developed values of less than 450, as determined per ASTM E 84.
- G. Provide firestopping products containing no detectable asbestos as determined by the method specified in 40 CFR Part 763, Subpart F, Appendix A, Section 1, "Polarized Light Microscopy."

1.3 SUBMITTALS

- A. Section 01300 - Submittals: Procedures for submittals.
 1. Product Data:
 - a. Submit "Letter of Conformance" with manufacturers product data (cut sheets) attached, indicating specified items selected for use in project. Submit for Architect's review and/or information as contract administrator or for the Owner.
 - b. Mark each copy to identify applicable products, characteristics, models, options and other supplemental data to clearly communicate information specific to this project.
 - c. Use standard "Letter of Conformance" found in Section 01300.
 - d. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop configuration for construction and penetrating items.
 - e. Where Project conditions require modification of qualified testing and inspecting agency's illustration to suit a particular through-penetration firestop condition, submit illustration approved by firestopping manufacturer's fire protection engineer with modifications marked.

2. Product certificates signed by manufacturers of firestopping products certifying that their products comply with specified requirements, comply with local regulations controlling use of volatile organic compounds (VOCs), and are nontoxic to building occupants.

1.4 QUALITY ASSURANCE

- A. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article:
 1. Firestopping tests are performed by a qualified testing and inspecting agency. A qualified testing and inspecting agency is UL, Warnock Hersey, or another agency performing testing and follow-up inspection services for firestop systems that is acceptable to authorities having jurisdiction.
 2. Through-penetration firestop systems are identical to those tested per ASTM E 814 under conditions where positive furnace pressure differential of at least 0.01 inch of water (2.5 Pa) is maintained at a distance of 0.78 inch (20 mm) below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:
 - a. Through-penetration firestop system products bear classification marking of qualified testing and inspecting agency.
 - b. Through-penetration firestop systems correspond to those indicated by reference to through-penetration firestop system designations listed by UL in their "Fire Resistance Directory," by Warnock Hersey, or by another qualified testing and inspecting agency.
 3. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E 119 under conditions where the positive furnace pressure differential is at least 0.01 inch of water (2.5 Pa), as measured 0.78 inch (20 mm) from the face exposed to furnace fire. Provide systems complying with the following requirements:
 - a. Fire-Resistance Ratings of Joint Sealants: As indicated by reference to design designations listed by UL in their "Fire Resistance Directory" or by another qualified testing and inspecting agency.
 - b. Joint sealants, including backing materials, bear classification marking of qualified testing and inspection agency.
- B. Information on drawings referring to specific design designations of through-penetration firestop systems is intended to establish requirements for performance based on conditions that are expected to exist during installation. Any changes in conditions and designated systems require the Architect's prior approval. Submit documentation

showing that the performance of proposed substitutions equals or exceeds that of the systems they would replace and are acceptable to authorities having jurisdiction.

- C. Installer Qualifications: Engage an experienced Installer who has completed firestopping that is similar in material, design, and extent to that indicated for Project and that has performed successfully.
- D. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.
- E. Coordinating Work: Coordinate construction of openings and penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

1.5 PROJECT CONDITIONS

- A. Environmental Conditions: Do not install firestopping when ambient or substrate temperatures are outside limits permitted by firestopping manufacturers or when substrates are wet due to rain, frost, condensation, or other causes.
- B. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

PART 2 PRODUCTS

2.1 FIRESTOPPING, GENERAL

- A. Compatibility: Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by firestopping manufacturer based on testing and field experience.
- B. Accessories: Provide components for each firestopping system that are needed to install fill materials and to comply with "System Performance Requirements" article in Part 1. Use only components specified by the firestopping manufacturer and approved by the qualified testing and inspecting agency for the designated fire-resistance-rated systems. Accessories include but are not limited to the following items:
 - 1. Permanent forming/damming/backing materials including the following:
 - a. Semirefractory fiber (mineral wool) insulation.
 - b. Ceramic fiber.
 - c. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
 - d. Fire-rated formboard.
 - e. Joint fillers for joint sealants.

2. Temporary forming materials.
3. Substrate primers.
4. Collars.
5. Steel sleeves.

C. Applications: Provide firestopping systems composed of materials specified in this Section that comply with system performance and other requirements.

2.2 FILL MATERIALS FOR THROUGH-PENETRATION FIRESTOP SYSTEMS

A. Fill Materials for Through-Penetration Firestop Systems: Subject to compliance with requirements, manufacturers offering specified items which may be incorporated in the work include the following:

1. Ceramic-Fiber and Mastic Coating:
 - a. FireMaster Bulk and FireMaster Mastic, Thermal Ceramics.
2. Intumescent Wrap Strips:
 - a. Dow Corning Fire Stop Intumescent Wrap Strip 2002, Dow Corning Corp.
 - b. CS2420 Intumescent Wrap, Hilti Construction Chemicals, Inc.
 - c. Fire Barrier FS-195 Wrap/Strip, 3M Fire Protection Products.
3. Silicone Foams:
 - a. Dow Corning Fire Stop Foam 2001, Dow Corning Corp.
 - b. Pensil 200 Foam, General Electric Co.
4. Silicone Sealants:
 - a. Dow Corning Firestop Sealant 2000, Dow Corning Corp.
 - b. Dow Corning Firestop Sealant SL 2003, Dow Corning Corp.
 - c. Pensil 100 Firestop Sealant, General Electric Co.
 - d. CS240 Firestop Sealant, Hilti Construction Chemicals, Inc.
 - e. Metacaulk 835, The RectorSeal Corporation.
 - f. Metacaulk 880, The RectorSeal Corporation.
 - g. Fyre-Sil, Tremco Inc.
 - h. Fyre-Sil S/L, Tremco Inc.

B. Substitutions: Under provisions of Section 01600.

C. Ceramic-Fiber and Mastic Coating: Ceramic fibers in bulk form formulated for use with mastic coating, and ceramic fiber manufacturer's mastic coating.

D. Intumescent Wrap Strips: Single-component, elastomeric sheet with aluminum foil on one side.

E. Silicone Foam: Two-component, silicone-based liquid elastomer that, when mixed,

expands and cures in place to produce a flexible, nonshrinking foam.

- F. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping/ gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
 - 2. Grade for Horizontal Surfaces: Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.
 - 3. Grade for Vertical Surfaces: Nonsag grade for openings in vertical and other surfaces.

PART 3 EXECUTION

3.1 PREPARATION

- A. Surface Cleaning: Clean out openings and joints immediately prior to installing firestopping to comply with recommendations of firestopping manufacturer and the following requirements:
 - 1. Remove all foreign materials from surfaces of opening and joint substrates and from penetrating items that could interfere with adhesion of firestopping.
 - 2. Clean opening and joint substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with firestopping. Remove loose particles remaining from cleaning operation.
- B. Priming: Prime substrates where recommended by firestopping manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- C. Masking Tape: Use masking tape to prevent firestopping from contacting adjoining surfaces that will remain exposed upon completion and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove smears from firestopping materials. Remove tape as soon as it is possible to do so without disturbing firestopping's seal with substrates.

3.2 INSTALLING THROUGH-PENETRATION FIRESTOPS

- A. General: Comply with the "System Performance Requirements" article in Part 1 and the through-penetration firestop manufacturer's installation instructions and drawings pertaining to products and applications indicated.

- B. Install forming/damming materials and other accessories of types required to support fill materials during their application and in the position needed to produce the cross-sectional shapes and depths required to achieve fire ratings of designated through-penetration firestop systems. After installing fill materials, remove combustible forming materials and other accessories not indicated as permanent components of firestop systems.
- C. Install fill materials for through-penetration firestop systems by proven techniques to produce the following results:
 - 1. Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
 - 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
 - 3. For fill materials that will remain exposed after completing Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.3 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

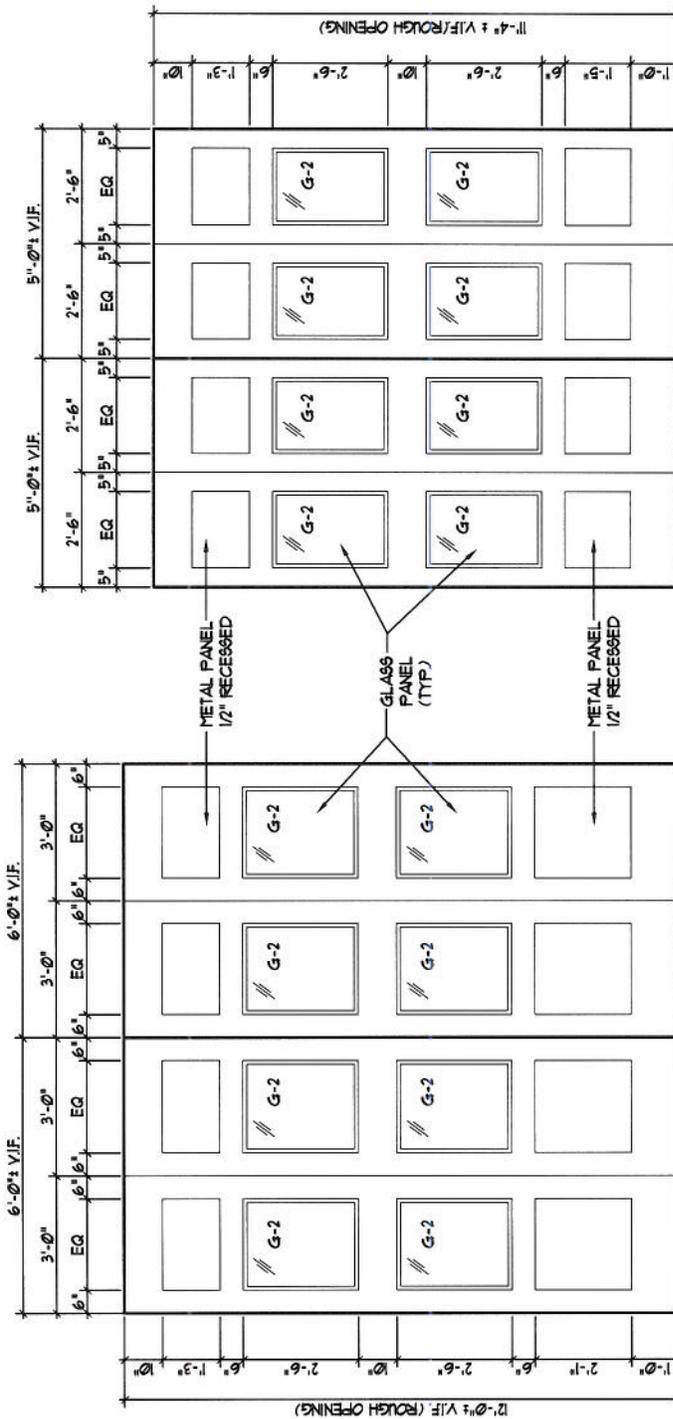
- A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C 1193, and with the sealant manufacturer's installation instructions and drawings pertaining to products and applications indicated.
- B. Install joint fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability and develop fire-resistance rating required.
- C. Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint width that optimum sealant movement capability. Install sealants at the same time joint fillers are installed.
- D. Tool nonsag sealants immediately after sealant application and prior to the time skinning or curing begins. Form smooth, uniform beads of configuration indicated or required to produce fire-resistance rating, as well as to eliminate air pockets, and to ensure contact and adhesion of sealants with sides of joint. Remove excess sealant from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

3.4 CLEANING

- A. Clean off excess fill materials and sealants adjacent to openings and joints as work progresses by methods and with cleaning materials approved by manufacturers of firestopping products and of products in which opening and joints occur.

- B. Protect firestopping during and after curing period from contact with contaminating substances or from damage.

END OF SECTION 07270



FOLDING DOOR
G

FOLDING DOOR
H

METAL PANEL
1/2" RECESSED

ENGINE COMPANY #29 - LEED
4811 MACARTHUR BLVD, NW, WASHINGTON, DC

GOVERNMENT OF THE DISTRICT OF COLUMBIA
D.C. FIRE & EMS

JOB NAME:	EC #29
JOB NO:	04101.06
DESCRIPTION:	ADDENDUM
DATE:	9-14-2011

SK-1

ATTACHMENT #2 TO AMENDMENT NO. 6 TO DCFC-2011-B-0167

ADDENDUM TO SPECIFICATIONS FOR ENGINE COMPANY NO. 29

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior and Exterior Aluminum Storefront Framing and Fixed Windows.
 - 2. Anchors, Brackets, and Attachments
- B. Work Installed but Furnished Under Other Sections: N/A
- C. Related Sections:
 - 1. Section 07920- Joint Sealants
 - 2. Section 08800 - Glazing

1.02 REFERENCES

- A. ANSI/ASTM A36 - "Standard Specification for Carbon Structural Steel"
- B. ANSI/ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products
- C. ANSI/ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- D. ANSI/ASTM B221 - "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes"
- E. ANSI/ASTM E283 - "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen"

1.03 SUBMITTALS

- A. Submit "Letter of Conformance" in accordance with Section 01330 (01 33 00) with the following supporting data:
 - 1. Submit Shop Drawings and product data and manufacturer's installation instructions. Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.

1.04 QUALITY ASSURANCE

- A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F. without causing detrimental effects to system or components.
- B. Design for windload of 30 PSF with maximum deflection in both vertical and horizontal mullions not to exceed 1/175 of span.
- C. Comply with the applicable standards of ANSI/AAMA 101 and the following:

1. AAMA Publication #10 - Care and Handling of Architectural Aluminum from Shop to Site.
 2. AAMA 603.8 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
 3. AAMA 610.1 - Voluntary Guide Specifications for Cleaning and Maintenance of Painted Aluminum Extrusions and Curtain Wall Panels.
- D. Certify that the proposed products have been tested to the following performance standards at an Independent Testing Laboratory accredited by AAMA and using the referenced ASTM standards:
1. Water Penetration: ASTM E331 no water penetration at a test pressure of 6.24 PSF.
 2. Structural Properties: 30 PSF acting inward and outward per ASTM E330. Deflection not to exceed 1/175 of span.
 3. Air Leakage per ASTM E283:
 - a. Fixed window walls - maximum of 0.06 CFM per sq. ft. of total exterior surface areas.
 4. Thermal Performance: Composite glass wall shall meet or exceed the "U" value shown on the Drawings and as tested per ASTM E 236.
- E. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- F. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Transportation and Handling: Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry. Provide equipment and personnel to handle products by method to prevent soiling or damage. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- B. Storage and Protection: Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

1.06 SPECIAL WARRANTY

- A. The work of this Section shall be jointly guaranteed by the manufacturer for a period of five (5) years after the date of Substantial Completion.
- B. All materials shall be free from manufacturing defects and defects in installation workmanship. Any material or workmanship judged defective during this period shall be removed and replaced at no cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. For purpose of designating design and quality of aluminum storefront system, fixed window system, Drawings and Specifications are based on the following:
 - 1. Storefront and Fixed Window Framing System: Insulated Glazing (Tempered)
 - a. Approved Manufacturers: "Trifab VersaGlaze 451T ", [Kawneer North America, an Alcoa Company](#). (770-449-5555)
 - b. "Multiplane Series 3000", [The Vistawall Group, a BlueScope Steel Company](#) (800-869-4567)
 - c. "Series TR-7850 Multi-Glaze Storefront System "; [Traco Commercial Group](#) (800-837-7002)

2.02 MATERIALS

- A. All framing members shall be extruded aluminum of 6063T-5 alloy and shall be of the size, shape, and intended function as shown on the Drawings. Performance requirements shall conform to standards established by the Architect in relation to wind load and deflection limits.
- B. Fasteners: Stainless Steel

2.03 FINISH:

- A. All exposed aluminum surfaces shall have a manufactured-applied, 20-year warrantied, Kynar 500 fluorocarbon finish, free from blemishes and surface defects.
- B. Color: Refer to Exterior Finish Index.

2.04 FABRICATION

- A. Aluminum door shall have tight hairline joints where rails are fitted against stiles and shall be fastened by means of tensioned steel tie rods in top and bottom rails. Doors shall have an adjusting mechanism in the top rail to provide for minor clearance adjustments. Glass stops shall be snap-in type with bulb type glazing strips. Weather stripping shall be pile.
- B. Store front sections shall be square cut and assembled with the proper clips and screws as provided by the manufacturer to form neat hairline joints. All fastenings shall be concealed except those specifically detailed by the Architect at certain transition areas. All glazing gaskets shall be cut over length and installed in slight linear compression to prevent shrinkage from the corners. All framing shall be erected square and true into correct size rough openings prepared by others and in strict accord with the Architectural Drawings.
- C. Doors: Reinforce doors as required for installing hardware, including electronic strikes and card readers.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.

- D. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

2.05 SEALANTS

- A. For metal to metal joints use Standard Products Company Stan Pro Urethane Epoxy Sealant No. 103, Dow Corning Silicone Rubber Sealant, or other as acceptable to Architect, color to match finish of aluminum to which applied.
- B. For perimeter of framing members, refer to Section 07920 (07 92 00) - Sealants.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install frames, glazing and hardware in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Coordinate attachment and seal of air and vapor barrier materials. Install sill flashings where required.
- E. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious, stone or other dissimilar materials.
- F. Install glass and infill panels in accordance with Section 08800 using exterior wet method of glazing.
- G. Install perimeter non-hardening, non-skinning type sealant, and installation requirements in accordance with Section 07920.
- H. Adjust operating hardware

3.03 TOLERANCES

- A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet, whichever is less.
- B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.

3.04 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash-down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION

SECTION 08410

ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 SUMMARY

- A. Section Includes:
 - 1. Interior and Exterior Aluminum Storefront Framing and Fixed Windows.
 - 2. Anchors, Brackets, and Attachments
- B. Work Installed but Furnished Under Other Sections: N/A
- C. Related Sections:
 - 1. Section 07920- Joint Sealants
 - 2. Section 08800 - Glazing

1.02 REFERENCES

- A. ANSI/ASTM A36 - "Standard Specification for Carbon Structural Steel"
- B. ANSI/ASTM A386 - Zinc Coating (Hot-Dip) on Assembled Steel Products
- C. ANSI/ASTM A446 - Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality
- D. ANSI/ASTM B221 - "Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes"
- E. ANSI/ASTM E283 - "Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen"

1.03 SUBMITTALS

- A. Submit "Letter of Conformance" in accordance with Section 01330 (01 33 00) with the following supporting data:
 - 1. Submit Shop Drawings and product data and manufacturer's installation instructions. Include system and component dimensions; components within assembly; framed opening requirements and tolerances; anchorage and fasteners; glass and infills; door hardware requirements; and affected related work.

1.04 QUALITY ASSURANCE

- A. System to provide for expansion and contraction within system components caused by a cycling temperature range of 170 degrees F. without causing detrimental effects to system or components.
- B. Design for windload of 30 PSF with maximum deflection in both vertical and horizontal mullions not to exceed 1/175 of span.
- C. Comply with the applicable standards of ANSI/AAMA 101 and the following:

1. AAMA Publication #10 - Care and Handling of Architectural Aluminum from Shop to Site.
 2. AAMA 603.8 - Voluntary Performance Requirements and Test Procedures for Pigmented Organic Coatings on Extruded Aluminum.
 3. AAMA 610.1 - Voluntary Guide Specifications for Cleaning and Maintenance of Painted Aluminum Extrusions and Curtain Wall Panels.
- D. Certify that the proposed products have been tested to the following performance standards at an Independent Testing Laboratory accredited by AAMA and using the referenced ASTM standards:
1. Water Penetration: ASTM E331 no water penetration at a test pressure of 6.24 PSF.
 2. Structural Properties: 30 PSF acting inward and outward per ASTM E330. Deflection not to exceed 1/175 of span.
 3. Air Leakage per ASTM E283:
 - a. Fixed window walls - maximum of 0.06 CFM per sq. ft. of total exterior surface areas.
 4. Thermal Performance: Composite glass wall shall meet or exceed the "U" value shown on the Drawings and as tested per ASTM E 236.
- E. Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior.
- F. System to accommodate, without damage to system or components, or deterioration of perimeter seal: Movement within system; movement between system and perimeter framing components; dynamic loading and release of loads; and deflection of structural support framing.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Transportation and Handling: Transport products by methods to avoid product damage; deliver in undamaged condition in manufacturer's unopened containers or packaging, dry. Provide equipment and personnel to handle products by method to prevent soiling or damage. Promptly inspect shipments to assure that products comply with requirements, quantities are correct, and products are undamaged.
- B. Storage and Protection: Store products in accordance with manufacturer's instructions, with seals and labels intact and legible. Store sensitive products in weather-tight enclosures; maintain within temperature and humidity ranges required by manufacturer's instructions.

1.06 SPECIAL WARRANTY

- A. The work of this Section shall be jointly guaranteed by the manufacturer for a period of five (5) years after the date of Substantial Completion.
- B. All materials shall be free from manufacturing defects and defects in installation workmanship. Any material or workmanship judged defective during this period shall be removed and replaced at no cost to the Owner.

PART 2 PRODUCTS

2.01 MANUFACTURERS

- A. For purpose of designating design and quality of aluminum storefront system, fixed window system, Drawings and Specifications are based on the following:
 - 1. Storefront and Fixed Window Framing System: Insulated Glazing (Tempered)
 - a. Approved Manufacturers: "Trifab VersaGlaze 451T ", [Kawneer North America, an Alcoa Company](#). (770-449-5555)
 - b. "Multiplane Series 3000", [The Vistawall Group, a BlueScope Steel Company](#) (800-869-4567)
 - c. "Series TR-7850 Multi-Glaze Storefront System "; [Traco Commercial Group](#) (800-837-7002)

2.02 MATERIALS

- A. All framing members shall be extruded aluminum of 6063T-5 alloy and shall be of the size, shape, and intended function as shown on the Drawings. Performance requirements shall conform to standards established by the Architect in relation to wind load and deflection limits.
- B. Fasteners: Stainless Steel

2.03 FINISH:

- A. All exposed aluminum surfaces shall have a manufactured-applied, 20-year warrantied, Kynar 500 fluorocarbon finish, free from blemishes and surface defects.
- B. Color: Refer to Exterior Finish Index.

2.04 FABRICATION

- A. Aluminum door shall have tight hairline joints where rails are fitted against stiles and shall be fastened by means of tensioned steel tie rods in top and bottom rails. Doors shall have an adjusting mechanism in the top rail to provide for minor clearance adjustments. Glass stops shall be snap-in type with bulb type glazing strips. Weather stripping shall be pile.
- B. Store front sections shall be square cut and assembled with the proper clips and screws as provided by the manufacturer to form neat hairline joints. All fastenings shall be concealed except those specifically detailed by the Architect at certain transition areas. All glazing gaskets shall be cut over length and installed in slight linear compression to prevent shrinkage from the corners. All framing shall be erected square and true into correct size rough openings prepared by others and in strict accord with the Architectural Drawings.
- C. Doors: Reinforce doors as required for installing hardware, including electronic strikes and card readers.
 - 1. At pairs of exterior doors, provide sliding weather stripping retained in adjustable strip mortised into door edge.
 - 2. At exterior doors, provide weather sweeps applied to door bottoms.

- D. Hardware Installation: Factory install hardware to the greatest extent possible. Cut, drill, and tap for factory-installed hardware before applying finishes.

2.05 SEALANTS

- A. For metal to metal joints use Standard Products Company Stan Pro Urethane Epoxy Sealant No. 103, Dow Corning Silicone Rubber Sealant, or other as acceptable to Architect, color to match finish of aluminum to which applied.
- B. For perimeter of framing members, refer to Section 07920 (07 92 00) - Sealants.

PART 3 EXECUTION

3.01 INSPECTION

- A. Verify wall openings and adjoining air and vapor seal materials are ready to receive work of this Section.
- B. Beginning of installation means acceptance of existing conditions.

3.02 INSTALLATION

- A. Install frames, glazing and hardware in accordance with manufacturer's instructions.
- B. Use anchorage devices to securely attach frame assembly to structure.
- C. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.
- D. Coordinate attachment and seal of air and vapor barrier materials. Install sill flashings where required.
- E. Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious, stone or other dissimilar materials.
- F. Install glass and infill panels in accordance with Section 08800 using exterior wet method of glazing.
- G. Install perimeter non-hardening, non-skinning type sealant, and installation requirements in accordance with Section 07920.
- H. Adjust operating hardware

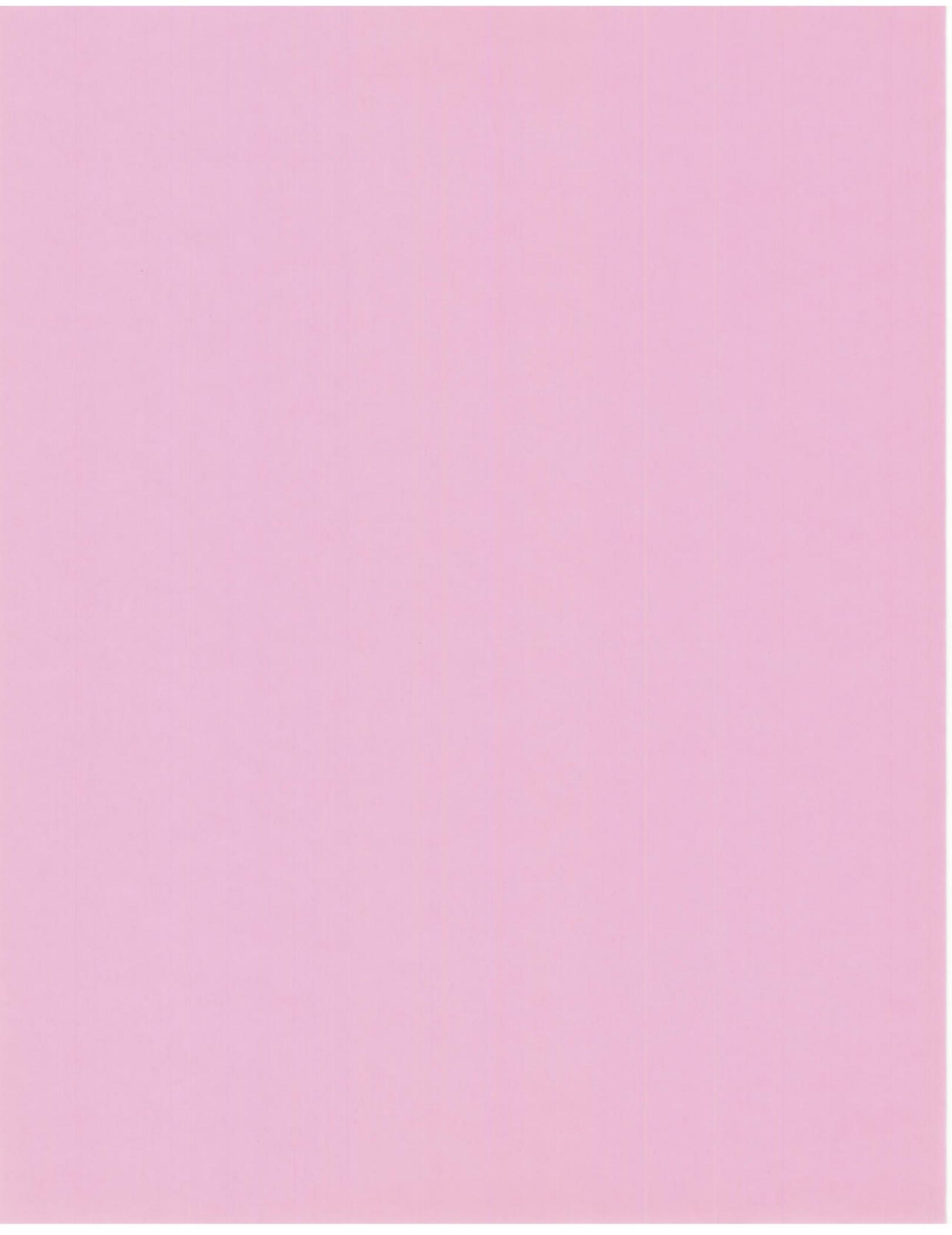
3.03 TOLERANCES

- A. Variation from Plane: 0.03 inches per foot maximum or 0.25 inches per 30 feet, whichever is less.
- B. Misalignment of Two Adjoining Members Abutting in Plane: 0.015 inches.

3.04 CLEANING

- A. Remove protective material from prefinished aluminum surfaces.
- B. Wash-down exposed surfaces using a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant manufacturer.

END OF SECTION



SECTION 04810 - UNIT MASONRY ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Concrete masonry units.
 - 2. Face brick.
 - 3. Mortar and grout.
 - 4. Steel reinforcing bars.
 - 5. Masonry joint reinforcement.
 - 6. Ties and anchors.
 - 7. Embedded flashing.
 - 8. Miscellaneous masonry accessories.
 - 9. Cavity-wall insulation.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. LEED Submittals:
 - 1. Product Certificates for Credit MR 5: For products and materials required to comply with requirements for regional materials indicating location and distance from Project of material manufacturer and point of extraction, harvest, or recovery for each raw material. Include statement indicating cost for each regional material and the fraction by weight that is considered regional.
- C. Samples for Verification: For each type and color of the following:

1. Exposed CMUs.
2. Face brick, in the form of straps of five or more bricks.
3. Special brick shapes.
4. Pigmented and colored-aggregate mortar. Make Samples using same sand and mortar ingredients to be used on Project.
5. Weep holes and vents.
6. Accessories embedded in masonry.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include data on material properties material test reports substantiating compliance with requirements.
 - b. For brick, include size-variation data verifying that actual range of sizes falls within specified tolerances.
 - c. For exposed brick, include test report for efflorescence according to ASTM C 67.
 - d. For surface-coated brick, include test report for durability of surface appearance after 50 cycles of freezing and thawing per ASTM C 67 or a list of addresses of buildings in Project's area where proposed brick has been used successfully and with a history of durability.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.
- E. Sample Panels: Build sample panels to verify selections made under sample submittals and to demonstrate aesthetic effects. Comply with requirements in Division 1 Section "Quality Requirements" for mockups.
 - 1. Build sample panels for each type of exposed unit masonry construction typical exterior and interior walls in sizes approximately 48 inches (1200 mm) long by 48 inches (1200 mm) high.
 - 2. Where masonry is to match existing, erect panels adjacent and parallel to existing surface.
 - 3. Clean one-half of exposed faces of panels with masonry cleaner indicated.
 - 4. Protect approved sample panels from the elements with weather-resistant membrane.
 - 5. Approval of sample panels is for color, texture, and blending of masonry units; relationship of mortar and sealant colors to masonry unit colors; tooling of joints; aesthetic qualities of workmanship; and other material and construction qualities specifically approved by Architect in writing.
 - a. Approval of sample panels does not constitute approval of deviations from the Contract Documents contained in sample panels unless such deviations are specifically approved by Architect in writing.
- F. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 - 1. Extend cover a minimum of **24 inches (600 mm)** down both sides of walls and hold cover securely in place.
 - 2. Where one wythe of multiwythe masonry walls is completed in advance of other wythes, secure cover a minimum of **24 inches (600 mm)** down face next to unconstructed wythe and hold cover in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is **40 deg F (4 deg C)** and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

- A. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do not use units where such defects will be exposed in the completed Work.
- B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by equivalent masonry thickness, or by other means, as acceptable to authorities having jurisdiction.

2.2 CONCRETE MASONRY UNITS

- A. Regional Materials: CMUs shall be manufactured within **500 miles (800 km)** of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.
- B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
- C. CMUs: ASTM C 90.
 - 1. Density Classification: Lightweight unless otherwise indicated
 - 2. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 3. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 - 4. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 BRICK

- A. Regional Materials: Brick shall be manufactured within **500 miles (800 km)** of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within **500 miles (800 km)** of Project site.

- B. General: Provide shapes indicated and as follows, with exposed surfaces matching finish and color of exposed faces of adjacent units:
1. For ends of sills and caps and for similar applications that would otherwise expose unfinished brick surfaces, provide units without cores or frogs and with exposed surfaces finished.
 2. Provide special shapes for applications where stretcher units cannot accommodate special conditions, including those at corners, movement joints, bond beams, sashes, and lintels.
 3. Provide special shapes for applications requiring brick of size, form, color, and texture on exposed surfaces that cannot be produced by sawing.
 4. Provide special shapes for applications where shapes produced by sawing would result in sawed surfaces being exposed to view.
- C. Face Brick: Facing brick complying with ASTM C 216 or hollow brick complying with ASTM C 652, Class H40V (void areas between 25 and 40 percent of gross cross-sectional area).
1. Products: provide the following:
 - a. Watsontown Brick, Cayuga MB Watex, Type 2 modular. As distributed by L.C. Smith, Inc. (703)-751-5420
 2. Application: Use where brick is exposed unless otherwise indicated.
 3. Where shown to "match existing," provide face brick matching color range, texture, and size of existing adjacent brickwork.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout, cement, and lime that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- B. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated. Use low alkali cement only.
- C. Hydrated Lime: ASTM C 207, Type S.
- D. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients. Use low alkali cement only.
- E. Mortar Pigments: Natural and synthetic iron oxides and chromium oxides, compounded for use in mortar mixes and complying with ASTM C 979. Use only pigments with a record of satisfactory performance in masonry mortar.
1. Products: Subject to compliance with requirements, provide one of the following:

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- a. Davis Colors; True Tone Mortar Colors.
 - b. Solomon Colors, Inc.; SGS Mortar Colors.
 - c. Centurion Pigments; Lafarge Corporation.
- F. Colored Cement Product: Packaged blend made from portland cement and hydrated lime and mortar pigments, all complying with specified requirements, and containing no other ingredients.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Colored Portland Cement-Lime Mix:
 - 1) Capital Materials Corporation; Riverton Portland Cement Lime Custom Color.
 - 2) Holcim (US) Inc.; Rainbow Mortamix Custom Color Cement/Lime.
 - 3) Lafarge North America Inc.; Eaglebond Portland & Lime.
 - 4) Lehigh Cement Company; Lehigh Custom Color Portland/Lime Cement.
 - 5) Eaglebond; Blue Circle Cement.
 - 6) Color Mortar Blend; Glen-Gery Corporation.
 - 7) Riverton Portland Cement Lime Custom Color; Riverton Corporation (The).
 2. Formulate blend as required to produce color indicated or, if not indicated, as selected from manufacturer's standard colors.
 3. Pigments shall not exceed 10 percent of portland cement by weight.
- G. Aggregate for Mortar: ASTM C 144.
1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 2. For joints less than **1/4 inch (6 mm)** thick, use aggregate graded with 100 percent passing the **No. 16 (1.18-mm)** sieve.
 3. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.
- H. Aggregate for Grout: ASTM C 404.
- I. Cold-Weather Admixture: Nonchloride, noncorrosive, accelerating admixture complying with ASTM C 494/C 494M, Type C, and recommended by manufacturer for use in masonry mortar of composition indicated.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Euclid Chemical Company (The); Accelguard 80.
 - b. Grace Construction Products, W. R. Grace & Co. - Conn.; Morset.
 - c. Sonneborn Products, BASF Aktiengesellschaft; Trimix-NCA.

- J. Water Repellent Admixture:
 - a. Mortar Tite; Addiment Inc.
 - b. Dry-Block Mortar Admixture; W.R. Grace & Co., Construction Products Division.
 - c. Rheopel; Master Builders.
- K. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, **Grade 60 (Grade 420)**.
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill-galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: **0.187-inch (4.76-mm)** diameter.
 - 4. Wire Size for Cross Rods: **0.187-inch (4.76-mm)** diameter.
 - 5. Wire Size for Veneer Ties: **0.187-inch (4.76-mm)** diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than **16 inches (407 mm)** o.c.
 - 7. Provide in lengths of not less than **10 feet (3 m)**, with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.
- D. Masonry Joint Reinforcement for Multiwythe Masonry:
 - 1. Ladder type with 1 side rod at each face shell of hollow masonry units more than **4 inches (100 mm)** wide, plus 1 side rod at each wythe of masonry **4 inches (100 mm)** wide or less.
 - 2. Tab type, either ladder or truss design, with 1 side rod at each face shell of backing wythe and with rectangular tabs sized to extend at least halfway through facing wythe but with at least **16-mm** cover on outside face.
 - 3. Adjustable (two-piece) type, either ladder or truss design, with one side rod at each face shell of backing wythe and with separate adjustable ties with pintle-and-eye connections having a maximum adjustment of **1-1/4 inches (32 mm)**. Size ties to extend at least halfway through facing wythe but with at least **5/8-inch (16-mm)** cover on outside face.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
1. Mill-Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 641/A 641M, Class 1 coating.
 2. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 3. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 (Z180) zinc coating.
 4. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Partition Top anchors: 0.105-inch- (2.66-mm-) thick metal plate with 3/8-inch- (9.5-mm-) diameter metal rod 6 inches (152 mm) long welded to plate and with closed-end plastic tube fitted over rod that allows rod to move in and out of tube. Fabricate from steel, hot-dip galvanized after fabrication.
- C. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS ANCHORS

- A. Anchor Bolts: L-shaped steel bolts complying with ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); with ASTM A 563 (ASTM A 563M) hex nuts and, where indicated, flat washers; hot-dip galvanized to comply with ASTM A 153/A 153M, Class C; of dimensions indicated.

2.8 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with SMACNA's "Architectural Sheet Metal Manual" Division 7 Section "Sheet Metal Flashing and Trim" and as follows:
1. Copper: ASTM B 370, Temper H00, cold-rolled copper sheet, 16-oz./sq. ft. (4.9-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick or ASTM B 370, Temper H01, high-yield copper sheet, 12-oz./sq. ft. (3.7-kg/sq. m) weight or 0.0162 inch (0.41 mm) thick.
 2. Fabricate continuous flashings in sections 96 inches (2400 mm) long minimum, but not exceeding 12 feet (3.7 m). Provide splice plates at joints of formed, smooth metal flashing.
 3. Fabricate through-wall metal flashing embedded in masonry from copper, with ribs at 3-inch (76-mm) intervals along length of flashing to provide an integral mortar bond.

- a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Cheney Flashing Company; Cheney Flashing (Dovetail) or Cheney 3-Way Flashing (Sawtooth).
 - 2) Keystone Flashing Company, Inc.; Keystone 3-Way Interlocking Thruwall Flashing.
 - 4. Metal Expansion-Joint Strips: Fabricate from copper to shapes indicated.
- B. Flexible Flashing: Use one of the following unless otherwise indicated:
- 1. Copper-Laminated Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet bonded between 2 layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Copper Fabric Flashing Copper Sealtite 2000.
 - 2) Hohmann & Barnard, Inc.; H & B C-Fab Flashing.
 - 3) Phoenix Building Products; Type FCC-Fabric Covered Copper.
 - 4) Sandell Manufacturing Co., Inc.; Copper Fabric Flashing.
 - 5) York Manufacturing, Inc.; Multi-Flash 500.
 - 2. Asphalt-Coated Copper Flashing: 5-oz./sq. ft. (1.5-kg/sq. m) copper sheet coated with flexible asphalt. Use only where flashing is fully concealed in masonry.
 - a. Products: Subject to compliance with requirements, provide one of the following:
 - 1) Advanced Building Products Inc.; Cop-R-Cote.
 - 2) Hohmann & Barnard, Inc.; H & B C-Coat Flashing.
 - 3) Phoenix Building Products; Type ACC-Asphalt Bituminous Coated.
 - 4) Sandell Manufacturing Co., Inc.; Coated Copper Flashing.
- C. Application: Unless otherwise indicated, use the following:
- 1. Where flashing is indicated to receive counterflashing, use metal flashing.
 - 2. Where flashing is indicated to be turned down at or beyond the wall face, use metal flashing.
 - 3. Where flashing is fully concealed, use metal flashing or flexible flashing.
- D. Solder and Sealants for Sheet Metal Flashings: As specified in Division 7 Section "Sheet Metal Flashing and Trim."
- 1. Solder for Stainless Steel: ASTM B 32, Grade Sn60, with acid flux of type recommended by stainless-steel sheet manufacturer.

2. Solder for Copper: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
 3. Elastomeric Sealant: ASTM C 920, chemically curing urethane polysulfide silicone sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Adhesives, Primers, and Seam Tapes for Flashings: Flashing manufacturer's standard products or products recommended by flashing manufacturer for bonding flashing sheets to each other and to substrates.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Weep/Vent Products: Use one of the following unless otherwise indicated:
1. Wicking Material: Absorbent rope, made from cotton or UV-resistant synthetic fiber, **1/4 to 3/8 inch (6 to 10 mm)** in diameter, in length required to produce **2-inch (50-mm)** exposure on exterior and **18 inches (450 mm)** in cavity. Use only for weeps.
 2. Round Plastic Weep/Vent Tubing: Medium-density polyethylene, **3/8-inch (9-mm)** OD by **4 inches (100 mm)** long.
- E. Cavity Drainage Material: Free-draining mesh, made from polymer strands that will not degrade within the wall cavity.
1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Advanced Building Products Inc.; Mortar Break Mortar Break II.
 - b. Archovations, Inc.; CavClear Masonry Mat.
 - c. Dayton Superior Corporation, Dur-O-Wal Division; Polytite MortarStop.
 - d. Mortar Net USA, Ltd.; Mortar Net.
 2. Provide one of the following configurations:
 - a. Strips, full-depth of cavity and **10 inches (250 mm)** high, with dovetail shaped notches **7 inches (175 mm)** deep that prevent clogging with mortar droppings.

- b. Strips, not less than **3/4 inch (19 mm)** **1-1/2 inches (38 mm)** thick and **10 inches (250 mm)** high, with dimpled surface designed to catch mortar droppings and prevent weep holes from clogging with mortar.
- c. Sheets or strips full depth of cavity and installed to full height of cavity.
- d. Sheets or strips not less than **3/4 inch (19 mm)** thick and installed to full height of cavity with additional strips **4 inches (100 mm)** high at weep holes and thick enough to fill entire depth of cavity and prevent weep holes from clogging with mortar.

2.10 CAVITY-WALL INSULATION

- A. Extruded-Polystyrene Board Insulation with Increased R-Value: ASTM C 578, Type IV, but with an aged thermal resistance (R-value) for **1-inch (25-mm)** thickness of **5.6 deg F x h x sq. ft./Btu at 75 deg F (1.0 K x sq. m/W at 24 deg C)** at 5 years; closed-cell product with a carbon-black filler and extruded with an integral skin.
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

2.11 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry without discoloring or damaging masonry surfaces. Use product expressly approved for intended use by cleaner manufacturer and manufacturer of masonry units being cleaned.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Diedrich Technologies, Inc.
 - b. EaCo Chem, Inc.
 - c. ProSoCo, Inc.

2.12 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
 - 1. Mix proportion for Type N mortar: 1 Part Portland cement, 1 Part Lime, 6 parts Sand.
 - 2. Mix proportion for Type S mortar: 1 Part Portland cement, 1/2 Part Lime, 6 parts Sand.

3. Do not use calcium chloride in mortar or grout.
 4. Use portland cement-lime mortar unless otherwise indicated.
 5. For exterior masonry, use portland cement-lime mortar.
 6. For reinforced masonry, use portland cement-lime mortar.
 7. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.
- C. Mortar for Unit Masonry: Comply with ASTM C 270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated.
1. For masonry below grade or in contact with earth, use Type M Type S.
 2. For reinforced masonry, use Type S.
 3. For mortar parge coats, use Type S.
 4. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions; and for other applications where another type is not indicated, use Type N.
 5. For interior non-load-bearing partitions, Type O may be used instead of Type N.
- D. Pigmented Mortar: Use colored cement product or select and proportion pigments with other ingredients to produce color required. Do not add pigments to colored cement products.
1. Pigments shall not exceed 10 percent of portland cement by weight.
 2. Mix to match Architect's sample.
 3. Application: Use pigmented mortar for exposed mortar joints with the following units:
 - a. Face brick.
 - b. Cast stone trim units.
- E. Colored-Aggregate Mortar: Produce required mortar color by using colored aggregates and natural color or white cement as necessary to produce required mortar color.
1. Mix to match Architect's sample.
 2. Application: Use colored aggregate mortar for exposed mortar joints with the following units:
 - a. Face brick.
 - b. Cast stone trim units.
- F. Grout for Unit Masonry: Comply with ASTM C 476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi (14 MPa).
 3. Provide grout with a slump of 8 to 11 inches (203 to 279 mm) as measured according to ASTM C 143/C 143M.
- G. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
1. Application: Use epoxy pointing mortar for exposed mortar joints with the following units:

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build cavity and composite walls and other masonry construction to full thickness shown. Build single-wythe walls to actual widths of masonry units, using units of widths indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections.
- C. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.

- D. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Select and arrange units for exposed unit masonry to produce a uniform blend of colors and textures.
 - 1. Mix units from several pallets or cubes as they are placed.
- F. Matching Existing Masonry: Match coursing, bonding, color, and texture of existing masonry.
- G. Wetting of Brick: Wet brick before laying if initial rate of absorption exceeds **30 g/30 sq. in. (30 g/194 sq. cm)** per minute when tested per ASTM C 67. Allow units to absorb water so they are damp but not wet at time of laying.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

- 1. For dimensions in cross section or elevation do not vary by more than plus **1/2 inch (12 mm)** or minus **1/4 inch (6 mm)**.
- 2. For location of elements in plan do not vary from that indicated by more than plus or minus **1/2 inch (12 mm)**.
- 3. For location of elements in elevation do not vary from that indicated by more than plus or minus **1/4 inch (6 mm)** in a story height or **1/2 inch (12 mm)** total.

B. Lines and Levels:

- 1. For bed joints and top surfaces of bearing walls do not vary from level by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** maximum.
- 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
- 3. For vertical lines and surfaces do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
- 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than **1/8 inch in 10 feet (3 mm in 3 m)**, **1/4 inch in 20 feet (6 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
- 5. For lines and surfaces do not vary from straight by more than **1/4 inch in 10 feet (6 mm in 3 m)**, **3/8 inch in 20 feet (9 mm in 6 m)**, or **1/2 inch (12 mm)** maximum.
- 6. For vertical alignment of exposed head joints, do not vary from plumb by more than **1/4 inch in 10 feet (6 mm in 3 m)**, or **1/2 inch (12 mm)** maximum.

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7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than **1/16 inch (1.5 mm)** except due to warpage of masonry units within tolerances specified for warpage of units.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**, with a maximum thickness limited to **1/2 inch (12 mm)**.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than **1/8 inch (3 mm)**.
3. For head and collar joints, do not vary from thickness indicated by more than plus **3/8 inch (9 mm)** or minus **1/4 inch (6 mm)**.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus **1/8 inch (3 mm)**. Do not vary from adjacent bed-joint and head-joint thicknesses by more than **1/8 inch (3 mm)**.
5. For exposed bed joints and head joints of stacked bond, do not vary from a straight line by more than **1/16 inch (1.5 mm)** from one masonry unit to the next.

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.
- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than **2 inches (50 mm)**. Bond and interlock each course of each wythe at corners. Do not use units with less than nominal **4-inch (100-mm)** horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout **24 inches (600 mm)** under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide **1/2-inch (13-mm)** clearance between end of anchor rod and end of tube. Space anchors **48 inches (1200 mm)** o.c. unless otherwise indicated.
 - 3. Wedge non-load-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
 - 4. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 7 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Lay solid masonry units with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.
- C. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.

- D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.
- E. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 CAVITY WALLS

- A. Bond wythes of cavity walls together using one of the following methods:
 - 1. Masonry Joint Reinforcement: Installed in horizontal mortar joints.
 - a. Where bed joints of both wythes align, use ladder-type reinforcement extending across both wythes.
 - b. Where bed joints of wythes do not align, use adjustable (two-piece) type reinforcement with continuous horizontal wire in facing wythe attached to ties.
 - 2. Header Bonding: Provide masonry unit headers extending not less than **3 inches (76 mm)** into each wythe. Space headers not over **8 inches (203 mm)** clear horizontally and **16 inches (406 mm)** clear vertically.
 - 3. Through Wall Flashing: Provide a continuous 1" wide sealant bed on the underside of the exterior edge of the flashing at the face brick. Trim the flashing flush with the exterior face of the brick.
- B. Bond wythes of cavity walls together using bonding system indicated on Drawings.
- C. Keep cavities clean of mortar droppings and other materials during construction. Bevel beds away from cavity, to minimize mortar protrusions into cavity. Do not attempt to trowel or remove mortar fins protruding into cavity.
- D. Parge cavity face of backup wythe in a single coat approximately **3/8 inch (10 mm)** thick. Trowel face of parge coat smooth.
- E. Coat cavity face of backup wythe to comply with Division 7 Section "Bituminous Dampproofing."
- F. Apply air barrier to face of backup wythe to comply with Division 7 Section "Self-Adhering Sheet Air Barriers Fluid-Applied Membrane Air Barriers."
- G. Installing Cavity-Wall Insulation: Place small dabs of adhesive, spaced approximately **12 inches (300 mm)** o.c. both ways, on inside face of insulation boards, or attach with plastic fasteners designed for this purpose. Fit courses of insulation between wall ties and other confining obstructions in cavity, with edges butted tightly both ways. Press units firmly against inside wythe of masonry or other construction as shown.

1. Fill cracks and open gaps in insulation with crack sealer compatible with insulation and masonry.

3.7 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of **5/8 inch (16 mm)** on exterior side of walls, **1/2 inch (13 mm)** elsewhere. Lap reinforcement a minimum of **6 inches (150 mm)**.
 1. Space reinforcement not more than **16 inches (406 mm)** o.c.
 2. Space reinforcement not more than **8 inches (203 mm)** o.c. in foundation walls and parapet walls.
 3. Provide reinforcement not more than **8 inches (203 mm)** above and below wall openings and extending **12 inches (305 mm)** beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.8 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 1. Provide an open space not less than **1/2 inch (13 mm)** wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 3. Space anchors as indicated, but not more than **24 inches (610 mm)** o.c. vertically and **36 inches (915 mm)** o.c. horizontally.

3.9 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry as follows using one of the following methods:

1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
2. Install preformed control-joint gaskets designed to fit standard sash block.
3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

C. Form expansion joints in brick as follows:

1. Build flanges of metal expansion strips into masonry. Lap each joint **4 inches (100 mm)** in direction of water flow. Seal joints below grade and at junctures with horizontal expansion joints if any.
2. Build flanges of factory-fabricated, expansion-joint units into masonry.
3. Build in compressible joint fillers where indicated.
4. Form open joint full depth of brick wythe and of width indicated, but not less than **3/8 inch (10 mm)** for installation of sealant and backer rod specified in Division 7 Section "Joint Sealants."

D. Provide horizontal, pressure-relieving joints by either leaving an air space or inserting a compressible filler of width required for installing sealant and backer rod specified in Division 7 Section "Joint Sealants," but not less than **3/8 inch (10 mm)**.

1. Locate horizontal, pressure-relieving joints beneath shelf angles supporting masonry.

3.10 LINTELS

- A. Install steel lintels where indicated.
- B. Provide minimum bearing of **8 inches (200 mm)** at each jamb unless otherwise indicated.

3.11 FLASHING, WEEP HOLES, CAVITY DRAINAGE, AND VENTS

- A. General: Install embedded flashing and weep holes in masonry at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
- B. Install flashing as follows unless otherwise indicated:
 1. Prepare masonry surfaces so they are smooth and free from projections that could puncture flashing. Where flashing is within mortar joint, place through-wall flashing on sloping bed of mortar and cover with mortar. Before covering with

- mortar, seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer.
2. At multiwythe masonry walls, including cavity walls, extend flashing through outer wythe, turned up a minimum of **8 inches (200 mm)**, and through inner wythe to within **1/2 inch (13 mm)** of the interior face of wall in exposed masonry. Where interior face of wall is to receive furring or framing, carry flashing completely through inner wythe and turn flashing up approximately **2 inches (50 mm)** on interior face.
 3. At lintels and shelf angles, extend flashing a minimum of **6 inches (150 mm)** into masonry at each end. At heads and sills, extend flashing **6 inches (150 mm)** at ends and turn up not less than **2 inches (50 mm)** to form end dams.
 4. Interlock end joints of ribbed sheet metal flashing by overlapping ribs not less than **1-1/2 inches (38 mm)** or as recommended by flashing manufacturer, and seal lap with elastomeric sealant complying with requirements in Division 7 Section "Joint Sealants" for application indicated.
- C. Install reglets and nailers for flashing and other related construction where they are shown to be built into masonry.
- D. Install weep holes in head joints in exterior wythes of first course of masonry immediately above embedded flashing and as follows:
1. Use specified weep/vent products or open head joints to form weep holes.
 2. Use wicking material to form weep holes above flashing under brick sills. Turn wicking down at lip of sill to be as inconspicuous as possible.
 3. Space weep holes **24 inches (600 mm)** o.c. unless otherwise indicated.
 4. Space weep holes formed from plastic tubing or wicking material **16 inches (400 mm)** o.c.
 5. Trim wicking material flush with outside face of wall after mortar has set.
- E. Place pea gravel in cavities as soon as practical to a height equal to height of first course above top of flashing, but not less than **2 inches (50 mm)**, to maintain drainage.
1. Fill cavities full height by placing pea gravel in cavities as masonry is laid so that at any point masonry does not extend more than **24 inches (600 mm)** above top of pea gravel.
- F. Place cavity drainage material in cavities to comply with configuration requirements for cavity drainage material in "Miscellaneous Masonry Accessories" Article.
1. Close cavities off vertically and horizontally with blocking in manner indicated. Install through-wall flashing and weep holes above horizontal blocking.

3.12 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.

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1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 2. Limit height of vertical grout pours to not more than **60 inches (1520 mm)**

3.13 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of **3/4 inch (19 mm)**. Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of **1/8 inch per foot (3 mm per 300 mm)**. Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.14 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
5. Clean brick by bucket-and-brush hand-cleaning method described in BIA Technical Notes 20.
6. Clean masonry with a proprietary acidic cleaner applied according to manufacturer's written instructions.
7. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.15 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.
- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 1. Crush masonry waste to less than **4 inches (100 mm)** in each dimension.
 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 2 Section "Earthwork."
 3. Do not dispose of masonry waste as fill within **18 inches (450 mm)** of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04810

SECTION 04901 - CLAY MASONRY RESTORATION AND CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes maintenance of unit masonry consisting of brick clay masonry restoration and cleaning as follows:
 - 1. Repairing unit masonry, including replacing units.
 - 2. Repointing joints.
 - 3. Cleaning exposed unit masonry surfaces.
- B. Related Sections:
 - 1. Division 1 Section "Special Procedures for Historic Treatment."
 - 2. Division 4 Section "Unit Masonry Assemblies" for new clay masonry construction.
 - 3. Division 4 Section "Stone Restoration and Cleaning."
 - 4. Division 7 Section "Water Repellents" for water repellents applied to clay masonry.
 - 5. Division 7 Section "Sheet Metal Flashing and Trim" for metal flashing installed in or on restored clay masonry.

1.3 DEFINITIONS

- A. Medium-Pressure Spray: 400 to 800 psi (2750 to 5510 kPa); 4 to 6 gpm (0.25 to 0.4 L/s).
- B. Saturation Coefficient: Ratio of the weight of water absorbed during immersion in cold water to weight absorbed during immersion in boiling water; used as an indication of resistance of masonry units to freezing and thawing.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include recommendations for application and use. Include test data substantiating that products comply with requirements.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For restoration specialists including field supervisors and restoration workers and testing service.
- B. Restoration Program.
- C. Cleaning Program.

1.6 QUALITY ASSURANCE

- A. Restoration Specialist Qualifications: Engage an experienced, preapproved masonry restoration and cleaning firm to perform work of this Section. Firm shall have completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.
 - 1. At Contractor's option, work may be divided between two specialist firms: one for cleaning work and one for repair work.
 - 2. Field Supervision: Restoration specialist firms shall maintain experienced full-time supervisors on Project site during times that clay masonry restoration and cleaning work is in progress. Supervisors shall not be changed during Project except for causes beyond the control of restoration specialist firm.
 - 3. Restoration Worker Qualifications: Persons who are experienced and specialize in restoration work of types they will be performing. When masonry units are being patched, assign at least one worker among those performing patching work who is trained and certified by manufacturer of patching compound to apply its products.
- B. Source Limitations: Obtain each type of material for masonry restoration (face brick, cement, sand, etc.) from one source with resources to provide materials of consistent quality in appearance and physical properties.
- C. Restoration Program: Prepare a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of restoration work including protection of surrounding materials and Project site.
 - 1. Include methods for keeping pointing mortar damp during curing period.
 - 2. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- D. Cleaning Program: Prepare a written cleaning program that describes cleaning process in detail, including materials, methods, and equipment to be used, protection of surrounding materials, and control of runoff during operations.

1. If materials and methods other than those indicated are proposed for any phase of restoration work, add to the Quality-Control Program a written description of such materials and methods, including evidence of successful use on comparable projects, and demonstrations to show their effectiveness for this Project and worker's ability to use such materials and methods properly.
- E. Cleaning and Repair Appearance Standard: Cleaned and repaired surfaces are to have a uniform appearance as viewed from **20 feet (6 m)** away by Architect. Perform additional paint and stain removal, general cleaning, and spot cleaning of small areas that are noticeably different, so that surface blends smoothly into surrounding areas.
- F. Mockups: Prepare mockups of restoration and cleaning to demonstrate aesthetic effects and set quality standards for materials and execution and for fabrication and installation.
1. Masonry Repair: Prepare sample areas for each type of masonry material indicated to have repair work performed. If not otherwise indicated, size each mockup not smaller than 2 adjacent whole units or approximately **48 inches (1200 mm)** in least dimension. Erect sample areas in existing walls unless otherwise indicated, to demonstrate quality of materials, workmanship, and blending with existing work. Include the following as a minimum:
 - a. Replacement:
 - 1) Four brick units replaced.
 - b. Patching: Three small holes at least **1 inch (25 mm)** in diameter for each type of masonry material indicated to be patched, so as to leave no evidence of repair.
 - c. Widening Joints: Widen a joint in 2 separate locations , each approximately **12 inches (300 mm)** long.
 2. Repointing: Rake out joints in 2 separate areas , each approximately **36 inches (900 mm)** high by **48 inches (1200 mm)** wide for each type of repointing required and repoint one of the areas.
 3. Cleaning: Clean an area approximately **25 sq. ft. (2.3 sq. m)** for each type of masonry and surface condition.
 - a. Test cleaners and methods on samples of adjacent materials for possible adverse reactions. Do not use cleaners and methods known to have deleterious effect.
 - b. Allow a waiting period of not less than seven days after completion of sample cleaning to permit a study of sample panels for negative reactions.
 4. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
 5. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver masonry units to Project site strapped together in suitable packs or pallets or in heavy-duty cartons.
- B. Deliver other materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.
- C. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- D. Store hydrated lime in manufacturer's original and unopened containers. Discard lime if containers have been damaged or have been opened for more than two days.
- E. Store lime putty covered with water in sealed containers.
- F. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.8 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit masonry restoration and cleaning work to be performed according to manufacturers' written instructions and specified requirements.
- B. Repair masonry units and repoint mortar joints only when air temperature is between **40 and 90 deg F (4 and 32 deg C)** and is predicted to remain so for at least 7 days after completion of the Work unless otherwise indicated.
- C. Cold-Weather Requirements: Comply with the following procedures for masonry repair and mortar-joint pointing unless otherwise indicated:
 - 1. When air temperature is below **40 deg F (4 deg C)**, heat mortar ingredients, masonry repair materials, and existing masonry walls to produce temperatures between **40 and 120 deg F (4 and 49 deg C)**.
 - 2. When mean daily air temperature is below **40 deg F (4 deg C)**, provide enclosure and heat to maintain temperatures above **32 deg F (0 deg C)** within the enclosure for 7 days after repair and pointing.
- D. Hot-Weather Requirements: Protect masonry repair and mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar and repair materials. Provide artificial shade and wind breaks and use cooled materials as required to minimize evaporation. Do not apply mortar to substrates with temperatures of **90 deg F (32 deg C)** and above unless otherwise indicated.
- E. For manufactured repair materials, perform work within the environmental limits set by each manufacturer.

- F. Clean masonry surfaces only when air temperature is 40 deg F (4 deg C) and above and is predicted to remain so for at least 7 days after completion of cleaning.

1.9 COORDINATION

- A. Coordinate masonry restoration and cleaning with public circulation patterns at Project site. Some work is near public circulation patterns. Public circulation patterns cannot be closed off entirely, and in places can be only temporarily redirected around small areas of work. Plan and execute the Work accordingly.

1.10 SEQUENCING AND SCHEDULING

- A. Order replacement materials at earliest possible date to avoid delaying completion of the Work.
- B. Order sand for pointing mortar immediately after approval of. Take delivery of and store at Project site a sufficient quantity to complete Project.
- C. Perform masonry restoration work in the following sequence:
 - 1. Remove plant growth.
 - 2. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 3. Remove paint.
 - 4. Clean masonry surfaces.
 - 5. Where water repellents, specified in Division 7, are to be used on or near masonry work, delay application of these chemicals until after pointing.
 - 6. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
 - 7. Repair masonry, including replacing existing masonry with new masonry materials.
 - 8. Rake out mortar from joints to be repointed.
 - 9. Point mortar and sealant joints.
 - 10. Inspect for open mortar joints and repair before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
 - 11. Clean masonry surfaces.
- D. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units to comply with "Masonry Unit Patching" Article. Patch holes in mortar joints to comply with "Repointing Masonry" Article.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

04901 - 5/11

EC#28 LEED (ADDENDUM ISSUED ON 09-12-2011)

ZHA # 04100.08

- A. Salvaged Brick: Obtain salvaged brick from Owner from location shown on Drawings. Clean off residual mortar.

2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150, Type I or Type II, white or gray or both where required for color matching of exposed mortar.

- 1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C 114.

- B. Hydrated Lime: ASTM C 207, Type S.

- C. Factory-Prepared Lime Putty: ASTM C 1489.

- D. Quicklime: ASTM C 5, pulverized lime.

- E. Mortar Sand: ASTM C 144 unless otherwise indicated.

- 1. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.
 - 2. For pointing mortar, provide sand with rounded edges.
 - 3. Match size, texture, and gradation of existing mortar sand as closely as possible. Blend several sands if necessary to achieve suitable match.

- F. Mortar Pigments: Natural and synthetic iron oxides, compounded for mortar mixes. Use only pigments with a record of satisfactory performance in masonry mortars.

- G. Water: Potable.

2.3 ACCESSORY MATERIALS

- A. Liquid Strippable Masking Agent: Manufacturer's standard liquid, film-forming, strippable masking material for protecting glass, metal, and polished stone surfaces from damaging effects of acidic and alkaline masonry cleaners.

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

- a. ABR Products, Inc.; Rubber Mask.
 - b. Price Research, Ltd.; Price Mask.
 - c. PROSOCO; Sure Klean Strippable Masking.
 - d. .

- B. Setting Buttons: Resilient plastic buttons, nonstaining to masonry, sized to suit joint thicknesses and bed depths of masonry units without intruding into required depths of pointing materials.

- C. Masking Tape: Nonstaining, nonabsorbent material, compatible with pointing mortar, joint primers, sealants, and surfaces adjacent to joints; that will easily come off entirely, including adhesive.
- D. Miscellaneous Products: Select materials and methods of use based on the following, subject to approval of a mockup:
 - 1. Previous effectiveness in performing the work involved.
 - 2. Little possibility of damaging exposed surfaces.
 - 3. Consistency of each application.
 - 4. Uniformity of the resulting overall appearance.
 - 5. Do not use products or tools that could do the following:
 - a. Remove, alter, or in any way harm the present condition or future preservation of existing surfaces, including surrounding surfaces not in contract.
 - b. Leave a residue on surfaces.

2.4 MORTAR MIXES

- A. Preparing Lime Putty: Slake quicklime and prepare lime putty according to appendix to ASTM C 5 and manufacturer's written instructions.
- B. Measurement and Mixing: Measure cementitious materials and sand in a dry condition by volume or equivalent weight. Do not measure by shovel; use known measure. Mix materials in a clean, mechanical batch mixer.
 - 1. Mixing Pointing Mortar: Thoroughly mix cementitious materials and sand together before adding any water. Then mix again adding only enough water to produce a damp, unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for 15 to 30 minutes. Add remaining water in small portions until mortar reaches desired consistency. Use mortar within one hour of final mixing; do not retemper or use partially hardened material.
- C. Colored Mortar: Produce mortar of color required by using specified ingredients. Do not alter specified proportions without Architect's approval.
 - 1. Mortar Pigments: Where mortar pigments are indicated, do not exceed a pigment-to-cement ratio of 1:10 by weight.
- D. Do not use admixtures in mortar unless otherwise indicated.
- E. Mortar Proportions: Mix mortar materials in the following proportions:
 - 1. Pointing Mortar for Brick: 1 part portland cement, 2 parts lime, and 6 parts sand.

- a. Add mortar pigments to produce mortar colors required.
2. Rebuilding (Setting) Mortar: Same as pointing mortar.
3. Rebuilding (Setting) Mortar: Comply with ASTM C 270, Proportion Specification, Type N unless otherwise indicated; with cementitious material limited to portland cement and lime.

PART 3 - EXECUTION

3.1 PROTECTION

- A. Protect persons, motor vehicles, surrounding surfaces of building being restored, building site, plants, and surrounding buildings from harm resulting from masonry restoration work.
 1. Erect temporary protective covers over walkways and at points of pedestrian and vehicular entrance and exit that must remain in service during course of restoration and cleaning work.
- B. Prevent mortar from staining face of surrounding masonry and other surfaces.
 1. Cover sills, ledges, and projections to protect from mortar droppings.
 2. Keep wall area wet below rebuilding and pointing work to discourage mortar from adhering.
 3. Immediately remove mortar in contact with exposed masonry and other surfaces.
 4. Clean mortar splatters from scaffolding at end of each day.
- C. Remove gutters and downspouts adjacent to masonry and store during masonry restoration and cleaning. Reinstall when masonry restoration and cleaning are complete.
 1. Provide temporary rain drainage during work to direct water away from building.

3.2 BRICK REMOVAL AND REPLACEMENT

- A. At locations indicated, remove bricks that are damaged, spalled, or deteriorated or are to be reused. Carefully demolish or remove entire units from joint to joint, without damaging surrounding masonry, in a manner that permits replacement with full-size units.
 1. When removing single bricks, remove material from center of brick and work toward outside edges.
- B. Support and protect remaining masonry that surrounds removal area. Maintain flashing, reinforcement, lintels, and adjoining construction in an undamaged condition.

- C. Notify Architect of unforeseen detrimental conditions including voids, cracks, bulges, and loose units in existing masonry backup, rotted wood, rusted metal, and other deteriorated items.
- D. Remove in an undamaged condition as many whole bricks as possible.
 - 1. Remove mortar, loose particles, and soil from brick by cleaning with hand chisels, brushes, and water.
 - 2. Remove sealants by cutting close to brick with utility knife and cleaning with solvents.
 - 3. Store brick for reuse. Store off ground, on skids, and protected from weather.
 - 4. Deliver cleaned brick not required for reuse to Owner unless otherwise indicated.
- E. Clean bricks surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.
- F. Replace removed damaged brick with other removed brick and salvaged brick in good quality, where possible, or with new brick matching existing brick, including size. Do not use broken units unless they can be cut to usable size.
- G. Install replacement brick into bonding and coursing pattern of existing brick. If cutting is required, use a motor-driven saw designed to cut masonry with clean, sharp, unchipped edges.
 - 1. Maintain joint width for replacement units to match existing joints.
 - 2. Use setting buttons or shims to set units accurately spaced with uniform joints.
- H. Lay replacement brick with completely filled bed, head, and collar joints. Butter ends with sufficient mortar to fill head joints and shove into place. Wet both replacement and surrounding bricks that have ASTM C 67 initial rates of absorption (suction) of more than 30 g/30 sq. in. per min. (30 g/194 sq. cm per min.). Use wetting methods that ensure that units are nearly saturated but surface is dry when laid.
 - 1. Tool exposed mortar joints in repaired areas to match joints of surrounding existing brickwork.
 - 2. Rake out mortar used for laying brick before mortar sets and point new mortar joints in repaired area to comply with requirements for repointing existing masonry, and at same time as repointing of surrounding area.
 - 3. When mortar is sufficiently hard to support units, remove shims and other devices interfering with pointing of joints.

3.3 WIDENING JOINTS

- A. Do not widen a joint, except where indicated or approved by Architect.

- B. Location Guideline: Where an existing masonry unit abuts another or the joint is less than **1/8 inch (3 mm)**, widen the joint for length indicated and to depth required for repointing after obtaining Architect's approval.
- C. Carefully perform widening by cutting, grinding, routing, or filing procedures demonstrated in an approved mockup.
- D. Widen joint to width equal to or less than predominant width of other joints on building. Make sides of widened joint uniform and parallel. Ensure that edges of units along widened joint are in alignment with joint edges at unaltered joints.

3.4 REPOINTING MASONRY

- A. Rake out and repoint joints to the following extent:
 - 1. All joints in areas indicated.
 - 2. Joints where mortar is missing or where they contain holes.
 - 3. Cracked joints where cracks can be penetrated at least **1/4 inch (6 mm)** by a knife blade **0.027 inch (0.7 mm)** thick.
 - 4. Cracked joints where cracks are **1/16 inch (1.6 mm)** or more in width and of any depth.
 - 5. Joints where they sound hollow when tapped by metal object.
 - 6. Joints where they are worn back **1/4 inch (6 mm)** or more from surface.
 - 7. Joints where they are deteriorated to point that mortar can be easily removed by hand, without tools.
 - 8. Joints where they have been filled with substances other than mortar.
 - 9. Joints indicated as sealant-filled joints.
- B. Do not rake out and repoint joints where not required.
- C. Rake out joints as follows, according to procedures demonstrated in approved mockup:
 - 1. Remove mortar from joints to depth of 2-1/2 times joint width, but not less than **1/2 inch (13 mm)** or not less than that required to expose sound, unweathered mortar.
 - 2. Remove mortar from masonry surfaces within raked-out joints to provide reveals with square backs and to expose masonry for contact with pointing mortar. Brush, vacuum, or flush joints to remove dirt and loose debris.
 - 3. Do not spall edges of masonry units or widen joints. Replace or patch damaged masonry units as directed by Architect.
 - a. Cut out mortar by hand with chisel and resilient mallet. Do not use power-operated grinders without Architect's written approval based on approved quality-control program.
 - b. Cut out center of mortar bed joints using angle grinders with diamond-impregnated metal blades. Remove remaining mortar by hand with chisel and resilient mallet. Strictly adhere to approved quality-control program.

- D. Notify Architect of unforeseen detrimental conditions including voids in mortar joints, cracks, loose masonry units, rotted wood, rusted metal, and other deteriorated items.
- E. Pointing with Mortar:
1. Rinse joint surfaces with water to remove dust and mortar particles. Time rinsing application so, at time of pointing, joint surfaces are damp but free of standing water. If rinse water dries, dampen joint surfaces before pointing.
 2. Apply pointing mortar first to areas where existing mortar was removed to depths greater than surrounding areas. Apply in layers not greater than **3/8 inch (9 mm)** until a uniform depth is formed. Fully compact each layer thoroughly and allow it to become thumbprint hard before applying next layer.
 3. After low areas have been filled to same depth as remaining joints, point all joints by placing mortar in layers not greater than **3/8 inch (9 mm)**. Fully compact each layer and allow to become thumbprint hard before applying next layer. Where existing masonry units have worn or rounded edges, slightly recess finished mortar surface below face of masonry to avoid widened joint faces. Take care not to spread mortar beyond joint edges onto exposed masonry surfaces or to featheredge the mortar.
 4. When mortar is thumbprint hard, tool joints to match original appearance of joints as demonstrated in approved mockup. Remove excess mortar from edge of joint by brushing.
 5. Cure mortar by maintaining in thoroughly damp condition for at least 72 consecutive hours including weekends and holidays.
 - a. Acceptable curing methods include covering with wet burlap and plastic sheeting, periodic hand misting, and periodic mist spraying using system of pipes, mist heads, and timers.
 - b. Adjust curing methods to ensure that pointing mortar is damp throughout its depth without eroding surface mortar.
 6. Hairline cracking within the mortar or mortar separation at edge of a joint is unacceptable. Completely remove such mortar and repoint.
- F. Where repointing work precedes cleaning of existing masonry, allow mortar to harden at least 30 days before beginning cleaning work.

END OF SECTION 04901

SECTION 05511 - METAL RAILINGS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Steel tube handrails

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

- 1. Handrails and Top Rails of Guards:

- a. Uniform load of **50 lbf/ ft. (0.73 kN/m)** applied in any direction.
- b. Concentrated load of **200 lbf (0.89 kN)** applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

- 2. Infill of Guards:

- a. Concentrated load of **50 lbf (0.22 kN)** applied horizontally on an area of **1 sq. ft. (0.093 sq. m)**.
- b. Infill load and other loads need not be assumed to act concurrently.

- 3. Component Importance Factor is 1.5.

1.4 ACTION SUBMITTALS

- A. Product Data: For metal rails and the following:

- 1. Paint products

- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

- C. Samples for Verification: For the following products, in manufacturer's standard sizes:
 - 1. Metal railing
 - 2. Paint sample for approval

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.
- B. NAAMM Railing Standard: Comply with "Recommended Voluntary Minimum Standards for Fixed Metal Rails" in NAAMM AMP 510, "Metal Railing Manual," for class of rail designated, unless more stringent requirements are indicated.
 - 1. Preassembled Railing: Commercial class.
- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- D. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3, "Structural Welding Code - Sheet Steel."

1.6 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorages for metal stairs. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.
- C. Coordinate locations of hanger rods and struts with other work so that they will not encroach on required stair width and will be within the fire-resistance-rated stair enclosure.

PART 2 - PRODUCTS

2.1 METALS, GENERAL

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

2.2 FERROUS METALS

- A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Steel Tubing: ASTM A 500 (cold formed) or ASTM A 513.
- C. Wire Rod for Grating Crossbars: **ASTM A 510 (ASTM A 510M)**.
- D. Cast Iron: Either gray iron, ASTM A 48/A 48M, or malleable iron, ASTM A 47/A 47M, unless otherwise indicated.
- E. Uncoated, Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, either commercial steel, Type B, or structural steel, **Grade 25 (Grade 170)**, unless another grade is required by design loads; exposed.
- F. Uncoated, Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, either commercial steel, Type B, or structural steel, **Grade 30 (Grade 205)**, unless another grade is required by design loads.
- G. Galvanized-Steel Sheet: ASTM A 653/A 653M, **G90 (Z275)** coating, either commercial steel, Type B, or structural steel, **Grade 33 (Grade 230)**, unless another grade is required by design loads.

2.3 NONFERROUS METALS

- A. Aluminum Extrusions: **ASTM B 221 (ASTM B 221M)**, Alloy 6063-T6.
- B. Aluminum Castings: ASTM B 26/B 26M, Alloy 443.0-F.
- C. Bronze Extrusions: ASTM B 455, Alloy UNS No. C38500 (extruded architectural bronze).
- D. Bronze Castings: ASTM B 584, Alloy UNS No. C83600 (leaded red brass) or No. C84400 (leaded semired brass).
- E. Nickel Silver Castings: ASTM B 584, Alloy UNS No. C97600 (20 percent leaded nickel bronze).

2.4 FASTENERS

- A. General: Provide zinc-plated fasteners with coating complying with ASTM B 633 or **ASTM F 1941 (ASTM F 1941M)**, Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, **ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6)**; with hex nuts, **ASTM A 563 (ASTM A 563M)**; and, where indicated, flat washers.
- C. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, **ASTM A 563 (ASTM A 563M)**; and, where indicated, flat washers.
 - 1. Provide mechanically deposited or hot-dip, zinc-coated anchor bolts for stairs indicated to be shop primed with zinc-rich primer.
- D. Machine Screws: **ASME B18.6.3 (ASME B18.6.7M)**.
- E. Lag Screws: **ASME B18.2.1 (ASME B18.2.3.8M)**.
- F. Plain Washers: Round, **ASME B18.22.1 (ASME B18.22M)**.
- G. Lock Washers: Helical, spring type, **ASME B18.21.1 (ASME B18.21.2M)**.
- H. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 - 1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or **ASTM F 1941 (ASTM F 1941M)**, Class Fe/Zn 5, unless otherwise indicated.

2.5 MISCELLANEOUS MATERIALS

- A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.
- B. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
 - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- C. Concrete Materials and Properties: Comply with requirements in Division 3 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of **3000 psi (20 MPa)** unless otherwise indicated.

- D. Welded Wire Fabric: ASTM A 185/A 185M, 6 by 6 inches (152 by 152 mm), W1.4 by W1.4, unless otherwise indicated.

2.6 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
 - 1. Join components by welding unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.
- B. Preassembled Stairs: Assemble stairs in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch (1 mm) unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with the following:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.7 RAILINGS

- A. Steel Tube Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including wall thickness of tube, post spacings, and anchorage, but not less than that needed to withstand indicated loads.
 - 1. Rails and Posts: **1-5/8-inch- (41-mm-)** diameter top and bottom rails and **1-1/2-inch- (38-mm-)** square posts.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
 - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 1 welds: no evidence of a welded joint.
- C. Form changes in direction of railings as follows:
 - 1. As detailed.
 - 2. By bending or by inserting prefabricated elbow fittings.
- D. Form simple and compound curves by bending members in jigs to produce uniform curvature for each repetitive configuration required; maintain cross section of member throughout entire bend without buckling, twisting, cracking, or otherwise deforming exposed surfaces of components.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails unless otherwise indicated. Close ends of returns unless clearance between end of rail and wall is **1/4 inch (6 mm)** or less.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work. Furnish inserts and other anchorage devices for connecting to concrete or masonry work.
 - 1. Connect posts to stair framing by direct welding unless otherwise indicated.
 - 2. For galvanized railings, provide galvanized fittings, brackets, fasteners, sleeves, and other ferrous-metal components.
 - 3. For nongalvanized railings, provide nongalvanized ferrous-metal fittings, brackets, fasteners, and sleeves, except galvanize anchors embedded in exterior masonry and concrete construction.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, where needed to transfer wall bracket loads through wall finishes to structural supports. Size fillers to suit wall finish thicknesses and to produce adequate bearing area to prevent bracket rotation and overstressing of substrate.

2.8 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish metal railing after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 1. Interior Stairs: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
 - 2. Interior Stairs: SSPC-SP 3, "Power Tool Cleaning."
- D. Apply shop primer to uncoated surfaces of metal stair components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
 - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing metal rails to in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.

3.2 INSTALLING RAILINGS

05511 - 7/8

- A. Adjust railing systems before anchoring to ensure matching alignment at abutting joints. Space posts at spacing indicated or, if not indicated, as required by design loads. Plumb posts in each direction. Secure posts and rail ends to building construction as follows:
 - 1. Anchor posts to steel by welding directly to steel supporting members.
 - 2. Anchor handrail ends to concrete and masonry with steel round flanges welded to rail ends and anchored with postinstalled anchors and bolts.

- B. Attach handrails to wall with wall brackets. Use type of bracket with flange tapped for concealed anchorage to threaded hanger bolt with predrilled hole for exposed bolt anchorage. Provide bracket with 1-1/2-inch (38-mm) clearance from inside face of handrail and finished wall surface. Locate brackets as indicated or, if not indicated, at spacing required to support structural loads. Secure wall brackets to building construction as follows:
 - 1. For steel-framed partitions, use self-tapping screws fastened to steel framing or to concealed steel reinforcements.
 - 2. For steel-framed partitions, use toggle bolts installed through flanges of steel framing or through concealed steel reinforcements.

3.3 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 - 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.

- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections. Division 9 Section "High-Performance Coatings." Division 9 painting Sections and Division 9 Section "High-Performance Coatings."

END OF SECTION 05511

SECTION 14100 – AUTOMATED PARKING STRUCTURE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:

- 1. Automated Parking Structure

1.3 PERFORMANCE REQUIREMENTS

- A. Provide a self-parking high-density vehicle storage and retrieval system that maneuvers stacked vehicles on platforms in horizontal and vertical motions in order to deliver vehicles to an “On Grade” position through the use of a Programmable Logic Control (PLC). System must allow direct access to vehicles without the need to remove vehicles from any stack in order to retrieve a specific vehicle (no attendant required). The system is to be designed with a pit depth for up to a minimum of 3 vehicles below grade and up to 5 vehicles above grade. Provide a total vertical stacking capacity of 8 vehicles in any typical space. The system provided will have no horizontal limitations. External applications such as façade cladding/siding, garage doors and roof, will be per client specifications.

- 1. Structural:

- a. The Parking Structure must be a stand-alone system with no interference from the building’s site or structural systems. Coordinate building columns and footings with the parking structure envelope to provide clear system movement and access.

- 2. Required Safety Features:

- a. Safety fence on Grade
- b. Roller shutter doors on Alley level
- c. Infra red vehicle sizing – length only
- d. Infra red all clear beams
- e. Vertical limits

- f. Travel limits
- g. Audible alarm
- h. Emergency stop
- i. Overload protection
- j. Phase protection
- k. Fault indicator

2. Operation:

- a. System operation is via a push-button control unit and access swipe card located at or near the point of vehicle entry. Remote control devices are optional. For in-ground units, a safety gate is required.

1.4 ACTION SUBMITTALS

A. Product Data: :

- 1. Provide complete product data for all system components and operation.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work. GC to coordinate system installation with adjacent structural system and building systems.

C. Samples for Verification: In the manufacturer's standard sizes:

- 1. All finishes
- 2. Paints samples for approval

1.5 QUALITY ASSURANCE / APPROVED MANUFACTURER

A. Installer Qualifications: Single source of system installation and products.

B. Park Plus, Inc.: 480 Main Avenue, Unit 1, Wallington, NJ 07057, 1-800-966-5509

1.6 COORDINATION

- A. Coordinate installation of the automated parking structure with all adjacent construction. Furnish shop drawings, setting drawings, templates, and directions for installing structure, including sleeves, concrete inserts, anchor bolts, and any items associated with the integral performance of the system. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 SYSTEM SPECIFICATION

- A. Model: LS2h1dx14 Automated Parking Structure
- B. Vehicle Size and Weight: 19 ft. x 7 ft. x 6 ft. 6 in. & 7,000 lbs.
- C. Spaces: 14 spaces
- D. Speed: Lifting 13 ft. per minute. Traversing 26 ft. per minute
- E. Power: 5 HP Lift Motor, .75 HP Traverse Motors
- F. Power Supply: 3PH + N + G / 220V / 60HZ with a 40 Amp cut-off switch
- G. Control: Push button and numbered key pad

2.2 SYSTEM INSTALLATION TO INCLUDE

- A. Delivery to site
- B. Erection and installation
- C. Site preparation
- D. Operator training

2.3 WARRANTY & SERVICE

- A. Provide system and equipment Warranty for a period of twelve (12) months from acceptance of the work by the Owner.
- B. Provide service after the installation at six month intervals.
- C. At the end of the Warranty period provide the option of a service contract for acceptance by the Owner.

2.4 FABRICATION, GENERAL

- A. Provide a complete Automated Parking System assembly, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and any other components necessary for the support and use of the structure.
 - 1. Join components per Manufacturer's requirements unless otherwise indicated.
 - 2. Use connections that maintain structural value of joined pieces.

- B. Preassembled Components: Assemble in shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.
- C. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately **1/32 inch (1 mm)** unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- D. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- E. Form exposed work with accurate angles and surfaces and straight edges.
- F. Weld connections to comply with Manufacturer's requirements:
 - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - 2. Obtain fusion without undercut or overlap.
 - 3. Remove welding flux immediately.
 - 4. Weld exposed corners and seams continuously unless otherwise indicated.
 - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for Type 2 welds: completely sanded joint, some undercutting and pinholes okay.
- G. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) screws or bolts unless otherwise indicated. Locate joints where least conspicuous.
- H. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish Parking System after assembly.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
- D. Apply shop primer to uncoated surfaces of Parking System components, except those with galvanized finishes and those to be embedded in concrete or masonry unless otherwise indicated. Comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Fastening to Adjacent In-Place Construction: Provide anchorage devices and fasteners where necessary for securing Parking System to any in-place construction. Include threaded fasteners for concrete and masonry inserts, through-bolts, lag bolts, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing Parking System. Set unit accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.
- D. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- E. Field Welding: Comply with Manufacturer's requirements for field welding.

3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
 1. Apply by brush or spray to provide a minimum 2.0-mil (0.05-mm) dry film thickness.
- B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Division 9 painting Sections. Division 9 Section "High-Performance Coatings." Division 9 painting Sections and Division 9 Section "High-Performance Coatings."

END OF SECTION 05511

ATTACHMENT #4 TO AMENDMENT NO. 6 TO DCFC-2011-B-0167

ADDITIONAL SPECIAL RESPONSIBILITY STANDARDS

**ATTACHMENT NO. 4 TO AMENDMENT NO. 6
TO SOLICITATION NO. DCFB-2011-B-0167**

ADD THE FOLLOWING SPECIAL STANDARDS OF RESPONSIBILITY REQUIREMENTS TO SECTION L.23:

1. Section L. 23.6 - For the cast-in-place requirement the contractor or its subcontractor shall provide evidence with its bid that it or its subcontractor specializes in the placement of formwork, reinforcing steel, and concrete with a minimum of 3 years experience on projects of similar size and scope.
2. Section L.23.7 - For clay masonry restoration and cleaning the contractor or its subcontractor shall provide evidence with its bid that it or its subcontractor is an experienced, preapproved masonry restoration and cleaning firm. Evidence that the company has completed work similar in material, design, and extent to that indicated for this Project with a record of successful in-service performance. Experience installing standard unit masonry is not sufficient experience for masonry restoration work.
3. Section L.23.8 - Bids submitted in response to this IFB shall be deemed non-responsible and shall be rejected if the bidder fails to submit with its bid the above information required by Paragraph L.23.

ATTACHMENT #3 TO AMENDMENT NO. 6 TO DCFC-2011-B-0167

ANSWERS TO QUESTIONS RAISED BY PROSPECTIVE BIDDERS

1. **Is testing and inspection part of the scope of work? Please clarify.**

Yes, the contractor is responsible for all testing and inspection of his work and the work of his subcontractor. The District however, will conduct its own independent inspection and testing to ensure that the contractor is in compliance with all contract requirements. For example, the District will employ a third party company to test all concrete pours and/or steel installation.

2. **Has the [District] appli[ed]cation for class of service [application] being applies to PEPCO? Is the WASA / PEPCO fees paid by the Owner? It's very difficult for the general contractor to obtain an estimate of the above fee within the time parameter. If the fee is to be included in the scope of work, we recommend that an "allowance" should be established for the WASA / PEPCO fees to be included by all bidders in their bids. Please advise.**

The District has applied for the "Class of Services" with Pepco, Washington Gas and D.C. Water. All fees associated with these utilities have already been paid for by the District.

3. **Are there electric and water utilities available on site? Who is responsible for paying the water and electric consumptions during the construction period? Please clarify.**

The water has been cut off at Engine Company Number 28. The electric, gas and water will be turned off by Pepco, DC Water and Washington Gas, respectfully, once the District informs them with the "Notice to Proceed" date for the awardee. In accordance with section H.4, "Utilities Connections and Services" of the solicitation specification, the successful bidder is responsible for these costs.

4. **Demolition keynote #19 states, "Existing pole and overhead electric line to be removed and relocated per PEPCO Standards and Specifications. Coordinate requirements with PEPCO." Please confirm this is correct.**

The note is correct. It is the responsibility of the successful bidder to schedule and make arrangements with the local utility company for this new work.

5. **Engine Company #28 and #29: Specification sections 08350, parts 2.01B refer to substitution sections 01630. These referred sections are not provided in the bid document. Please provide these missing referred sections.**

Specification Section 08350 part 2.01 B incorrectly refers to a section 01630 "Substitution." This Section does not exist. Please refer to the Standard

Contracts Provisions, Section 14, for allowable procedures for the substitution of equipment, material and workmanship.

6. **Engine Company #29: Door schedule on drawing A7.2 shows apparatus bay doors #100 and #101A as wood folding doors. However, specification section, part 2 indicates Model 41 Hydraulic Door from Electric Power Door for metal folding doors. Are these doors wood or metal? If they are wood, please provide the appropriate specification section.**

All apparatus bay doors shall be metal in accordance with drawing sheet number A2.1.

7. **Engine Company #29: Drawing A7.3 shows aluminum window A, B, C, and D. In addition, sill and jamb details 1-6 on drawing A7.03 also indicate those above windows have aluminum frames. The bid document does not have a specification section for aluminum window. Please provide this missing specification section.**

See Attachment #2 to Amendment No. 6 of DCFB-2011-B-0167 for Specification Section for Aluminum Storefront (Section 08410).

8. **East elevation on drawing A2.1 shows a type K1 window. However, the window schedule on drawing A7.2 does not provide type K1 window. Please provide this missing type K1 window.**

That statement is incorrect. For Engine Company Number 28, drawing sheets A2.1 and A7.2 show window type "K-1" right next to type K

9. **Attic floor plan on drawing A1.2 shows two (2) type M windows. South elevation on drawing A2.1 indicates those openings as type P (as louvers), and not type M windows. However, north elevation also notes two (2) type P openings (as louvers) with key note #3 – existing windows to be replaced with new exterior windows. Those openings seem to be conflicting between the floor plans and elevations. Please clarify the correct opening types and locations.**

Drawing sheet number A2.1, "Exterior Elevations" depicts the windows and openings as Type P. Drawing sheet number A1.2 is a floor plan drawing which is not commonly used to establish window types.

10. **Please provide the following missing specification sections:**
- a. **Oil/water separator – shown on drawing P4, Engine Company #28**

See detail on Drawing P-1

- b. **Oil interceptor – shown on drawing P3, Engine Company #29**

That detail is shown on the drawings for EC #28. Both are similar. The Oil Interpreter is the same for Firehouses, EC #28 and EC #29.

- c. **Electric water heaters – shown on drawing P4 and P5, Engine Company #28 and #29**

The model number and manufacturer for the EWH is noted on drawing P-1

- d. **Water line – shown on drawing C1.05, Engine Company #28 and #29**

See utilities notes on drawing C1.05, DC Water Standards. Also, see Specifications Section 15410 and 15430.

- e. **Sanitary sewer line – shown on drawing C1.05, Engine Company #28 and #29**

See response to d.

- f. **Storm water management system – shown on drawing C1.05, Engine Company #28 and #29**

See response to d.

- g. **Asphalt pavement – shown on drawing C1.04, Engine Company #29**

See note 4 on drawing sheet C1.04

- h. **Telecommunication systems**

See notes on drawing sheet number E-1, E-6 and E-7

- 11. **There are specifications given for asbestos abatement, removal and disposal of lead paint, contaminated soils and PCB containing lighting ballasts. There isn't any hazardous material report given for Engine Company 28 and 29. Please provide the hazardous material reports for Engine Company #28 and #29.**

All known and exposed hazardous materials have been abated at the two stations. Therefore; there is no "Hazardous Material" reports. The listed Specification Section was included for reference and appropriate action in the

event hazardous materials are discovered inside concealed spaces of wall, ceiling etc. during renovation.

12. **There is a note on Drawing D1.5 for Engine Company #28 and Drawing D1.1 for Engine Company #29 which is written “Removal of lead based paint, asbestos materials and other toxins are not included in contract. G.C shall coordinate with authorized representatives that the required removal of such materials has been performed per code prior to starting any portion of work.” Please confirm that all the hazardous material abatement, removal and disposal are not part of this project.**

See response to number 11.

13. **Engine Company #28: Drawing M1 indicates the hood fire suppression system is to be furnished and installed by the kitchen equipment supplier. In addition, drawing M4 has key note #9, referring to kitchen hood, but this key note #9 does not show anywhere on the drawing. Specification section 11451 – Residential Appliances only specifies the kitchen equipment supplier to provide gas ranges, refrigerators, food waste disposers, dishwashers, washes/dryers, and microwave ovens. Where is this kitchen hood? Who is providing the suppression system? If required, please provide the missing specification section for this kitchen hood.**

The location of the Hood (Exhaust Fan) is clearly shown graphically on the Mechanical drawing M-4, keyed notes 5 and 9. The successful bidder will be responsible for the purchase and the installation of the kitchen hood. Drawing M-8 provides details for installation and manufacturer/model names.

14. **Engine Company #29: Drawing M3 has key note #2, referring to kitchen hood, but this key note #2 does not show anywhere on the drawing. Please provide the location of the kitchen hood.**

The location of the kitchen hood on Drawing Number M3 is the top of the drawing at 10 x 10 EA DUCT UP which is the stove.

15. **Fire Engine Company #28 and #29: Drawing P3 and P4 shows rain water disinfection systems with weather proof enclosures with 2-2KW heaters. As discussed with the specified manufacturer, they do not provide these systems with weather proof enclosures nor 2-2KW heaters. Also, the manufacturer recommends whatever the enclosures are provided; there should be some type of exhausts with louvers or fans. Please advice.**

The District has verified with the manufacturer that the suggested manufacturer does provide such an enclosure. Since this is an outdoor unit, exhaust fans are not required. Ventilation comes with the enclosure.

16. Fire Engine Company #28 and #29: Drawing P3 and P4 shows rain water disinfection systems. However, there is not detail given for the 1000 gallon concrete cistern or storage tanks. Please provide confirmation if a concrete cistern is required or a storage tank to be buried below the frost line.

Please see drawing sheet C1.05, key note 7 for details on the underground tank for Engine Company number 28. Also, see drawing sheet C1.05, key note 10 for details on the underground tank for Engine Company number 29.

17. Engine company speakers with Data Net systems and alert systems (“Muscat System”) with strip bells and strip lights – shown on drawing E1, E5, and E8 for Engine Company #28 and #29. Are these systems part of the scope of work? If so, please provide the missing specification sections.

The systems are part of the scope of work. The device specifications are listed on drawing E-1 of respective projects.

18. Power riser diagram note # 6 on drawing E1 of Fire Engine Company #28 shows a 56 KVA emergency generator rated at 208/120 V and note # 7 on drawing E7 for Fire Engine Company # 29 indicates a 60 KW emergency generators are normally sized based on KW not KVA. However, both specifications sections 16231, part 2.2Bs for the generators of Fire Engine Company #28 and #29 indicates that the generators are to be 60 KVA rating as the power output. What are the correct ratings for the generators? Please clarify.

Drawing sheet E.1, note 6 and Specification Section 16231, part 2.2B calls for the generator to be 60 KW.

19. Fire Engine Company #28: Note #11 on drawing E3 of demolition general note indicates that there is an existing Lucent telephone System to be removed. Will this project require a new telephone system, after removal of existing? Please advise.

On drawing sheet E-1, “Coordination with Power and telephone companies” notes 1 and 2 addresses the telephone system and all associated wiring and devices and installed as part of a complete system.

20. Fire Engine Company #29: Drawing E5 shows magnetic door holders with notes stating that they are not to be connected to the fire alarm system. However, specification section 13851, part 2.8 mentions these devices under the product data to be provided as part of the fire alarm system. In addition, under part 1.5D, item #5 requires that upon fire alarm signal, these door holders are to be unlocked the electric doors and item # 6 also releases fire and smoke doors held by the magnetic door holder. Please provide

clarification as to whether or not these magnetic door holders have to be tied to the fire alarm system.

The note on drawing sheet E-5 is correct. Hold open devices are used only at non rated doors. Integration to the Fire alarm system is not required.

21. **Fire Engine Company #29: The Electrical Riser shown of this drawing E7 does not indicate the feeder size for generator annunciator panel and panel EB. Please provide the information.**

Refer to wire and conduit schedule on the drawing.

22. **Fire Engine Company #28 and #29: Energy recovery unit schedule, note #4 on drawing M6 indicates to be completed with all required devices. However, there is no sequence of operation has been provided. The sequence of operation is provided in the specifications section 15940, but does not include these units. Please provide the missing information.**

The specification for sequence of operation includes the heat exchangers.

23. **Fire Engine Company #28 and #29: Make up air unit schedule, note #1 on drawing M6 indicates that this unit should be interlocked with the Kitchen Exhaust Fan. However, there is no indication that a sequence of operation for this units. The Electrical drawing E-4 shows the Hood Suppression System, but does not mention any tie-ins. Please provide additional information.**

Sequence of operation of Make-Up air unit (MAU) shall be interlocked with the kitchen hood and kitchen exhaust fan (KEF). When the kitchen hood is turned on/off, simultaneously. Sheet E-4 does mention tie-ins for the hood suppression system. The tie-in is required.

24. **Fire Engine Company #28 and #29: Specification Section 15325, part 1.4d indicates a fire pump as a major piece of equipment required under this system description. However, the sprinkler system note # 5 on drawing P1 requires that the contractor obtain the current flow test and provide a fire pump as required. Please the flow test information so we can determine if fire pumps are required and what size will have to be provided in each of these buildings.**

A complete Sprinkler system is to be provided and by the contractor. The system is a wet system in all heated space and a dry system in the unheated space. The Architectural reflected ceiling plans show approximate location of the sprinkler heads. Quantity and location to be finalized by the designer and to be approved by the DC Fire Marshal. The designer who will be hired by the successful bidder will lay out the location and number of sprinkler heads. Their location must come with DCRA approval. There is no requirement for a

fire pump. The pump noted under sprinkler note is a pump that may be needed for the dry system and it would be up to the Contractor how he/she wants to layout the system within the given perimeters. Flow test information is available from the DC Water Authority.

- 25. Fire Engine Company #29: Drawing P4 shows gas piping connection to MAU-1, FU-1 & 2 without any vent piping. Please verify whether or not vent piping is required at these connections.**

MAU-1 does not require for EC 28. FU-1 & 2 vent piping is shown on sheet M-4. The unit "MAU-1" does not require vent piping.

- 26. Specifications, Table of Contents show "Report Geotechnical Investigation" for Engine Company #28. There isn't any Geotechnical Investigation Report provided in the specification. Please provide missing Geotechnical Investigation Report for Engine Company #28.**

The statement is incorrect. There is no Geotechnical Investigation Report for Engine Company #28.

- 27. Engine Company #29, Drawings A1.0 and 1/A5.1 show waterproofing work. We need to excavate 13' below the perimeter of the basement wall to provide waterproofing. Therefore, underpinning, and sheeting and shoring works need to be provided, in order to protect the existing foundation walls and footings. Please provide structural drawing details of underpinning, and sheeting and shoring work.**

Why do you think you need to go 13' deep? This is a simple excavation up to the top of the footing as detailed on section drawings. Detailed number 1-A, A-5.4. No excavation below the footing, so there is no question of underpinning. There is a specifications section on Shoring and Bracing (section 02150) already included.

- 28. Engine Company #28: Drawing C1.05, Utility Keynote #12 "New trench drain. Refer to architectural drawings for details." Architectural drawings don't show any trench drain details. Please provide the trench drain drawing details.**

Details on Trench Drain can be viewed on drawing sheet A1.1 and A8.2, Section 4.

- 29. Fire Engine Company #28: Drawing A7.3 has a combined rubber tread and nosing material legend. Detail 7/A5.2 shows a concrete filled pan stair without any finish. Is this material used anywhere in the building? If so, please specify.**

Rubber Nosing is to be installed on the stair tread and risers as shown on the finish schedule. See A7.3.

30. **Fire Engine Company #28: Drawing A7.3 has a combined rubber tread and nosing material legend. Detail 7/A5.2 shows a concrete filled pan stair without any finish. Is this material used anywhere in the building? If so, please specify.**

Same answer as # 29.

31. **Engine Company #28: Drawing C1.04, Site Key Note #6, "*Install new concrete pavement at driveway and indicate partial area to be pave.*" Drawing AS.1 indicates the entire driveway area to be new concrete pavement. Which is correct? Please advise.**

The successful bidder will be required to provide all new pavements on the front apron and at the rear of the property.

32. **Engine Company #28 and #29: Drawing A2.1, Key Note#1 and #2 states, "*All exterior exposed clay and stone masonry to be restored, medium pressure wash and tuck pointed typical.*" Does this mean the entire structural are to be tuck pointed, where needed? Please clarify.**

This is correct. This note is applicable to each building's exposed exterior façade.

33. **Engine Company #29: Drawing C1.04, Site Key Note #11 indicates 12" CMU retaining walls and refers to Architectural Drawings. However, detail 3/AS.1 and drawing S3.2 indicates these retaining walls as concrete retaining walls. Which is correct? Please clarify.**

The detail on S3.2 and detail 3/A5.1 provide the correct information for the concrete retaining wall.

34. **Engine Company #28: Drawing A4.1 shows 1" thick acoustical ceiling panels, surface mounted at room #108 Apparatus Bay. Drawing A7.3 Room Finish Schedule shows GB-1. Please advise and provide manufacturer name, product name, color for the 1" thick acoustical ceiling panels.**

Acoustic ceiling tile are required in the Apparatus Bay. Acoustic ceiling panel specifications are listed as section 09511 on the Table of Contents. However, inside these section have been tagged as Section # 09250 (in EC 28) and 09622 (in EC 29) on the bottom. All sheets are labeled correct on the top of sheets but incorrect on the bottom of sheets.

35. Engine Company #28: Drawing A4.2 shows a note: *“Attach 5/8” gyp. brd. to exist. 2X6 ceiling joist directly thru exist plaster ceiling for entire 2nd floor ceiling.”* Please confirm.

That is correct.

36. Engine Company #28, Table of Contents shows specification sections 03301, 05120, 05210, 05310, 05510, 05720, 06100, 06601, 07161, 07270, 07272, 07531, 07610, 15055, 15542, 15550, 17080, 17100, 17286, and 17351 but there aren't any of these sections given in the bid document. Please provide these missing specification sections.

Specification Sections 03301, 05120, 06100 and 07270 are provided as attachments to the addendum. Although the other Sections that you asked about are listed in the Table of Contents they are not applicable to this solicitation and therefore not included.

37. Fire Engine Company #29: At the site visit, it was stated that during construction on the property to the south-side of the building, where a butterfly sanctuary that had to be protected at all times. We need a detail and specifications as how to provide this protection. Please advise.

The “Butterfly Sanctuary” is outside the construction limits and the property line. The area should be protected from construction debris and dust as much as possible. There is no detail or specifications as how to provide this protection. Bidders should use their own means and methods.

38. We have noticed that the project drawings are in conflict with the automatic temperature control system. Some of the drawings refer to Carrier VVT System with programmable thermostats. The specifications have two control sections with one of them referring to Lon Works DDC control system. Drawing M9 shows an input/output summary which monitors and/or controls most of not all the pieces of equipment in the building. In order for the system to be designed and operated correctly, the DDC control system should be the primary system operating the building component and not a mixture of several types of systems. Please advise.

The Contractor shall provide a Direct Digital Control (DDC) system for all HVAC systems and components as specified, and shown on the drawings. Factory-wired controls shall be interlocked with the DDC.