PROJECT MANUAL

REBID - Change in Scope

Means of Egress

Missouri School for the Blind

St Louis, Missouri

Designed By: Patterhn Ives llc
130 South Bemiston Ave, Suite 800
St. Louis, MO 63105

Date Issued: June 29, 2026

Project No.: E2332-01

STATE *of* MISSOURI

OFFICE *of* ADMINISTRATION
Facilities Management, Design and Construction

ARCHITECTURE: Patterhn Ives LLC
130 South Bemiston Avenue
Suite 800
Saint Louis, Missouri 63105
314 833 0301
www.patterhn-ives.com

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Saint Louis, Missouri 63102
314 645 6232
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STRUCTURAL ENGINEERING: KPFF
1630 Des Peres Road
Suite 100
Saint Louis, Missouri 63131
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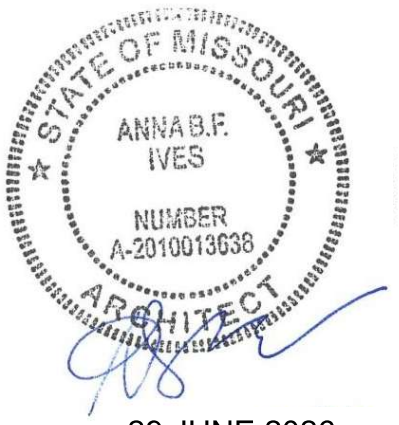
CIVIL: Civil Design, Inc. (CDI)
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314 916 1178
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10027 Stratton Drive
Saint Louis, Missouri 63126
314 306 7535
www.everestst l.com

SECTION 000107 - PROFESSIONAL SEALS AND CERTIFICATIONS

PROJECT NUMBER: E2332-01 [INSTALL MEANS OF EGRESS, INFRASTRUCTURE]

THE FOLLOWING DESIGN PROFESSIONALS HAVE SIGNED AND SEALED THE ORIGINAL PLANS AND SPECIFICATIONS FOR THIS PROJECT, WHICH ARE ON FILE WITH THE DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION:



29 JUNE 2026

Patterhn Ives, LLC



29 JUNE 2026

McClure Engineering



06-29-2026

KPFF



006/29/2026

Civil Design Inc.

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NOTICE TO BIDDERS

The following procurement forms can be found on our website at:
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PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section provides a comprehensive list of the drawings that comprise the Bid Documents for this project.

PART 2 - PRODUCTS (NOT APPLICABLE)

PART 3 - EXECUTION

3.1 LIST OF DRAWINGS

A. The following list of drawings is a part of the Bid Documents:

	TITLE	SHEET #	DATE
	GENERAL		
1.	COVER	G-001	06/29/26
2.	GENERAL NOTES / ABBREVIATIONS / SYMBOLOGY	G-002	06/29/26
3.	3D VIEW DIAGRAMS	G-003	06/29/26
4.	LIFE SAFETY PLANS & CODE ANALYSIS	G-004	06/29/26
	CIVIL		
5.	CIVIL GENERAL INFORMATION	C-000	06/29/26
6.	DEMOLITION PLAN	C-100	06/29/26
7.	SITE PLAN	C-200	06/29/26
8.	CIVIL DETAILS	C-300	06/29/26
9.	CIVIL DETAILS	C-301	06/29/26
	STRUCTURAL		
10.	GENERAL NOTES	S-100	06/29/26
11.	GENERAL NOTES & ABBREVIATIONS	S-101	06/29/26
12.	SPECIAL INSPECTIONS	S-102	06/29/26
13.	TYPICAL DETAILS	S-103	06/29/26
14.	LEVELS S1 & S2	S-201	06/29/26
15.	LEVEL S3	S-202	06/29/26
16.	LEVEL S4 & ROOF	S-203	06/29/26
17.	SECTIONS & DETAILS	S-301	06/29/26
18.	SECTIONS & DETAILS	S-302	01/14/26
	ARCHITECTURE		
19.	SELECTIVE REMOVAL SITE PLAN	A-100	06/29/26
20.	SELECTIVE REMOVAL FLOOR PLANS - LEVEL S2 / N1 & LEVEL S3 / N2	A-101	06/29/26

21.	SELECTIVE REMOVAL FLOOR PLANS - LEVEL S4 / N3	A-102	06/29/26
22.	ARCHITECTURAL SITE PLAN	A-103	06/29/26
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26.	ROOF PLANS	A-107	06/29/26
27.	STAIR ELEVATIONS AND SECTION	A-200	06/29/26
28.	WALL SECTIONS	A-400	06/29/26
29.	EXTERIOR DETAILS - STAIR AND RAILING	A-500	06/29/26
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31.	EXTERIOR DETAILS - SITE	A-502	06/29/26
32.	MATERIAL LEGEND, FINISH PLANS, AND PARTITION TYPE	A-600	06/29/26
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	ELECTRICAL		
34.	ELECTRICAL SYMBOLS AND ABBREVIATIONS	E-000	06/29/26
35.	LIGHTING SCHEDULES, DETAILS, DIAGRAMS	E-020	06/29/26
36.	LIGHTING SCHEDULES, DETAILS, DIAGRAMS	E-021	06/29/26
37.	LIGHTING SCHEDULES, DETAILS, DIAGRAMS	E-022	06/29/26
38.	FLOOR PLANS – ELECTRICAL DEMOLITION	E-101	06/29/26
39.	FLOOR PLANS – ELECTRICAL DEMOLITION	E-102	06/29/26
40.	SITE PLAN - ELECTRICAL	E-103	06/29/26
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44.	FLOOR PLANS - ELECTRICAL	E-302	06/29/26

END OF SECTION 000115

SECTION 001116 - INVITATION FOR BID

1.0 OWNER:

A. The State of Missouri
Office of Administration,
Division of Facilities Management, Design and Construction
Jefferson City, Missouri

2.0 PROJECT TITLE AND NUMBER:

A. REBID - Change in Scope, Means of Egress
Missouri School for the Blind
St Louis, Missouri
Project No.: E2332-01

3.0 BIDS WILL BE RECEIVED:

A. Until: 1:30 PM, October 6, 2026

B. **Only electronic bids sent to FMDCBids@oa.mo.gov shall be accepted: (See Instructions to Bidders for further detail)**

4.0 DESCRIPTION:

A. Scope: The project includes new egress stair, infrastructure, site improvements, and playground equipment to serve the Missouri School for the Blind campus.

B. MBE/WBE/SDVE Goals: MBE **0%**, WBE **0%**, and SDVE **3%. NOTE: Only MBE/WBE firms certified by the State of Missouri Office of Equal Opportunity as of the date of bid opening, or SDVE(s) meeting the requirements of Section 34.074, RSMo and 1 CSR 30-5.010, can be used to satisfy the MBE/WBE/SDVE participation goals for this project.**

5.0 PRE-BID MEETING:

A. Place/Time**:** 10:00 AM, September 10, 2026, at Missouri School for the Blind, 3815 Magnolia Avenue, St. Louis, Missouri 63110

B. Access to State of Missouri property requires presentation of a photo ID by all persons.

6.0 HOW TO GET PLANS & SPECIFICATIONS:

A. View Only Electronic bid sets are available at no cost or paper bid sets for a deposit. of **$100.00** from American Document Solutions (ADS). MAKE CHECKS PAYABLE TO: American Document Solutions. Mail to: American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433, https://www.adsplanroom.net. NOTE: Prime contractors will be allowed a maximum of two bid sets at the deposit rate shown above. Other requesters will be allowed only one bid set at this rate. Additional bid sets or parts thereof may be obtained by any bidder at the cost of printing and shipping by request to American Document Solutions at the address shown above. Bidder must secure at least one bid set to become a planholder.

B. **Refunds: Return plans and specifications in unmarked condition within 15 working days of bid opening to American Document Solutions, 1400 Forum Blvd., Suite 7A, Columbia, Missouri 65203. Phone 573-446-7768, Fax 573-355-5433. Deposits for plans not returned within 15 working days shall be forfeited.**

C. Information for upcoming bids, including downloadable plans, specifications, Invitation for Bid, bid tabulation, award, addenda, and access to the ADS planholders list, is available on the Division of Facilities Management, Design and Construction's web site: https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

7.0 POINT OF CONTACT:

A. Project Manager: Sandra Walther, 573-257-7322, email: sandra.walther@oa.mo.gov

8.0 GENERAL INFORMATION:

A. The State reserves the right to reject any and all bids and to waive all informalities in bids. No bid may be withdrawn for a period of 20 working days subsequent to the specified bid opening time. The contractor shall pay not less than the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed, as determined by the Missouri Department of Labor and Industrial Relations and as set out in the detailed plans and specifications.

B. Bid results will be available at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans after it is verified that at least one bid is awardable and affordable.

SECTION 002113 – INSTRUCTIONS TO BIDDERS

1.0 - SPECIAL NOTICE TO BIDDERS

A. If awarded a contract, the Bidder's employees, and the employees of all subcontractors, who perform the work on the project must adhere to requirements in Section 013513 – Site Security and Health Requirements as applicable per Agency.

B. The Bidder's prices shall include all city, state, and federal sales, excise, and similar taxes that may lawfully be assessed in connection with the performance of work, and the purchased of materials to be incorporated in the work. **THIS PROJECT IS NOT TAX EXEMPT.**

2.0 - BID DOCUMENTS

A. The number of sets obtainable by one (1) party may be limited in accordance with available supply.

B. For the convenience of contractors, subcontractors and suppliers, bidding documents are available on the Owner's website at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans.

3.0 - BIDDERS' OBLIGATIONS

A. Bidders must carefully examine the entire site of the work and shall make all reasonable and necessary investigations to inform themselves thoroughly as to the facilities available as well as to all the difficulties involved in the completion of all work in accordance with the specifications and the plans. Bidders are required to examine all maps, plans and data mentioned in the specifications. No plea of ignorance concerning observable existing conditions or difficulties that may be encountered in the execution of the work under this contract will be accepted as an excuse for any failure or omission on the part of the successful Bidder (contractor) to fulfill every detail of the requirements of the contract, nor accepted as a basis for any claims for extra compensation or time extension.

B. Under no circumstances will Bidders give their plans and specifications to other Bidders. It is highly encouraged, but not required, that all Bidders be on the official planholders list to receive project updates including but not limited to any addenda that are issued during the bidding process.

4.0 - INTERPRETATIONS

A. No Bidder shall be entitled to rely on oral or written representations from any person as to the meaning of the plans and specifications or the acceptability of alternate products, materials, form or type of construction.

B. Bidders shall make all requests for interpretations in writing and submit all requests to the Project Manager identified in Section 007300 – Supplementary Conditions with all necessary supporting documentation no less than five (5) working days before opening of bids. Responses to requests for interpretation will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.

C. Bidders shall make all requests for an "Acceptable Substitution" on the Section 006325 Substitution Request Form. The request shall be emailed to the Project Manager identified in Section 007300 – Supplementary Conditions no less than five (5) working days before opening of bids. Responses to requests for substitutions will be issued via a written addendum and will be sent as promptly as is practicable to all official planholders and posted on the Owner's website. All such addenda shall become part of the bid and contract documents.

D. An "Acceptable Substitution" requested after the award of bid will only be approved if proven to the satisfaction of the Owner and the Designer that the product is acceptable in design, strength, durability, usefulness, and convenience for the purpose intended. Approval of the substitution after award is at the sole discretion of the Owner and all requests of this nature must be submitted in accordance with Article 3.1 of the General Conditions.

5.0 - BIDS AND BIDDING PROCEDURE

A. Bidders shall submit all submission forms and accompanying documents listed in Section 004113 – Bid Form, Article 5.0, Attachments to Bid by the stated time on the bid documents or the bid will be rejected for being non-responsive.

B. Depending on the specific project requirements, **the following is a GENERIC list** of all possible bid forms that may be due with bid submittals. Bidders must verify each specific project's requirements in Section 004113 to ensure they have provided all the required documentation with their submission.

Bid Submittal – due before stated date and time of bid opening (see IFB):

004113	Bid Form (all pages are always required)
004322	Unit Prices Form
004336	Proposed Subcontractors Form
004337	MBE/WBE/SDVE Compliance Evaluation Form
004338	MBE/WBE/SDVE Eligibility Determination for Joint Ventures
004339	MBE/WBE/SDVE GFE Determination
004340	SDVE Business Form
004541	Affidavit of Work Authorization
004545	Anti-Discrimination Against Israel Act Certification form

C. The Bidder shall submit its bid on the forms provided by the Owner in the same file format (PDF) with each space fully and properly completed, typewritten or legibly printed, including all amounts required for alternate bids, unit prices, cost accounting data, etc. The Owner will reject bids that are not on the Owner's forms and that do not contain all requested information. All forms can be found on the Owner's website at https://oa.mo.gov/facilities/bid-opportunities/bid-listing-electronic-plans and shall be submitted to FMDCBids@oa.mo.gov.

D. All bids shall be submitted without additional terms and conditions, modifications, or reservations. The completed forms shall not include interlineations, alterations, or erasures. Bids not in compliance with the requirements of this paragraph will be rejected as non-responsive.

E. All bids shall be accompanied by a bid bond executed by the bidder and a duly authorized surety company, certified check, cashier's check or bank draft made payable to the Division of Facilities Management, Design and Construction, State of Missouri, in the amount indicated in the bid documents in Section 004113. Failure of the Bidder to submit the duly authorized bid bond or the full amount required shall be sufficient cause to reject his bid. The Bidder agrees that the proceeds of the check, draft, or bond shall become the property of the State of Missouri, if for any reason the Bidder withdraws his bid after bid closing or if the Bidder, within ten (10) working days after notification of award, refuses or is unable to 1) execute the tendered contract, 2) provide an acceptable performance and payment bond, or 3) provide evidence of required insurance coverage.

F. The bid bond check or draft submitted by the successful Bidder will be returned after the receipt of an acceptable performance and payment bond and execution of the formal contract. Checks or drafts of all other Bidders will be returned within a reasonable time after it is determined that the bid represented by same will receive no further consideration by the State of Missouri.

6.0 - SIGNING OF BIDS

A. A bid shall contain the full and correct legal name of the Bidder. If the Bidder is an entity registered with the Missouri Secretary of State, the Bidder's name on the bid form shall appear as shown in the Secretary of State's records. If the Bidder is an entity organized in a state other than Missouri, the Bidder must provide a Certificate of Authority to do business in the State of Missouri.

B. If the successful Bidder is doing business in the State of Missouri under a fictitious name, the Bidder shall furnish to Owner, attached to the Bid Form, a properly certified copy of the certificate of Registration of Fictitious Name from the State of Missouri, and such certificate shall remain on file with the Owner.

C. A bid from an individual shall be signed as noted on the Bid Form.

D. A bid from a partnership or joint venture shall require only one signature of a partner, an officer of the joint venture authorized to bind the venture, or an attorney-in-fact. If the bid is signed by an officer of

a joint venture or an attorney-in-fact, a document evidencing the individual's authority to execute contracts should be included with the bid form.

E. A bid from a limited liability company (LLC) shall be signed by a manager or a managing member of the LLC.

F. A bid from a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation. Title of office held by the person signing for the corporation shall appear, along with typed name of said individual and the corporate license number shall be provided. In addition, for corporate proposals, the President or Vice-President listed per the current filing with the Missouri Secretary of State should sign as the Bidder. If the signatory is other than the corporate president or vice president, the bidder must provide satisfactory evidence that the signatory has the legal authority to bind the corporation.

7.0 - RECEIVING BID SUBMITTALS

A. It is the Bidder's sole responsibility to ensure receipt of the bid submittals by Owner on or before the date and time specified in the Invitation for Bid or as modified via written addenda. Bids received after the date and time specified will not be considered by the Owner.

B. All bids shall be received via email at FMDCBids@oa.mo.gov. A bid submitted through any other means, including hard copies, will not be considered and will be discarded by the Owner unopened.

8.0 - MODIFICATION AND WITHDRAWAL OF BIDS

A. Bidder may withdraw a bid at any time prior to the scheduled closing time for receipt of bids, but no bidder may withdraw his bid for a period of twenty (20) working days after the scheduled closing time for receipt of bids.

B. Bidder may modify a bid until the scheduled closing time by sending a revised bid to FMDCBids@oa.mo.gov with a note in the subject line and body of the email that it is a revised bid. A revised bid sent via any other method will not be considered.

9.0 - AWARD OF CONTRACT

A. The Owner reserves the right to reject any and/or all bids and further to waive all informalities in bidding when deemed in the best interest of the State of Missouri.

B. The Owner reserves the right to let other contracts in connection with the work including, but not limited to, contracts for the furnishing and installation of furniture, equipment, machinery, appliances and other apparatuses.

C. The Owner will award a contract to the lowest, responsive, and responsible Bidder in accordance with Section 8.250, RSMo. No contract will be awarded to any Bidder who has had a contract with the Owner terminated within the preceding twelve months for material breach of contract or who has been suspended or debarred by the Owner.

D. Award of alternates, if any, will be made in numerical order unless all bids received are such that the order of acceptance of alternates does not affect the determination of the lowest, responsive, responsible bidder.

E. No award shall be considered binding upon the Owner until the written contract has been properly executed and the following documentation has been provided: 1) performance and payment bond consistent with Article 6.1 of the General Conditions; 2) proof of the required insurance coverage; 3) an executed Section 004541 - Affidavit of Work Authorization form; and 4) documentation evidence enrollment and participation in a federal work authorization program.

F. Failure to execute and return the contract and associated documents within the prescribed period shall be treated, at the option of the Owner, as a breach of Bidder's obligation and the Owner shall be under no further obligation to Bidder.

G. Transient employers subject to Sections 285.230 and 285.234, RSMo, (out-of-state employers who temporarily transact any business in the State of Missouri) may be required to file a bond with the Missouri Department of Revenue. No contract will be awarded by the Owner unless the successful Bidder certifies that he has complied with all applicable provisions of Section 285.230-234.

H. Sections 285.525 and 285.530, RSMo, require business entities to enroll and participate in a federal work authorization program in order to be eligible to receive award of any state contract in excess of $5,000. Bidders should submit with their bid an Affidavit of Work Authorization (Section 004541) along with appropriate documentation evidencing such enrollment and participation. Bidders must also submit an E-Verify Memorandum before the Owner may award a contract to the Bidder. Information regarding E-Verify is located at https://www.e-verify.gov/employers/enrolling-in-e-verify. The contractor shall be responsible for ensuring that all subcontractors and suppliers associated with this contract enroll in E-Verify.

I. The successful Bidder must be registered in MissouriBUYS powered by MOVERS at https://missouribuys.mo.gov/supplier-registration# as an approved vendor prior to being issued a contract.

10.0 - CONTRACT SECURITY

A. The successful Bidder shall furnish a performance/payment bond as set forth in General Conditions Article 6.1 prior to the State executing the contract and issuing a notice to proceed.

11.0 - WORKING DAYS

A. Contract duration time is stated in working days and will use the following definition in determining the actual calendar date for contract completion:

1. Working days are defined as all calendar days except Saturdays, Sundays and the following State of Missouri observed holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday, Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day, Thanksgiving Day and Christmas Day.

12.0 - AMERICAN AND MISSOURI - MADE PRODUCTS AND FIRMS

A. By signing the bid form and submitting a bid on this project, the Bidder certifies that it will use American and Missouri products as set forth in Article 1.7 of the General Conditions. Bidders are advised to review those requirements carefully prior to bidding.

B. A preference shall be given to Missouri firms, corporations or individuals, or firms, corporations or individuals that maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less.

C. Pursuant to Section 34.076, RSMo, a contractor or Bidder domiciled outside the boundaries of the State of Missouri shall be required, in order to be successful, to submit a bid the same percent less than the lowest bid submitted by a responsible contractor or Bidder domiciled in Missouri as would be required for such a Missouri domiciled contractor or Bidder to succeed over the bidding contractor or Bidder domiciled outside Missouri on a like contract or bid being let in the Bidder's domiciliary state and, further, the contractor or Bidder domiciled outside the boundaries of Missouri shall be required to submit an audited financial statement as would be required of a Missouri domiciled contractor or Bidder on a like contract or bid being let in the domiciliary state of that contractor or Bidder.

13.0 – ANTI-DISCRIMINATION AGAINST ISRAEL ACT CERTIFICATION:

A. If the Bidder meets the section 34.600, RSMo., definition of a "company" and the Bidder has ten or more employees, the Bidder must certify in writing that the Bidder is not currently engaged in a boycott of goods or services from the State of Israel and shall not engage in a boycott of goods or services from the State of Israel, if awarded a contract, for the duration of the contract. The Bidder is required to complete and submit the applicable portion of Section 004545 - Anti-Discrimination Against Israel Act Certification with its Bid Form. The applicable portion of the exhibit must be submitted prior to execution of a contract by the Owner and issuance of Notice to Proceed.

14.0 - MBE/WBE/SDVE INSTRUCTIONS

A. Definitions:

1. **"MBE"** means a Minority Business Enterprise.

2. **"MINORITY"** has the same meaning as set forth in 1 C.S.R. 10-17.010.

3. **"MINORITY BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

4. **"WBE"** means a Women's Business Enterprise.

5. **"WOMEN'S BUSINESS ENTERPRISE"** has the same meaning as set forth in section 37.020, RSMo.

6. **"SDVE"** means a Service-Disabled Veterans Enterprise.

7. **"SERVICE-DISABLED VETERAN"** has the same meaning as set forth in section 34.074, RSMo.

8. **"SERVICE-DISABLED VETERAN ENTERPRISE"** has the same meaning as "Service-Disabled Veteran Business" set forth in section 34.074, RSMo.

B. MBE/WBE/SDVE General Requirements:

1. For all bids greater than $100,000, the Bidder shall obtain MBE, WBE and SDVE participation in an amount equal to or greater than the percentage goals set forth in the Invitation for Bid and the Bid Form, unless the Bidder is granted a Good Faith Effort waiver by the Director of the Division, as set forth below. If the Bidder does not meet the MBE, WBE and SDVE goals, or make a good faith effort to do so, the Bidder shall be nonresponsive, and its bid shall be rejected.

2. The Bidder should submit with its bid all the information requested in the MBE/WBE/SDVE Compliance Evaluation Form for every MBE, WBE, or SDVE subcontractor or material supplier the Bidder intends to use for the contract work. The Bidder is required to submit all MBE/WBE/SDVE documentation before the stated time and date set forth in the Invitation for Bid. If the Bidder fails to provide such information by the specified date and time, the Owner shall reject the bid.

3. The Director reserves the right to request additional information from a Bidder to clarify the Bidder's proposed MBE, WBE, and/or SDVE participation. The Bidder shall submit the clarifying information requested by the Owner within two (2) working days of receiving the request for clarification.

4. Pursuant to section 34.074, RSMo, a Prime Bidder that qualifies as an SDVE shall receive a three-percentage point bonus preference in the contract award evaluation process. The bonus preference will be calculated and applied by reducing the bid amount of the eligible SDVE by three percent of the apparent low responsive Bidder's bid. Based on this calculation, if the eligible SDVE's evaluation is less than the apparent low responsive Bidder's bid, the eligible SDVE's bid will become the apparent low responsive bid. This reduction is for evaluation purposes only and will have no impact on the actual amount(s) of the bid or the amount(s) of any contract awarded. In order to be eligible for the SDVE preference, the Bidder must complete and submit with its bid the Missouri Service-Disabled Veteran Business Form, and any information required by the form.

C. Computation of MBE/WBE/SDVE Goal Participation:

1. A Bidder who is a MBE, WBE, or SDVE may count 100% of the contract towards the MBE, WBE or SDVE goal, less any amounts awarded to another MBE, WBE or SDVE. (NOTE: a MBE firm that bids as general contractor must obtain WBE and SDVE participation; a WBE firm that bids as a general contractor must obtain MBE and SDVE participation; and a SDVE firm that bids as general contractor must obtain MBE and WBE participation.) For the remaining contract amount to be counted towards the MBE, WBE or SDVE goal, the Bidder must complete the MBE/WBE/SDVE Compliance Evaluation Form (Section 004337) identifying itself as an MBE, WBE or SDVE.

2. The total dollar value of the work granted to a certified MBE, WBE or SDVE by the Bidder shall be counted towards the applicable goal.

3. Expenditures for materials and supplies obtained from a certified MBE, WBE, or SDVE supplier or manufacturer may be counted towards the MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE assumes the actual and contractual responsibility for the provision of the materials and supplies.

4. The total dollar value of the work granted to a second or subsequent tier subcontractor or a supplier may be counted towards a Bidder's MBE, WBE and SDVE goals, if the MBE, WBE, or SDVE properly assumes the actual and contractual responsibility for the work.

5. The total dollar value of work granted to a certified joint venture equal to the percentage of the ownership and control of the MBE, WBE, or SDVE partner in the joint venture may be counted towards the MBE/WBE/SDVE goals.

6. Only expenditures to a MBE, WBE, or SDVE that performs a commercially useful function in the work may be counted towards the MBE, WBE and SDVE goals. A MBE, WBE, or SDVE performs a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by performing, managing and supervising the work or providing supplies or manufactured materials.

D. Certification of MBE/WBE/SDVE Subcontractors:

1. In order to be counted towards the goals, an MBE or WBE must be certified by the State of Missouri Office of Equal Opportunity and an SDVE must be certified by the State of Missouri, Office of Equal Opportunity or by the Federal U.S. Small Business Administration directory.

2. The Bidder may determine the certification status of a proposed MBE or WBE subcontractor or supplier by referring to the Office of Equal Opportunity (OEO)'s online MBE/WBE directory https://apps1.mo.gov/MWBCertifiedFirms/. The Bidder may determine the eligibility of a SDVE subcontractor or supplier by referring to the Office of Equal Opportunity online SDVE directory at https://oeo.mo.gov/sdve-certification-program/ or the Federal U.S. Small Business Administration directory https://veterans.certify.sba.gov/#search.

3. Additional information, clarifications, or other information regarding the MBE/WBE/SDVE listings in the directories may be obtained by contacting the Contract Specialist of record as shown in the Supplementary Conditions (Section 007300).

E. Waiver of MBE/WBE/SDVE Participation:

1. If a Bidder has made a good faith effort to secure the required MBE, WBE and/or SDVE participation and has failed, the Bidder shall submit with its bid the information requested in MBE/WBE/SDVE Good Faith Effort (GFE) Determination form. The Director will determine if the Bidder made a good faith effort to meet the applicable goals. If the Director determines that the Bidder did not make a good faith effort, the bid shall be rejected as being nonresponsive to the bid requirements. Bidders who demonstrate that they have made a good faith effort to include MBE, WBE, and/or SDVE participation will be granted a waiver and will be considered to be responsive to the applicable participation goals, regardless of the percent of actual participation obtained, if the bid is otherwise acceptable.

2. In determining whether a Bidder has made a good faith effort to obtain MBE, WBE and/or SDVE participation, the Director may evaluate the factors set forth in 1 CSR 30-5.010(6)(C) and the following:

   a. The amount of actual participation obtained;

   b. How and when the Bidder contacted potential MBE, WBE, and SDVE subcontractors and suppliers;

   c. The documentation provided by the Bidder to support its contacts, including whether the Bidder provided the names, addresses, phone numbers, and dates of contact for MBE/WBE/SDVE firms contacted for specific categories of work;

   d. If project information, including plans and specifications, were provided to MBE/WBE/SDVE subcontractors;

   e. Whether the Bidder made any attempts to follow-up with MBE, WBE or SDVE firms prior to bid;

f. Amount of bids received from any of the subcontractors and/or suppliers that the Bidder contacted;

g. The Bidder's stated reasons for rejecting any bids;

F. Contractor MBE/WBE/SDVE Obligations

1. If awarded a contract, the Bidder will be contractually required to subcontract with or obtain materials from the MBE, WBE, and SDVE firms listed in its bid, in amounts equal to or greater than the dollar amount in the bid, unless the amount is modified in writing by the Owner.

2. If the Contractor fails to meet or maintain the participation requirements contained in the Contractor's bid, the Contractor must satisfactorily explain to the Director why it cannot comply with the requirement and why failing meeting the requirement was beyond the Contractor's control. If the Director finds the Contractor's explanation unsatisfactory, the Director may take any appropriate action including, but not limited to:

   a. Declaring the Contractor ineligible to participate in any contracts with the Division for up to twelve (12) months (suspension); and/or

   b. Declaring the Contractor be nonresponsive to the Invitation for Bid, or in breach of contract and rejecting the bid or terminating the contract.

3. If the Contractor replaces an MBE, WBE, or SDVE during the course of the contract, the Contractor shall replace it with another MBE, WBE, or SDVE or make a good faith effort to do so. All MBE, WBE and SDVE substitutions must be approved by the Director in writing.

4. The Contractor shall provide the Owner with regular reports on its progress in meeting its MBE/WBE/SDVE obligations. At a minimum, the Contractor shall report the dollar-value of work completed by each MBE, WBE, or SDVE during the preceding month and the cumulative total of work completed by each MBE, WBE or SDVE to date with each monthly application for payment. The Contractor shall also make a final report, which shall include the total dollar-value of work completed by each MBE, WBE, and SDVE during the entire contract.

State of Missouri
Construction Contract

THIS AGREEMENT is made (DATE) by and between:

Contractor Name and Address

hereinafter called the "Contractor," and the **State of Missouri**, hereinafter called the **"Owner"**, represented by the Office of Administration, Division of Facilities Management, Design and Construction.

WITNESSETH, that the Contractor and the Owner, for the consideration stated herein agree as follows:

ARTICLE 1. STATEMENT OF WORK

The Contractor shall furnish all labor and materials and perform all work required for furnishing and installing all labor, materials, equipment and transportation and everything necessarily inferred from the general nature and tendency of the plans and specifications for the proper execution of the work for:

Project Name:	**REBID - Change in Scope, Means of Egress** **Missouri School for the Blind** **St Louis, Missouri**
Project Number:	**E2332-01**

in strict accordance with the Contract Documents as enumerated in Article 7, all of which are made a part hereof.

ARTICLE 2. TIME OF COMPLETION

The contract performance time is **255 working days** from the transmittal date of this agreement. The contract completion date is **MONTH, DAY, YEAR**. This time includes ten (10) working days for the Contractor to receive, sign and return the contract form along with required bonding and insurance certificates. Failure of the Contractor to provide correct bonding and insurance within the ten (10) working days shall not be grounds for a time extension. Receipt of proper bonding and insurance is a condition precedent to the formation of the contract and if not timely received, may result in forfeiture of the Contractor's bid security. Work may not commence until the Owner issues a written Notice to Proceed and must commence within seven (7) working days thereafter.

ARTICLE 3. LIQUIDATED DAMAGES

Whenever time is mentioned in this contract, time shall be and is of the essence of this contract. The Owner would suffer a loss should the Contractor fail to have the work embraced in this contract fully completed on or before the time above specified. THEREFORE, the parties hereto realize in order to adjust satisfactorily the damages on account of such failure that it might be impossible to compute accurately or estimate the amount of such loss or damages which the Owner would sustain by reason of failure to complete fully said work within the time required by this contract. The Contractor hereby covenants and agrees to pay the Owner, as and for **liquidated damages, the sum of $1,000** per day for each and every day, Sunday and legal holidays excepted, during which the work remains incomplete and unfinished. Any sum which may be due the Owner for such damages shall be deducted and retained by the Owner from any balance which may be due the Contractor when said work shall have been finished and accepted. But such provisions shall not release the Bond of the Contractor from liability according to its terms. In case of failure to complete, the Owner will be under no obligation to show or prove any actual or specific loss or damage.

ARTICLE 4. CONTRACT SUM

The Owner shall pay the Contractor for the prompt, faithful and efficient performance of the conditions and undertakings of this contract, subject to additions, and deductions as provided herein, in current funds the sum of:

Base Bid: $

Accepted Alternates, if applicable to the Project and accepted by the Owner.

TOTAL CONTRACT AMOUNT: ($CONTRACT AMOUNT)

UNIT PRICES: The Owner accepts the following Unit Prices:

For changing specified quantities of work from those indicated by the contract drawings and specifications, upon written instructions of Owner, the following unit prices shall prevail. The unit prices include all labor, overhead and profit, materials, equipment, appliances, bailing, shoring, shoring removal, etc., to cover the finished work of the several kinds of work called for. Only a single unit price shall be given and it shall apply for either MORE or LESS work than that shown on the drawings and called for in the specifications or included in the Base Bid. In the event of more or less units than so indicated or included, change orders may be issued for the increased or decreased amount.

ARTICLE 5. PREVAILING WAGE RATE

MISSOURI PREVAILING WAGE LAW (Sections 290.210 to 290.340, RSMo): The Contractor shall pay not less than the specified hourly rate of wages, as set out in the wage order attached to and made part of the specifications for work under this contract, to all workers performing work under the contract, in accordance with sections 290.210 to 290.340, RSMo. The Contractor shall forfeit a penalty to the Owner of one hundred dollars per day (or portion of a day) for each worker that is paid less than the specified rates for any work done under the contract by the Contractor or by any subcontractor, in accordance with section 290.250, RSMo.

DAVIS-BACON ACT: If this Project is financed in whole or in part from Federal funds (as indicated in the Instructions to Bidders or other bid or contract documents for this Project), then this contract shall be subject to all applicable federal labor statutes, rules and regulations, including provisions of the Davis-Bacon Act, 40 U.S.C. §3141 et seq., and the "Federal Labor Standards Provisions," as further set forth in Section 007333 – Supplementary General Conditions for Federally Funded/Assisted Construction Projects, which is incorporated into the contract by reference. Where the Missouri Prevailing Wage Law and the Davis-Bacon Act require payment of different wages for work performed under this contract, the Contractor and all Subcontractors shall pay the greater of the wages required under either law, on a classification-by-classification basis.

ARTICLE 6. MINORITY/WOMEN/SERVICE DISABLED VETERAN BUSINESS ENTERPRISE PARTICIPATION

The Contractor has been granted a waiver of the 0% MBE and 0% WBE and 3% SDVE participation goals. The Contractor agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows: (OR)

The Contractor has met the MBE/WBE/SDVE participation goals and agrees to secure the MBE/WBE/SDVE participation amounts for this project as follows:

MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$
MBE/WBE/SDVE Firm: Subcontract Amt:$

Total $

MBE/WBE/SDVE assignments identified above shall not be changed without a contract change signed by the Owner.

The Director of the Division of Facilities Management, Design and Construction or his Designee shall be the final authority to resolve disputes and disagreements between the Contractor and the MBE/WBE/SDVE firms listed above when such disputes impact the subcontract amounts shown above.

ARTICLE 7. CONTRACT DOCUMENTS

The following documents are hereby incorporated into this contract by reference (all division/section numbers and titles are as utilized in the Project Manual published by the Owner for this Project):

1. Division 0 – Procurement and Contracting Information, including, but not limited to:
    a. Invitation for Bid (Section 001116)
    b. Instructions to Bidders (Section 002113)
    c. Supplementary Instructions to Bidders (if applicable) (Section 002213)
    d. The following documents as completed and executed by the Contractor and accepted by the Owner, if applicable:
        i. Bid Form (Section 004113)
        ii. MBE, WBE, SDVE Compliance Evaluation Form(s) (Section 004337)
        iii. MBE, WBE, SDVE Eligibility Determination Form for Joint Ventures (Section 004338)
        iv. MBE, WBE, SDVE Good Faith Effort (GFE) Determination Form (Section 004339)
        v. Missouri Service Disabled Veteran Business Form (Section 004340)
        vi. Affidavit of Work Authorization (Section 004541)
    e. Performance and Payment Bond, completed and executed by the Contractor and surety (Section 006113)
    f. General Conditions (Section 007213)
    g. Supplementary Conditions (Section 007300)
    h. Supplementary General Conditions for Federally Funded/Assisted Construction Projects (Section 007333), if applicable
    i. Wage Rate(s) (Section 007346)
2. Division 1 – General Requirements
3. All Drawings identified in the Project Manual
4. All Technical Specifications included in the Project Manual
5. Addenda, if applicable

ARTICLE 8 – CERTIFICATION

By signing this contract, the Contractor hereby re-certifies compliance with all legal requirements set forth in Section 6.0, Bidder's Certifications of the Bid Form.

By signature below, the parties hereby execute this contract document.

APPROVED:

_____
Crystal Wessing, Interim Director
Division of Facilities Management,
Design and Construction

_____
Contractor's Authorized Signature

I, Corporate Secretary, certify that I am Secretary of the corporation named above and that (CONTRACTOR NAME), who signed said contract on behalf of the corporation, was then (TITLE) of said corporation and that said contract was duly signed for and in behalf of the corporation by authority of its governing body, and is within the scope of its corporate powers.

_____
Corporate Secretary

Bond No._____

SECTION 006113 - PERFORMANCE AND PAYMENT BOND FORM

KNOW ALL MEN BY THESE PRESENTS, THAT we _____

as principal, and _____

_____as Surety, are held and firmly bound unto the

STATE OF MISSOURI. in the sum of _____ Dollars ($)

for payment whereof the Principal and Surety bind themselves, their heirs, executors, administrators and successors, jointly and severally, firmly by these presents.

WHEREAS, the Principal has, by means of a written agreement dated the _____

day of_____, 20_____, enter into a contract with the State of Missouri for

_____

_____

_____

(Insert Project Title and Number)

NOW, THEREFORE, if the Principal shall faithfully perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the State of Missouri, with or without notice to the Surety and during the life of any guaranty required under the contract; and shall also faithfully perform and fulfill all undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made with or without notice to the Surety; and shall also promptly make payment for materials incorporated, consumed or used in connection with the work set forth in the contract referred to above, and all insurance premiums, both compensation and all other kinds of insurance, on said work, and for all labor performed on such work, whether by subcontractor or otherwise, at not less than the prevailing hourly rate of wages for work of a similar character (exclusive of maintenance work) in the locality in which the work is performed and not less than the prevailing hourly rate of wages for legal holiday and overtime work (exclusive of maintenance work) in the locality in which the work is performed both as determined by the Department of Labor and Industrial Relations or determined by the Court of Appeal, as provided for in said contract and in any and all duly authorized modifications of said contract that may be hereafter made, with or without notice to the Surety, then, this obligation shall be void and of no effect, but it is expressly understood that if the Principal should make default in or should fail to strictly, faithfully and efficiently do, perform and comply with any or more of the covenants, agreements, stipulations, conditions, requirements or undertakings, as specified in or by the terms of said contract, and with the time therein named, then this obligation shall be valid and binding upon each of the parties hereto and this bond shall remain in full force and effect; and the same may be sued on at the instance of any material man, laborer, mechanic, subcontractor, individual, or otherwise to whom such payment is due, in the name of the State of Missouri, to the use of any such person.

AND, IT IS FURTHER specifically provided that any modifications which may hereinafter be made in the terms of the contract or in the work to be done under it or the giving by the Owner of any extension of the time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal to the other, shall not in any way release the Principal and the Surety, or either or any of them, their heirs, executors, administrators and successors, from their liability hereunder, notice to the Surety of any such extension, modifications or forbearance being hereby waived.

IN WITNESS WHEREOF, the above bounden parties have executed the within instrument this _____ day of _____, 20 ____.

AS APPLICABLE:

AN INDIVIDUAL

Name: _____

Signature: _____

A PARTNERSHIP

Name of Partner: _____

Signature of Partner: _____

Name of Partner: _____

Signature of Partner: _____

CORPORATION

Firm Name: _____

Signature of President: _____

SURETY

Surety Name: _____

Attorney-in-Fact: _____

Address of Attorney-in-Fact: _____

_____

Telephone Number of Attorney-in-Fact: _____

Signature Attorney-in-Fact: _____

NOTE: Surety shall attach Power of Attorney

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

PRODUCT SUBSTITUTION REQUEST

PROJECT NUMBER

PROJECT TITLE AND LOCATION

CHECK APPROPRIATE BOX

☐ SUBSTITUTION PRIOR TO BID OPENING
(Minimum of (5) working days prior to receipt of Bids as per Article 4 – Instructions to Bidders)

☐ SUBSTITUTION FOLLOWING AWARD
(Maximum of (20) working days from Notice to Proceed as per Article 3 – General Conditions)

FROM: BIDDER/CONTRACTOR (PRINT COMPANY NAME)

TO: ARCHITECT/ENGINEER (PRINT COMPANY NAME)

Bidder/Contractor hereby requests acceptance of the following product or systems as a substitution in accordance with provisions of Division One of the Bidding Documents:

SPECIFIED PRODUCT OR SYSTEM

SPECIFICATION SECTION NO.

SUPPORTING DATA

☐ Product data for proposed substitution is attached (include description of product, standards, performance, and test data)

☐ Sample ☐ Sample will be sent, if requested

QUALITY COMPARISON

	SPECIFIED PRODUCT	SUBSTITUTION REQUEST
NAME, BRAND		
CATALOG NO.		
MANUFACTURER		
VENDOR		

PREVIOUS INSTALLATIONS

PROJECT	ARCHITECT/ENGINEER	
LOCATION		DATE INSTALLED

SIGNIFICANT VARIATIONS FROM SPECIFIED PRODUCT

REASON FOR SUBSTITUTION

DOES PROPOSED SUBSTITUTION AFFECT OTHER PARTS OF WORK?

☐ YES ☐ NO

IF YES, EXPLAIN

SUBSTITUTION REQUIRES DIMENSIONAL REVISION OR REDESIGN OF STRUCTURE OR A/E WORK

☐ YES ☐ NO

BIDDER'S/CONTRACTOR'S STATEMENT OF CONFORMANCE OF PROPOSED SUBSTITUTION TO CONTRACT REQUIREMENT:

We have investigated the proposed substitution. We believe that it is equal or superior in all respects to specified product, except as stated above; that it will provide the same Warranty as specified product; that we have included complete implications of the substitution; that we will pay redesign and other costs caused by the substitution which subsequently become apparent; and that we will pay costs to modify other parts of the Work as may be needed, to make all parts of the Work complete and functioning as a result of the substitution.

BIDDER/CONTRACTOR	DATE

REVIEW AND ACTION

☐ Resubmit Substitution Request with the following additional information:

☐ Substitution is accepted.

☐ Substitution is accepted with the following comments:

☐ Substitution is not accepted.

ARCHITECT/ENGINEER	DATE

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION

FINAL RECEIPT OF PAYMENT AND RELEASE

PROJECT NUMBER

KNOW ALL MEN BY THESE PRESENT THAT: hereinafter called "Subcontractor" who heretofore entered into an agreement with hereinafter called "Contractor", for the performance of work and/or furnishing of material for the construction of the project entitled

(PROJECT TITLE, PROJECT LOCATION, AND PROJECT NUMBER)

at

(ADDRESS OF PROJECT)

for the State of Missouri (Owner) which said subcontract is by this reference incorporated herein, in consideration of such final payment by Contractor.

DOES HEREBY:

1. ACKNOWLEDGE that they have been **PAID IN FULL** all sums due for work and materials contracted or done by their Subcontractors, Material Vendors, Equipment and Fixture Suppliers, Agents and Employees, or otherwise in the performance of the Work called for by the aforesaid Contract and all modifications or extras or additions thereto, for the construction of said project or otherwise.
2. RELEASE and fully, finally, and forever discharge the Owner from any and all suits, actions, claims, and demands for payment for work performed or materials supplied by Subcontractor in accordance with the requirements of the above referenced Contract.
1. REPRESENT that all of their Employees, Subcontractors, Material Vendors, Equipment and Fixture Suppliers, and everyone else has been **paid in full** all sums due them, or any of them, in connection with performance of said Work, or anything done or omitted by them, or any of them in connection with the construction of said improvements, or otherwise.

DATED this day of , 20 .

NAME OF SUBCONTRACTOR

BY (TYPED OR PRINTED NAME)

SIGNATURE

TITLE

ORIGINAL: FILE/Closeout Documents

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT,
DESIGN AND CONSTRUCTION

PAY APP NO.	PROJECT NUMBER
CHECK IF FINAL ☐**FINAL**	DATE

MBE/WBE/SDVE PROGRESS REPORT

Remit with **ALL** Progress and Final Payments

(Please check appropriate box) ☐CONSULTANT ☐CONSTRUCTION

PROJECT TITLE	
PROJECT LOCATION	
FIRM	
ORIGINAL CONTRACT SUM (Same as Line Item 1. on Form A of Application for Payment) **$**	TOTAL CONTRACT SUM TO DATE (Same as Line Item 3. on Form A of Application for Payment) **$**

THE TOTAL MBE/WBE/SDVE PARTICIPATION DOLLAR AMOUNT OF THIS PROJECT AS INDICATED IN THE ORIGINAL CONTRACT: **$**

SELECT MBE, WBE, SDVE	ORIGINAL CONTRACT PARTICIPATION AMOUNT	PARTICIPATION AMOUNT PAID-TO-DATE (includes approved contract changes)	CONSULTANT/SUBCONSULTANT OR CONTRACTOR/SUBCONTRACTOR/SUPPLIER COMPANY NAME
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	
☐ MBE ☐ WBE ☐ SDVE	$	$	

Revised 06/2023

INSTRUCTIONS FOR MBE/WBE/SDVE PROGRESS REPORT

CONTRACTOR OR CONSULTANT TO FILL OUT AND REMIT WITH EACH PAY APPLICATION:

The MBE/WBE/SDVE Progress Report for the project is issued with the contract comprising values reported in the consultant's Proposal or on the successful contractor's Section 004337 Compliance Evaluation Forms.

At Initial Pay Application fill in the following:

1. Pay App No. Start with 1.
2. Fill in the Project Number and Date.
3. Enter Project Title, Project Location, and Firm.
4. Fill in the "Original Contract Sum" and "Total Contract Sum To Date" (Reference applicable Line Items on Form A of Application for Payment).
5. Indicate the Total Participation Dollar Amount from the Original Contract.
6. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier.
7. Enter the "Total Amount of Subcontract", "$ Amount (Paid-To-Date)", and Company Name.

For all subsequent Pay Applications fill in the following:

1. Pay App No.
2. If Final Pay App, check box.
3. Fill in the Project Number and Date.
4. Enter Project Title, Project Location, and Firm
5. At each Pay App fill in the "Original Contract Sum" and "Total Contract Sum To Date" (reference applicable Line Items on Form A of Application for Payment).
6. Indicate the Total Participation Dollar Amount from the Original Contract.
7. Select MBE, WBE, or SDVE for each Consultant/Subconsultant or Contractor/Subcontractor/Supplier
8. Enter the "Total Amount of Subcontract", "$ Amount (Paid-To-Date)", and Company Name.

STATE OF MISSOURI
OFFICE OF ADMINISTRATION
DIVISION OF FACILITIES MANAGEMENT, DESIGN AND CONSTRUCTION
AFFIDAVIT – COMPLIANCE WITH PREVAILING WAGE LAW

PROJECT NUMBER

Before me, the undersigned Notary Public, in and for the County of _____

State of _____ personally came and appeared _____
(NAME)

_____ of the _____
(POSITION) (NAME OF THE COMPANY)

(a corporation) (a partnership) (a proprietorship) and after being duly sworn did depose and say that all provisions and requirements set out in Chapter 290, Sections 290.210 through and including 290.340, Missouri Revised Statutes, pertaining to the payment of wages to workmen employed on public works project have been fully satisfied and there has been no exception to the full and completed compliance with said provisions and requirements and with Wage Determination No: _____ issued by the Department of Labor and Industrial Relations, State of Missouri on the _____ day of _____ 20 __ in carrying out the contract and working in connection with _____
(NAME OF PROJECT)

Located at _____ in _____ County
(NAME OF THE INSTITUTION)

Missouri, and completed on the _____ day of _____ 20 __

SIGNATURE

NOTARY INFORMATION

NOTARY PUBLIC EMBOSSER OR BLACK INK RUBBER STAMP SEAL	STATE		COUNTY (OR CITY OF ST. LOUIS)
	SUBSCRIBED AND SWORN BEFORE ME, THIS DAY OF YEAR		**USE RUBBER STAMP IN CLEAR AREA BELOW**
	NOTARY PUBLIC SIGNATURE	MY COMMISSION EXPIRES	
	NOTARY PUBLIC NAME (TYPED OR PRINTED)		

FILE: Closeout Documents

GENERAL CONDITIONS

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A. These General Conditions apply to each section of these specifications. The Contractor is subject to the provisions contained herein.

B. The General Conditions are intended to define the relationship of the Owner, the Designer and the Contractor thereby establishing certain rules and provisions governing the operation and performance of the work so that the work may be performed in a safe, orderly, expeditious and workmanlike manner.

ARTICLE 1 – GENERAL PROVISIONS

ARTICLE 1.1 - DEFINITIONS

As used in these contract documents, the following terms shall have the meanings and refer to the parties designated in these definitions.

1. **"COMMISSIONER":** The Commissioner of the Office of Administration.
2. **"CONSTRUCTION DOCUMENTS":** The "Construction Documents" shall consist of the Project Manual, Drawings and Addenda.
3. **"CONSTRUCTION REPRESENTATIVE:"** Whenever the term "Construction Representative" is used, it shall mean the Owner's Representative at the work site.
4. **"CONTRACTOR"**: Party or parties who have entered into a contract with the Owner to furnish work under these specifications and drawings.
5. **"DESIGNER"**: When the term "Designer" is used herein, it shall refer to the Architect, Engineer, or Consultant of Record specified and defined in Paragraph 2.0 of the Supplemental Conditions, or his duly authorized representative. The Designer may be either a consultant or state employee.
6. **"DIRECTOR"**: Whenever the term "Director" is used, it shall mean the Director of the Division of Facilities Management, Design and Construction or his Designee, representing the Office of Administration, State of Missouri. The Director is the agent of the Owner.
7. **"DIVISION":** Shall mean the Division of Facilities Management, Design and Construction, State of Missouri.
8. **"INCIDENTAL JOB BURDENS":** Shall mean those expenses relating to the cost of work, incurred either in the home office or on the job-site, which are necessary in the course of doing business but are incidental to the job. Such costs include office supplies and equipment, postage, courier services, telephone expenses including long distance, water and ice and other similar expenses.
9. **"JOINT VENTURE"**: An association of two (2) or more businesses to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills and knowledge.
10. **"OWNER"**: Whenever the term "Owner" is used, it shall mean the State of Missouri. Acting by and through the Office of Administration, Division of Facilities Management, Design and Construction.
11. **"PROJECT"**: Wherever the term "Project" is used, it shall mean the work required to be completed by the construction contract.
12. **"PROJECT MANUAL"**: The "Project Manual" shall consist of Introductory Information, Invitation for Bid, Instructions to Bidders, Bid Documents, Additional Information, Standard Forms, General Conditions, Supplemental General Conditions, General Requirements and Technical Specifications.
13. **"SUBCONTRACTOR"**: Party or parties who contract under, or for the performance of part or this entire Contract between the Owner and Contractor. The subcontract may or may not be direct with the Contractor.
14. **"WORK"**: All supervision, labor, materials, tools, supplies, equipment, and any incidental operations and/or activities required by or reasonably inferable from the Contract Documents necessary to construct the Project and to produce the results intended by the Contract Documents in a safe, expeditious, orderly, and workmanlike manner so that the project shall be complete and finished in the best manner known to each respective trade.
15. "**WORKING DAYS**": are all calendar days except Saturdays, Sundays and the following holidays: New Year's Day, Martin Luther King, Jr. Day, Lincoln Day, Washington's Birthday (observed), Truman Day, Memorial Day, Juneteenth, Independence Day, Labor Day, Columbus Day, Veterans Day (observed), Thanksgiving Day, Christmas Day.

ARTICLE 1.2 DRAWINGS AND SPECIFICATIONS

A. In case of discrepancy between drawings and specifications, specifications shall govern. Should discrepancies in architectural drawings, structural drawings and mechanical drawings occur, architectural drawings shall govern and, in case of conflict between structural and mechanical drawings, structural drawings shall govern.

B. Specifications are separated into titled divisions for convenience of reference only and to facilitate letting of contracts and subcontracts. The Contractor is responsible for establishing the scope of work for subcontractors, which may cross titled divisions. Neither the Owner nor Designer will establish limits and jurisdiction of subcontracts.

C. Figured dimensions take precedence over scaled measurements and details over smaller scale general drawings. In the event of conflict between any of the documents contained within the contract, the documents shall take precedence and be controlling in the following sequence: addenda, supplementary general conditions, general conditions, division 1 specifications, technical division specifications, drawings, bid form and instructions to bidders.

D. Anything shown on drawings and not mentioned in these specifications or vice versa, as well as any incidental work which is obviously necessary to complete the project within the limits established by the drawings and specifications, although not shown on or described therein, shall be performed by the Contractor at no additional cost as a part of his contract.

E. Upon encountering conditions differing materially from those indicated in the contract documents, the Contractor shall promptly notify the Designer and Construction Representative in writing before such conditions are disturbed. The Designer shall promptly investigate said conditions and report to the Owner, with a recommended course of action**.** If conditions do materially differ and cause an increase or decrease in contract cost or time required for completion of any portion of the work, a contract change will be initiated as outlined in Article 4 of these General Conditions.

E. Only work included in the contract documents is authorized, and the Contractor shall do no work other than that described therein or in accordance with appropriately authorized and approved contract changes.

ARTICLE 1.3 - COMPLIANCE WITH LAWS, PERMITS, REGULATIONS AND INSPECTIONS

A. Since the Owner is the State of Missouri, municipal or political subdivisions, zoning ordinances, construction codes (other than licensing of trades), and other like ordinances are not applicable to construction on Owner's property, and Contractor will not be required to submit drawings and specifications to any municipal or political subdivision, authority, obtain construction permits or any other licenses (other than licensing of trades) or permits from or submit to inspections by any municipality or political subdivision relating to the construction for this project. All permits or licenses required by municipality or political subdivision for operation on property not belonging to Owner shall be obtained by and paid for by Contractor. Each Contractor shall comply with all applicable laws, ordinances, rules and regulations that pertain to the work of this contract.

B. Contractors, subcontractors and their employees engaged in the businesses of electrical, mechanical, plumbing, carpentry, sprinkler system work, and other construction related trades shall be licensed to perform such work by the municipal or political subdivision where the project is located, if such licensure is required by local code. Local codes shall dictate the level (master, journeyman, and apprentice) and the number, type and ratio of licensed tradesmen required for this project within the jurisdiction of such municipal or political subdivision.

C. Equipment and controls manufacturers and their authorized service and installation technicians that do not maintain an office within the jurisdiction of the municipal or political subdivision but are a listed or specified contractor or subcontractor on this project are exempt from Paragraph 1.3 B above.

D. The Contractor shall post a copy of the wage determination issued for the project and included as a part of the contract documents, in a prominent and easily accessible location at the site of construction for the duration of the project.

E. Any contractor or subcontractor to such contractor at any tier signing a contract to work on this project shall provide a ten-hour Occupational Safety and Health Administration (OSHA) construction safety program for their on-site employees which includes a course in construction safety and health approved by OSHA or a similar program approved by the Department of Labor and Industrial Relations which is at least as stringent as an approved OSHA program. The contractor shall forfeit as a penalty to the public body on whose

behalf the contract is made or awarded, two thousand five hundred dollars plus one hundred dollars for each employee employed by the contractor or subcontractor, for each calendar day, or portion thereof, such employee is employed without the required training.

ARTICLE 1.4 - NONDISCRIMINATION IN EMPLOYMENT

A. The Contractor and his subcontractors will not discriminate against individuals based on race, color, religion, national origin, sex, disability, or age, but may use restrictions which relate to bona fide occupational qualifications. Specifically, the Contractor and his subcontractors shall not discriminate:

1. Against recipients of service on the basis of race, color, religion, national origin, sex, disability or age.
2. Against any employee or applicant, for employment on the basis of race, color, religion, national origin, sex or otherwise qualified disability status.
3. Against any applicant for employment or employee on the basis of age, where such applicant or employee is between ages 40 and 70 and where such Contractor employs at least 20 persons.
4. Against any applicant for employment or employee on the basis of that person's status as a disabled or Vietnam-era veteran.

The Contractor and his Subcontractors will ensure applicants for employment and employees are treated equally without regard to race, color, religion, national origin, sex, disability, or age. Such action shall include, but not be limited to, the following: employment, upgrading, demotion and transfer; recruitment or recruitment advertising; and selection for training, including apprenticeship. The Contractor and his Subcontractors will give written notice of their commitments under this clause to any labor union with which they have bargaining or other agreements under this clause to any labor union with which they have bargaining or other agreements.

B. In the event of the Contractor's or his subcontractor's noncompliance with any provisions of this Article of the Contract, the Owner may cancel this contract in whole or in part or require the Contractor to terminate his contract with the subcontractor.

ARTICLE 1.5 - ANTI-KICKBACK

No employee of the division, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract or in any part hereof. No officer, employee, designer, attorney, or administrator of or for the Owner who is authorized in such capacity and on behalf of the Owner to exercise any legislative, executive, supervisory or other similar functions in connection with the construction of the project, shall have or acquire any pecuniary interest, whether direct or indirect, in this contract, any material supply contract, subcontract, insurance contract, or any other contract pertaining to the project.

ARTICLE 1.6 - PATENTS AND ROYALTIES

A. The Contractor shall hold and save the Owner and its officers, agents, servants, and employees harmless from liabilities of any nature or kind, including cost and expenses, for, or on account of, any patented or unpatented invention, process, article or appliance manufactured or used in the performance of this contract, including its use by the Owner, unless otherwise specifically stipulated in the contract documents.

B. If the Contractor uses any design, device or materials covered by letters, patent or copyright, the Contractor shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device or material. It is mutually agreed and understood, without exception, that the contract prices shall include all royalties or costs arising from the use of such design, device or materials, in any way involved in the work. The Contractor and/or his sureties shall indemnify and save harmless the Owner of the project from any and all claims for infringement by reason of the use of such patented or copyrighted design, device or materials or any trademark or copyright in connection with work agreed to be performed under this contract and shall indemnify the Owner for any cost, expense or damage it may be obliged to pay by reason of such infringement at any time during the prosecution of the work or after completion of the work.

ARTICLE 1.7 - PREFERENCE FOR AMERICAN AND MISSOURI PRODUCTS AND SERVICES

A. By virtue of statutory authority a preference will be given to Missouri labor and to products of mines, forests and quarries of the state of Missouri when they are found in marketable quantities in the state, and all such materials shall be of the best quality and suitable character that can be obtained at reasonable market prices, all as provided for in Section 8.280, Missouri Revised Statutes and Cumulative Supplements.

B. Furthermore, pursuant to Section 34.076 Missouri Revised Statutes and Cumulative Supplements, a preference shall be given to those persons doing business as Missouri firms, corporations, or individuals, or which maintain Missouri offices or places of business, when the quality of performance promised is equal or better and the price quoted is the same or less. In addition, in order for a non-domiciliary bidder to be successful, his bid must be that same percentage lower than a domiciliary Missouri bidder's bid, as would be required for a Missouri bidder to successfully bid in the non-domiciliary state.

C In accordance with the Missouri Domestic Products Procurement Act Section 34.350 RSMo and Cumulative Supplements any manufactured goods or commodities used or supplied in the performance of this contract or any subcontract thereto shall be manufactured, assembled or produced in the United States, unless the specified products are not manufactured, assembled or produced in the United States in sufficient quantities to meet the agency's requirements or cannot be manufactured, assembled or produced in the United States within the necessary time in sufficient quantities to meet the contract requirements, or if obtaining the specified products manufactured, assembled or produced in the United States would increase the cost of this contract for purchase of the product by more than ten percent.

ARTICLE 1.8 - COMMUNICATIONS

A. All notices, requests, instructions, approvals, and claims must be in writing and shall be delivered to the Designer and copied to the Construction Representative for the project except as required by Article 1.12 Disputes and Disagreements, or as otherwise specified by the Owner in writing as stated in Section 012600. Any such notice shall be deemed to have been given as of the time of actual receipt.

B. The Contractor shall attend on-site progress and coordination meetings, as scheduled by the Construction Representative, no less than once a month.

C. The Contractor shall ensure that major subcontractors and suppliers shall attend monthly progress meetings as necessary to coordinate the work, and as specifically requested by the Construction Representative.

ARTICLE 1.9 - SEPARATE CONTRACTS AND COOPERATION

A. The Owner reserves the right to let other contracts in connection with this work. The Contractor shall afford other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work and shall properly connect and coordinate his work with theirs.

B. The Contractor shall consult the drawings for all other contractors in connection with this work. Any work conflicting with the above shall be brought to the attention of the Owner’s Representative before the work is performed. If the Contractor fails to do this, and constructs any work which interferes with the work of another contractor, the Contractor shall remove any part so conflicting and rebuild same, as directed by the Owner’s Representative at no additional cost to the Owner.

C. Each contractor shall be required to coordinate his work with other contractors so as to afford others reasonable opportunity for execution of their work. No contractor shall delay any other contractor by neglecting to perform contract work at the proper time. If any contractor causes delay to another, they shall be liable directly to that contractor for such delay in addition to any liquidated damages which might be due the Owner.

D. Should the Contractor or project associated subcontractors refuse to cooperate with the instructions and reasonable requests of other Contractors or other subcontractors in the overall coordinating of the work, the Owner may take such appropriate action and issue directions, as required, to avoid unnecessary and unwarranted delays.

E. Each Contractor shall be responsible for damage done to Owner's or other Contractor's property by him/her or workers in his employ through their fault or negligence.

F. Should a Contractor sustain any damage through any act or omission of any other Contractor having a contract with the Owner, the Contractor so damaged shall have no claim or cause of action against the Owner for such damage, but shall have a claim or cause of action against the other Contractor to recover any and all damages sustained by reason of the acts or omissions of such Contractor. The phrase "acts or omissions" as used in this section shall be defined to include, but

not be limited to, any unreasonable delay on the part of any such contractors.

ARTICLE 1.10 - ASSIGNMENT OF CONTRACT

A. No assignment by Contractor of any amount or any part of this contract or of the funds to be received there under will be recognized unless such assignment has had the written approval of the Director and the surety has been given due notice of such assignment and has furnished written consent thereto. In addition to the usual recitals in assignment contracts, the following language must be set forth: "It is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor of this contract and to claims or liens for services rendered or materials supplied for the performance of the work called for in said contract in favor of all persons, firms or corporations rendering such services or supplying such materials."

ARTICLE 1.11 - INDEMNIFICATION

A. Contractor agrees to indemnify and save harmless Owner and its respective commissioners, officers, officials, agents, consultants and employees and Designer, their agents, servants and employees, from and against any and all liability for damage arising from injuries to persons or damage to property occasioned by any acts or omissions of Contractor, any subcontractors, agents, servants or employees, including any and all expense, legal or otherwise, which may be incurred by Owner or Designer, its agents, servants or employees, in defense of any claim, action or suit.

B. The obligations of the Contractor under this paragraph shall not extend to the liability of the Designer, his agents or employees, arising out of (1) the preparation or approval of maps, drawings, opinions, reports, surveys, contract changes, design or specifications, or (2) giving of or the failure to give directions or instructions by the Designer, his agents or employees as required by this contract documents provided such giving or failure to give is the primary cause of the injury or damage.

ARTICLE 1.12 - DISPUTES AND DISAGREEMENTS

It is hereby expressly agreed and understood that in case any controversy or difference of opinion arises during construction, best efforts will be given to resolution at the field level. Should those efforts be unsuccessful, the Contractor has the right to appeal in writing, the decision of the Director's Designee to the Director at Room 730 Truman Building, P.O. Box 809, Jefferson City, Missouri 65102. The decision of the Director shall be final and binding on all parties.

ARTICLE 2 -- OWNER/DESIGNER RESPONSIBILITIES

A. The Owner shall give all orders and directions contemplated under this contract relative to the execution of the work. During progress of work the Owner will be represented at the project site by the Construction Representative and/or Designer, whose responsibilities are to see that this contract is properly fulfilled.

B. The Owner shall at all times have access to the work whenever it is in preparation or progress. The Contractors shall provide proper facilities for such access and for inspection and supervision.

C. All materials and workmanship used in the work shall be subject to the inspection of the Designer and Construction Representative, and any work which is deemed defective shall be removed, rebuilt or made good immediately upon notice. The cost of such correction shall be borne by the Contractor. Contractor shall not be entitled to an extension of the contract completion date in order to remedy defective work. All rejected materials shall be immediately removed from the site of the work.

D. If the Contractor fails to proceed at once with the correction of rejected defective materials or workmanship, the Owner may, by separate contract or otherwise, have the defects remedied or rejected. Materials removed from the site and charge the cost of the same against any monies which may be due the Contractor, without prejudice to any other rights or remedies of the Owner.

E. Failure or neglect on the part of Owner to observe faulty work, or work done which is not in accordance with the drawings and specifications shall not relieve the Contractor from responsibility for correcting such work without additional compensation.

F. The Owner shall have the right to direct the Contractor to uncover any completed work.

1. If the Contractor fails to adequately notify the Construction Representative and/or Designer of an inspection as required by the Contract Documents, the Contractor shall, upon written request, uncover the work. The Contractor shall bear all costs associated with uncovering and again covering the work exposed.

2. If the Contractor is directed to uncover work, which was not otherwise required by the Contract Documents to be inspected, and the work is found to be defective in any respect, no compensation shall be allowed for this work. If, however, such work is found to meet

the requirements of this contract, the actual cost of labor and material necessarily involved in the examination and replacement plus 10% shall be allowed the Contractor.

G. The Designer shall give all orders and directions contemplated under this contract relative to the scope of the work and shall give the initial interpretation of the contract documents.

H. The Owner may file a written notice to the Contractor to dismiss immediately any subcontractors, project managers, superintendents, foremen, workers, watchmen or other employees whom the Owner may deem incompetent, careless or a hindrance to proper or timely execution of the work. The Contractor shall comply with such notice as promptly as practicable without detriment to the work or its progress.

I. If in the Owner's judgment it becomes necessary at any time to accelerate work, when ordered by the Owner in writing, the Contractor shall redirect resources to such work items and execute such portions of the work as may be required to complete the work within the current approved contract schedule.

ARTICLE 3 -- CONTRACTOR RESPONSIBILITIES

The Contractor shall register and utilize the Owner's eBuilder digital project management system for submission of documents described in the following sections. This includes but is not limited to submittals as required by designer, payment applications, Request for Information (RFI), construction change orders, Request for Proposals (RFP), Designer Supplemental Instructions (DSI), etc.

ARTICLE 3.1 -- ACCEPTABLE SUBSTITUTIONS

A. The Contractor may request use of any article, device, product, material, fixture, form or type of construction which in the judgment of the Owner and Designer is equal in all respects to that named. Standard products of manufacturers other than those specified will be accepted when, prior to the ordering or use thereof, it is proven to the satisfaction of the Owner and Designer that they are equal in design, strength, durability, usefulness and convenience for the purpose intended.

B. Any changes required in the details and dimensions indicated on the drawings for the substitution of products other than those specified shall be properly made at the expense of the Contractor requesting the substitution or change.

C. The Contractor shall submit a request for such substitutions in writing to the Owner and Designer within twenty (20) working days after the date of the "Notice to Proceed." Thereafter no consideration will be given to alternate forms of accomplishing the work. This Article does not preclude the Owner from exercising the provisions of Article 4 hereof.

D. Any request for substitution by the Contractor shall be submitted in accordance with SECTION 002113 - INSTRUCTIONS TO BIDDERS.

E. When a material has been approved, no change in brand or make will be permitted unless:

1. Written verification is received from the manufacturer stating they cannot make delivery on the date previously agreed, or
2. Material delivered fails to comply with contract requirements.

ARTICLE 3.2 -- SUBMITTALS

A. The Contractor's submittals must be submitted with such promptness as to allow for review and approval so as not to cause delay in the work. The Contractor shall coordinate preparation and processing of submittals with performance of construction activities.

Coordinate each submittal with fabrication, = purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

Submit four (4) copies to the Designer and additional copies as required for the subcontractors and material suppliers. Also provide copies to meet the requirements for maintenance manuals.

B. All subcontractors' shop drawings and schedules shall be submitted by the Contractor and shall bear evidence that Contractor has received, reviewed, and approved them. Any shop drawings and schedules submitted without this evidence will be returned to the Contractor for resubmission.

C. The Contractor shall include with the shop drawing, a letter indicating any and all deviations from the drawings and/or specifications. Failure to notify the Designer of such deviations will be grounds for subsequent rejection of the related work or materials. If, in the opinion of the Designer, the deviations are not acceptable, the Contractor will be required to furnish the item as specified and indicated on the drawings.

D. The Designer shall check shop drawings and schedules with reasonable promptness and approve them only if they conform to the design concept of the project and comply with the information given in the contract documents. The approval shall not relieve the Contractor from the responsibility to comply with the drawings and specifications, unless the Contractor has called the Designer's attention to the deviation, in writing, at the time of

submission and the Designer has knowingly approved thereof. An approval of any such modification will be given only under the following conditions:

1. It is in the best interest of the Owner
2. It does not increase the contract sum and/or completion time
3. It does not deviate from the design intent
4. It is without prejudice to any and all rights under the surety bond.

E. No extension of time will be granted because of the Contractor's failure to submit shop drawings and schedules in ample time to allow for review, possible resubmission, and approval. Fabrication of work shall not commence until the Contractor has received approval. The Contractor shall furnish prints of approved shop drawings and schedules to all subcontractors whose work is in any way related to the work under this contract. Only prints bearing this approval will be allowed on the site of construction

F. The Contractor shall maintain a complete file on-site of approved shop drawings available for use by the Construction Representative.

ARTICLE 3.3 – AS-BUILT DRAWINGS

A. The Contractor shall update a complete set of the construction drawings, shop drawings and schedules of all work monthly by marking changes, and at the completion of their work (prior to submission of request for final payment) note all changes and turn the set over to the Construction Representative. The updates shall show all addenda, all field changes that were made to adapt to field conditions, changes resulting from contract changes or supplemental instructions, and all locations of structures, buried installations of piping, conduit, and utility services. All buried and concealed items both inside and outside shall be accurately located as to depth and referenced to permanent features such as interior or exterior wall faces and dimensions shall be given in a neat and legible manner in a contrasting colored pencil or ink. If approved by the Designer, an electronic file format may be provided.

ARTICLE 3.4 – GUARANTY AND WARRANTIES

A. General Guaranty

1. Neither the final certificate of payment nor any provision in the contract documents nor partial use or occupancy of the premises by the Owner shall constitute an acceptance of work not done in accordance with contract requirements.
2. The Contractor or surety shall remedy any defects in the work and pay for any damage to property resulting there from which shall appear within a period of one (1) year from the date of substantial completion unless a longer period is otherwise specified or a differing guaranty period has been established in the substantial completion certificate. The Owner will give notice of observed defects with reasonable promptness.
3. In case of default on the part of the Contractor in fulfilling this part of this contract, the Owner may correct the work or repair the damage and the cost and expense incurred in such event shall be paid by or recoverable from the Contractor or surety.
4. The work will be free from defects not inherent in the quality required or permitted, and that the Work will conform to the requirements of the Contract Documents. Work not conforming to these requirements, including substitutions not properly approved and authorized, may be considered defective. The Contractor's guaranty excludes remedy for damage or defect caused by abuse, modifications not executed by the Contractor, improper or insufficient maintenance, improper operation, or normal wear and tear under normal usage. If required by the Owner, the Contractor shall furnish satisfactory evidence as to the kind and quality of materials and equipment

B. Extended Warranty

Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year. Where a longer period is offered at no additional cost or called for in the specific equipment specifications, the longer period shall govern.

ARTICLE 3.5 -- OPERATION AND MAINTENANCE MANUALS

A. Immediately after equipment submittals are approved and no later than ten (10) working days prior to the substantial completion inspection, the Contractor shall provide to the Designer three (3) copies of operating instructions and service manuals, containing the following:

1. Start-up and Shut-down Procedures: Provide a step-by-step write up of all major equipment. When manufacturer’s printed start-up, trouble shooting and shut-down procedures are available; they may be incorporated into the operating manual for reference.

2. Operating Instructions: Written operating instructions shall be included for the efficient and safe operation of all equipment.

3. Equipment List: List of all major equipment as installed shall be prepared to include model number, capacities, flow rate, name place data, shop drawings and air and water balance reports.

4. Service Instructions: Provide the following information for all pieces of equipment.

   a. Recommended spare parts including catalog number and name of local supplier or factory representative.

   b. Belt sizes, types, and lengths.

   c. Wiring diagrams.

5. Manufacturer's Certificate of Warranty as described in Article 3.4.

6. Prior to the final payment, furnish to the Designer three (4) copies of parts catalogs for each piece of equipment furnished by him/her on the project with the components identified by number for replacement ordering.

B. Submission of operating instructions shall be done in the following manner.

1. Manuals shall be in quadruplicate, and all materials shall be bound into volumes of standard 8½" x 11" hard binders. Large drawings too bulky to be folded into 8½" x 11" shall be separately bound or folded and in envelopes, cross referenced and indexed with the manuals.

2. The manuals shall identify project name, project number, and include the name and address of the Contractor, subcontractors and manufacturers who were involved with the activity described in that particular manual.

3. Internally subdivide the binder contents with permanent page dividers, logically organized with tab titles clearly printed under reinforced laminated plastic tabs.

4. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.

ARTICLE 3.6 – OTHER CONTRACTOR RESPONSIBILITIES

A. The Contractor shall keep on site, during progress of the work, a competent superintendent satisfactory to the Construction Representative. The superintendent shall represent the Contractor and all agreements made by the superintendent shall be binding. The superintendent shall carefully study and compare all drawings, specifications and other instructions and shall promptly notify the Construction Representative and Designer, in writing, any error, inconsistency or omission which may be discovered. The superintendent shall coordinate all work on the project. Any change of the superintendent shall be approved by the Construction Representative.

B. Contractor shall, at all times, enforce strict discipline and good order among his employees, and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him/her.

C. The Contractor shall supply sufficient labor, material, plant and equipment and pay when due any laborer, subcontractor or supplier for supplies furnished and otherwise prosecute the work with diligence to prevent work stoppage and ensure completion thereof within the time specified.

D. The Contractor and each of his subcontractors shall submit to the Construction Representative, through the Designer such schedules of quantities and costs, progress schedules, payrolls, reports, estimates, records and other data as the Owner may request concerning work performed or to be performed under this contract.

E. The Contractor, subcontractors, and material suppliers shall upon written request, give the Owner access to all time cards, material invoices, payrolls, estimates, profit and loss statements, and all other direct or indirect costs related to this work.

F. The Contractor shall be responsible for laying out all contract work such as layout of architectural, structural, mechanical and electrical work, which shall be coordinated with layouts of subcontractors for general construction work. The Contractor is also responsible for unloading, uncrating and handling of all materials and equipment to be erected or placed by him/her, whether furnished by Contractor or others. No extra charges or compensation will be allowed as a result of failure to verify dimensions before ordering materials or fabricating items.

G. The Contractor must notify the Construction Representative at least one working day before placing concrete or burying underground utilities, pipelines, etc.

H. Contractors shall prearrange time with the Construction Representative for the interruption of any facility operation. Unless otherwise specified in these documents, all connections, alterations or relocations as well as all other portions of the work will be performed during normal working hours.

I. The Contractor shall coordinate all work so there will not be prolonged interruptions of existing equipment operation. Any existing plumbing, heating, ventilating, air conditioning or electrical disconnections necessary for the project, which affect portions of this construction or building or any other building must be scheduled with the Construction Representative to minimize or avoid any disruption of facility operations. In no case, unless previously approved in writing by the Construction Representative, shall utilities be left disconnected at the end of a work day or over a weekend. Any interruption of utilities either intentionally or accidentally shall not relieve the Contractor responsible for the interruption from the responsibility to repair and restore the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.

J. Contractors shall limit operations and storage of materials to the area within the project, except as necessary to connect to existing utilities, and shall not encroach on neighboring property. The Contractor shall be responsible for repair of their damage to property on or off the project site occurring during construction of project. All such repairs shall be made to the satisfaction of the property owner.

K. Unless otherwise permitted, all materials shall be new and both workmanship and materials shall be of the best quality.

L. Unless otherwise provided and stipulated within these specifications, the Contractor shall furnish, construct, and/or install and pay for materials, devices, mechanisms, equipment, all necessary personnel, utilities including, but not limited to water, heat, light and electric power, transportation services, applicable taxes of every nature, and all other facilities necessary for the proper execution and completion of the work.

M. Contractor shall carefully examine the plans and drawings and shall be responsible for the proper fitting of his material, equipment and apparatus into the building.

N. The Contractor or subcontractors shall not overload, or permit others to overload, any part of any structure during the performance of this contract.

O. All temporary shoring, bracing, etc., required for the removal of existing work and/or for the installation of new work shall be included in this contract. The Contractor shall make good, at no cost to the Owner, any damage caused by improper support or failure of shoring in any respect. Each Contractor shall be responsible for shoring required to protect his work or adjacent property and improvements of Owner and shall be responsible for shoring or for giving written notice to adjacent property owners. Shoring shall be removed only after completion of permanent supports.

P. The Contractor shall provide at the proper time such material as is required for support of the work. If openings are required, whether shown on drawings or not, the Contractor shall see that they are properly constructed.

Q. During the performance of work the Contractor shall be responsible for providing and maintaining warning signs, lights, signal devices, barricades, guard rails, fences and other devices appropriately located on site which will give proper and understandable warning to all persons of danger of entry onto land, structure or equipment.

R. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials.

S. The Contractor shall be responsible for care of the finished work and shall protect same from damage or defacement until substantial completion by the Owner. If the work is damaged by any cause, the Contractor shall immediately begin to make repairs in accordance with the drawings and specifications. Contractor shall be liable for all damage or loss unless attributable to the acts or omissions of the Owner or Designer. Any claim for reimbursement shall be submitted in accordance with Article 4. After substantial completion the Contractor will only be responsible for damage resulting from acts or omissions of the Contractor or subcontractors through final warranty.

T. In the event the Contractor encounters an unforeseen hazardous material, the Contractor shall immediately stop work in the area affected and report the condition to the Owner and Designer in writing. The Contractor shall not be required, pursuant to Article 4, to perform, any work relating to hazardous materials.

U. In an emergency affecting safety of persons or property, the Contractor shall act, at the Contractor's discretion, to prevent threatened damage, injury or loss. Additional compensation or extension of time claimed by the Contractor on account of an emergency shall be determined as provided in Article 4.

V. Before commencing work, Contractors shall confer with the Construction Representative and facility representative and review any facility rules and regulations which may affect the conduct of the work.

W. Project signs will only be erected on major projects and only as described in the specifications. If no sign is specified, none shall be erected.

ARTICLE 3.7 -- SUBCONTRACTS

A. Subcontractor assignments as identified in the bid form shall not be changed without written approval of the Owner. The Owner will not approve changes of a listed subcontractor unless the Contractor documents, to the satisfaction of the Owner that the subcontractor cannot or will not perform the work as specified.

B. The Contractor is fully responsible to the Owner for the acts and omissions of all subcontractors and of persons either directly or indirectly employed by them.

C. Every subcontractor shall be bound by the applicable terms and provisions of these contract documents, but no contractual relationship shall exist between any subcontractor and the Owner unless the right of the Contractor to proceed with the work is suspended or this contract is terminated as herein provided, and the Owner in writing elects to assume the subcontract.

D. The Contractor shall upon receipt of "Notice to Proceed" and prior to submission of the first payment request, notify the Designer and Construction Representative in writing of the names of any subcontractors to be used in addition to those identified in the bid form and all major material suppliers proposed for all parts of the work.

ARTICLE 4 -- CHANGES IN THE WORK

4.1 CHANGES IN THE WORK

A. The Construction Representative, without giving notice to the surety and without invalidating this contract, may order extra work or make changes by altering, adding to or deducting from the work, this contract sum being adjusted accordingly. All such work shall be executed under the conditions of the original contract. A claim for extension of time caused by any change must be adjusted at the time of ordering such change. No future request for time will be considered.

B. Each Contract Change shall include all costs required to perform the work including all labor, material, equipment, overheads and profit, delay, disruptions, or other miscellaneous expenses. No subsequent requests for additional compensation including claims for delay, disruption, or reduced efficiency as a result of each change will be considered. Values from the Schedule of Values will not be binding as a basis for additions to or deductions from the contract price.

C. The amount of any adjustment in this contract price for authorized changes shall be agreed upon before such changes become effective and shall be determined, through submission of a request for proposal, as follows:

1. By an acceptable fixed price proposal from the Contractor. Breakdowns shall include all takeoff sheets of each Contractor and subcontractor. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

2. By a cost-plus-fixed-fee (time and material) basis with maximum price, total cost not to exceed said maximum. Breakdown shall include a listing of each item of material with unit prices and number of hours of labor for each task. Labor costs per hour shall be included with labor burden identified, which shall be not less than the prevailing wage rate, etc. Overhead and profit shall be shown separately for each subcontractor and the Contractor.

3. By unit prices contained in Contractor's original bid form and incorporated in the construction contract.

D. Overhead and Profit on Contract Changes shall be applied as follows:

1. The overhead and profit charge by the Contractor and all subcontractors shall be considered to include, but is not limited to: incidental job burdens, small truck (under 1 ton) expense, mileage, small hand tools, warranty costs, company benefits and general office overhead. Project supervision including field supervision and job site office expense shall be considered a part of overhead and profit unless a compensable time extension is granted.

2. The percentages for overhead and profit charged on Contract Changes shall be subject to the following limits: (a) the percentage mark-up for the Contractor shall be limited to the Contractor’s fee: (b) fifteen percent (15%) maximum for Work directly performed by employees of a subcontractor, or sub-subcontractor; (c) five percent (5%) maximum for the Work performed or passed through to the Owner by the Contractor; (d) five percent (5%) maximum subcontractor’s mark-up for

Work performed by a sub-subcontractor and passed through to the Owner by the subcontractor and Contractor; and (e) in no case shall the total overhead and profit paid by the Owner on any Contract Changes exceed twenty-five percent (25%) of the cost of materials, labor and equipment (exclusive of Contractor or any Subcontractor overhead and profit) necessary to put the contract change work in place.

3. The Contractor will be allowed to add the cost of Contractor's payment and performance bonding, builder's risk insurance, and general liability insurance to their cost of work. The above listed bonding and insurance cost shall not exceed two percent (2%) and shall be allowed on the total cost of the added work, including overhead and profit.

4. On proposals covering both increases and decreases in the amount of this contract, the application of overhead and profit shall be on the net change in the cost of the work.

5. The percentage(s) for overhead and profit to be credited to the Owner on Contract Changes that are solely decreases in the quantity of work or materials shall be the same as those for additive Contract Changes provided above.

E. No claim for an addition to this contract sum shall be valid unless authorized as aforesaid in writing by the Owner. In the event that none of the foregoing methods are agreed upon, the Owner may order the Contractor to perform work on a time and material basis. The cost of such work shall be determined by the Contractor's actual labor and material cost to perform the work plus overhead and profit as outlined herein. The Designer and Construction Representative shall approve the Contractor's daily time and material invoices for the work involved.

F. If the Contractor claims that any instructions involve extra cost under this contract, the Contractor shall give the Owner's Representative written notice thereof within a reasonable time after the receipt of such instructions, and in any event before proceeding to execute the work. No such claim shall be valid unless so made and authorized by the Owner, in writing.

G. In an emergency affecting the safety of life or of the structure or of adjoining property, the Contractor, without special instruction or authorization from the Construction Representative, is hereby permitted to act at their discretion to prevent such threatened loss or injury. The Contractor shall submit a claim for compensation for such emergency work in writing to the Owner's Representative.

ARTICLE 4.2 – CHANGES IN COMPLETION TIME

A. Extension of the number of work days stipulated in the Contract for completion of the work with compensation may be made when:

1. The contractor documents that proposed Changes in the work, as provided in Article 4.1, extends construction activities critical to contract completion date, OR

2. The Owner suspends all work for convenience of the Owner as provided in Article 7.3, OR

3. An Owner caused delay extends construction activities critical to contract completion (except as provided elsewhere in these General Conditions). The Contractor is to review the work activities yet to begin and evaluate the possibility of rescheduling the work to minimize the overall project delay.

B. Extension of the number of work days stipulated in the Contract for completion of the work <u>without</u> compensation may be made when:

1. Weather-related delays occur, subject to provisions for the inclusion of a specified number of "bad weather" days when provided for in Section 012100-Allowances, OR

2. Labor strikes or acts of God occur, OR

3. The work of the Contractor is delayed on account of conditions which were beyond the control of the Contractor, subcontractors or suppliers, and were not the result of their fault or negligence.

C. No time extension or compensation will be provided for delays caused by or within the control of the Contractor, subcontractors or suppliers and for concurrent delays caused by the Owner.

D. The Contractor shall notify the Owner promptly of any occurrence or conditions which in the Contractor's opinion results in a need for an extension of time. The notice shall be in writing and shall include all necessary supporting materials with details of any resultant costs and be submitted in time to permit full investigation and evaluation of the Contractor's claim. The Owner shall promptly acknowledge the Contractor's notice and, after recommendation from the Owner's Representative and/or Designer, shall provide a decision to the Contractor. Failure on the part of the Contractor to provide such notice and to detail the costs shall constitute a waiver by the Contractor of any claim. Requests for extensions of time shall be for working days only.

ARTICLE 5 - CONSTRUCTION AND COMPLETION

ARTICLE 5.1 – CONSTRUCTION COMMENCEMENT

A. Upon receipt of the "Intent to Award" letter, the Contractor must submit the following properly executed instruments to the Owner:

1. Contract;
2. Performance/payment bond as described in Article 6.1;
3. Certificates of Insurance, or the actual policies themselves, showing that the Contractor has obtained the insurance coverage required by Article 6.2.

Above referenced items must be received by the Owner within ten (10) working days after the effective date of the contract. If not received, the Owner may treat the failure to timely submit them as a refusal by the Contractor to accept a contract for this work and may retain as liquidated damages the Contractor's bid bond, cashier's check or certified check as provided in the Instructions to Bidders. Upon receipt the Owner will issue a "Notice to Proceed" with the work to the Contractor.

B. Within the time frame noted in Section 013200 - Schedules, following receipt of the "Notice to Proceed", the Contractor shall submit to the Owner a progress schedule and schedule of values, showing activities through the end of the contract period. Should the Contractor not receive written notification from the Owner of the disapproval of the schedule of values within fifteen (15) working days, the Contractor may consider it approved for purpose of determining when the first monthly Application and Certification for Payment may be submitted.

C. The Contractor may commence work upon receipt of the Division of Facilities Management, Design and Construction's "Notice to Proceed" letter. Contractor shall prosecute the work with faithfulness and energy, and shall complete the entire work on or before the completion time stated in the contract documents or pay to the Owner the damages resulting from the failure to timely complete the work as set out within Article 5.4.

ARTICLE 5.2 -- PROJECT CONSTRUCTION

A. Each Contractor shall submit for the Owner's approval, in reproducible form, a progress schedule showing the rate of progress and the order of the work proposed to carry on various phases of the project. The schedule shall be in conformance with the requirements outlined in Section 013200 – Schedules.

B. Contractor shall employ and supply a sufficient force of workers, material, and equipment and shall pay when due, any worker, subcontractor or supplier and otherwise prosecute the work with such diligence so as to maintain the rate of progress indicated on the progress schedule, prevent work stoppage, and insure completion of the project within the time specified.

ARTICLE 5.3 -- PROJECT COMPLETION

A. Substantial Completion. A Project is substantially complete when construction is essentially complete and work items remaining to be completed can be done without interfering with the Owner's ability to use the Project for its intended purpose.

1. Once the Contractor has reached what they believe is Substantial Completion, the Contractor shall notify the Designer and the Construction Representative of the following:
   a. That work is essentially complete with the exception of certain listed work items. The list shall be referred to as the "Contractor's Punch."
   b. That all Operation and Maintenance Manuals have been assembled and submitted in accordance with Article 3.5A.
   c. That the Work is ready for inspection by the Designer and Construction Representative. The Owner shall be entitled to a minimum of ten working days notice before the inspection shall be performed.
2. If the work is acceptable, the Owner shall issue a Certificate of Substantial Completion, which shall set forth the responsibilities of the Owner and the Contractor for utilities, security, maintenance, damage to the work and risk of loss. The Certificate shall also identify those remaining items of work to be performed by the Contractor. All such work items shall be complete within 30 working days of the date of the Certificate, unless the Certificate specifies a different time. If the Contractor shall be required to perform tests that must be delayed due to climatic conditions, it is understood that such tests and affected equipment will be identified on the Certificate and shall be accomplished by the Contractor at the earliest possible date. Performance of the tests may not be required before Substantial Completion can be issued. The date of the issuance of the Certificate of

Substantial Completion shall determine whether or not the work was completed within the contract time and whether or not Liquidated Damages are due.

3. If the work is not acceptable, and the Owner does not issue a Certificate of Substantial Completion, the Owner shall be entitled to charge the Contractor with the Designer's and Owner's costs of re-inspection, including time and travel.

B. Partial Occupancy. Contractor agrees that the Owner shall be permitted to occupy and use any completed or partially completed portions of the Project, when such occupancy and use is in the Owner's best interest. Owner shall notify Contractor of its desire and intention to take Partial Occupancy as soon as possible but at least ten (10) working days before the Owner intends to occupy. If the Contractor believes that the portion of the work the Owner intends to occupy is not ready for occupancy, the Contractor shall notify the Owner immediately. The Designer shall inspect the work in accordance with the procedures above. If the Contractor claims increased cost of the project or delay in completion as a result of the occupancy, he shall notify the Owner immediately but in all cases before occupancy occurs.

C. Final Completion. The Project is finally complete when the Certificate of Substantial Completion has been issued and all work items identified therein as incomplete have been completed, and when all administrative items required by the contract have been completed. Final Completion entitles the Contractor to payment of the outstanding balance of the contract amount including all change orders and retainage. Within five (5) working days of the date of the Certificate of Substantial Completion, the Contractor shall identify the cost to complete any outstanding items of work. The Designer shall review the Contractor's estimate and either approve it or provide an independent estimate for all such items. If the Contractor fails to complete the remaining items within the time specified in the Certificate, the Owner may terminate the contract and go to the surety for project completion in accordance with Article 7.2 or release the contract balance to the Contractor less 150% of the approved estimate to complete the outstanding items. Upon completion of the outstanding items, when a final cost has been established, any monies remaining shall be paid to the Contractor. Failure to complete items of work does not relieve the Contractor from the obligation to complete the administrative requirements of the contract, such as the provisions of Article 5.3 FAILURE TO COMPLETE ALL ITEMS OF WORK UNDER THE CONTRACT SHALL BE CONSIDERED A DEFAULT AND BE GROUNDS FOR CONTRACT TERMINATION AND DEBARMENT.

D. Liquidated Damages. Contractor agrees that the Owner may deduct from the contract price and retain as liquidated damages, and not as penalty or forfeiture, the sum stipulated in this contract for each work day after the Contract Completion Day on which work is not Substantially Complete. Assessment of Liquidated Damages shall not relieve the Contractor or the surety of any responsibility or obligation under the Contract. In addition, the Owner may, without prejudice to any other rights, claims, or remedies the Owner may have including the right to Liquidated Damages, charge the Contractor for all additional expenses incurred by the Owner and/or Designer as the result of the extended contract period through Final Completion. Additional Expenses shall include but not be limited to the costs of additional inspections.

E. Early Completion. The Contractor has the right to finish the work before the contract completion date; however, the Owner assumes no liability for any hindrances to the Contractor unless Owner caused delays result in a time extension to the contract completion date. The Contractor shall not be entitled to any claims for lost efficiencies or for delay if a Certificate of Substantial Completion is given on or before the Contract Completion Date.

ARTICLE 5.4 -- PAYMENT TO CONTRACTOR

A. Payments on account of this contract will be made monthly in proportion to the work which has been completed. Request for payment must be submitted on the Owner's forms. No other pay request will be processed. Supporting breakdowns must be in the same format as Owner's forms and must provide the same level of detail. The Designer will, within 5 working days from receipt of the contractor's request for payment either issue a Certificate for Payment to the Owner, for such amount as the Designer determines is properly due, or notify the Contractor in writing of reasons for withholding a Certificate. The Owner shall make payment within 30 calendar days after the "Application and Certification for Payment" has been received and certified by the Designer. The following items are to be attached to the contractor's pay request:

1. Updated construction schedule
2. Certified payrolls consisting of name, home addresses of all workers, occupation and craft, number of hours worked and actual wages paid for each individual employee, of the Contractor and all subcontractors working on the project

B. The Owner shall retain 5 percent of the amount of each such payment application, except as allowed by Article 5.4, until final completion and acceptance of all work covered by this contract.

C. Each payment made to Contractor shall be on account of the total amount payable to Contractor and all material and work covered by paid partial payment shall thereupon become the sole property of Owner. This provision shall not be construed as relieving Contractor from sole responsibility for care and protection of materials and work upon which payments have been made or restoration of any damaged work or as a waiver of the right of Owner to require fulfillment of all terms of this contract.

D. Materials delivered to the work site and not incorporated in the work will be allowed in the Application and Certification for Payment on the basis of one hundred (100%) percent of value, subject to the 5% retainage providing that they are suitably stored on the site or in an approved warehouse in accordance with the following requirements:

1. Material has previously been approved through submittal and acceptance of shop drawings conforming to requirements of Article 3.2 of General Conditions.

2. Delivery is made in accordance with the time frame on the approved schedule.

3. Materials, equipment, etc., are properly stored and protected from damage and deterioration and remain so - if not, previously approved amounts will be deleted from subsequent pay applications.

4. The payment request is accompanied by a breakdown identifying the material equipment, etc. in sufficient detail to establish quantity and value.

E. The Contractor shall be allowed to include in the Application and Certification for Payment, one hundred (100%) of the value, subject to retainage, of major equipment and material stored off the site if all of the following conditions are met:

1. The request for consideration of payment for materials stored off site is made at least 15 working days prior to submittal of the Application for Payment including such material. Only materials inspected will be considered for inclusion on Application for Payment requests.

2. Materials stored in one location off site are valued in excess of $25,000.

3. That a Certificate of Insurance is provided indicating adequate protection from loss, theft conversion or damage for materials stored off site. This Certificate shall show the State of Missouri as an additional insured for this loss.

4. The materials are stored in a facility approved and inspected, by the Construction Representative.

5. Contractor shall be responsible for, Owner costs to inspect out of state facilities, and any delays in the completion of the work caused by damage to the material or for any other failure of the Contractor to have access to this material for the execution of the work.

F. The Owner shall determine the amount, quality and acceptability of the work and materials which are to be paid for under this contract. In the event any questions shall arise between the parties, relative to this contract or specifications, determination or decision of the Owner or the Construction Representative and the Designer shall be a condition precedent to the right of the Contractor to receive any money or payment for work under this contract affected in any manner or to any extent by such question.

G. Payments Withheld: The Owner may withhold or nullify in whole or part any certificate to such extent as may be necessary to protect the Owner from loss on account of:

1. Defective work not remedied. When a notice of noncompliance is issued on an item or items, corrective action shall be undertaken immediately. Until corrective action is completed, no monies will be paid and no additional time will be allowed for the item or items. The cost of corrective action(s) shall be borne by the Contractor.

2. A reasonable doubt that this contract can be completed for the unpaid balance.

3. Failure of the Contractor to update as-built drawings monthly for review by the Construction Representative.

4. Failure of the Contractor to update the construction schedule.

When the Construction Representative is satisfied the Contractor has remedied above deficiencies, payment shall be released.

H. Final Payment: Upon receipt of written notice from the Contractor to the Designer and Project Representative that the work is ready for final inspection and acceptance, the Designer and Project Representative, with the Contractor, shall promptly make such inspection. If the work is acceptable and the contract fully performed, the Construction Representative shall complete a final acceptance report and the Contractor will be

directed to submit a final Application and Certification for Payment. If the Owner approves the same, the entire balance shall be due and payable, with the exception of deductions as provided for under Article 5.4.

1. Where the specifications provide for the performance by the Contractor of (certain tests for the purpose of balancing and checking the air conditioning and heating equipment and the Contractor shall have furnished and installed all such equipment in accordance with the specifications, but said test cannot then be made because of climatic conditions, such test shall may be considered as required under the provisions of the specifications, Section 013300 and this contract may be substantial Full payment will not be made until the tests have been made and the equipment and system is finally accepted. If the tests are not completed when scheduled, the Owner may deduct 150% of the value of the tests from the final payment.
2. The final payment shall not become due until the Contractor delivers to the Construction Representative:

    a) A complete file of releases, on the standard form included in the contract documents as "Final Receipt of Payment and Release Form", from subcontractors and material suppliers evidencing payment in full for services, equipment and materials, as the case may require, if the Owner approves, or a consent from the Surety to final payment accepting liability for any unpaid amounts.

    b) An Affidavit of Compliance with Prevailing Wage Law, in the form as included in this contract specifications, properly executed by each subcontractor, and the Contractor

    c) Certified copies of all payrolls

    d) As-built drawings

3. If any claim remains unsatisfied after all payments are made, the Contractor shall refund to the Owner all monies that the latter may be compelled to pay in discharging such a claim including all costs and a reasonable attorney's fee.
4. Missouri statute requires prompt payment from the Owner to the Contractor within thirty calendar days and from the Contractor to his subcontractors within fifteen calendar days. Failure to make payments within the required time frame entitles the receiving party to charge interest at the rate of one and one half percent per month calculated from the expiration of the statutory time period until paid.
5. The value of all unused unit price allowances and/or 150% of the value of the outstanding work items, and/or liquidated damages may be deducted from the final pay request without executing a Contract Change. Any unit price items which exceed the number of units in the contract may be added by Contract Change.

ARTICLE 6 -- INSURANCE AND BONDS

ARTICLE 6.1 -- BOND

A. Contractor shall furnish a performance/payment bond in an amount equal to 100% of the contract price to guarantee faithful performance of the contract and 100% of the contract price to guarantee the payment of all persons performing labor on the project and furnishing materials in connection therewith under this contract as set forth in the standard form of performance and payment bond included in the contract documents. The surety on such bond shall be issued by a surety company authorized by the Missouri Department of Insurance to do business in the state of Missouri.

B. All Performance/Payment Bonds furnished in response to this provision shall be provided by a bonding company with a rating of B+ or higher as established by A.M. Best Company, Inc. in their most recent publication.

ARTICLE 6.2 – INSURANCE

A. The successful Contractor shall procure and maintain for the duration of the contract issued a policy or policies of insurance for the protection of both the Contractor and the Owner and their respective officers, officials, agents, consultants and employees. The Owner requires certification of insurance coverage from the Contractor prior to commencing work.

B. Minimum Scope and Extent of Coverage

1. General Liability

Commercial General Liability, ISO coverage form number or equivalent CG 00 01 ("occurrence" basis), or I-SO coverage form number CG 00 02, or ISO equivalent.

If ISO equivalent or manuscript general liability coverage forms are used, minimum coverage will be as follows: Premises/Operations; Independent Contractors; Products/Completed Operations; personal Injury; Broad Form Property Damage including Completed Operations; Broad Form Contractual Liability Coverage to include Contractor's obligations under Article 1.11 Indemnification and any other Special Hazards required by the work of the contract.

2. Automobile Liability

Business Automobile Liability Insurance, ISO Coverage form number or equivalent CA 00 01 covering automobile liability, code 1 "ANY AUTO".

3. Workers' Compensation and Employer's Liability

Statutory Workers' Compensation Insurance for Missouri and standard Employer's Liability Insurance, or the authorization to self-insure for such liability from the Missouri Division of Workers' Compensation.

4. Builder's Risk or Installation Floater Insurance

Insurance upon the work and all materials, equipment, supplies, temporary structures and similar items which may be incident to the performance of the work and located at or adjacent to the site, against loss or damage from fire and such other casualties as are included in extended coverage in broad "All Risk" form, including coverage for Flood and Earthquake, in an amount not less than the replacement cost of the work or this contact price, whichever is greater, with loss payable to Contractor and Owner as their respective interests may appear.

Contractor shall maintain sufficient insurance to cover the full value of the work and materials as the work progresses, and shall furnish Owner copies of all endorsements. If Builder's Risk Reporting- Form of Endorsement is used, Contractor shall make all reports as required therein so as to keep in force an amount of insurance which will equal the replacement cost of the work, materials, equipment, supplies, temporary structures, and other property covered thereby; and if, as a result of Contractor's failure to make any such report, the amount of insurance so recoverable shall be less than such replacement cost, Contractor's interest in the proceeds of such insurance, if any, shall be subordinated to Owner's interest to the end that Owner may receive full reimbursement for its loss.

C. Minimum Limits of Insurance

1. General Liability

Contractor

$2,000,000	combined single limit per occurrence for bodily injury, personal injury, and property damage
$2,000,000	annual aggregate

2. Automobile Liability

$2,000,000	combined single limit per occurrence for bodily injury and property damage

3. Workers' Compensation and Employers Liability

Workers' Compensation limits as required by applicable State Statutes (generally unlimited) and minimum of $1,000,000 limit per accident for Employer's Liability.

General Liability and Automobile Liability insurance may be arranged under individual policies for the full limits required or by a combination of underlying policies with the balance provided by a form-following Excess or Umbrella Liability policy.

D. Deductibles and Self-Insured Retentions

All deductibles, co-payment clauses, and self-insured retentions must be declared to and approved by the Owner. The Owner reserves the right to request the reduction or elimination of unacceptable deductibles or self-insured retentions, as they would apply to the Owner, and their respective officers, officials, agents, consultants and employees. Alternatively, the Owner may request Contractor to procure a bond guaranteeing

payment of losses and related investigations, claims administration, and defense expenses.

E. Other Insurance Provisions and Requirements

The respective insurance policies and coverage, as specified below, must contain, or be endorsed to contain the following conditions or provisions:

1. General Liability

The Owner, and its respective commissioners, officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 Additional Insured - Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance of self-insurance programs maintained by the designated additional -insured's shall be excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's general liability insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner, or for any of their officers, officials, agents, consultants or employees.

2. Automobile Insurance

The Owner, and their respective officers, officials, agents, consultants and employees shall be endorsed as additional insured's by ISO form CG 20 26 - Additional Insured Designated Person or Organization. As additional insured's, they shall be covered as to work performed by or on behalf of the Contractor or as to liability which arises out of Contractor's activities or resulting from the performance of services or the delivery of goods called for by the Contract.

Contractor's insurance coverage shall be primary with respect to all additional insured's. Insurance or self-insurance programs maintained by the designated additional insured's shall be in excess of the Contractor's insurance and shall not contribute with it.

Additionally, the Contractor and Contractor's automobile insurer shall agree to waive all rights of subrogation against the Owner and any of their respective officers, officials, agents, consultants or employees for claims, losses, or expenses which arise out of Contractor's activities or result from the performance of services or the delivery of goods called for by the Contract.

Contractor's failure to comply with the terms and conditions of these insurance policies shall not affect or abridge coverage for the Owner or for any of its officers, officials, agents, consultants or employees.

3. Workers' Compensation/Employer's Liability

Contractor's workers' compensation insurance shall be endorsed with NCCI form WC 00 03 01 A - Alternative Employer Endorsement. The Alternative Employer Endorsement shall designate the Owner as "alternate employers."

4. All Coverages

Each insurance policy required by this section of the Contract shall contain a stipulation, endorsed if necessary, that the Owner will receive a minimum of a thirty (30) calendar day advance notice of any policy cancellation. Ten (10) calendar days advance notice is required for policy cancellation due to non-payment of premium.

F. Insurer Qualifications and Acceptability

Insurance required hereunder shall be issued by an A.M. Best, "B+" rated, Class IX insurance company approved to conduct insurance business in the state of Missouri.

G. Verification of Insurance Coverage

Prior to Owner issuing a Notice to Proceed, the Contractor-shall furnish the Owner with Certificate(s) of Insurance and with any applicable original endorsements evidencing the required insurance coverage. The insurance certificates and endorsements are to be signed by a person authorized by that insurer to bind coverage on its behalf. All certificates and endorsements received by the Owner are subject to review and approval by the Owner. The Owner reserves the right to require certified copies of all required policies at any time. If the scope of this contract will exceed one (1) year - or, if any of Contractor's applicable insurance coverage expires prior to completion of the work or services required under this contract -

the Contractor will provide a renewal or replacement certificate before continuing work or services hereunder. If the Contractor fails to provide documentation of required insurance coverage, the Owner may issue a stop work order and no additional contract completion time and/or compensation shall be granted as a result thereof.

ARTICLE 7 – SUSPENSION OR TERMINATION OF CONTRACT

ARTICLE 7.1 - FOR SITE CONDITIONS

When conditions at the site of the proposed work are considered by the Owner to be unsatisfactory for prosecution of the work, the Contractor may be ordered in writing to suspend the work or any part thereof until reasonable conditions exist. When such suspension is not due to fault or negligence of the Contractor, time allowed for completion of such suspended work will be extended by a period of time equal to that lost due to delay occasioned by ordered suspension. This will be a no cost time extension.

ARTICLE 7.2 - FOR CAUSE

A. Termination or Suspension for Cause:

1. If the Contractor shall file for bankruptcy, or should make a general assignment for the benefit of the creditors, or if a receiver should be appointed on account of insolvency, or if the contractor should persistently or repeatedly refuse or fail to supply enough properly skilled workers or proper materials, or if the contractor should fail to make prompt payment to subcontractors or for material or labor, or persistently disregard laws, ordinances or the instructions of the Owner, or otherwise be guilty of a substantial violation of any provision of this contract, then the Owner may serve notice on the Contractor and the surety setting forth the violations and demanding compliance with this contract. Unless within ten (10) consecutive calendar days after serving such notice, such violations shall cease and satisfactory arrangements for correction be made, the Owner may suspend the Contractor's right to proceed with the work or terminate this contract.

2. In the event the Owner suspends Contractor's right to proceed with the work or terminates the contract, the Owner may demand that the Contractor's surety take over and complete the work on this contract, after the surety submits a written proposal to the Owner and receives written approval and upon the surety's failure or refusal to do so within ten (10) consecutive calendar days after demand therefore, the Owner may take over the work and prosecute the same to completion by bid or negotiated contract, or the Owner may elect to take possession of and utilize in completing the work such materials, supplies, appliances and plant as may be on the site of the work, and all subcontractors, if the Owner elects, shall be bound to perform their contracts.

B. The Contractor and its surety shall be and remain liable to the Owner for any excess cost or damages occasioned to the Owner as a result of the actions above set forth.

C. The Contractor in the event of such suspension or termination shall not be entitled to receive any further payments under this contract until the work is wholly finished. Then if the unpaid balance under this contract shall exceed all expenses of the Owner as certified by the Director, such excess shall be paid to the Contractor; but, if such expenses shall exceed the unpaid balance as certified by the Director, the Contractor and their surety shall be liable for and shall pay the difference and any damages to the Owner.

D. In exercising Owner's right to secure completion of the work under any of the provisions hereof, the Director shall have the right to exercise Owner's sole discretion as to the manner, methods and reasonableness of costs of completing the work.

E. The rights of the Owner to suspend or terminate as herein provided shall be cumulative and not exclusive and shall be in addition to any other remedy provided by law.

F. The Contractor in the event of such suspension or termination may be declared ineligible for Owner contracts for a minimal period of twelve (12) months. Further, no contract will be awarded to any Contractor who lists in their bid form any subcontractor whose prior performance has contributed, as determined by the Owner, to a breach of a contract. In order to be considered for state-awarded contracts after this period, the Contractor/subcontractor will be required to forward acceptance reports to the Owner regarding successful completion of non-state projects during the intervening twelve (12) months from the date of default. No contracts will be awarded to a subcontractor/Contractor until the ability to perform responsibly in the private sector has been proven to the Owner.

ARTICLE 7.3 -- FOR CONVENIENCE

A. The Owner may terminate or suspend the Contract or any portion of the Work without cause at any time, and at the Owner's convenience. Notification of a termination or suspension shall be in writing

and shall be given to the Contractor and their surety. If the Contract is suspended, the notice will contain the anticipated duration of the suspension or the conditions under which work will be permitted to resume. If appropriate, the Contractor will be requested to demobilize and re-mobilize and will be reimbursed time and costs associated with the suspension.

B. Upon receipt of notification, the Contractor shall:

1. Cease operations when directed.

2. Take actions to protect the work and any stored materials.

3. Place no further subcontracts or orders for material, supplies, services or facilities except as may be necessary to complete the portion of the Contract that has not been terminated. No claim for payment of materials or supplies ordered after the termination date shall be considered.

4. Terminate all existing subcontracts, rentals, material, and equipment orders.

5. Settle all outstanding liabilities arising from termination with subcontractors and suppliers.

6. Transfer title and deliver to the Owner, work in progress, completed work, supplies and other material produced or acquire for the work terminated, and completed or partially completed plans, drawings information and other property that, if the Contract had been completed, would be required to be furnished to the Owner.

C. For termination without cause and at the Owner's convenience, in addition to payment for work completed prior to date of termination, the Contractor may be entitled to payment of other documented costs directly associated with the early termination of the contract. Payment for anticipated profit and unapplied overhead will not be allowed.

SECTION 007300 - SUPPLEMENTARY CONDITIONS

1.0 GENERAL:

A. These Supplementary General Conditions clarify, add, delete, or otherwise modify standard terms and conditions of DIVISION 0, BIDDING AND CONTRACTING REQUIREMENTS.

2.0 CONTACT:

Project Manager: Sandra Walther
Division of Facilities Management, Design and Construction
301 West High Street, Room 730
Jefferson City, MO 65101
Telephone: 573-257-7322
Email: sandra.walther@oa.mo.gov

3.0 NOTICE: ALL BID MATERIALS ARE DUE AT THE TIME OF BID SUBMITTAL. THERE IS NO SECOND SUBMITTAL FOR THIS PROJECT.

4.0 FURNISHING CONSTRUCTION DOCUMENTS:

A. The Owner will furnish the Contractor with approximately 6 complete sets of drawings and specifications at no charge.

B. The Owner will furnish the Contractor with approximately 6 sets of explanatory or change drawings at no charge.

C. The Contractor may make copies of the documents as needed with no additional cost to the Owner.

5.0 SAFETY REQUIREMENTS

Contractor and subcontractors at any tier shall comply with RSMo 292.675 and Article 1.3, E, of Section 007213, General Conditions.

6.0 LEAD AND ASBESTOS CERTIFICATION REQUIREMENTS:

From SECTION 007213 – GENERAL CONDITIONS, Article 5.4.H.2, ADD receipt of Certification from Contractor meeting the requirements set forth in SECTION 013513.13 – SITE SECURITY AND HEALTH REQUIREMENTS, 3.4., NO ASBESTOS AND NO LEAD CERTIFICATION.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MIKE KEHOE, Governor

Annual Wage Order No. 33

Section 096
CITY OF ST. LOUIS CITY

In accordance with Section 290.262 RSMo 2000, within thirty (30) days after a certified copy of this Annual Wage Order has been filed with the Secretary of State as indicated below, any person who may be affected by this Annual Wage Order may object by filing an objection in triplicate with the Labor and Industrial Relations Commission, P.O. Box 599, Jefferson City, MO 65102-0599. Such objections must set forth in writing the specific grounds of objection. Each objection shall certify that a copy has been furnished to the Division of Labor Standards, P.O. Box 449, Jefferson City, MO 65102-0449 pursuant to 8 CSR 20-5.010(1). A certified copy of the Annual Wage Order has been filed with the Secretary of State of Missouri.

Original Signed by
Logan Hobbs, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2026**

Last Date Objections May Be Filed: **April 9, 2026**

Prepared by Missouri Department of Labor and Industrial Relations

CITY OF ST. LOUIS CITY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$68.05
Boilermaker	$47.06*
Bricklayer - Stone Mason	$67.67
Carpenter	$69.16
Lather	
Linoleum Layers & Cutter	
Millwright	
Pile Driver	
Cement Mason	$63.28
Plasterer	
Communication Technician	$55.55
Electrician (Inside Wireman)	$78.66
Electrician (Outside Lineman)	$47.06*
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Elevator Constructor	$106.55
Glazier	$71.86
Iron Worker	$74.68
Laborer	$59.67
Laborer - First Semi-Skilled	
Laborer - General	
Laborer - Second Semi-Skilled	
Laborer - Skilled	
Mason	$63.56
Marble Finisher	
Marble Mason	
Terrazzo Finisher	
Terrazzo Worker	
Tile Finisher	
Tile Setter	
Operating Engineer	$76.81
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group III - A	
Operating Engineer - Group IV	
Operating Engineer - Group V	
Painter	$57.26
Plumber	$83.95
Pipe Fitter	
Roofer/WaterProofer	$62.68
Sheet Metal Worker	$79.59
Sprinkler Fitter - Fire Protection	$86.89
Truck Driver	$47.06*
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

*** The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. The public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.**

****The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title as defined in RSMo Section 290.210.**

CITY OF ST. LOUIS CITY

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$71.40
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$83.01
Outside - Groundman	
Outside - Groundman Tree Trimmer	
Outside - Lineman Operator	
Outside - Lineman Tree Trimmer	
Laborer	$59.17
Laborer - General	
Laborer - Skilled	
Operating Engineer	$75.73
Operating Engineer - Group I	
Operating Engineer - Group II	
Operating Engineer - Group III	
Operating Engineer - Group IV	
Truck Driver	$47.06*
Truck Control Service Driver	
Truck Driver, Teamsters Group I	
Truck Driver, Teamsters Group II	
Truck Driver, Teamsters Group III	
Truck Driver, Teamsters Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance iwth the classifications of construction work established in 8 CSR 30-3.040(3).

Use Building Construction Rates on Building construction in accordance with the classifications of construction work established in 8 CSR 30-3.040(2).

If a worker is performing work on a heavy construction project within an occupational title that is not listed on the Heavy Construction Rate Sheet, use the rate for that occupational title shown on the Building Construction Rate Sheet.

***The Division of Labor Standards received fewer than 1,000 reportable hours for this occupational title. Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.**

****The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.**

OVERTIME
and
HOLIDAYS

OVERTIME

For all work performed on a Sunday or a holiday, not less than twice (2x) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work.

For all overtime work performed, not less than one and one-half (1½) the prevailing hourly rate of wages for work of a similar character in the locality in which the work is performed or the public works contracting minimum wage, whichever is applicable, shall be paid to all workers employed by or on behalf of any public body engaged in the construction of public works, exclusive of maintenance work or contractual obligation. For purposes of this subdivision, **"overtime work"** shall include work that exceeds ten hours in one day and work in excess of forty hours in one calendar week; and

A thirty-minute lunch period on each calendar day shall be allowed for each worker on a public works project, provided that such time shall not be considered as time worked.

HOLIDAYS

January first;
The last Monday in May;
July fourth;
The first Monday in September;
November eleventh;
The fourth Thursday in November; and
December twenty-fifth;

If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

SECTION 011000 – SUMMARY

GENERAL

1.1 RELATED DOCUMENTS

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

WORK COVERED BY CONTRACT DOCUMENTS

The Project consists of the following:

1. Project Location:
   Missouri School for the Blind, 3815 Magnolia Avenue, Saint Louis, Missouri 63110.
2. Owner:
   State of Missouri, Office of Administration, Division of Facilities Management, Design and Construction, Harry S. Truman State Office Building, Post Office Box 809, 301 West High Street, Jefferson City, Missouri 65102.

B. Contract Documents dated 29 JUNE 2026 were prepared for the Project by Patterhn Ives, LLC at 130 South Bemiston Avenue, Suite 800 Saint Louis, Missouri 63105.

C. The Work consists of new egress stair, infrastructure, site improvements, and playground equipment to serve the Missouri School for the Blind campus.

The Work includes:

1. Site Demolition: Remove existing site elements including pavement, concrete porch stair and handrails, landscaping, topsoil, existing playground equipment, and any other obstructions indicated for demolition within project limits. Locate, protect, and relocate existing utilities as shown on the Drawings. Salvage play equipment for reuse as indicated on the Drawings.
2. Asbestos containing materials have been identified in one interior location. Remediate the asbestos containing materials.
3. Civil & Site Improvements: Perform excavation, fill, compaction, and finish grading to achieve design elevations, ensure proper drainage, and prepare subgrade for subsequent improvements. Furnish and install new downspout piping. Modify one existing storm structure. Install soil, mulch, and landscape edging within new planter bed areas as indicated on plans. Modify existing irrigation system to meet new design requirements. Install new playground surface, including concrete or aggregate base, as indicated on plans. Install new playground equipment and install salvaged existing playground equipment.
4. Architecture: Install new stair tower to provide additional egress from two existing buildings, accessed via five new doors at enlarged existing window openings, reusing existing lintels. The new stair has an integral slide. A metal screen wall encloses the stairs, and the south wall of the screen has a custom perforated design. The stair system including stair structure, handrails, guardrails (for stair, porch and terrace), treads, landings and miscellaneous components are to be fully engineered and constructed by a single design-build contractor responsible for the metal fabrication components of the project. Guardrails at the new roof terrace, and existing porch are continuous with the new stair guardrails. Re-roof existing porch roof and install pedestal paver system with select new gutter and downspouts.

5. Structural: Structural engineering scope includes metal roof diaphragm, structural steel beams, structural steel connections, wood blocking, concrete pilasters, and concrete spread footings.

6. Mechanical / Plumbing: Demolish limited components to accommodate new exit doors. Provision and installation of new hose bibb.

7. Electrical: Demolish existing devices and underground conduit to support adding additional exits door and stair tower. Add new receptacles to support new outdoor areas. Add new site lighting for stair tower and new landscaped areas, connected to existing Wattstopper lighting control system. Add new CCTV cameras connected and integrated to existing CCTV system. Add new card readers connected and integrated to existing access control system. Add snow melt system for path of egress for patio.

    a. ALTERNATE: Add snow melt system for entire patio.

D. The Work will be constructed under a single prime contract.

1.3 WORK SEQUENCE

A. The Work will be conducted in a single phase.

1. Work of this phase shall be substantially complete, ready for occupancy within **two hundred forty-five working days** of commencement of construction.

1.4 CONTRACTOR USE OF PREMISES

A. General: During the construction period the Contractor shall have partial use of the premises for construction operations, including use of the site. The Contractor's use of the premises limited only by the Owner's right to perform work or to retain other contractors on portions of the Project.

B. Use of the Site: Confine operations to areas within contract limits indicated. Do not disturb portions of the site beyond the areas in which the Work is indicated.

1. Owner Occupancy: The Owner will occupy the site and existing building during the entire construction period. Cooperate with the Owner during construction operations to minimize conflicts and facilitate owner usage. Perform the Work so as not to interfere with the Owner's operations.

2. Driveways and Entrances: Keep driveways and entrances serving the premises clear and available to the Owner, the Owner's employees, and emergency vehicles at all times. Do not use these areas for parking or storage of materials. Schedule deliveries to minimize space and time requirements for storage of materials and equipment on-site.

C. Use of the Existing Building: Maintain the existing building in a weathertight condition throughout the construction period. Repair damage cause by construction operations. Take all precautions necessary to protect the building and its occupants during the construction period.

D. Fully coordinate site access and materials storage prior to the commencement of the project.

E. Fully coordinate temporary closure of existing egress doors entering the project area to ensure egress requirements are met and site security is maintained.

F. The student population at the school is visually impaired. Contractor shall take all additional precautions necessary to protect the students.

OCCUPANCY REQUIREMENTS

1.6 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockups of areas as indicated on Drawings or specified herein.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Subject to compliance with requirements, approved mockups may become park of the completed Work if undisturbed at time of Substantial Completion.
4. Refer to respective specification sections for requirements associated with mockups as required by section.

1.7 WORK RESTRICTIONS

A. Coordinate Work Restrictions with the School and State of Missouri OA designated professionals prior to commencement of the project.

1.8 SPECIFICATION AND DRAWING CONVENTIONS

A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Text Color: Text used in the Specifications, including units of measure, manufacturer and product names, and other text may appear in multiple colors or underlined as part of a hyperlink; no emphasis is implied by text with these characteristics.
3. Hypertext: Text used in the Specifications may contain hyperlinks. Hyperlinks may allow for access to linked information that is not residing in the Specifications. Unless otherwise indicated, linked information is not part of the Contract Documents.
4. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

B. Division 00 Contracting Requirements: General provisions of the Contract, including General and Supplementary Conditions, apply to all Sections of the Specifications.

C. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.

D. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:

1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.

2. Abbreviations: Materials and products are identified by abbreviations published as part of the U.S. National CAD Standard and scheduled on Drawings.
3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS [Not Used]

PART 3 - EXECUTION [Not Used]

END OF SECTION 011000

SECTION 012100 – ALLOWANCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Sheet A-103 of the Construction Documents indicates areas designated as “New Landscape”.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements governing allowances.

1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.

B. Types of allowances include the following:

1. Lump-sum allowances.
2. Weather allowances.

C. Related Sections include the following:

1. Division 01 section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.

1.3 WEATHER ALLOWANCE

A. Included within the completion period for this project are a specified number of “bad weather” days (see Schedule of Allowances).

B. The Contractor’s progress schedule shall clearly indicate the bad weather day allowance as an “activity” or “activities”. In the event weather conditions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to weather (a “bad weather” day) and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.

C. The Contractor’s Representative and the Construction Representative shall agree daily on the number of “bad weather” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “bad weather” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “bad weather” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “bad weather” day determination contained in that document.

D. There will be no modification to the time of contract performance due solely to the failure to deplete the “bad weather” day allowance.

E. Once this allowance is depleted, a no cost Change Order time extension will be executed for “bad weather” days, as defined above, encountered during the remainder of the Project.

1.4 FACILITY INTERRUPTION ALLOWANCE

A. Included within the completion period for this project are a specified number of “Facility Interruption” days (see Schedule of Allowances).

B. The Contractor’s progress schedule shall clearly indicate the facility interruption day allowance as an “activity” or “activities”. In the event facility interruptions preclude performance of critical work activities for 50% or more of the Contractor’s scheduled workday, that day shall be declared unavailable for work due to facility interruption and charged against the above allowance. Critical work activities will be determined by review of the Contractor’s current progress schedule.

C. The Contractor’s Representative and the Construction Representative shall agree monthly on the number of “facility interruption” days to be charged against the allowance. This determination will be documented in writing and be signed by the Contractor and the Construction Representatives. If there is a failure to agree on all or part of the “facility interruption” days for a particular month, that disagreement shall be noted on this written document and signed by each party’s representative. Failure of the Contractor’s representative to sign the “facility interruption” day documentation after it is presented, with or without the notes of disagreement, shall constitute agreement with the “facility interruption” day determination contained in that document.

D. There will be no modification to the time of contract performance due solely to the failure to deplete the “facility interruption” day allowance.

E. Once this allowance is depleted, a no cost Change Order time extension will be executed for “facility interruption days” days, as defined above, encountered during the remainder of the Project.

1.5 SELECTION AND PURCHASE

A. At the earliest practical date after award of the Contract, Designer of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.

B. At Designer's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work.

C. Purchase products and systems selected by Designer from the designated supplier.

1.6 SUBMITTALS

A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.

B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.

C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

1.7 COORDINATION

A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

1.8 LUMP-SUM ALLOWANCES

A. Unless otherwise indicated, Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials selected by Designer under allowance shall be included as part of the Contract Sum and not part of the allowance.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

3.2 PREPARATION

A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

3.3 SCHEDULE OF ALLOWANCES

A. Weather Allowance: Included within the completion period for this Project (5) “bad weather” days.

B. Facility Interruption: Included within the completion period for this Project (0) “facility interruption” days.

C. Landscape Plantings: Provide proposal from qualified landscape nursery for selection and installation of plantings for the areas identified on sheet A-103 of the Construction Documents as ‘New Landscape’. Included with the project budget is $8,000 for this scope of work.

END OF SECTION 012100

SECTION 012300 - ALTERNATES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.

1. Alternates described in this Section are part of the Work only if enumerated in the Agreement.
2. The cost or credit for each alternate is the net addition to or deduction from the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

A. Coordination: Revise or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.

1. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.

B. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated revisions to alternates.

1. Execute accepted alternates under the same conditions as other work of the Contract.

2. Schedule: A SCHEDULE OF ALTERNATES is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

A. Reference Playground Equipment Schedule on Sheet A-103 for Alternates 1-4.

B. Base Bid: Double 2-Person Swing and Wausau Furnishings (Items 5, 11-13) are base bid playground equipment scope.

C. Alternate No. 1: Ninja Course

1. Base Bid: NA
2. Alternate: Furnish and Install Playground Equipment #1, Ninja Course Equipment as scheduled and per Drawings, with custom finish and climbing wall.

D. Alternate No. 2: Basketball Goals, Bikes & Reinstall Existing Playground Equipment

1. Base Bid: NA
2. Alternate: Furnish and Install Playground Equipment #3-4, Basketball Goals, and Bikes as scheduled and per Drawings. Install Playground Equipment #8-10 (existing salvaged equipment) per Drawings and as scheduled.

E. Alternate No. 3: New Single Stainless Steel Slide that runs from S2 Landing to S1 Playground Level.

1. Base Bid: NA
2. Alternate: Furnish and Install Playground Equipment #6 as scheduled, within the stair tower as indicated in the Drawings.

F. Alternate No. 4: Heat Trace at Full Roof Terrace; Install New Single Stainless Steel Slide that runs from S4 Landing to S3 Landing.

1. Base Bid: Install heat trace at egress path on the new pedestal paver terrace, as indicated in the Drawings.
2. Alternate: Furnish and Install heat trace throughout full extent of new pedestal paver terrace.
3. Alternate: Furnish and Install Playground Equipment #7 as scheduled, within stair tower as indicated in the Drawings.
4. Reference specification section 077600 Roof Paver System.

END OF SECTION 012300

SECTION 012600 – CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements for handling and processing Contract Modifications.

B. Related Sections include the following:

1. Division 1, Section 012100 "Allowances" for procedural requirements for handling and processing Allowances.
2. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.
3. Division 0, Section 007213, Article 3.1 "Acceptable Substitutions" for administrative procedures for handling Requests for Substitutions made after Contract award.
4. Division 0, Section 007213, Article 4.0 "Changes in the Work" for Change Order requirements.

1.3 REQUESTS FOR INFORMATION

A. In the event that the Contractor or Subcontractor, at any tier, determines that some portion of the Drawings, Specifications, or other Contract Documents requires clarification or interpretation, the Contractor shall submit a “Request for Information” (RFI) in writing to the Designer. A RFI may only be submitted by the Contractor and shall only be submitted on the RFI forms provided by the Owner. The Contractor shall clearly and concisely set forth the issue for which clarification or interpretation is sought and why a response is needed. In the RFI, the Contractor shall set forth an interpretation or understanding of the requirement along with reasons why such an understanding was reached.

B. Responses to RFI shall be issued within ten (10) working days of receipt of the Request from the Contractor unless the Designer determines that a longer time is necessary to provide an adequate response. If a longer time is determined necessary by the Designer, the Designer will, within five (5) working days of receipt of the request, notify the Contractor of the anticipated response time. If the Contactor submits a RFI on a time sensitive activity on the current project schedule, the Contractor shall not be entitled to any time extension due to the time it takes the Designer to respond to the request provided that the Designer responds within the ten (10) working days set forth above.

C. Responses from the Designer will not change any requirement of the Contract Documents. In the event the Contractor believes that a response to a RFI will cause a change to the requirements of the Contract Document, the Contractor shall give written notice to the Designer requesting a Change Order for the work. Failure to give such written notice within ten (10) working days, shall waive the Contractor’s right to seek additional time or cost under Article 4, “Changes in the Work” of the General Conditions.

1.4 MINOR CHANGES IN THE WORK

A. Designer will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Amount or the Contract Time, on ”Designer’s Supplemental Instructions” (DSI).

1.5 PROPOSAL REQUESTS

A. The Designer or Owner Representative will issue a detailed description of proposed Changes in the Work that may require adjustment to the Contract Amount or the Contract Time. The proposed Change Description will be issued using the “Request for Proposal” (RFP) form. If necessary, the description will include supplemental or revised Drawings and Specifications.

1. Proposal Requests issued by the Designer or Owner Representative are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.

2. Within ten (10) working days after receipt of Proposal Request, submit a proposal for the cost adjustments to the Contract Amount and the Contract Time necessary to execute the Change. The Contractor shall submit his proposal on the appropriate Change Order Detailed Breakdown form. Subcontractors may use the appropriate Change Order Detailed Breakdown form or submit their proposal on their letterhead provided the same level of detail is included. All proposals shall include:

   a. A detailed breakdown of costs per Article 4.1 of the General Conditions.

   b. If requesting additional time per Article 4.2 of the General Conditions, include an updated Contractor's Construction Schedule that indicates the effect of the Change including, but not limited to, changes in activity duration, start and finish times, and activity relationship.

1.6 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, the Designer or Owner Representative will issue a Change Order for signatures of Owner and Contractor on the “Change Order” form.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600

SECTION 013100 – COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Projects including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.

B. Each Contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific Contractor.

C. Related Sections include the following:

1. Division 1, Section 013200 "Schedules" for preparing and submitting Contractor's Construction Schedule.
2. Articles 1.8.B and 1.8.C of Section 007213 "General Conditions" for coordinating meetings onsite.
3. Article 5.4.H of Section 007213 "General Conditions" for coordinating Closeout of the Contract.

1.3 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations included in different Sections, which depend on each other for proper installation, connection, and operation.

B. Coordination: Each Contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each Contractor shall coordinate its operations with operations included in different Sections that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other Contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required

maintenance, service, and repair of all components including mechanical and electrical.

C. Prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate Contractors if coordination of their Work is required.

D. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other Contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Startup and adjustment of systems.
8. Project Closeout activities.

E. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.4 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

B. Key Personnel Names: Within fifteen (15) work days of starting construction operations, submit a list of key personnel assignments including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.5 PROJECT MEETINGS

A. The Owner’s Construction Representative will schedule a Pre-Construction Meeting prior to beginning of construction. The date, time, and exact place of this meeting will be determined after Contract Award and notification of all interested parties. The Contractor shall arrange to have the Job Superintendent and all prime Subcontractors present at the

meeting. During the Pre-Construction Meeting, the construction procedures and information necessary for submitting payment requests will be discussed and materials distributed along with any other pertinent information.

1. Minutes: Designer will record and distribute meeting minutes.

B. Progress Meetings: The Owner's Construction Representative will conduct Monthly Progress Meetings as stated in Articles 1.8.B and 1.8.C of Section 007213 "General Conditions".

1. Minutes: Designer will record and distribute to Contractor the meeting minutes.

C. Preinstallation Conferences: Contractor shall conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of Manufacturers and Fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Designer and Construction Representative of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration including requirements for the following:

    a. Contract Documents

    b. Options

    c. Related RFIs

    d. Related Change Orders

    e. Purchases

    f. Deliveries

    g. Submittals

    h. Review of mockups

    i. Possible conflicts

    j. Compatibility problems

    k. Time schedules

    l. Weather limitations

    m. Manufacturer's written recommendations

    n. Warranty requirements

    o. Compatibility of materials

    p. Acceptability of substrates

    q. Temporary facilities and controls

    r. Space and access limitations

    s. Regulations of authorities having jurisdiction

    t. Testing and inspecting requirements

    u. Installation procedures

    v. Coordination with other Work

w. Required performance results

x. Protection of adjacent Work

y. Protection of construction and personnel

3. Contractor shall record significant conference discussions, agreements, and disagreements including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.

6. Project name

7. Name and address of Contractor

8. Name and address of Designer

9. RFI number including RFIs that were dropped and not submitted

10. RFI description

11. Date the RFI was submitted

12. Date Designer's response was received

13. Identification of related DSI or Proposal Request, as appropriate

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

ATTACHMENTS: Electronic Data Transfer Agreement

END OF SECTION 013100

SECTION 013115 - PROJECT MANAGEMENT COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 013300 – Submittals

C. Division 1, Section 012600 – Contract Modification Procedures

1.2 SUMMARY

A. Project Management Communications: The Contractor shall use the Internet web-based project management communications tool, Trimble Unity Construct® (Formerly eBuilder) ASP software, and protocols included in that software during this project. The use of project management communications as herein described does not replace or change any contractual responsibilities of the participants.

1. Project management communications is available through Trimble Unity Construct® (Formerly eBuilder) as provided by "Trimble Unity Construct®" in the form and manner required by the Owner.

2. The project communications database is on-line and fully functional. User registration, electronic and computer equipment, and Internet connections are the responsibility of each project participant. The sharing of user accounts is prohibited

B. Support: Trimble Unity Construct® (Formerly eBuilder) will provide on-going support through on-line help files.

C. Copyrights and Ownership: Nothing in this specification or the subsequent communications supersedes the parties' obligations and rights for copyright or document ownership as established by the Contract Documents. The use of CAD/BIM files, processes or design information distributed in this system is intended only for the project specified herein.

D. Purpose: The intent of using Trimble Unity Construct®(Formerly eBuilder) is to improve project work efforts by promoting timely initial communications and responses. Secondly, to reduce the number of paper documents while providing improved record keeping by creation of electronic document files

E. Authorized Users: Access to the web site will be by individuals who are authorized users.

1. Individuals shall complete the Trimble Unity Construct (Formerly eBuilder) New Company/User Request Form located at the following web site: https://oa.mo.gov/facilities/vendor-links/contractor-forms. Completed forms shall be emailed to the following email address: OA.FMDCE-BuilderSupport@oa.mo.gov.

2. Authorized users will be contacted directly and assigned a temporary user password.

3. Individuals shall be responsible for the proper use of their passwords and access to data as agents of the company in which they are employed.

F. Administrative Users: Administrative users have access and control of user licenses and all posted items. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE! Improper or abusive language toward any party or repeated posting of items intended to deceive or disrupt the work of the project will not be tolerated and will result in deletion of the offensive items and revocation of user license at the sole discretion of the Administrative User(s).

G. Communications: The use of fax, email and courier communication for this project is discouraged in favor of using Trimble Unity Construct® (Formerly eBuilder) to send messages. Communication functions are as follows:

1. Document Integrity and Revisions:

    a. Documents, comments, drawings and other records posted to the system shall remain for the project record. The authorship time and date shall be recorded for each document submitted to the system. Submitting a new document or record with a unique ID, authorship, and time stamp shall be the method used to make modifications or corrections.
    b. The system shall make it easy to identify revised or superseded documents and their predecessors.
    c. Server or Client-side software enhancements during the life of the project shall not alter or restrict the content of data published by the system. System upgrades shall not affect access to older documents or software.

2. Document Security:

    a. The system shall provide a method for communication of documents. Documents shall allow security group assignment to respect the contractual parties communication except for Administrative Users. DO NOT POST PRIVATE OR YOUR COMPANY CONFIDENTIAL ITEMS IN THE DATABASE!

3. Document Integration:

    a. Documents of various types shall be logically related to one another and discoverable. For example, requests for information, daily field reports, supplemental sketches and photographs shall be capable of reference as related records.

4. Reporting:

    a. The system shall be capable of generating reports for work in progress, and logs for each document type. Summary reports generated by the system shall be available for team members.

5. Notifications and Distribution:

    a. Document distribution to project members shall be accomplished both within the extranet system and via email as appropriate. Project document distribution to parties outside of the project communication system shall be accomplished by secure email of outgoing documents and attachments, readable by a standard email client.

6. Required Document Types:

    a. RFI, Request for Information.
    b. Submittals, including record numbering by drawing and specification section.
    c. Transmittals, including record of documents and materials delivered in hard copy.
    d. Meeting Minutes.
    e. Application for Payments (Draft or Pencil).
    f. Review Comments.
    g. Field Reports.
    h. Construction Photographs.

i. Drawings.
j. Supplemental Sketches.
k. Schedules.
l. Specifications.
m. Request for Proposals
n. Designer's Supplemental Instructions
o. Punch Lists

H. Record Keeping: Except for paper documents, which require original signatures and large format documents (greater than 8½ x 11 inches), all other 8½ x 11 inches documents shall be submitted by transmission in electronic form to the Trimble Unity Construct® (Formerly eBuilder) web site by licensed users.

a. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier shall respond to documents received in electronic form on the web site and consider them as if received in paper document form.

b. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier reserves the right to and shall reply or respond by transmissions in electronic form on the web site to documents actually received in paper document form.

c. The Owner and his representatives, the Designer and his consultants, and the Contractor and his Subcontractors and suppliers at every tier reserves the right to and shall copy any paper document into electronic form and make same available on the web site.

I. Minimum Equipment and Internet Connection: In addition to other requirements specified in this Section, the Owner and his representatives, the Construction Manager and his representatives, the Architect and his consultants, and the Contractor and his sub-contractors and suppliers at every tier required to have a user license(s) shall be responsible for the following:

1. Providing suitable computer systems for each licensed user at the users normal work location[1] with high-speed Internet access, i.e. DSL, local cable company's Internet connection, or T1 connection.
2. Each of the above referenced computer systems shall have the following minimum system[2] and software requirements:

a. Desktop configuration (Laptop configurations are similar and should be equal to or exceed desktop system.)

1) Operating System: Windows XP or newer
2) Internet Browser: Internet Explorer 6.01SP2+ (Recommend IE7.0+)
3) Minimum Recommend Connection Speed: 256K or above
4) Processor Speed: 1 Gigahertz and above
5) RAM: 512 mb
6) Operating system and software shall be properly licensed.
7) Internet Explorer version 7 (current version is a free distribution for download). This specification is not intended to restrict the host server or client computers provided that industry standard HTTP clients may access the published content.
8) Adobe Acrobat Reader (current version is a free distribution for download).

[1] The normal work location is the place where the user is assigned for more than one-half of his time working on this project.
[2] The minimum system herein will not be sufficient for many tasks and may not be able to process all documents and files stored in the Trimble Unity Construct® (Formerly eBuilder) Documents area.

9) Users should have the standard Microsoft Office Suite (current version must be purchased) or the equivalent.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable.)

END OF SECTION 013115

SECTION 013200 – SCHEDULE – BAR CHART

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for a Bar Chart Schedule for the project construction activities, schedule of submittals, and schedule for testing.

PART 2 - PRODUCTS – (Not Applicable)

PART 3 - EXECUTION

3.1 SUBMITTAL PROCEDURES

A. The Contractor shall submit to the Designer, within ten (10) working days following the Notice to Proceed, a Progress Schedule including Schedule of Values showing the rate of progress the Contractor agrees to maintain and the order in which he proposed to carry out the various phases of Work. No payments shall be made to the Contractor until the Progress Schedule has been approved by the Owner.

1. The Schedule of Values must have the following line items included with the value of the item as indicated below:

   a. O&M's (Owner's Manual)

      1) $1,000,000.00 (One million) and under – 2% of the total contract amount

      2) Over $1,000,000.00 (One million) – 1% of the total contract amount

   b. Close Out Documents

      1) $1,000,000.00 (One million) and under – 2% of the total contract amount

      2) Over $1,000,000.00 (One million) – 1% of the total contract amount

   c. General Conditions

      1) No more than 10%

B. The Contractor shall submit an updated Schedule for presentation at each Monthly Progress Meeting. The Schedule shall be updated by the Contractor as necessary to reflect the current Schedule and its relationship to the original Schedule. The updated Schedule shall reflect any changes in the logic, sequence, durations, or completion date. Payments to the Contractor shall be suspended if the Progress Schedule is not adequately updated to reflect actual conditions.

C. The Contractor shall submit Progress Schedules to Subcontractors to permit coordinating their Progress Schedules to the general construction Work. The Contractor shall coordinate preparation and processing of Schedules and reports with performance of other construction activities.

3.2 CONSTRUCTION PROGRESS SCHEDULE – BAR CHART SCHEDULE

A. Bar-Chart Schedule: The Contractor shall prepare a comprehensive, fully developed, horizontal bar chart-type Contractor's Construction Schedule. The Contractor for general construction shall prepare the Construction Schedule for the entire Project. The Schedule shall show the percentage of work to be completed at any time, anticipated monthly payments by Owner, as well as significant dates (such as completion of excavation, concrete foundation work, underground lines, superstructure, rough-ins, enclosure, hanging of fixtures, etc.) which shall serve as check points to determine compliance with the approved Schedule. The Schedule shall also include an activity for the number of "bad" weather days specified in Section 012100 – Allowances.

1. The Contractor shall provide a separate time bar for each significant construction activity. Provide a continuous vertical line to identify the first working day of each week.

    a. If practical, use the same Schedule of Values breakdown for schedule time bars.

2. The Contractor shall provide a base activity time bar showing duration for each construction activity. Each bar is to indicate start and completion dates for the activity. The Contractor is to place a contrasting bar below each original schedule activity time for indicating actual progress and planned remaining duration for the activity.

3. The Contractor shall prepare the Schedule on a minimal number of separate sheets to readily show the data for the entire construction period.

4. Secure time commitments for performing critical elements of the Work from parties involved. Coordinate each element on schedule with other construction activities. Include minor elements involved in the overall sequence of the Work. Show each activity in proper sequence. Indicate graphically the sequences necessary for completion of related portions of the Work.

5. Coordinate the Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittal Schedule, progress reports, payment requests, and other required schedules and reports.

6. Indicate the Intent to Award and the Contract Substantial Completion dates on the schedule.

B. Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:

1. Requirement for Phased completion

2. Work by separate Contractors

3. Work by the Owner

4. Pre-purchased materials

5. Coordination with existing construction

6. Limitations of continued occupancies

7. Un-interruptible services
8. Partial Occupancy prior to Substantial Completion
9. Site restrictions
10. Provisions for future construction
11. Seasonal variations
12. Environmental control

C. Work Stages: Use crosshatched bars to indicate important stages of construction for each major portion of the Work. Such stages include, but are not necessarily limited to, the following:

1. Subcontract awards
2. Submittals
3. Purchases
4. Mockups
5. Fabrication
6. Sample testing
7. Deliveries
8. Installation
9. Testing
10. Adjusting
11. Curing
12. Startup and placement into final use and operation

D. Area Separations: Provide a separate time bar to identify each major area of construction for each major portion of the Work. For the purposes of this Article, a "major area" is a story of construction, a separate building, or a similar significant construction element.

1. Indicate where each construction activity within a major area must be sequenced or integrated with other construction activities to provide for the following:
    a. Structural completion.
    b. Permanent space enclosure
    c. Completion of mechanical installation
    d. Completion of the electrical portion of the Work
    e. Substantial Completion

3.3 SCHEDULE OF SUBMITTALS

A. Upon acceptance of the Construction Progress Schedule, prepare and submit a complete schedule of submittals. Coordinate the submittal schedule with Section 013300 SUBMITTALS, the approved Construction Progress Schedule, list of subcontracts, Schedule of Values and the list of products.

B. Prepare the schedule in chronological order. Provide the following information

1. Scheduled date for the first submittal
2. Related Section number
3. Submittal category
4. Name of the Subcontractor
5. Description of the part of the Work covered
6. Scheduled date for resubmittal
7. Scheduled date for the Designer's final release or approval

C. Distribution: Following the Designer's response to the initial submittal schedule, print and distribute copies to the Designer, Owner, subcontractors, and other parties required to comply with submittal dates indicated.

1. Post copies in the Project meeting room and temporary field office.
2. When revisions are made, distribute to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned part of the Work and are no longer involved in construction activities.

D. Schedule Updating: Revise the schedule after each meeting or other activity where revisions have been recognized or made. Issue the updated schedule concurrently with the report of each meeting.

3.4 SCHEDULE OF INSPECTIONS AND TESTS

A. Prepare a schedule of inspections, tests, and similar services required by the Contract Documents. Submit the schedule with (15) days of the date established for commencement of the Contract Work. The Contractor is to notify the testing agency at least (5) working days in advance of the required tests unless otherwise specified.

B. Form: This schedule shall be in tabular form and shall include, but not be limited to, the following:

1. Specification Section number
2. Description of the test
3. Identification of applicable standards
4. Identification of test methods
5. Number of tests required
6. Time schedule or time span for tests
7. Entity responsible for performing tests
8. Requirements for taking samples
9. Unique characteristics of each service

C. Distribution: Distribute the schedule to the Owner, Architect, and each party involved in performance of portions of the Work where inspections and tests are required.

END OF SECTION 013200

SECTION 013300 – SUBMITTALS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Division 1, Section 013115 “Project Management Communications” for administrative requirements for communications.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submittals required for performance of the Work including the following:

1. Shop Drawings
2. Product Data
3. Samples
4. Quality Assurance Submittals
5. Construction Photographs
6. Operating and Maintenance Manuals
7. Warranties

B. Administrative Submittals: Refer to General and Supplementary Conditions other applicable Division 1 Sections and other Contract Documents for requirements for administrative submittals. Such submittals include, but are not limited to, the following:

1. Construction Progress Schedule including Schedule of Values
2. Performance and Payment Bonds
3. Insurance Certificates
4. Applications for Payment
5. Certified Payroll Reports
6. Partial and Final Receipt of Payment and Release Forms
7. Affidavit – Compliance with Prevailing Wage Law
8. Record Drawings
9. Notifications, Permits, etc.

C. The Contractor is obliged and responsible to check all shop drawings and schedules to assure compliance with contract plans and specifications. The Contractor is responsible for the content of the shop drawings and coordination with other contract work. Shop drawings and schedules shall indicate, in detail, all parts of an Item or Work including erection and setting instructions and integration with the Work of other trades.

D. The Contractor shall at all times make a copy, of all approved submittals, available on site to the Construction Representative.

1.3 SUBMITTAL PROCEDURES

A. The Contractor shall comply with the General and Supplementary Conditions and other applicable sections of the Contract Documents. The Contractor shall submit, with such promptness as to cause no delay in his work or in that of any other contractors, all required submittals indicated in Part 3.1 of this section and elsewhere in the Contract Documents. Coordinate preparation and processing of submittals with performance of construction activities. Transmit each submittal sufficiently in advance of performance of related construction activities to avoid delay.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related elements of the Work so processing will not be delayed by the need to review submittals concurrently for coordination.

    a. The Designer reserves the right to withhold action on a submittal requiring coordination with other submittals until all related submittals are received.

B. Each drawing and/or series of drawings submitted must be accompanied by a letter of transmittal giving a list of the titles and numbers of the drawings. Each series shall be numbered consecutively for ready reference and each drawing shall be marked with the following information:

1. Date of Submission
2. Name of Project
3. Location
4. Section Number of Specification
5. State Project Number
6. Name of Submitting Contractor
7. Name of Subcontractor
8. Indicate if Item is submitted as specified or as a substitution

1.4 SHOP DRAWINGS

A. Comply with the General Conditions, Article 3.2.

B. The Contractor shall submit newly prepared information drawn accurately to scale. Highlight, encircle, or otherwise indicate deviations from the Contract Documents. Do not reproduce Contract Documents or copy standard information as the basis of Shop Drawings. Standard information prepared without specific reference to the Project is not a Shop Drawing.

C. Shop Drawings include fabrication and installation drawings, setting diagrams, schedules, patterns, templates, and similar drawings including the following information:

1. Dimensions
2. Identification of products and materials included by sheet and detail number
3. Compliance with specified standards
4. Notation of coordination requirements

5. Notation of dimensions established by field measurement

6. Sheet Size: Except for templates, patterns and similar full-size Drawings, submit Shop Drawings on sheets at least 8½"x11" but no larger than 36"x48".

1.5 PRODUCT DATA

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall collect Product Data into a single submittal for each element of construction or system. Product Data includes printed information, such as manufacturer's installation instructions, catalog cuts, standard color charts, roughing-in diagrams and templates, standard wiring diagrams, and performance curves.

1. Mark each copy to show applicable choices and options. Where printed Product Data includes information on several products that are not required, mark copies to indicate the applicable information including the following information:

   a. Manufacturer's printed recommendations

   b. Compliance with Trade Association standards

   c. Compliance with recognized Testing Agency standards

   d. Application of Testing Agency labels and seals

   e. Notation of dimensions verified by field measurement

   f. Notation of coordination requirements

2. Do not submit Product Data until compliance with requirements of the Contract Documents has been confirmed.

1.6 SAMPLES

A. The Contractor shall comply with the General Conditions, Article 3.2.

B. The Contractor shall submit full-size, fully fabricated samples, cured and finished as specified, and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or containers of materials, color range sets, and swatches showing color, texture, and pattern.

1. The Contractor shall mount or display samples in the manner to facilitate review of qualities indicated. Prepare samples to match the Designer's sample including the following:

   a. Specification Section number and reference

   b. Generic description of the Sample

   c. Sample source

   d. Product name or name of the Manufacturer

   e. Compliance with recognized standards

   f. Availability and delivery time

2. The Contractor shall submit samples for review of size, kind, color, pattern, and texture. Submit samples for a final check of these characteristics with other elements and a comparison of these characteristics between the final submittal and the actual component as delivered and installed.

a. Where variation in color, pattern, texture, or other characteristic is inherent in the material or product represented, submit at least three (3) multiple units that show approximate limits of the variations.

b. Refer to other Specification Sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation, and similar construction characteristics.

c. Refer to other Sections for samples to be returned to the Contractor for incorporation in the Work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

d. Samples not incorporated into the Work, or otherwise designated as the Owner's property, are the property of the Contractor and shall be removed from the site prior to Substantial Completion.

3. Field samples are full-size examples erected onsite to illustrate finishes, coatings, or finish materials and to establish the Project standard.

a. The Contractor shall comply with submittal requirements to the fullest extent possible. The Contractor shall process transmittal forms to provide a record of activity.

1.7 QUALITY ASSURANCE DOCUMENTS

A. The Contractor shall comply with the General Conditions, Article 3.2

B. The Contractor shall submit quality control submittals including design data, certifications, manufacturer's instructions, manufacturer's field reports, and other quality-control submittals as required under other Sections of the Specifications.

C. Certifications: Where other Sections of the Specifications require certification that a product, material, or installation complies with specified requirements, submit a notarized certification from the Manufacturer certifying compliance with specified requirements.

1. Signature: Certification shall be signed by an officer of the Manufacturer or other individual authorized to contractually bind the Company.

D. Inspection and Test Reports: The Contractor shall submit the required inspection and test reports from independent testing agencies as specified in this Section and in other Sections of the Contract Documents.

E. Construction Photographs: The Contractor shall submit record construction photographs as specified in this Section and in other Sections of the Contract Documents.

1. The Contractor shall submit digital photographs. The Construction Administrator shall determine the quantity and naming convention at the preconstruction meeting.

2. The Contractor shall identify each photograph with project name, location, number, date, time, and orientation.

3. The Contractor shall submit progress photographs monthly unless specified otherwise. Photographs shall be taken one (1) week prior to submitting.

4. The Contractor shall take four (4) site photographs from differing directions and a minimum of five (5) interior photographs indicating the relative progress of the Work.

1.8 OPERATING AND MAINTENANCE MANUALS AND WARRANTIES

A. The Contractor shall submit all required manufacturer's operating instructions, maintenance/service manuals, and warranties in accordance with the General Conditions, Article 3.5, and Supplementary Conditions along with this and other Sections of the Contract Documents.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 REQUIRED SUBMITTALS

A. Contractor shall submit the following information for materials and equipment to be provided under this contract.

SPEC SECTION	TITLE	CATEGORY
013100	Coordination	List of Subcontractors
013200	Schedules	Construction Schedule
013200	Schedules	Submittal Schedule
013200	Schedules	Testing Schedule
13513.13	Site Security and Health Requirements	Product Data
13513.13	Site Security and Health Requirements	List of Employees
13513.13	Site Security and Health Requirements	Certification/Qualification
13513.13	Site Security and Health Requirements	Construction Schedule
014000	Quality Requirements	Shop Drawings
014000	Quality Requirements	Certification/Qualification
014000	Quality Requirements	Test Report
014000	Quality Requirements	Construction Schedule
017300	Execution	Certification/Qualification
017300	Execution	Construction Schedule
017900	Demonstration and Training	Operation / Maintenance Manual
017900	Demonstration and Training	Construction Schedule
24119	Selective Demolition	Certification/Qualification
24119	Selective Demolition	Test Report
28000	Facility Remediation, Abatement and Disposal	Shop Drawings
28000	Facility Remediation, Abatement and Disposal	Certification/Qualification
28000	Facility Remediation, Abatement and Disposal	Test Report
032000	Concrete Reinforcing	Product Data
032000	Concrete Reinforcing	Shop Drawings

032000	Concrete Reinforcing	Certification/Qualification
032000	Concrete Reinforcing	Test Report
033000	Cast-In-Place Concrete	Product Data
033000	Cast-In-Place Concrete	Certification/Qualification
033000	Cast-In-Place Concrete	Shop Drawings
033000	Cast-In-Place Concrete	Sample
033000	Cast-In-Place Concrete	Schedule
040120	Masonry Repair & Repointing	Certification/Qualification
055000	Metal Fabrications	Delegated Design
055000	Metal Fabrications	Product Data
055000	Metal Fabrications	Shop Drawings
055000	Metal Fabrications	Certification/Qualification
051200	Structural Steel Framing	Product Data
051200	Structural Steel Framing	Shop Drawings
051200	Structural Steel Framing	Certification/Qualification/Qualification
051200	Structural Steel Framing	Test Report
051200	Structural Steel Framing	Delegated Design
061000	Routh Carpentry	Product Data
061000	Routh Carpentry	Certification/Qualification
061600	Sheathing	Product Data
074113	Formed Metal Roof Panel System	Product Data
074113	Formed Metal Roof Panel System	Shop Drawings
074113	Formed Metal Roof Panel System	Sample
074113	Formed Metal Roof Panel System	Certification/Qualification
074113	Formed Metal Roof Panel System	Delegated Design
074113	Formed Metal Roof Panel System	Operation / Maintenance Manual
074113	Formed Metal Roof Panel System	Mock up
074113	Formed Metal Roof Panel System	Warranty
075423	TPO Roofing System	Product Data
075423	TPO Roofing System	Shop Drawings
075423	TPO Roofing System	Sample
075423	TPO Roofing System	Certification/Qualification
075423	TPO Roofing System	Operation / Maintenance Manual
075423	TPO Roofing System	Warranty
076200	Sheet Metal Flashing and Trim	Product Data
076200	Sheet Metal Flashing and Trim	Shop Drawings
076200	Sheet Metal Flashing and Trim	Sample
076200	Sheet Metal Flashing and Trim	Certification/Qualification
076200	Sheet Metal Flashing and Trim	Test Report
076200	Sheet Metal Flashing and Trim	Operation / Maintenance Manual
076200	Sheet Metal Flashing and Trim	Warranty
077100	Roof Specialties	Product Data
077100	Roof Specialties	Shop Drawings

077100	Roof Specialties	Sample
077100	Roof Specialties	Certification/Qualification
077100	Roof Specialties	Test Report
077100	Roof Specialties	Operation / Maintenance Manual
077100	Roof Specialties	Warranty
077600	Roof Paver System	Product Data
077600	Roof Paver System	Sample
077600	Roof Paver System	Shop Drawings
077600	Roof Paver System	Test Report
077600	Roof Paver System	Certification/Qualification
077600	Roof Paver System	Warranty
077600	Roof Paver System	Operation / Maintenance Manual
077600	Roof Paver System	Mock up
078446	Firestopping	Product Data
078446	Firestopping	Shop Drawings
078446	Firestopping	Certification/Qualification
078446	Firestopping	Test Report
079200	Joint Sealant	Product Data
079200	Joint Sealant	Sample
079200	Joint Sealant	Schedule
079200	Joint Sealant	Certification/Qualification
084113	Aluminum Framed Entrances	Product Data
084113	Aluminum Framed Entrances	Shop Drawings
084113	Aluminum Framed Entrances	Sample
084113	Aluminum Framed Entrances	Certification/Qualification
084113	Aluminum Framed Entrances	Delegated Design
084113	Aluminum Framed Entrances	Test Report
084113	Aluminum Framed Entrances	Mock up
084113	Aluminum Framed Entrances	Operation / Maintenance Manual
087100	Door Hardware	Product Data
087100	Door Hardware	Sample
087100	Door Hardware	Schedule
087100	Door Hardware	Certification/Qualification
087100	Door Hardware	Test Report
087100	Door Hardware	Operation / Maintenance Manual
088000	Glazing	Product Data
088000	Glazing	Sample
088000	Glazing	Certification/Qualification
088000	Glazing	Delegated Design
088000	Glazing	Test Report
088000	Glazing	Mock up
092216	Non-Load Bearing Metal Framing	Product Data
092216	Non-Load Bearing Metal Framing	Certification/Qualification

092900	Gypsum Board Assemblies	Product Data
092900	Gypsum Board Assemblies	Shop Drawings
092900	Gypsum Board Assemblies	Sample
092900	Gypsum Board Assemblies	Mock up
096513	Resilient Base and Accessories	Product Data
096513	Resilient Base and Accessories	Sample
096513	Resilient Base and Accessories	Test Report
099100	Painting	Product Data
099100	Painting	Mock up
099611	High-Performance Coating	Product Data
099611	High-Performance Coating	Sample
099611	High-Performance Coating	Mock up
104416	Fire Extinguishers	Product Data
104416	Fire Extinguishers	Schedule
104416	Fire Extinguishers	Operation / Maintenance Manual
104416	Fire Extinguishers	Warranty
116800	Playfield Equipment and Structures	Product Data
116800	Playfield Equipment and Structures	Sample
116800	Playfield Equipment and Structures	Shop Drawings
116800	Playfield Equipment and Structures	Delegated Design
116800	Playfield Equipment and Structures	Warranty
116800	Playfield Equipment and Structures	Test Report
116800	Playfield Equipment and Structures	Quality Control Report
116800	Playfield Equipment and Structures	Operation / Maintenance Manual
260519	Low-Voltage Electrical Power Conductors and Cables	Product Data
260519	Low-Voltage Electrical Power Conductors and Cables	Operation / Maintenance Manual
260526	Grounding and Bonding for Electrical Systems	Product Data
260526	Grounding and Bonding for Electrical Systems	Quality Control Report
260526	Grounding and Bonding for Electrical Systems	Operation / Maintenance Manual
260533	Raceway for Electrical Systems	Product Data
260534	Boxes for Electrical Systems	Product Data
260543	Underground Ducts and Raceways for Electrical Systems	Product Data
260543	Underground Ducts and Raceways for Electrical Systems	Installation Manual
260543	Underground Ducts and Raceways for Electrical Systems	Parts List
260543	Underground Ducts and Raceways for Electrical Systems	Installation Manual

260543	Underground Ducts and Raceways for Electrical Systems	Operation / Maintenance Manual
260544	Sleeves and Seals for Electrical	Product Data
260544	Sleeves and Seals for Electrical	Parts List
260544	Sleeves and Seals for Electrical	Quality Control Report
260544	Sleeves and Seals for Electrical	Installation Manual
260548	Seismic Restraint	Product Data
260548	Seismic Restraint	Shop Drawings
260548	Seismic Restraint	Certification/Qualification
260533	Identification for Electrical Systems	Product Data
260533	Identification for Electrical Systems	Schedule
260573	Arc Flash Hazard, Short Circuit Analysis, Selective Coordination	Test Report
260573	Arc Flash Hazard, Short Circuit Analysis, Selective Coordination	Operation / Maintenance Manual
260923	Lighting Control Devices	Product Data
260923	Lighting Control Devices	Shop Drawings
260923	Lighting Control Devices	Operation / Maintenance Manual
260943	Network/Addressible Lighting Controls	Product Data
260943	Network/Addressible Lighting Controls	Shop Drawings
260943	Network/Addressible Lighting Controls	Operation / Maintenance Manual
262416	Panelboards	Product Data
262416	Panelboards	Shop Drawings
262416	Panelboards	Installation Manual
262416	Panelboards	Operation / Maintenance Manual
262416	Panelboards	Parts List
262726	Wiring Devices	Product Data
262816	Disconnect Switches	Product Data
263323	Emergency Lighting Inverters	Product Data
263323	Emergency Lighting Inverters	Shop Drawings
263323	Emergency Lighting Inverters	Installation Manual
263323	Emergency Lighting Inverters	Test Report
263323	Emergency Lighting Inverters	Operation / Maintenance Manual
265100	LED Interior Lighting	Product Data
265100	LED Interior Lighting	Shop Drawings
265100	LED Interior Lighting	Operation / Maintenance Manual
265213	Emergency Lighting Transfer Devices	Product Data
265213	Emergency Lighting Transfer Devices	Operation / Maintenance Manual
266020	Electrical Suface Snow/Ice Melt	Product Data
266020	Electrical Suface Snow/Ice Melt	Shop Drawings
266020	Electrical Suface Snow/Ice Melt	Operation / Maintenance Manual
266020	Electrical Suface Snow/Ice Melt	Test Report
266020	Electrical Suface Snow/Ice Melt	Installation Photographs

270528	Pathways for Communication Systems	Product Data
271323	Communications Optical Fiber Backbone Cabling	Product Data
271323	Communications Optical Fiber Backbone Cabling	Installation Manual
271323	Communications Optical Fiber Backbone Cabling	Test Report
271513	Communications Copper Horizontal Cabling Systems	Product Data
271513	Communications Copper Horizontal Cabling Systems	Installation Manual
281300	Access Control Systems	Product Data
281300	Access Control Systems	Shop Drawings
281300	Access Control Systems	Certification/Qualification
281300	Access Control Systems	Test Report
281300	Access Control Systems	Operation / Maintenance Manual
281300	Access Control Systems	Warranty
282300	Video Surveillance Systems	Product Data
282300	Video Surveillance Systems	Shop Drawings
282300	Video Surveillance Systems	Parts List
282300	Video Surveillance Systems	Operation / Maintenance Manual
282300	Video Surveillance Systems	Quality Control Report
282300	Video Surveillance Systems	Warranty
283000	Fire Detection and Alarm System	Shop Drawings
283000	Fire Detection and Alarm System	Certification/Qualification
321123	Aggregate Base Courses	Certification/Qualification
321123	Aggregate Base Courses	Test Report
321313	Concrete Paving	Product Data
321313	Concrete Paving	Test Report
321816,13	Playground Protective Surfacing	Product Data
321816,13	Playground Protective Surfacing	Shop Drawings
321816,13	Playground Protective Surfacing	Sample
321816,13	Playground Protective Surfacing	Certification/Qualification
321816,13	Playground Protective Surfacing	Test Report
321816,13	Playground Protective Surfacing	Installation Manual
321816,13	Playground Protective Surfacing	Warranty
329300	Exterior Plants and Soils	Product Data
329300	Exterior Plants and Soils	Operation / Maintenance Manual
329300	Exterior Plants and Soils	Shop Drawings

END OF SECTION 013300

SECTION 013513.13 - SITE SECURITY AND HEALTH REQUIREMENTS (DESE)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general Institution rules.

B. This Section includes requirements for environments that employees are domiciled in, or public participation in program activities in or adjacent to the Scope of Work area:

1. The Contractor shall have the applicable measures specified below in-place any time demolition or construction activities occur in occupied or non-occupied project work areas.

2. The Contractor shall complete all specified cleaning procedures and receive clearance from the Construction Representative prior to removing any barriers and other precautionary measures – even for areas that the employees or public do not occupy during construction.

1.3 SUMMARY

A. This Section includes general Institution rules.

B. This Section includes requirements for environments that employees are domiciled in, or public participate in program activities in or adjacent to the Scope of Work area:

1. The Contractor shall have the applicable measures specified below in-place any time demolition or construction activities occur in occupied or non-occupied project work areas.

   The Contractor shall complete all specified cleaning procedures and receive clearance from the Construction Representative prior to removing any barriers and other precautionary measures – even for areas that the employees or public do not occupy during construction.

1.4 SUBMITTALS

A. List of required submittals:

1. Materials Safety Data Sheets for all hazardous materials to be brought onsite.
2. Schedule of proposed shutdowns, if applicable.
3. A list of the names of all employees who will submit fingerprints for a background check, and the signed privacy documents identified below for each employee.
4. “No Asbestos and No Lead” certification.
5. Drug testing program and certification.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

3.1 ACCESS TO THE SITE

A. The Contractor shall arrange with Facility Representatives to establish procedures for the controlled entry of workers and materials into the work areas at the Facility.

B. The Contractor shall establish regular working hours with Facility Representatives. The Contractor must report changes in working hours or overtime to Facility Representatives and obtain approval twenty-four (24) hours ahead of time. The Contractor shall report emergency overtime to Facility Representatives as soon as it is evident that overtime is needed. The Contractor must obtain approval from Facility Representatives for all work performed after dark.

C. The Contractor shall provide the name and phone number of the Contractor's employee or agent who is in charge onsite; this individual must be able to be contacted in case of emergency. The Contractor must be able to furnish names and address of all employees upon request.

D. All construction personnel shall visibly display issued identification badges.

3.2 RULES OF THE FACILITY

A. No alcohol, drugs, guns, or other weapons are permitted anywhere at the Facility (i.e., inside or outside buildings, or anywhere on school grounds); violators will be referred to local law enforcement for prosecution.

B. No tobacco or smoking products may be used anywhere at the Facility.

C. Sexual harassment, offensive or fraternizing behavior, or foul language around or towards students or staff will not be tolerated. Violations by workers will result in one warning from the Facility Representative. Subsequent infractions will require permanent ejection of offending worker(s) from the jobsite, with no change to the contract schedule or additional cost to the State.

D. The Contractor shall consider the safety of the Facility's students at all times, and shall maintain excavations, scaffolding/ladders, equipment, tools, and materials in as safe a manner as possible during and after working hours.

E. Vehicles should be locked and parked in areas designated by the Facility Representative.

F. Neither the Owner nor DESE assumes responsibility for the Contractor's vehicles, equipment, tools, or materials.

G. The Contractor shall coordinate and communicate planned daily work activities with the Facility Representative at least two (2) working days in advance. This will allow time for the Facility Representative to consider temporarily relocating special education students whose health could be adversely affected by loud noises, chemical odors, temperature extremes, etc.

3.3 SECURITY CLEARANCES AND RESTRICTIONS

A. FMDC CONTRACTOR BACKGROUND AND ID BADGE PROCESS

1. All employees of the Contractor are required to submit fingerprints to the Missouri State Highway Patrol to enable the Office of Administration, Division of Facilities Management, Design and Construction (FMDC) to receive state and national criminal background checks on such employees. FMDC reserves the right to prohibit any employee of the Contractor from performing work in or on the premises of any facility owned, operated, or utilized by the State of Missouri for any reason.

2. The Contractor shall ensure all of its employees submit fingerprints to the Missouri State Highway Patrol and pay for the cost of such background checks. The Contractor shall submit to FMDC via email to FMDCSecurity@oa.mo.gov a list of the names of the Contractor's employees who will be fingerprinted and a signed Missouri Applicant Fingerprint Privacy Notice, Authorization For Release Of Information Confidentiality Oath and State Identification Badge Agreement for each employee. All employees of the Contractor approved by FMDC to work at a State facility must obtain a contractor ID badge from FMDC prior to beginning work on-site, unless the Director of FMDC, at the Director's discretion, waives the requirement for a contractor ID badge. The Contractor and its employees must comply with the process for background checks and contractor ID badges found on FMDC's website at: https://oa.mo.gov/fmdc-contractor-id-badges.

3. Pursuant to section 43.540, RSMo, FMDC participates in the Missouri Rap Back and National Rap Back programs as of August 28, 2018. This means that the Missouri State Highway Patrol, Central Records Repository, and the Federal Bureau of Investigation will retain the fingerprints submitted by each of the Contractor's employees, and those fingerprints will be searched against other fingerprints on file, including latent fingerprints. While retained, an employee's fingerprints may continue to be compared against other fingerprints submitted or retained by the Federal Bureau of Investigation, including latent fingerprints.

4. As part of the Missouri and National Rap Back programs, FMDC will receive notification if a new arrest is reported for an employee whose fingerprints have been submitted for FMDC after August 28, 2018. If the employee is performing work on a State contract at the time of the arrest notification, FMDC will request and receive the employee's updated criminal history records. If the employee is no longer performing work on a State contract, FMDC will not obtain updated criminal records.

5. Pursuant to section 43.540, RSMo, the Missouri State Highway Patrol will provide the results of the employee's background check directly to FMDC. FMDC may NOT release the results of a background check to the Contractor or provide the Contractor any information obtained from a background check, either verbally or in writing. FMDC will notify the Contractor only whether an employee is approved to work on State property.

6. Each employee who submits fingerprints to the Missouri State Highway Patrol has a right to obtain a copy of the results of his or her background check. The employee may challenge the accuracy and completeness of the information contained in a background check report and obtain a determination from the Missouri State Highway Patrol and/or the FBI regarding the validity of such challenge prior to FMDC making a final decision about his or her eligibility to perform work under a State contract.

7. The Contractor shall notify FMDC via email to FMDCSecurity@oa.mo.gov if an employee is terminated or resigns from employment with the Contractor. If the Contractor does not anticipate performing work on a State contract in the future, the Contractor may request that FMDC remove its employees from the Rap Back programs. However, if removed from the Rap Back programs, employees will be required to submit new fingerprints should the contractor be awarded another State contract.

8. Upon award of a Contract, the Contractor should contact FMDC at

FMDCSecurity@oa.mo.gov to determine if its employees need to provide a new background check. If a Contractor's employee has previously submitted a fingerprint background check to FMDC as part of the Missouri and National Rap Back programs, the employee may not need to submit another fingerprint search for a period of three to six years, depending upon the circumstances. The Contractor understands and agrees that FMDC may require more frequent background checks without providing any explanation to the Contractor. The fact that an additional background check is requested by FMDC does not indicate that the employee has a criminal record.

3.4 FIRE PROTECTION, SAFETY, AND HEALTH CONTROLS

A. The Contractor shall take all necessary precautions to guard against and eliminate possible fire hazards.

1. Onsite burning is prohibited.
2. The Contractor shall store all flammable or hazardous materials in proper containers located outside the buildings or offsite, if possible.
3. The Contractor shall provide and maintain, in good order, during construction fire extinguishers as required by the National Fire Protection Association. In areas of flammable liquids, asphalt, or electrical hazards, 15-pound carbon dioxide or 20-pound dry chemical extinguishers shall be provided.

B. The Contractor shall not obstruct streets or walks without permission from the Owner's Construction Representative and Facility Representatives.

C. The Contractor's personnel shall not exceed the speed limit of 15 mph while at the Facility unless otherwise posted.

D. The Contractor shall take all necessary, reasonable measures to reduce air and water pollution by any material or equipment used during construction. The Contractor shall keep volatile wastes in covered containers and shall not dispose of volatile wastes or oils in storm or sanitary drains.

E. The Contractor shall keep the project site neat, orderly, and in a safe condition at all times. The Contractor shall immediately remove all hazardous waste and shall not allow rubbish to accumulate. The Contractor shall provide onsite containers for collection of rubbish and shall dispose of it at frequent intervals during the progress of the Work.

F. Fire exits, alarm systems, and sprinkler systems shall remain fully operational at all times, unless written approval is received from the Owner's Construction Representative and the appropriate Facility Representative at least twenty-four (24) hours in advance. The Contractor shall submit a written time schedule for any proposed shutdowns.

G. For all hazardous materials brought onsite, Material Safety Data Sheets shall be on site and readily available upon request at least a day before delivery.

H. The Contractor's workers shall not be under the influence of any intoxicating substances while on the Facility premises.

3.5 NO ASBESTOS AND NO LEAD CERTIFICATION REQUIREMENTS

A. No asbestos containing material (1.0% asbestos by dry weight) or lead containing material (0.06% or 600ppm/10,000ppm lead by dry weight) shall be included in any project submittals or

physically installed during construction work on this project.

B. USEPA regulations exclude local education agencies (i.e., DESE MSB, MSD, & SSSH) from the requirements of inspection, sampling, and analysis of homogenous areas that have been newly constructed or repaired/replaced in special education school buildings; where an Architect or Project Engineer responsible for the construction, or an Accredited Inspector, provides a signed statement that no asbestos (or lead) was specified, or used, as a building material (or system component) in any project construction documents, or physically installed as part of the project work. It is recommended that the Contractor research each material/component used on the job to verify that it contains no asbestos or lead (i.e., look at manufacturer's cut-sheet specifications, Material Safety Data Sheets, DOT shipping classification, or even contact the manufacturer for their verification); then, the Contractor should write on each project submittal: "To the best of my knowledge, items covered by this submittal contain no asbestos or lead containing material".

C. Contractor Certification Requirement

1. Prior to final payment, the Contractor shall submit a signed letter on company letterhead certifying that, to the best of its knowledge, no asbestos or lead containing materials were used or installed during the work. The Contractor shall address the letter to the Service Level Manager/ Designated Person for FMDC, at P.O. Box 809, Jefferson City, MO 65102, and (if applicable) to the Architect or Project Engineer. The letter shall reference the Site/Facility Name, Project Number, Project Title, and shall include the following statement:

2. "The Contractor certifies, to the best of its knowledge, that no asbestos containing material (1.0% asbestos by dry weight) or lead containing material (0.06% or 600ppm/10,000ppm lead by dry weight) was included in any project submittals or physically installed during construction work on this project. Contractor agrees to pay all costs incurred by the Owner discovering, abating, and/or restoring any component or portion of the work that is later found to include an asbestos or lead containing material in excess of these limitations."

D. Architect or Project Engineer Certification

1. As part of the final as built/close-out document submittal requirements, it is requested that the Project Architect or Engineer (or Accredited Inspector as a last resort) responsible for design and submittal approval, submit a signed letter on company letterhead that references the Site/Facility Name, Project Number, Project Title, and includes the following statement:

2. "As the Designer, or Accredited Inspector, I certify, to the best of my knowledge, that no asbestos containing material (1.0% asbestos by dry weight) or lead containing material (0.06%, or, 600ppm/10,000ppm lead by dry weight) was specified in the construction documents, or approved for installation by the Contractor during construction work, on this project."

3.6 DRUG & ALCOHOL TESTING PROGRAM CONTRACTUAL REQUIREMENT (1 CSR 30-7.010)

A. BASIS AND LEGAL REQUIREMENTS

1. In an effort to create safe and healthy schools and workplaces, the State of Missouri requires that Contractors and Subcontractors shall maintain and enforce a written substance abuse testing program for public works construction projects on public and charter elementary and secondary education construction projects that are subject to the control of the State of Missouri. This policy is not intended to be a substitute for the Contractor's or Subcontractor's complete written substance abuse policy. These

requirements shall be the minimum requirements for complying with Section 161.371, RSMo, and may be supplemented at the discretion of the Contractor or Subcontractor.

2. The State of Missouri has a vital interest in protecting the safety of students and maintaining safe, healthful, and efficient working conditions for both the state and its' Contractors' and Subcontractors' employees; and has determined that the educational and work environment is safer and more productive without the presence of illegal or inappropriate drugs, alcohol, or other substances in the body or on state property on which any state elementary or secondary school is located or being constructed or improved.

3. The use of illegal drugs, on or off duty, is inconsistent with law-abiding behavior expected of all persons. The use of illegal drugs, or abuse of alcohol or prescription drugs, may impair the ability of employees to perform tasks that are critical to proper work performance. The result is an increase in accidents and failures that pose a serious threat to the safety of all students, employees, visitors and the general public. Impaired employees also tend to be less productive, less reliable and prone to greater absenteeism, resulting in the potential for increased cost and delays in the timely completion of contracts.

B. CONTRACTUAL REQUIREMENTS

1. Each contract entered into for the performance of work on any public and charter elementary or secondary project subject to the control of the State of Missouri shall require that each Contractor and each Subcontractor have in place a drug and alcohol testing program consistent with this rule. These contractual requirements shall apply to Contractor and Subcontractor employees on public and charter elementary and secondary education construction projects that are subject to the control of the State of Missouri, including workers, new hires, replacements, and supervisory personnel. The Contractor and all Subcontractors shall comply with this contractual requirement. The State of Missouri shall determine, in its sole discretion, when this contractual requirement shall be applicable; and in such instances, any bid submitted in response to a request for proposal shall comply with this contractual requirement.

2. In order to be eligible to perform work on public and charter elementary and secondary education construction projects that are subject to the control by the State of Missouri, a Contractor must have and enforce a written drug and alcohol testing program incorporating the following testing requirements, terms and conditions applicable to all its employees, prospective employees and Subcontractors. Neither employee nor prospective employee of a Contractor or Subcontractor shall be permitted to work on public and charter elementary and secondary education construction projects that are subject to this rule unless such employee submits to testing as required by the contractual requirement required by this rule.

3. Each Contractor and Subcontractor subject to this rule shall train its' supervisory employees in methods that will allow them to recognize the signs and symptoms of substance abuse and to take action provided by this contractual requirement in a manner consistent with generally accepted safety training procedures.

4. Each Contractor and Subcontractor subject to this rule is responsible for the cost of developing, implementing, and enforcing its drug and alcohol testing program, including the cost of drug and alcohol testing of its employees provided by the contractual requirement required by this rule.

5. Each Contractor shall furnish a copy of its drug and alcohol testing program and certify that it and its' Subcontractors are in compliance with the provisions of this rule to the State of Missouri at the time it submits a bid for any contract with the State of Missouri for work on public and charter elementary and secondary education construction projects that are subject to the control of the State of Missouri. Additionally, each Subcontractor

shall furnish a copy of its substance abuse testing program to the Contractor prior to commencement of work on public and charter elementary and secondary education construction projects that are subject to this contractual requirement. The Contractor may reject a Subcontractor's program as noncompliant with the contractual requirement required by this rule.

C. TESTING REQUIREMENTS

1. PRE-ENGAGEMENT TESTING: Testing for all substances other than alcohol as described in this rule shall be conducted by each Contractor and Subcontractor for its employees or prospective employees within 120 days prior to any employee's appearance on a public and charter elementary and secondary education construction project that is subject to this contractual requirement. Contractors' or Subcontractors' employees that can provide certification of a previous drug test occurring within 120 days or employees that have been subject during the preceding consecutive two (2) years to a random and periodic selection program that meets the standards as set forth in this rule and, if the employee actually has been tested, that indicates a negative result for each of the substances listed herein, may be exempted from pre-engagement testing provided by this rule. If the employee was not employed by the Contractor or Subcontractor that is his or her current employer at the time of the previous test, the employee may be exempted from pre-engagement testing only upon certification of the non-negative test directly from the administrator of the testing program that conducted the previous test.

2. RANDOM TESTING: All employees of the Contractor and Subcontractor shall be subject to random testing by the Contractor or Subcontractor. For employees holding a commercial driver license, the annualized drug and alcohol testing rate shall comply with 49 CFR Part 382, as may be amended from time to time and similar applicable regulations of the Federal Highway Administration. All other employees of the Contractor or Subcontractor shall be subject to testing for all substances other than alcohol at the random annualized selection rate of fifty (50) percent of the Contractor's or Subcontractor's employees. Employees selected for random testing shall report in a timely manner to the drug and alcohol testing laboratory or collection site where directed for drug and/or alcohol testing.

3. PERIODIC TESTING: All employees working on public and charter elementary and secondary education construction projects that are subject to this rule shall be subject to periodic and random testing for all substances other than alcohol on at least a biannual basis. Employees subject to periodic testing shall report in a timely manner as directed to the drug and alcohol testing laboratory or collection site for drug testing.

4. REASONABLE SUSPICION TESTING: All employees of the Contractor and Subcontractor on public and charter elementary and secondary education construction projects that are subject to this rule shall be subject to a drug and alcohol test when an employee is acting in an abnormal manner that leads a supervisory employee of the Contractor or Subcontractor to have reasonable suspicion that the employee is under the influence of alcohol or controlled substances. Reasonable suspicion means suspicion based on specific personal observations by the supervisory employee concerning the appearance, behavior, speech or breath odor of the employee.

5. POST-ACCIDENT/INCIDENT TESTING: All employees of Contractors and Subcontractors on public and charter elementary and secondary education construction projects who are subject to this rule shall be subject to a drug and alcohol test following an on-the-job injury requiring medical treatment or following a serious or potentially serious incident, including near misses, during which safety precautions were violated, persons were or could have been injured, unsafe instructions or orders were given, vehicles, equipment, or property was damaged, careless acts were performed, or when prescribed personal protective or safety equipment was not worn. Employees involved or who may have contributed to the incident, shall be subject to a drug and alcohol test. If it

is impossible or impractical, because of the physical condition of the person involved in the accident to be subjected to drug and alcohol testing; and if in subsequent medical treatment, that person's blood or other bodily fluid will be drawn, then that blood or other bodily fluids may be analyzed for drugs and alcohol.

D. SUBSTANCE ABUSE TESTING PROTOCOLS

1. A Contractor or Subcontractor subject to the provisions of this rule shall perform pre-engagement, random, periodic, reasonable suspicion, and post-accident/incident testing in the following manner:

   a. Drug Testing

      1) All urine samples collected under this program shall be analyzed by a laboratory certified by the National Institute on Drug Abuse/Substance Abuse and Mental Health Service Administration of the U.S. Department of Health and Human Services and shall include an initial Enzyme Multiplied Immunoassay Screening Test (EMIT) and, when necessary, confirmed by a Gas Chromatography /Mass Spectrometry (GC/MS) confirmation test. All samples confirmed by the laboratory as non-negative shall be interpreted as positive or negative by a Medical Review Officer licensed by the American Association of Medical Review Officers, American College of Occupational and Environmental Medicine, Medical Review Officer Certification Council, or American Society of Addiction Medicine.

   b. Alcohol Testing

      1) The initial screening tests for alcohol shall be performed by using either a saliva test or a DOT approved breathalyzer.

      2) Alcohol confirmatory tests shall be performed by either a blood alcohol test or a DOT approved breathalyzer.

2. Testing for the presence of drugs or alcohol in an employee's system and the handling of test specimens shall be conducted in accordance with guidelines for laboratory testing procedures and chain-of-custody procedures established by the Substance Abuse and Mental Health Service Administration of the U.S. Department of Health and Human Services.

3. The program shall require notification to the employer and employee of the results of any non-negative drug and alcohol test and the Division of Facilities Management, Design and Construction shall be notified of the action taken to protect the safety of students as a result of such positive test, provided that no requirement of individual confidentiality of test results provided by federal law or regulation or state statute shall be violated in providing such notifications.

E. THRESHOLD LIMITS

1. All samples collected shall be analyzed by a laboratory certified by the Substance Abuse and Mental Health Service Administration of the U.S. Department of Health and Human Services, and shall include an initial Enzyme Multiplied Immunoassay Screening Test (EMIT) and, when necessary, confirmed by a Gas Chromatography/Mass Spectrometry (GC/MS) Confirmation Test. Said testing must screen, at a minimum, for the substances and levels of such substances provided by 49 CFR Part 40 and for alcohol as provided by 49 CFR Part 382, as may be amended from time to time. The levels that shall be deemed to result in a negative test result shall be defined by 49 CFR Part 40 and 49 CFR Part 382, as may be amended from time to time; provided that if such regulations shall no longer define substances and testing levels in the future, testing as required by this rule shall screen for the following substances that shall not exceed the following levels in order to be deemed a negative test result:

F. (EMIT) CONFIRMED/(GC/MS) CONFIRMATION TEST:

1. Drug tested/ Initial Level(ng/ml)/ Cut-Off Level(ng/ml)

    a. Amphetamines/500/250 - Includes Amphetamines, Methamphetamines and Ecstasy (MDMA)
    b. Barbiturates/300/200
    c. Benzodiazepines/300/200
    d. Cocaine Metabolite/150/100
    e. Cannabinoids (Marijuana THC)/50/15
    f. Methadone/300/200
    g. Opiates:

        1) Codeine/Morphine/2000/2000
        2) Heroine Metabolite/10/10
        3) Phencyclidine (PCP)/25/25
        4) Propoxyphene/300/200
        5) Breath/Blood Alcohol Content (BAC)/.04%/.04%
        6) Removal from jobsite (BAC)/.0200-.0399%/.0200%-.0399%

G. REFUSAL TO SUBMIT TO TESTING/CONFIRMED POSITIVE RESULTS

1. Any employee of a Contractor or Subcontractor performing any duties or work that are subject to this rule who refuses to submit to testing or receives a confirmed positive test result for any of the substances indicated in Section E shall be required to immediately leave the construction site and be prohibited from returning to any construction site subject to control of the State of Missouri until evidence is provided of the completion of the reinstatement procedures as set forth in section G.

2. Determination for Violation of Policy

    a. A confirmed positive drug or alcohol test.
    b. Failure to contact the Medical Review Officer as directed.
    c. Failure to report as directed for random testing.
    d. The use, possession, sale or distribution of alcohol or a controlled illegal or unauthorized substance, or the presence of any employee with such ingested substances for non-medical reasons on a public and charter elementary and secondary education construction project subject to the control of the State of Missouri.
    e. Working, reporting to work, being on a public and charter elementary and secondary education construction project that is subject to the control of the State of Missouri, or in a state or employer owned, leased or rented vehicle, while under the influence of alcohol (0.04% BAC or greater).
    f. Switching, adulterating or attempting to tamper with any sample submitted for drug or alcohol testing or otherwise interfering or attempting to interfere with the testing process.
    g. Refusal to submit a specimen for testing shall be deemed to be a positive test result and shall be subject to the same consequences as specimens tested and confirmed as positive.
    h. The use of a controlled substance by an individual other than the individual for whom the controlled substance was prescribed or the abuse of a controlled substance by the individual for whom it was prescribed.

H. REINSTATEMENT PROCEDURES

1. An employee receiving a confirmed positive test result for any of the substances indicated in Section 5 may return to work on a public and charter elementary and secondary education construction project that is subject to the control of the State of Missouri only after the following conditions have been satisfied:

2. Evidence is submitted to the Contractor or Subcontractor that the employee has completed or is actively participating in an approved drug/alcohol assessment, treatment, and/or counseling program. The costs of this assessment, treatment or program need not be borne by the Contractor or Subcontractor.

3. Evidence is submitted of the employee passing of a drug and alcohol test that meets the requirements of Sections E and F of this rule. The costs of this subsequent retesting need not be borne by the Contractor or Subcontractor.

4. The employee shall be subject to additional random drug and alcohol testing on a monthly basis while on any public and charter elementary and secondary education construction project that is subject to the control of the State of Missouri. The costs of this additional testing, treatment or program need not be borne by the Contractor or Subcontractor.

5. An employee known by the Contractor or Subcontractor to have previously had a positive test result who receives a second or subsequent confirmed positive test result in connection with subsequent testing required by this Section H of this rule shall be removed by the Contractor or Subcontractor from all public and charter elementary and secondary education construction projects that are subject to the control of the State of Missouri. The employee shall not return to work on any public and charter elementary and secondary education construction project subject to this rule until that the employee has completed an approved drug/alcohol assessment, treatment, and/or counseling program; and until after evidence is submitted of the employee passing of a drug and alcohol test that meets the requirements of sections E and F of this rule and that indicates a blood alcohol concentration of less than 0.02 percent.

I. COMPLIANCE DETERMINATION

1. The State of Missouri may audit any substance abuse testing program implemented pursuant to this contractual requirement to verify compliance, upon at least 24 hours notice by the State to the Contractor of its intent to audit. The State shall have free access to all relevant records of the Contractor and its Subcontractors for this purpose.

2. Any portion of this program that is in violation of applicable federal or state law or regulation shall be deemed unenforceable.

3.7 DISRUPTION OF UTILITIES

A. The Contractor shall give a minimum of 72 hours written notice to the Construction Representative and Facility Representative before disconnecting electric, gas, water, fire protection, or sewer service to any building.

B. The contractor shall give a minimum of 72 hours written notice to the Construction Representative and Facility Representative before closing any access drives and shall make temporary access available if possible. The contractor shall not obstruct streets, walks, or parking.

3.8 PROTECTION OF PERSONS AND PROPERTY

A. SAFETY PRECAUTIONS AND PROGRAMS

1. The Contractor shall at all times conduct operations under this Contract in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. The Contractor shall promptly take precautions which are necessary and adequate against conditions created during the progress of the Contractor's activities hereunder which

involve a risk of bodily harm to persons or a risk of damage to property. The Contractor shall continuously inspect Work, materials, and equipment to discover and determine any such conditions and shall be solely responsible for discovery, determination, and correction of any such conditions. The Contractor shall comply with applicable safety laws, standards, codes, and regulations in the jurisdiction where the Work is being performed, specifically, but without limiting the generality of the foregoing, with rules regulations, and standards adopted pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970 and applicable amendments.

2. All contractors, subcontractors and workers on this project are subject to the Construction Safety Training provisions 292.675 RSMo.

3. In the event the Contractor encounters on the site, material reasonably believed to be asbestos, polychlorinated biphenyl (PCB), lead, mercury, or other material known to be hazardous, which has not been rendered harmless, the Contractor shall immediately stop Work in the area affected and report the condition to the Owner's Representative and the Architect in writing. The Work in the affected area shall not thereafter be resumed except by written agreement of the Owner's Representative and Contractor if in fact the material is asbestos or polychlorinated biphenyl (PCB) and has not been rendered harmless. The Work in the affected area shall be resumed in the absence of asbestos or polychlorinated biphenyl (PCB), or when it has been rendered harmless by written agreement of the Owner's Representative and the Contractor. “Rendered Harmless” shall mean that levels of such materials are less than any applicable exposure standards, including but limited to OSHA regulations.

B. SAFETY OF PERSONS AND PROPERTY

1. The Contractor shall take reasonable precautions for safety of, and shall provide protection to prevent damage, injury, or loss to:

   a. clients, staff, the public, construction personnel, and other persons who may be affected thereby;

   b. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody, or control of the Contractor or the Contractor's Subcontractors of any tier; and

   c. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures, and utilities not designated for removal, relocation, or replacement in the course of construction.

2. The Contractor shall give notices and comply with applicable laws, standards, codes, ordinances, rules, regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury, or loss.

3. The Contractor shall erect and maintain, as required by existing conditions and performance of the Contract, safeguards for safety and protection, including, but not limited to, posting danger signs and other warnings against hazards, promulgating safety regulations, and notifying owners and users of adjacent sites and utilities.

4. When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise the highest degree of care and carry on such activities under supervision of properly qualified personnel.

5. The Contractor shall promptly remedy damage and loss (other than damage or loss insured under property insurance required by the Contract Documents) to property referred to in this Section caused in whole or in part by the Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable, and for which the Contractor is responsible under this Section, except damage or loss attributable solely to acts or omissions of Owner or the Architect

or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's other obligations stated elsewhere in the Contract.

6. The Contractor shall designate a responsible member of the Contractor's organization at the site whose duty shall be the prevention of accidents, and the maintaining, enforcing and supervising of safety precautions and programs. This person shall be the Contractor's superintendent unless otherwise designated by the Contractor in writing to the Owner's Representative and Architect. The Contractor shall hold regularly scheduled safety meetings to instruct Contractor personnel on safety practices, accident avoidance and prevention, and the Project Safety Program. The Contractor shall furnish safety equipment and enforce the use of such equipment by its employees and its subcontractors of any tier.

7. The Contractor shall not load or permit any part of the construction or site to be loaded so as to endanger its safety.

8. The Contractor shall promptly report in writing to the Owner all accidents arising out of or in connection with the Work which cause death, lost time injury, personal injury, or property damage, giving full details and statements of any witnesses. In addition, if death, serious personal injuries, or serious property damages are caused, the accident shall be reported immediately.

9. The Contractor shall promptly notify in writing to the Owner of any claims for injury or damage to personal property related to the work, either by or against the Contractor.

10. The Owner assumes no responsibility or liability for the physical condition or safety of the Work site or any improvements located on the Work site. The Contractor shall be solely responsible for providing a safe place for the performance of the Work. The Owner shall not be required to make any adjustment in either the Contract Sum or Contract Time concerning any failure by the Contractor or any Subcontractor to comply with the requirements of this Paragraph.

11. In no event shall the Owner have control over, charge of, or any responsibility for construction means, methods, techniques, sequences or procedures or for safety precautions and programs in connection with the Work, notwithstanding any of the rights and authority granted the Owner in the Contract Documents.

12. The Contractor shall maintain at his own cost and expense, adequate, safe and sufficient walkways, platforms, scaffolds, ladders, hoists and all necessary, proper, and adequate equipment, apparatus, and appliances useful in carrying on the Work and which are necessary to make the place of Work safe and free from avoidable danger for clients, staff, the public and construction personnel, and as may be required by safety provisions of applicable laws, ordinances, rules regulations and building and construction codes.

END OF SECTION 013513.13

SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
4. Refer to the Consultant’s Participation in Observation and Testing schedule at the end of this section.

C. Contractor is required to provide a consolidated record in a single spreadsheet format of all tests, inspections, and observations by his own or Owner’s agencies and personnel.

D. Related Requirements:

1. Division 01 section "Temporary Facilities and Controls".
2. Division 01 section "Execution" for repair and restoration of construction disturbed by testing and inspecting activities.
3. Division 01 section "Construction Progress Documentation" for distribution requirements of project records.
4. Divisions 02 through 50 sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Experienced: When used with an entity, "experienced", unless otherwise further described, means having successfully completed a minimum of three (3) previous projects similar in nature, size, and extent to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

B. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

C. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, assembly, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

D. Mockups: Full-size, physical assemblies that are constructed on-site. Mockups are used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. Approved mockups establish the standard by which the Work will be judged.

E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

H. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect or Construction Manager.

I. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

J. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

1.4 DELEGATED DESIGN SERVICES

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated Design Services Statement: Submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional, indicating that the products and systems are in

compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.5 CONFLICTING REQUIREMENTS

A. General: In case of conflicting requirements within the Contract Documents, provide the greater quantity and higher quality indicated as solely determined by the Project Team. Inform the Project Team regarding the conflict and obtain clarification prior to proceeding with the Work.

B. Conflicting Standards and Other Requirements: If compliance with two or more standards or requirements is specified and the standards or requirements establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Project Team for clarification before proceeding.

C. Conflicts Within Contract Documents: Reasonable effort has been made to coordinate the Contract Documents of disciplines involved. Examine the Contract documents of disciplines to determine that coordination is satisfactory. Apparent conflicts shall be brought to the attention of the Project Team for resolution prior to award of the Contract.

D. Quantities: Insofar as the Contract Documents may, in some instances, be diagrammatic and scope in nature, precise quantities and sizes of some items may not be explicitly indicated. The Contractor shall provide materials of the size and quantity necessary to accomplish the Work and satisfy performance criteria. If sizes, quantities and/or performance criteria cannot be reasonably inferred from the Contract Documents that are critical to the formulation of a bid proposal, the Contractor shall request a clarification from the Architect.

E. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Project Team for a decision before proceeding.

F. Dimensions: Where, in the opinion of the Contractor, the Contract Documents lack dimensional information or contain dimensional conflicts that are critical to the formulation of a bid proposal or the execution of the Work, the Contractor shall request a clarification from the Architect.

G. Testing services and agencies are not empowered to release, revoke, alter or enlarge requirements of the Contract Documents or approve, reject, or accept any portions of the Work.

1.6 ACTION SUBMITTALS

A. Shop Drawings: For integrated exterior mockups.

1. Include plans, sections, and elevations, indicating materials and size of mockup construction.
2. Indicate manufacturer and model number of individual components.
3. Provide axonometric drawings for conditions difficult to illustrate in two dimensions.

B. Delegated-Design Services Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit a statement signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or

certified by a design professional, indicating that the products and systems are in compliance with performance and design criteria indicated. Include list of codes, loads, and other factors used in performing these services.

1.7 INFORMATIONAL SUBMITTALS

A. Contractor's Quality-Control Plan: For quality-assurance and quality-control activities and responsibilities.

B. Qualification Data: For Contractor's quality-control personnel.

C. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility submitted to authorities having jurisdiction before starting work on the following systems:

1. Seismic-force-resisting system, designated seismic system, or component listed in the Statement of Special Inspections.
2. Main wind-force-resisting system or a wind-resisting component listed in the Statement of Special Inspections.

D. Testing Agency Qualifications: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.

E. Schedule of Tests and Inspections: Prepare in tabular form and include the following:

1. Specification Section number and title.
2. Entity responsible for performing tests and inspections.
3. Description of test and inspection.
4. Identification of applicable standards.
5. Identification of test and inspection methods.
6. Number of tests and inspections required.
7. Time schedule or time span for tests and inspections.
8. Requirements for obtaining samples.
9. Unique characteristics of each quality-control service.

F. Reports: Prepare and submit certified written reports and documents as specified.

G. Permits, Licenses, and Certificates: For Owner's record, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents established for compliance with standards and regulations bearing on performance of the Work.

1.8 CONTRACTOR'S QUALITY-CONTROL PLAN

A. Quality-Control Plan, General: Submit a project-specific quality-control plan within **ten (10) business** days of Notice to Proceed, and not less than five days prior to preconstruction conference. Submit in format acceptable to Architect. Identify personnel, procedures, controls, instructions, tests, records, and forms to be used to carry out Contractor's quality-assurance and quality-control responsibilities. Coordinate with Contractor's Construction Schedule.

B. Quality-Control Personnel Qualifications: Engage qualified personnel trained and experienced in managing and executing quality-assurance and quality-control procedures similar in nature and extent to those required for Project.

1. Project quality-control manager may also serve as Project superintendent.

C. Submittal Procedure: Describe procedures for ensuring compliance with requirements through review and management of submittal process. Indicate qualifications of personnel responsible for submittal review.

D. Testing and Inspection: In quality-control plan, include a comprehensive schedule of Work requiring testing or inspection, including the following:

1. Contractor-performed tests and inspections including Subcontractor-performed tests and inspections. Include required tests and inspections and Contractor-elected tests and inspections. Distinguish source quality-control tests and inspections from field quality-control tests and inspections.

2. Special inspections required by authorities having jurisdiction and indicated on the Statement of Special Inspections.

3. Owner-performed tests and inspections indicated in the Contract Documents.

E. Continuous Inspection of Workmanship: Describe process for continuous inspection during construction to identify and correct deficiencies in workmanship in addition to testing and inspection specified. Indicate types of corrective actions to be required to bring work into compliance with standards of workmanship established by Contract requirements and approved mockups.

F. Monitoring and Documentation: Maintain testing and inspection reports including log of approved and rejected results. Include work Architect has indicated as nonconforming or defective. Indicate corrective actions taken to bring nonconforming work into compliance with requirements. Comply with requirements of authorities having jurisdiction.

1.9 REPORTS AND DOCUMENTS

A. Test and Inspection Reports: Prepare and submit certified written reports specified in other Sections. Include the following:

1. Date of issue.

2. Project title and number.

3. Name, address, telephone number, and email address of testing agency.

4. Dates and locations of samples and tests or inspections.

5. Names of individuals making tests and inspections.

6. Description of the Work and test and inspection method.

7. Identification of product and Specification Section.

8. Complete test or inspection data.

9. Test and inspection results and an interpretation of test results.

10. Record of temperature and weather conditions at time of sample taking and testing and inspection.

11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.

12. Name and signature of laboratory inspector.

13. Recommendations on retesting and reinspecting.

B. Manufacturer's Technical Representative's Field Reports: Prepare written information documenting manufacturer's technical representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of technical representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

C. Factory-Authorized Service Representative's Reports: Prepare written information documenting manufacturer's factory-authorized service representative's tests and inspections specified in other Sections. Include the following:

1. Name, address, telephone number, and email address of factory-authorized service representative making report.
2. Statement that equipment complies with requirements.
3. Results of operational and other tests and a statement of whether observed performance complies with requirements.
4. Statement whether conditions, products, and installation will affect warranty.
5. Other required items indicated in individual Specification Sections.

D. Permits, Licenses, and Certificates: For Owner's records, submit copies of per its, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

1.10 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in the State of Missouri and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.

2. Requirement for specialists shall not supersede building codes and similar regulations governing the Work, nor interfere with local trade-union jurisdictional settlements and similar conventions.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.

2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Manufacturer's Technical Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to observe and inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

I. Factory Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are similar in material, design, and extent to those indicated for this Project.

J. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:

a. Provide test specimens representative of proposed products and construction.
b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
f. When testing is complete, remove test specimens, assemblies, and mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect and Owner, with copy to Contractor.

Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

K. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect **ten (10) business days** in advance of dates and times when mockups will be constructed.
3. Allow time for Owner's Field Observation consultant to review mockups.
4. Demonstrate the proposed range of aesthetic effects and workmanship.
5. Schedule mockup review to coincide with Architect's periodic site visits. Delays due to failure to schedule necessary reviews will not be cause for changes in cost or time extensions.
6. Obtain Architect's and Owner's approval of mockups before starting work, fabrication, or construction.
    a. Allow **two (2) weeks** from the date of Architect's on-site review for approval of each mockup. And one week for each subsequent re-review.
7. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
8. Demolish and remove mockups when directed, unless otherwise indicated.

1.11 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.
2. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

3. Notify testing agencies at least 5 days in advance of time when Work that requires testing or inspecting will be performed. Where continuing tests are required, notify agencies 3 days in advance for return testing or inspecting. Concurrently notify Owner to allow for Owner's Field observation personnel to observe tests or inspections.

4. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

5. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

6. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Owner's Field Consultant: Owner will designate a field observation representative to observe testing performed by the Contractor or Owner's agencies. Contractor will give Owner **ten (10) business day** notice to prior to initial tests and **five (5) business day** notice for each repeat test. A summary list of related Work includes but is not limited to:

1. Concrete.
2. Roofing.
3. Fireproofing.
4. Firestopping.
5. Aluminum-Framed Entrances and Storefronts.
6. Glazed Aluminum Curtainwall.
7. Flashing and sheet metal work.
8. Waterproofing.
9. Joints and sealants.
10. Test, Balance and Adjusting of HVAC.
11. Fire Alarm.

D. Record visit and any results or comments of Owner's Field Consultant in the testing logs.

E. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

F. Manufacturer's Technical Services: Where indicated, engage a manufacturer's technical representative to observe and inspect the Work. Manufacturer's technical representative's services include participation in preinstallation conferences, examination of substrates and conditions, verification of materials, observation of Installer activities, inspection of completed portions of the Work, and submittal of written reports.

G. Retesting / Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

H. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.

1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.

2. Determine the location from which test samples will be taken and in which on-site tests are conducted.

3. Conduct and interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from requirements.

4. Submit a certified written report, in duplicate, of each test, inspection, and similar quality-control service through Contractor.

5. Do not release, revoke, alter, or increase the Contract Document requirements or approve or accept any portion of the Work.

6. Do not perform any duties of Contractor.

I. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

J. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

K. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 15 days of date established for commencement of the Work.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

1.12 SPECIAL TESTS AND INSPECTIONS

A. Special Tests and Inspections: Owner will engage a qualified testing agency or special inspector to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner, and as follows:

B. Special Tests and Inspections: Conducted by a qualified testing agency or special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.

2. Notifying Architect, Owner, and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.

3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect, through Owner, with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which shall include a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of all tests and inspections. Include the following:
   1. Date test, observation, or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain consolidated spreadsheet at Project site. Post changes and modifications as they occur. Provide access to test and inspection spreadsheet for Architect's and Owner's Field Observation representative during normal working hours.

C. A summary list of project testing includes but not limited to the following sections. Reference individual sections for additional information.
   1. Temporary Tree Protection: Contractor responsible for monthly inspection of trees and their condition.
   2. Tree Fencing / Root Pruning: Contractor responsible for ongoing maintenance, Contractor responsible for regular inspection.
   3. 033000 Cast-In-Place Concrete: Material tests by Contractor-provided special inspection.
   4. 040120 Masonry Repair: Special inspections by Owner.
   5. 051200 Structural Steel: Special inspections by Owner; reference Structural 'S' Drawing Sheets for additional information.
   6. 075423 TPO Roofing System: Field Quality Control testing by Contractor.
   7. 078446 Firestopping: Special Inspection by Contractor.
   8. 084113 Aluminum-Framed Entrances and Storefronts: Optional Field Quality Control by Owner.
   9. 092900 Gypsum Board System: Vapor Barrier Inspection by Contractor.
   10. 260092 Testing and Adjusting: Contractor shall test and adjust all electrical systems including lighting & lighting controls for a period of not less than seventy-two (72) hours.
   11. 270000 Communication: All communication cabling tested by Contractor.

12. 280000 Fire Alarm System: Tested by Contractor and witnessed by the Owner representative.

13. 329300 Soil Preparation: Contractor responsible for inspection / testing.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

1. Provide materials and comply with installation requirements specified in other Specification Sections or matching existing substrates and finishes. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible. Comply with the Contract Document requirements for cutting and patching in Section 017300 "Execution."

B. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

SECTION 014200 - REFERENCES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 DEFINITIONS

A. General: Basic Contract definitions are included in the Conditions of the Contract.

B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.

C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."

D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."

E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.

F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.

G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.

H. “Installer”: An installer is the Contractor or another entity engaged by the Contactor, either as an employee, subcontractor or contractor of lower tier, to perform a particular construction activity including installation, erection, application and similar operations. Installers are required to be experienced, and in some cases, certified by a manufacturer, organization or governmental agency, in the operations they are engaged to perform.

1. Experienced when used with the term installer means having a minimum of 5 previous projects similar in size and scope to this Project, being familiar with the special requirements indicated and having complied with requirements of authorities having jurisdiction.
2. Assigning Specialists: Certain sections of the specifications require the assignment of specialists experienced in the particular systems or construction activities required. These installers shall be recognized experts in those operations or systems. The specialist must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, ultimate responsibility for fulfilling the terms of the Contract requirements remains with the Contractor.

a. The specialist requirement shall not be interpreted to conflict with enforcing building codes or to interfere with authorities having jurisdiction.

I. "Provide": Furnish and install, complete and ready for the intended use.

J. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS

A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.

B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.

C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. AABC - Associated Air Balance Council; www.aabc.com.
2. AAMA - American Architectural Manufacturers Association; www.aamanet.org.
3. AAPFCO - Association of American Plant Food Control Officials; www.aapfco.org.
4. AASHTO - American Association of State Highway and Transportation Officials; www.transportation.org.
5. AATCC - American Association of Textile Chemists and Colorists; www.aatcc.org.
6. ABMA - American Bearing Manufacturers Association; www.americanbearings.org.
7. ABMA - American Boiler Manufacturers Association; www.abma.com.
8. ACI - American Concrete Institute; (Formerly: ACI International); www.concrete.org
9. ACPA - American Concrete Pipe Association; www.concrete-pipe.org.
10. AEIC - Association of Edison Illuminating Companies, Inc. (The); www.aeic.org.
11. AF&PA - American Forest & Paper Association; www.afandpa.org.
12. AGA - American Gas Association; www.aga.org.
13. AHAM - Association of Home Appliance Manufacturers; www.aham.org.
14. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); www.ahrinet.org.

15. AI - Asphalt Institute; www.asphaltinstitute.org.
16. AIA - American Institute of Architects (The); www.aia.org.
17. AISC - American Institute of Steel Construction; www.aisc.org.
18. AISI - American Iron and Steel Institute; www.steel.org.
19. AITC - American Institute of Timber Construction; www.aitc-glulam.org.
20. AMCA - Air Movement and Control Association International, Inc.; www.amca.org.
21. ANSI - American National Standards Institute; www.ansi.org.
22. AOSA - Association of Official Seed Analysts, Inc.; www.aosaseed.com.
23. APA - APA - The Engineered Wood Association; www.apawood.org.
24. APA - Architectural Precast Association; www.archprecast.org.
25. API - American Petroleum Institute; www.api.org.
26. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
27. ARI - American Refrigeration Institute; (See AHRI).
28. ARMA - Asphalt Roofing Manufacturers Association; www.asphaltroofing.org.
29. ASCE - American Society of Civil Engineers; www.asce.org.
30. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
31. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; www.ashrae.org.
32. ASME - ASME International; (American Society of Mechanical Engineers); www.asme.org.
33. ASSE - American Society of Safety Engineers (The); www.asse.org.
34. ASSE - American Society of Sanitary Engineering; www.asse-plumbing.org.
35. ASTM - ASTM International; www.astm.org.
36. ATIS - Alliance for Telecommunications Industry Solutions; www.atis.org.
37. AWEA - American Wind Energy Association; www.awea.org.
38. AWI - Architectural Woodwork Institute; www.awinet.org.
39. AWMAC - Architectural Woodwork Manufacturers Association of Canada; www.awmac.com.
40. AWPA - American Wood Protection Association; www.awpa.com.
41. AWS - American Welding Society; www.aws.org.
42. AWWA - American Water Works Association; www.awwa.org.
43. BHMA - Builders Hardware Manufacturers Association; www.buildershardware.com.
44. BIA - Brick Industry Association (The); www.gobrick.com.
45. BICSI - BICSI, Inc.; www.bicsi.org.
46. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); www.bifma.org.
47. BISSC - Baking Industry Sanitation Standards Committee; www.bissc.org.
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); www.bissc.org.
49. CDA - Copper Development Association; www.copper.org.
50. CE - Conformite Europeenne; http://ec.europa.eu/growth/single-market/ce-marking/
51. CEA - Canadian Electricity Association; www.electricity.ca.
52. CEA - Consumer Electronics Association; www.ce.org.
53. CFFA - Chemical Fabrics and Film Association, Inc.; www.chemicalfabricsandfilm.com.
54. CFSEI - Cold-Formed Steel Engineers Institute; www.cfsei.org.
55. CGA - Compressed Gas Association; www.cganet.com.
56. CIMA - Cellulose Insulation Manufacturers Association; www.cellulose.org.
57. CISCA - Ceilings & Interior Systems Construction Association; www.cisca.org.
58. CISPI - Cast Iron Soil Pipe Institute; www.cispi.org.
59. CLFMI - Chain Link Fence Manufacturers Institute; www.chainlinkinfo.org.
60. CPA - Composite Panel Association; www.pbmdf.com.
61. CRI - Carpet and Rug Institute (The); www.carpet-rug.org.
62. CRRC - Cool Roof Rating Council; www.coolroofs.org.
63. CRSI - Concrete Reinforcing Steel Institute; www.crsi.org.
64. CSA - CSA Group; www.csa.ca.

65. CSA - CSA International; (Formerly: IAS - International Approval Services); www.csa-international.org.
66. CSI - Construction Specifications Institute (The); www.csinet.org.
67. CSSB - Cedar Shake & Shingle Bureau; www.cedarbureau.org.
68. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); www.cti.org.
69. CWC - Composite Wood Council; (See CPA).
70. DASMA - Door and Access Systems Manufacturers Association; www.dasma.com.
71. DHI - Door and Hardware Institute; www.dhi.org.
72. ECA - Electronic Components Association; (See ECIA).
73. ECAMA - Electronic Components Assemblies & Materials Association; (See ECIA).
74. ECIA - Electronic Components Industry Association; www.eciaonline.org.
75. EIA - Electronic Industries Alliance; (See TIA).
76. EIMA - EIFS Industry Members Association; www.eima.com.
77. EJMA - Expansion Joint Manufacturers Association, Inc.; www.ejma.org.
78. ESD - ESD Association; (Electrostatic Discharge Association); www.esda.org .
79. ESTA - Entertainment Services and Technology Association; (See PLASA).
80. ETL - Intertek (See Intertek); www.intertek.com.
81. EVO - Efficiency Valuation Organization; www.evo-world.org.
82. FCI - Fluid Controls Institute; www.fluidcontrolsinstitute.org.
83. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); www.fiba.com.
84. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); www.fivb.org.
85. FM Approvals - FM Approvals LLC; www.fmglobal.com.
86. FM Global - FM Global; (Formerly: FMG - FM Global); www.fmglobal.com.
87. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; www.floridaroof.com.
88. FSA - Fluid Sealing Association; www.fluidsealing.com.
89. FSC - Forest Stewardship Council U.S.; www.fscus.org.
90. GA - Gypsum Association; www.gypsum.org.
91. GANA - Glass Association of North America; www.glasswebsite.com.
92. GS - Green Seal; www.greenseal.org.
93. HI - Hydraulic Institute; www.pumps.org.
94. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
95. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
96. HPVA - Hardwood Plywood & Veneer Association; www.hpva.org.
97. HPW - H. P. White Laboratory, Inc.; www.hpwhite.com.
98. IAPSC - International Association of Professional Security Consultants; www.iapsc.org.
99. IAS - International Accreditation Service; www.iasonline.org.
100. IAS - International Approval Services; (See CSA).
101. ICBO - International Conference of Building Officials; (See ICC).
102. ICC - International Code Council; www.iccsafe.org.
103. ICEA - Insulated Cable Engineers Association, Inc.; www.icea.net.
104. ICPA - International Cast Polymer Alliance; www.icpa-hq.org.
105. ICRI - International Concrete Repair Institute, Inc.; www.icri.org.
106. IEC - International Electrotechnical Commission; www.iec.ch.
107. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); www.ieee.org.
108. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); www.ies.org.
109. IESNA - Illuminating Engineering Society of North America; (See IES).
110. IEST - Institute of Environmental Sciences and Technology; www.iest.org.
111. IGMA - Insulating Glass Manufacturers Alliance; www.igmaonline.org.
112. IGSHPA - International Ground Source Heat Pump Association; www.igshpa.okstate.edu.
113. ILI - Indiana Limestone Institute of America, Inc.; www.iliai.com.
114. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); www.intertek.com.

115. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); www.isa.org.
116. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
117. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); www.isfanow.org.
118. ISO - International Organization for Standardization; www.iso.org.
119. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
120. ITU - International Telecommunication Union; www.itu.int/home.
121. KCMA - Kitchen Cabinet Manufacturers Association; www.kcma.org.
122. LMA - Laminating Materials Association; (See CPA).
123. LPI - Lightning Protection Institute; www.lightning.org.
124. MBMA - Metal Building Manufacturers Association; www.mbma.com.
125. MCA - Metal Construction Association; www.metalconstruction.org.
126. MFMA - Maple Flooring Manufacturers Association, Inc.; www.maplefloor.org.
127. MFMA - Metal Framing Manufacturers Association, Inc.; www.metalframingmfg.org.
128. MHIA - Material Handling Industry of America; www.mhia.org.
129. MIA - Marble Institute of America; www.marble-institute.com.
130. MMPA - Moulding & Millwork Producers Association; www.wmmpa.com.
131. MPI - Master Painters Institute; www.paintinfo.com.
132. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; www.mss-hq.org.
133. NAAMM - National Association of Architectural Metal Manufacturers; www.naamm.org.
134. NACE - NACE International; (National Association of Corrosion Engineers International); www.nace.org.
135. NADCA - National Air Duct Cleaners Association; www.nadca.com.
136. NAIMA - North American Insulation Manufacturers Association; www.naima.org.
137. NBGQA - National Building Granite Quarries Association, Inc.; www.nbgqa.com.
138. NBI - New Buildings Institute; www.newbuildings.org.
139. NCAA - National Collegiate Athletic Association (The); www.ncaa.org.
140. NCMA - National Concrete Masonry Association; www.ncma.org.
141. NEBB - National Environmental Balancing Bureau; www.nebb.org.
142. NECA - National Electrical Contractors Association; www.necanet.org.
143. NeLMA - Northeastern Lumber Manufacturers Association; www.nelma.org.
144. NEMA - National Electrical Manufacturers Association; www.nema.org.
145. NETA - InterNational Electrical Testing Association; www.netaworld.org.
146. NFHS - National Federation of State High School Associations; www.nfhs.org.
147. NFPA - National Fire Protection Association; www.nfpa.org.
148. NFPA - NFPA International; (See NFPA).
149. NFRC - National Fenestration Rating Council; www.nfrc.org.
150. NHLA - National Hardwood Lumber Association; www.nhla.com.
151. NLGA - National Lumber Grades Authority; www.nlga.org.
152. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
153. NOMMA - National Ornamental & Miscellaneous Metals Association; www.nomma.org.
154. NRCA - National Roofing Contractors Association; www.nrca.net.
155. NRMCA - National Ready Mixed Concrete Association; www.nrmca.org.
156. NSF - NSF International; www.nsf.org.
157. NSPE - National Society of Professional Engineers; www.nspe.org.
158. NSSGA - National Stone, Sand & Gravel Association; www.nssga.org.
159. NTMA - National Terrazzo & Mosaic Association, Inc. (The); www.ntma.com.
160. NWFA - National Wood Flooring Association; www.nwfa.org.
161. PCI - Precast/Prestressed Concrete Institute; www.pci.org.
162. PDI - Plumbing & Drainage Institute; www.pdionline.org.
163. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); http://www.plasa.org.
164. RCSC - Research Council on Structural Connections; www.boltcouncil.org.
165. RFCI - Resilient Floor Covering Institute; www.rfci.com.

166. RIS - Redwood Inspection Service; www.redwoodinspection.com.
167. SAE - SAE International; www.sae.org.
168. SCTE - Society of Cable Telecommunications Engineers; www.scte.org.
169. SDI - Steel Deck Institute; www.sdi.org.
170. SDI - Steel Door Institute; www.steeldoor.org.
171. SEFA - Scientific Equipment and Furniture Association (The); www.sefalabs.com.
172. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
173. SIA - Security Industry Association; www.siaonline.org.
174. SJI - Steel Joist Institute; www.steeljoist.org.
175. SMA - Screen Manufacturers Association; www.smainfo.org.
176. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; www.smacna.org.
177. SMPTE - Society of Motion Picture and Television Engineers; www.smpte.org.
178. SPFA - Spray Polyurethane Foam Alliance; www.sprayfoam.org.
179. SPIB - Southern Pine Inspection Bureau; www.spib.org.
180. SPRI - Single Ply Roofing Industry; www.spri.org.
181. SRCC - Solar Rating & Certification Corporation; www.solar-rating.org.
182. SSINA - Specialty Steel Industry of North America; www.ssina.com.
183. SSPC - SSPC: The Society for Protective Coatings; www.sspc.org.
184. STI - Steel Tank Institute; www.steeltank.com.
185. SWI - Steel Window Institute; www.steelwindows.com.
186. SWPA - Submersible Wastewater Pump Association; www.swpa.org.
187. TCA - Tilt-Up Concrete Association; www.tilt-up.org.
188. TCNA - Tile Council of North America, Inc.; www.tileusa.com.
189. TEMA - Tubular Exchanger Manufacturers Association, Inc.; www.tema.org.
190. TIA - Telecommunications Industry Association (The); (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); www.tiaonline.org.
191. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
192. TMS - The Masonry Society; www.masonrysociety.org.
193. TPI - Truss Plate Institute; www.tpinst.org.
194. TPI - Turfgrass Producers International; www.turfgrasssod.org.
195. TRI - Tile Roofing Institute; www.tileroofing.org.
196. UL - Underwriters Laboratories Inc.; http://www.ul.com.
197. UNI - Uni-Bell PVC Pipe Association; www.uni-bell.org.
198. USAV - USA Volleyball; www.usavolleyball.org.
199. USGBC - U.S. Green Building Council; www.usgbc.org.
200. USITT - United States Institute for Theatre Technology, Inc.; www.usitt.org.
201. WA - Wallcoverings Association; www.wallcoverings.org
202. WASTEC - Waste Equipment Technology Association; www.wastec.org.
203. WCLIB - West Coast Lumber Inspection Bureau; www.wclib.org.
204. WCMA - Window Covering Manufacturers Association; www.wcmanet.org.
205. WDMA - Window & Door Manufacturers Association; www.wdma.com.
206. WI - Woodwork Institute; www.wicnet.org.
207. WSRCA - Western States Roofing Contractors Association; www.wsrca.com.
208. WWPA - Western Wood Products Association; www.wwpa.org.

C. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is believed to be accurate as of the date of the Contract Documents.

1. DIN - Deutsches Institut fur Normung e.V.; www.din.de.
2. IAPMO - International Association of Plumbing and Mechanical Officials; www.iapmo.org.
3. ICC - International Code Council; www.iccsafe.org.

4. ICC-ES - ICC Evaluation Service, LLC; www.icc-es.org.

D. Federal Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. Information is subject to change and is up to date as of the date of the Contract Documents.

1. COE - Army Corps of Engineers; www.usace.army.mil.
2. CPSC - Consumer Product Safety Commission; www.cpsc.gov.
3. DOC - Department of Commerce; National Institute of Standards and Technology; www.nist.gov.
4. DOD - Department of Defense; www.quicksearch.dla.mil.
5. DOE - Department of Energy; www.energy.gov.
6. EPA - Environmental Protection Agency; www.epa.gov.
7. FAA - Federal Aviation Administration; www.faa.gov.
8. FG - Federal Government Publications; www.gpo.gov/fdsys.
9. GSA - General Services Administration; www.gsa.gov.
10. HUD - Department of Housing and Urban Development; www.hud.gov.
11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; www.eetd.lbl.gov.
12. OSHA - Occupational Safety & Health Administration; www.osha.gov.
13. SD - Department of State; www.state.gov.
14. TRB - Transportation Research Board; National Cooperative Highway Research Program; The National Academies; www.trb.org.
15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; www.ars.usda.gov.
16. USDA - Department of Agriculture; Rural Utilities Service; www.usda.gov.
17. USDOJ - Department of Justice; Office of Justice Programs; National Institute of Justice; www.ojp.usdoj.gov.
18. USP - U.S. Pharmacopeial Convention; www.usp.org.
19. USPS - United States Postal Service; www.usps.com.

E. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CFR - Code of Federal Regulations; Available from Government Printing Office; www.gpo.gov/fdsys.
2. DOD - Department of Defense; Military Specifications and Standards; Available from DLA Document Services; www.quicksearch.dla.mil.
3. DSCC - Defense Supply Center Columbus; (See FS).
4. FED-STD - Federal Standard; (See FS).
5. FS - Federal Specification; Available from DLA Document Services; www.quicksearch.dla.mil.

    a. Available from Defense Standardization Program; www.dsp.dla.mil.
    b. Available from General Services Administration; www.gsa.gov.
    c. Available from National Institute of Building Sciences/Whole Building Design Guide; www.wbdg.org/ccb.

6. MILSPEC - Military Specification and Standards; (See DOD).
7. USAB - United States Access Board; www.access-board.gov.
8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
9. ADA – Americans with Disabilities Act

F. State Government Agencies: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities in the following list. This information is subject to change and is believed to be accurate as of the date of the Contract Documents.

1. CBHF; State of California; Department of Consumer Affairs; Bureau of Electronic and Appliance Repair, Home Furnishings and Thermal Insulation; www.bearhfti.ca.gov.
2. CCR; California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; www.calregs.com.
3. CDHS; California Department of Health Services; (See CDPH).
4. CDPH; California Department of Public Health; Indoor Air Quality Program; www.cal-iaq.org.
5. CPUC; California Public Utilities Commission; www.cpuc.ca.gov.
6. SCAQMD; South Coast Air Quality Management District; www.aqmd.gov.
7. TFS; Texas A&M Forest Service; Sustainable Forestry and Economic Development; www.txforestservice.tamu.edu.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

SECTION 015000 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for construction facilities and temporary controls including temporary utilities, support facilities, security, and protection.

B. Temporary utilities include, but are not limited to, the following:

1. Water service and distribution
2. Temporary electric power and light
3. Temporary heat
4. Ventilation
5. Telephone service
6. Sanitary facilities, including drinking water
7. Storm and sanitary sewer

C. Support facilities include, but are not limited to, the following:

1. Field offices and storage sheds
2. Temporary roads and paving
3. Dewatering facilities and drains
4. Temporary enclosures
5. Hoists and temporary elevator use
6. Temporary project identification signs and bulletin boards
7. Waste disposal services
8. Rodent and pest control
9. Construction aids and miscellaneous services and facilities

D. Security and protection facilities include, but are not limited to, to following:

1. Temporary fire protection
2. Barricades, warning signs, and lights
3. Sidewalk bridge or enclosure fence for the site
4. Environmental protection

1.3 SUBMITTALS

A. Temporary Utilities: Submit reports of tests, inspections, meter readings, and similar procedures performed on temporary utilities.

B. Implementation and Termination Schedule: Within (15) days of the date established for commencement of the Work, submit a schedule indicating implementation and termination of each temporary utility.

1.4 QUALITY ASSURANCE

A. Regulations: Comply with industry standards and applicable laws and regulations including, but not limited to, the following:

1. Building code requirements
2. Health and safety regulations
3. Utility company regulations
4. Police, fire department, and rescue squad rules
5. Environmental protection regulations

B. Standards: Comply with NFPA 241 "Standard for Safeguarding Construction, Alterations, and Demolition Operations". ANSI A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities".

1. Electrical Service: Comply with NEMA, NECA, and UL standards and regulations for temporary electric service. Install service in compliance with NFPA 70 "National Electric Code".

C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary utility before use. Obtain required certifications and permits.

1.5 PROJECT CONDITIONS

A. Temporary Utilities: Prepare a schedule indicating dates for implementation and termination of each temporary utility. At the earliest feasible time, when acceptable to the Owner, change over from use of temporary service to use of permanent service.

B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance. Operate in a safe and efficient manner. Relocate temporary services and facilities as the Work progresses. Do not overload facilities or permit them to interfere with progress. Take necessary fire-prevention measures. Do not allow hazardous, dangerous, or unsanitary conditions, or public nuisances to develop or persist onsite.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Provide new materials. If acceptable to the Designer, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Lumber and Plywood: Comply with requirements in Division 6 Section "Rough Carpentry".

1. For job-built temporary office, shops, and sheds within the construction area, provide UL-labeled, fire-treated lumber and plywood for framing, sheathing, and siding.

2. For signs and directory boards, provide exterior-type, Grade B-B high-density concrete form overlay plywood of sized and thicknesses indicated.

3. For fences and vision barriers, provide minimum 3/9" (9.5mm) thick exterior plywood.

4. For safety barriers, sidewalk bridges, and similar uses, provide minimum 5/8" (16mm) thick exterior plywood.

C. Gypsum Wallboard: Provide gypsum wallboard on interior walls of temporary offices.

D. Roofing Materials: Provide UL Class A standard-weight asphalt shingles or UL Class C mineral-surfaced roll roofing on roofs of job-built temporary office, shops, and shed.

E. Paint: Comply with requirements of Division 9 Section "Painting".

1. For job-built temporary offices, shops, sheds, fences, and other exposed lumber and plywood, provide exterior-grade acrylic-latex emulsion over exterior primer.

2. For sign panels and applying graphics, provide exterior-grade alkyd gloss enamel over exterior primer.

3. For interior walls of temporary offices, provide two (2) quarts interior latex-flat wall paint.

F. Tarpaulins: Provide waterproof, fire-resistant, UL-labeled tarpaulins with flame-spread rating of (15) or less. For temporary enclosures, provide translucent, nylon-reinforced laminated polyethylene or polyvinyl chloride, fire-retardant tarpaulins.

G. Water: Provide potable water approved by local health authorities.

H. Open-Mesh Fencing: Provide 0.120" (3mm) thick, galvanized 2" (50mm) chainlink fabric fencing 6' (2m) high with galvanized steel pipe posts, 1½" (38mm) ID for line posts and 2½" (64mm) ID for corner posts.

2.2 EQUIPMENT

A. General: Provide new equipment. If acceptable to the Designer, the Contractor may use undamaged, previously used equipment in serviceable condition. Provide equipment suitable for use intended.

B. Water Hoses: Provide ¾" (19mm), heavy-duty, abrasion-resistant, flexible rubber hoses 100' (30m) long, with pressure rating greater than the maximum pressure of the water distribution system. Provide adjustable shutoff nozzles at hose discharge.

C. Electrical Outlets: Provide properly configured, NEMA-polarized outlets to prevent insertion of 110 to 120V plugs into higher voltage outlets. Provide receptacle outlets equipped with ground-fault circuit interrupters, reset button, and pilot light for connection of power tools and equipment.

D. Electrical Power Cords: Provide grounded extension cords. Use hard-service cords where exposed to abrasion and traffic. Provide waterproof connectors to connect separate lengths of electric cords if single lengths will not reach areas where construction activities are in progress. Do not exceed safe length-voltage rating.

E. Lamps and Light Fixtures: Provide general service incandescent lamps of wattage required for adequate illumination. Provide guard cages or tempered-glass enclosures where exposed to breakage. Provide exterior fixture where exposed to moisture.

F. Heating Units: Provide temporary heating units that have been tested and labeled by UL, FM, or another recognized trade association related to the type of fuel being consumed.

G. Fire Extinguishers: Provide hand-carried, portable, UL-rated, Class A fire extinguishers for temporary offices and similar spaces. In other locations, provide hand-carried, portable, UL-rated, Class ABC, dry-chemical extinguishers, or a combination of extinguishers of NFPA-recommended classes for the exposures.

1. Comply with NFPA 10 and NFPA 241 for classification, extinguishing agent, and size required by location and class of fire exposure.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Use qualified personnel for installation of temporary facilities. Locate facilities where they will serve the Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required.

B. Provide each Facility ready for use when needed to avoid delay. Maintain and modify as required. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Engage the appropriate local utility company to install temporary service or connect to existing service. Where company provides only part of the service, provide the remainder with matching, compatible materials and equipment. Comply with company recommendations.

1. Arrange with company and existing users for a time when service can be interrupted, if necessary, to make connections for temporary services.

2. Provide adequate capacity at each stage of construction. Prior to temporary utility availability, provide trucked-in services.

3. Obtain easements to bring temporary utilities to the site where the Owner's easements cannot be used for that purpose.

4. Use Charges: Cost or use charges for temporary facilities are not chargeable to the Owner or Designer. Neither the Owner nor Designer will accept cost or use charges as a basis of claims for Change Order.

B. Temporary Water Service: The Owner will provide water for construction purposes from the existing building system. All required temporary extensions shall be provided and removed by the Contractor. Connection points and methods of connection shall be designated and approved by the Construction Representative.

C. Temporary Electric Power Service: The Owner will provide electric power for construction lighting and power tools. Contractors using such services shall pay all costs of temporary services, circuits, outlet, extensions, etc.

D. Temporary Lighting: When overhead floor or roof deck has been installed, provide temporary lighting with local switching.

1. Install and operate temporary lighting that will fulfill security and protection requirements without operating the entire system. Provide temporary lighting that will provide adequate illumination for construction operations and traffic conditions.

E. Temporary Heating and Cooling: The normal heating and/or cooling system of the building shall be maintained in operation during the construction. Should the Contractor find it necessary to interrupt the normal HVAC service to spaces, which have not been vacated for construction, such interruptions shall be pre-scheduled with the Construction Representative.

F. Temporary Telephones: The Owner will not provide telephones at the project site. The Contractor shall provide their phone communications throughout the construction period for all supervisory personnel engaged in construction activities. Phone number(s) shall be given to the Owner's Construction Representative and Architect.

G. Temporary Toilets: Use of the Owner's existing toilet facilities will be permitted, so long as facilities are cleaned and maintained in a condition acceptable to the Owner. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative. Privileges will be revoked if smoking is detected in the assigned restrooms. In such an event, the Contractor will be required to install self-contained toilet units at their own expense.

H. Wash Facilities: The Owner will provide wash facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative. Privileges will be revoked if smoking is detected in the assigned washroom areas. In such an event, the Contractor will be required to install wash facilities supplied with potable water at their own expense.

I. Drinking-Water Facilities: The Owner will provide drinking water facilities within the building. All construction personnel will be allowed access only to those specific facilities designated by the Construction Representative.

J. Provide earthen embankments and similar barriers in and around excavations and subgrade construction, sufficient to prevent flooding by runoff of storm water from heavy rains.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Locate field offices, storage sheds, and other temporary construction and support facilities for easy access.

1. Maintain support facilities until near Substantial Completion. Remove prior to Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to the Owner.

B. Storage Facilities: Limited areas for storage of building materials are available onsite. The Contractor shall provide his own security. Specific locations for storage and craning operations will be discussed at the Pre-Construction Meeting.

C. Temporary Paving: Construct and maintain temporary roads and paving to support the indicated loading adequately and to withstand exposure to traffic during the construction

period. Locate temporary paving for roads, storage areas, and parking where the same permanent facilities will be located. Review proposed modifications to permanent paving with the Designer.

1. Paving: Comply with Division 2 Section "Hot-Mixed Asphalt Paving" for construction and maintenance of temporary paving.
2. Coordinate temporary paving development with subgrade grading, compaction, installation and stabilization of subbase, and installation of base and finish courses of permanent paving.
3. Install temporary paving to minimize the need to rework the installations and to result in permanent roads and paved areas without damage or deterioration when occupied by the Owner.
4. Delay installation of the final course of permanent asphalt concrete paving until immediately before Substantial Completion. Coordinate with weather conditions to avoid unsatisfactory results.
5. Extend temporary paving in and around the construction area as necessary to accommodate delivery and storage of materials, equipment usage, administration, and supervision.

D. Construction Parking: Parking at the site will be provided in the areas designated at the Pre-Construction Meeting. Under no circumstances will any vehicle be parked in a fire lane. Parking on lawns shall be prohibited.

E. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and operations not directly associated with construction activities included under individual Sections, comply with dewatering requirements of applicable Division 2 Sections. Where feasible, utilize the same facilities. Maintain the site, excavations, and construction free of water.

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

1. Where heat is needed and the permanent building enclosure is not complete, provide temporary enclosures where there is no other provision for containment of heat. Coordinate enclosure with ventilating and materials drying or curing requirements to avoid dangerous conditions and effects.
2. Install tarpaulins securely with incombustible wood framing and other materials. Close openings of 25SqFt (2.3SqM) or less with plywood or similar materials.
3. Close openings through floor or roof decks and horizontal surfaces with load-bearing, wood-framed construction.
4. Where temporary wood or plywood enclosure exceeds 100SqFt (9.2SqM) in area, use UL-labeled, fire-retardant-treated material for framing and main sheathing.

G. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Project Identification and Temporary Signs: Prepare project identification and other signs of size indicated. Install signs where indicated to inform the public and persons

seeking entrance to the Project. Support on posts or framing of preservative-treated wood or steel. Do not permit installation of unauthorized signs.

1. Project Identification Signs: Engage an experienced sign painter to apply graphics. Comply with details indicated.

2. Temporary Signs: Prepare signs to provide directional information to construction personnel and visitors.

I. Temporary Exterior Lighting: Install exterior yard and sign lights so signs are visible when Work is being performed.

J. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven (7) days during normal weather or three (3) days when the temperature is expected to rise above 80°F (27°C). Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material lawfully.

K. Rodent Pest Control: Before deep foundation work has been completed, retain a local exterminator or pest control company to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests. Employ this service to perform extermination and control procedures are regular intervals so the Project will be free of pests and their residues at Substantial Completion. Perform control operations lawfully, using environmentally safe materials.

L. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished, permanent stairs with a protective covering of plywood or similar material so finishes will be undamaged at the time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Designer.

B. Temporary Fire Protection: Until fire-protection needs are supplied by permanent facilities, install and maintain temporary fire-protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 “Standard for Portable Fire Extinguishers” and NFPA 241 “Standard for Safeguarding Construction, Alterations, and Demolition Operations”.

1. Locate fire extinguishers where convenient and effective for their intended purpose, but not less than one (1) extinguisher on each floor at or near each usable stairwell.

2. Store combustible materials in containers in fire-safe locations.

3. Maintain unobstructed access to fire extinguishers, fire hydrants, temporary fire-protection facilities, stairways, and other access routes for fighting fires. Prohibit smoking in hazardous fire-exposure areas.

4. Provide supervision of welding operations, combustion-type temporary heating units, and similar sources of fire ignition.

C. Permanent Fire Protection: At the earliest feasible date in each area of the Project complete installation of the permanent fire-protection facility including connected services and place into operation and use. Instruct key personnel on use of facilities.

D. Barricades, Warning Signs, and Lights: Comply with standards and code requirements for erection of structurally adequate barricades. Paint with appropriate colors, graphics, and warning signs to inform personnel and the public of the hazard being protected against. Where appropriate and needed, provide lighting including flashing red or amber lights.

E. Enclosure Fence: Before excavation begins, install an enclosure fence with lockable entrance gates. Locate where indicated, or enclose the entire site or the portion determined sufficient to accommodate construction operations. Install in a manner that will prevent people, dogs, and other animals from easily entering the site, except by the entrance gates.

1. Provide open-mesh, chainlink fencing with posts set in a compacted mixture of gravel and earth.

2. Provide plywood fence, 8’ (2.5m) high, framed with (4) 2”x4” (50mm x 100mm) rails, and preservative-treated wood posts spaced not more than 8’ (2.5m) apart.

F. Covered Walkway: Erect a structurally adequate, protective covered walkway for passage of persons along the adjacent public street. Coordinate with entrance gates, other facilities, and obstructions. Comply with regulations of authorities having jurisdiction.

1. Construct covered walkways using scaffold or shoring framing. Provide wood plank overhead decking, protective plywood enclosure walls, handrails, barricades, warning signs, lights, safe and well-drained walkways, and similar provisions for protection and safe passage. Extend the back wall beyond the structure to complete the enclosure fence. Paint and maintain in a manner acceptable to the Owner and the Designer.

G. Security Enclosure and Lockup: Install substantial temporary enclosure of partially completed areas of construction. Provide locking entrances to prevent unauthorized entrance, vandalism, theft, and similar violations of security.

1. Storage: Where materials and equipment must be stored and are of value or attractive for theft, provide a secure lockup. Enforce discipline in connection with the installation and release of material to minimize the opportunity for theft and vandalism.

H. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and minimize the possibility that air, waterways, and subsoil might be contaminated or polluted or that other undesirable effects might result. Avoid use of tools and equipment that produce harmful noise. Restrict use of noisemaking tools and equipment to hours that will minimize complaints from persons or firms near the site.

3.5 OPERATION, TERMINATION AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. Limit availability of temporary facilities to essential and intended uses to minimize waste and abuse.

B. Maintenance: Maintain facilities in good operating condition until removal. Protect from damage by freezing temperatures and similar elements.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

2. Protection: Prevent water-filled piping from freezing. Maintain markers for underground lines. Protect from damage during excavation operations.

C. Termination and Removal: Unless the Designer requests that it be maintained longer, remove each temporary facility when the need has ended, when replaced by authorized use of a permanent facility, or no later than Substantial Completion. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with the temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are the Contractor's property. The Owner reserves the right to take possession of project identification signs.

2. Remove temporary paving not intended for or acceptable for integration into permanent paving. Where the area is intended for landscape development, remove soil and aggregate fill that do not comply with requirements for fill or subsoil in the area. Remove materials contaminated with road oil, asphalt and other petrochemical compounds, and other substances that might impair growth of plant materials or lawns. Repair or replace street paving, curbs, and sidewalks at the temporary entrances as required by the governing authority.

3. At Substantial Completion, clean and renovate permanent facilities used during the construction period including, but not limited to, the following:

a. Replace air filters and clean inside of ductwork and housing.

b. Replace significantly worn parts and parts subject to unusual operating conditions.

c. Replace lamps burned out or noticeably dimmed by hours of use.

END OF SECTION 015000

SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for selection of products for use in Project; product delivery, storage, and handling; manufacturers' standard warranties on products; special warranties; product substitutions; and comparable products.

B. Related Sections:

1. Division 01 section "References" for applicable industry standards for products specified.
2. Division 01 section "Substitution Procedures" for submission and evaluation requirements.
3. Division 01 section "Closeout Procedures" for submitting warranties for Contract closeout.
4. Divisions 02 through 49 sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.

1. Named Products: Items identified by manufacturer's product name, including make or model number or other designation shown or listed in manufacturer's published product literature, that is current as of date of the Contract Documents.

2. New Products: Items that have not previously been incorporated into another project or facility, except that products consisting of recycled-content materials are allowed, unless explicitly stated otherwise. Products salvaged or recycled from other projects are not considered new products.

3. Comparable Product: Product that is demonstrated and approved through submittal process, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.

B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor and meeting the provision of Division 01 Section Product Substitutions Before (and After) Award of Contract.

C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service

performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers named in the specifications.

D. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

E. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to providee more rights for Owner.

1.4 SUBMITTALS

A. Comparable Product Requests: Submit three copies of each request for consideration. Identify product or fabrication or installation method to be replaced. Include Specification Section number and title and Drawing numbers and titles.

1. Include data to indicate compliance with the requirements specified in "Comparable Products" Article.

2. Form: Tabulate information for each product under the following column headings:

    a. Specification Section number and title.
    b. Generic name used in the Contract Documents.
    c. Proprietary name, model number, and similar designations.
    d. Manufacturer's name and address.
    e. Supplier's name and address.
    f. Installer's name and address.
    g. Projected delivery date or time span of delivery period.
    h. Identification of items that require early submittal approval for scheduled delivery date.

3. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.

    a. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.

4. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.

5. Architect's Action: If necessary, Architect will request additional information or documentation for evaluation within one week of receipt of a comparable product request. Architect will notify Contractor of approval or rejection of proposed comparable product request within 15 days of receipt of request, or 7 days of receipt of additional information or documentation, whichever is later.

    a. Form of Approval: As specified in Division 01 section "Submittal Procedures."
    b. Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.

B. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 section "Submittals". Show compliance with requirements.

1.5 QUALITY ASSURANCE

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

1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.

2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. Comply with manufacturer's written instructions.

B. Delivery and Handling:

1. Schedule delivery to minimize long-term storage at Project site and to prevent overcrowding of construction spaces.
2. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.
3. Deliver products to Project site in an undamaged condition in manufacturer's original sealed container or other packaging system, complete with labels and instructions for handling, storing, unpacking, protecting, and installing.
4. Inspect products on delivery to ensure compliance with the Contract Documents and to ensure that products are undamaged and properly protected.

C. Storage:

1. Store products to allow for inspection and measurement of quantity or counting of units.
2. Store materials in a manner that will not endanger Project structure.
3. Store products that are subject to damage by the elements, under cover in a weathertight enclosure above ground, with ventilation adequate to prevent condensation.
4. Store cementitious products and materials on elevated platforms.
5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
7. Protect stored products from damage and liquids from freezing.

1.7 PRODUCT WARRANTIES

A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.

1. Warranty in first subparagraph below is manufacturer's standard and may have exclusions and limitations that do not suit Project. Check warranties and specify special warranties if manufacturers' warranties are not suitable.
2. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.

3. Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.

B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final execution.

1. Manufacturer's Standard Form: Modified to include Project-specific information and properly executed.
2. Specified Form: When specified forms are included with the Specifications, prepare a written document using appropriate form properly executed.
3. Refer to Divisions 02 through 49 Sections for specific content requirements and particular requirements for submitting special warranties.

C. Submittal Time: Comply with requirements in Division 01 section "Closeout Procedures."

PART 2 - PRODUCTS

2.1 PRODUCT SELECTION PROCEDURES

A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that are new at time of installation.

1. Provide products complete with accessories, trim, finish, fasteners, and other items needed for a complete installation and indicated use and effect.
2. Standard Products: If available, and unless custom products or nonstandard options are specified, provide standard products of types that have been produced and used successfully in similar situations on other projects.
3. Owner reserves the right to limit selection to products with warranties not in conflict with requirements of the Contract Documents.
4. Where products are accompanied by the term "as selected," Architect will make selection.
5. Where products are accompanied by the term "match sample," sample to be matched is Architect's.
6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.

B. Product Selection Procedures:

1. Product: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements.
2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
3. Products:
    a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
    b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed, or an unnamed

product, that complies with requirements. Comply with requirements in "Comparable Products" Article for ration of an unnamed product.

4. Manufacturers:

   a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

   b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed, or a product by an unnamed manufacturer, that complies with requirements. Comply with requirements in "Comparable Products" Article for consideration of an unnamed manufacturer's product.

5. Basis-of-Design Product: Where Specifications name a product and include a list of manufacturers, provide the specified product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Comply with provisions in Part 2 "Comparable Products" Article for consideration of an unnamed product by the other named manufacturers.

C. Visual Matching Specification: Where Specifications require "match Architect's sample", provide a product that complies with requirements and matches Architect's sample. Architect's decision will be final on whether a proposed product matches.

1. If no product available within specified category matches and complies with other specified requirements, comply with requirements in Division 01.

D. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.

1. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.

2. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items.

3. Custom: Where Specifications include the phrase “custom” colors, patterns or textures, Architect will provide information in the contract documents and/or samples to indicate desired finish.

2.2 PRODUCT SUBSTITUTIONS

A. Timing: Architect will consider requests for substitution according to the provisions in Division 01 sections for Product Substitutions. Requests received in any other manner may be considered or rejected at discretion of Architect.

B. Substitution Request Form attached to end of section for reference.

2.3 COMPARABLE PRODUCTS

A. Conditions: Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect will return requests without action, except to record noncompliance with these requirements:

1. Evidence that the proposed product does not require extensive revisions to the Contract Documents, that it is consistent with the Contract Documents and will produce the indicated results, and that it is compatible with other portions of the Work.
2. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements indicated.
3. Evidence that proposed product provides specified warranty.
4. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
5. Samples, if requested.

PART 3 - EXECUTION (Not Used)

ATTACHMENT(S): Substitution Request Form

END OF SECTION 016000

SECTION 017400 – CLEANING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for cleaning during the Project.

B. Environmental Requirements: Conduct cleaning and waste-disposal operations in compliance with local laws and ordinances. Comply fully with federal and local environmental and anti-pollution regulations.

1. Do not dispose of volatile wastes, such as mineral spirits, oil, or paint thinner, in storm or sanitary drains.

2. Burning or burying of debris, rubbish, or other waste material on the premises is not permitted.

PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 PROGRESS CLEANING

A. General

1. Retain all stored items in an orderly arrangement allowing maximum access, not impending drainage or traffic, and providing the required protection of materials.

2. Do not allow the accumulation of scrap, debris, waste material, and other items not required for construction of this Work.

3. At least **twice** each month, and more often if necessary, completely remove all scrap, debris, and waste material from the job site.

4. Provide adequate storage for all items awaiting removal from the job site, observing all requirements for fire protection and protection of the ecology.

B. Site:

1. Daily, inspect the site and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, inspect all arrangements of materials stored on the site. Re-stack, tidy, or otherwise service all material arrangements.

3. Maintain the site in a neat and orderly condition at all times.

C. Structures:

1. Daily, inspect the structures and pick up all scrap, debris, and waste material. Remove all such items to the place designated for their storage.

2. Weekly, sweep all interior spaces clean. “Clean,” for the purposes of this paragraph, shall be interpreted as meaning free from dust and other material capable of being removed by use of reasonable effort and handheld broom.

3. In preparation for installation of succeeding materials, clean the structures or pertinent portions thereof to the degree of cleanliness recommended by the manufacturer of the succeeding material, using all equipment and materials required to achieve the required cleanliness.

4. Following the installation of finish floor materials, clean the finish floor daily while work is being performed in the space in which finish materials have been installed. “Clean,” for the purposes of this subparagraph, shall be interpreted as meaning free from all foreign material which, in the opinion of the Construction Representative, may be injurious to the finish of the finish floor material.

3.2 FINAL CLEANING

A. General: Provide final cleaning operations when indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of Work to the condition expected from a commercial building cleaning and maintenance program. Comply with manufacturer’s instructions.

B. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for the entire Project or a portion of the Project.

1. Clean the Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and foreign substances.

2. Sweep paved areas broom clean. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.

3. Remove petrochemical spills, stains, and other foreign deposits.

4. Remove tools, construction equipment, machinery, and surplus material from the site.

5. Remove snow and ice to provide safe access to the building.

6. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.

7. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.

8. Broom clean concrete floors in unoccupied spaces.

9. Vacuum clean carpet and similar soft surfaces removing debris and excess nap. Shampoo, if required.

10. Clean transparent material, including mirrors and glass in doors and windows. Remove glazing compounds and other substances that are noticeable vision-obscuring materials.

Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.

11. Remove labels that are not permanent labels.
12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    a. Do not paint over “UL” and similar labels, including mechanical and electrical nameplates.
13. Wipe surfaces of mechanical and electrical equipment, elevator equipment, and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
14. Clean plumbing fixtures to a sanitary condition free of stains, including stains resulting from water exposure.
15. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
16. Clean ducts, blowers, and coils if units were operated without filters during construction
17. Clean, food-service equipment to a sanitary condition, ready and acceptable for its intended use.
18. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs and defective and noisy starters in fluorescent and mercury vapor fixtures.
19. Leave the Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid the Project of rodents, insects, and other pests. Comply with regulations of local authorities.

D. Removal of Protection: Remove temporary protection and facilities installed during construction to protect previously completed installations during the remainder of the construction period.

E. Compliances: Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from the site and dispose of lawfully.
    1. Where extra materials of value remain after Final Acceptance by the Owner, they become the Owner’s property.

END OF SECTION 017400

SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:

1. Demonstration of operation of systems, subsystems, and equipment.
2. Training in operation and maintenance of systems, subsystems, and equipment.
3. Demonstration and training video recordings.

1.3 INFORMATIONAL SUBMITTALS

A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.

B. Attendance Record: For each training module, submit list of participants and length of instruction time.

C. Evaluations: For each participant and for each training module, submit results and documentation of performance-based test.

1.4 CLOSEOUT SUBMITTALS

A. Demonstration and Training Video Recordings: Submit two copies within seven days of end of each training module.

1. Identification: On each copy, provide an applied label with the following information:
    a. Name of Project.
    b. Name and address of videographer.
    c. Name of Architect.
    d. Name of Construction Manager.
    e. Name of Contractor.
    f. Date of video recording.
2. Transcript: Prepared in PDF electronic format. Include a cover sheet with same label information as the corresponding video recording and a table of contents with links to corresponding training components. Include name of Project and date of video recording on each page.
3. At completion of training, submit complete training manual(s) for Owner's use in PDF electronic file format on compact disc.

1.5 QUALITY ASSURANCE

A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

B. Instructor Qualifications: A factory-authorized service representative experienced in operation and maintenance procedures and training.

C. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Coordination". Review methods and procedures related to demonstration and training including, but not limited to, the following:

1. Inspect and discuss locations and other facilities required for instruction.
2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
3. Review required content of instruction.
4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

1.6 COORDINATION

A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations and to ensure availability of Owner's personnel.

B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.

B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following as applicable to the system, equipment, or component:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
    a. System, subsystem, and equipment descriptions.
    b. Performance and design criteria if Contractor is delegated design responsibility.
    c. Operating standards.
    d. Regulatory requirements.
    e. Equipment function.
    f. Operating characteristics.

g. Limiting conditions.
h. Performance curves.

2. Documentation: Review the following items in detail:

a. Emergency manuals.
b. Operations manuals.
c. Maintenance manuals.
d. Project record documents.
e. Identification systems.
f. Warranties and bonds.
g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:

a. Instructions on meaning of warnings, trouble indications, and error messages.
b. Instructions on stopping.
c. Shutdown instructions for each type of emergency.
d. Operating instructions for conditions outside of normal operating limits.
e. Sequences for electric or electronic systems.
f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:

a. Startup procedures.
b. Equipment or system break-in procedures.
c. Routine and normal operating instructions.
d. Regulation and control procedures.
e. Control sequences.
f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:

a. Alignments.
b. Checking adjustments.
c. Noise and vibration adjustments.
d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:

a. Diagnostic instructions.
b. Test and inspection procedures.

7. Maintenance: Include the following:

a. Inspection procedures.
b. Types of cleaning agents to be used and methods of cleaning.
c. List of cleaning agents and methods of cleaning detrimental to product.
d. Procedures for routine cleaning
e. Procedures for preventive maintenance.
f. Procedures for routine maintenance.
g. Instruction on use of special tools.

8. Repairs: Include the following:

a. Diagnosis instructions.

b. Repair instructions.
c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
d. Instructions for identifying parts and components.
e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 007213 "General Conditions".

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

1. Schedule training with Owner with at least seven days' advance notice.

C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

D. Cleanup: Collect used and leftover educational materials and remove from Project site. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

3.3 DEMONSTRATION AND TRAINING VIDEO RECORDINGS

A. General: Engage a qualified commercial videographer to record demonstration and training video recordings. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.

1. At beginning of each training module, record each chart containing learning objective and lesson outline.

B. Video: Provide minimum 640 x 480 video resolution converted to format file type acceptable to Owner, on electronic media.

1. Electronic Media: Read-only format compact disc acceptable to Owner, with commercial-grade graphic label.
2. File Hierarchy: Organize folder structure and file locations according to project manual table of contents. Provide complete screen-based menu.

3. File Names: Utilize file names based upon name of equipment generally described in video segment, as identified in Project specifications.

4. Contractor and Installer Contact File: Using appropriate software, create a file for inclusion on the Equipment Demonstration and Training DVD that describes the following for each Contractor involved on the Project, arranged according to Project table of contents:

    a. Name of Contractor/Installer.
    b. Business address.
    c. Business phone number.
    d. Point of contact.
    e. E-mail address.

C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to adequately cover area of demonstration and training. Display continuous running time.

1. Film training session(s) in segments not to exceed 15 minutes.

    a. Produce segments to present a single significant piece of equipment per segment.
    b. Organize segments with multiple pieces of equipment to follow order of Project Manual table of contents.
    c. Where a training session on a particular piece of equipment exceeds 15 minutes, stop filming and pause training session. Begin training session again upon commencement of new filming segment.

D. Light Levels: Verify light levels are adequate to properly light equipment. Verify equipment markings are clearly visible prior to recording.

1. Furnish additional portable lighting as required.

E. Narration: Describe scenes on video recording by audio narration by microphone while video recording is recorded. Include description of items being viewed.

F. Transcript: Provide a transcript of the narration. Display images and running time captured from videotape opposite the corresponding narration segment.

G. Preproduced Video Recordings: Provide video recordings used as a component of training modules in same format as recordings of live training.

END OF SECTION 017900

SECTION 022200 – EXISTING CONDITIONS ASSESSMENT(S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Reference the following sub-sections for geotechnical and utility information:

1. **Appendix 1 -** 022200a "Core Drill Report – Missouri School for the Blind – Saint Louis, Missouri" dated 9 December 2025 by SITEX.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Not applicable.

END OF SECTION 022200

SECTION 022600 – HAZARDOUS MATERIAL ASSESSMENT(S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Reference the following sub-sections for geotechnical and utility information:

1. **Appendix 2 -** 022600a "Hazardous Materials Survey – Missouri School for the Blind –Saint Louis, Missouri" dated 15 December 2025 by SITEX.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Not applicable.

END OF SECTION 022600

SECTION 023200 – GEOTECHNICAL REPORT(S)

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Reference the following sub-sections for geotechnical and utility information:

1. **Appendix 3 -** 023200a "Geotechnical Report – MSB Nature Park – St. Louis, Missouri" dated August 2019 by SCI.

PART 2 - PRODUCTS

2.1 MANUFACTURER

A. Not applicable.

PART 3 - EXECUTION

3.1 PREPARATION

A. Not applicable.

END OF SECTION 023200

SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Demolition and removal of selected portions of building or structure.
2. Demolition and removal of selected site elements.
3. Salvage of existing items to be reused, reinstalled, or recycled.
4. Advance notice and coordination of utility outages with Owner.
5. Engineering and provision of temporary shoring.
6. Coordination of work restrictions with Owner.
7. Coordination of temporary partitions and enclosures.
8. Obtain all required permits and inspections and comply with all local ordinances for selective demolition work.

B. Related Requirements:

1. Division 00 section "Alternates" for description of bid alternates.
2. Division 01 section "Summary" for restrictions on use of the premises, Owner-occupancy requirements, and phasing requirements.
3. Division 01 section "Temporary Facilities and Controls" for quality control plans, construction fencing, signage, temporary partitions, and other related requirements.
4. Division 01 section "Execution" for cutting and patching procedures.
5. Division 02 section “Facility Remediation and Abatement”
6. Division 02 section “Hazardous Materials Assessments”
7. Reference divisions 20-28 for related MEPFT requirements.
8. Division 31 section "Site Clearing" for related selective removal scope.

1.3 DEFINITIONS

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

B. Remove and Salvage: Detach items from existing construction, in a manner to prevent damage, and deliver to Owner ready for reuse. Coordinate delivery location with Owner.

C. Remove and Reinstall: Detach items from existing construction, in a manner to prevent damage, prepare for reuse, and reinstall where indicated.

D. Existing to Remain: Leave existing items that are not to be removed and that are not otherwise indicated to be salvaged or reinstalled.

E. Dismantle: To remove by disassembling or detaching an item from a surface, using gentle methods and equipment to prevent damage to the item and surfaces; disposing of items unless indicated to be salvaged or reinstalled.

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Playground equipment to be salvaged for Owner's reuse.

C. Copper gutters and downspouts to be salvaged for Owner's reuse.

1.5 PREDEMOLITION CONFERENCE

A. Predemolition Conference: Conduct conference at Project site.

1. Inspect and discuss condition of construction to be selectively demolished.
2. Review structural load limitations of existing structure.
3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
4. Review existing conditions with identified hazardous materials and Contractor Abatement Workplan.
5. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
6. Review areas where existing construction is to remain and require protection.

INFORMATIONAL SUBMITTALS

A. Qualification Data: For refrigerant recovery technician.

B. Proposed Protection Measures: Submit Project-specific report, including Drawings, that indicate the measures proposed for protecting individuals and property, for environmental protection, for dust control, for vibration control, and for noise control. Indicate proposed locations and construction of barriers.

C. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Coordinate on-site operations with Owner to allow uninterrupted operations.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Use of elevator and stairs.
    a. Use of existing elevators and public stairs require advance approval by Owner.
5. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

D. Predemolition Photographs or Video: Show existing conditions of adjoining construction, including finish surfaces, that might be misconstrued as damage caused by demolition operations. Reference 'Examination' requirements in this section. Submit before Work begins.

E. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that

recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

F. Warranties: Documentation indicating that existing warranties are still in effect after completion of selective demolition.

G. Qualification Data: For professional engineer to be registered in State of Missouri.

H. Delegated-Design Engineering Submittal: For shoring, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.7 CLOSEOUT SUBMITTALS

A. Inventory: Submit a list of items that have been removed and salvaged.

B. Landfill Records: Comply with requirements specified in Owner’s general requirements.

1.8 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

B. Engineer Qualifications: A professional engineer legally authorized to practice in jurisdiction where Project is located and experienced in providing engineering services of the kind indicated – shoring systems – with a record of successful performance.

1.9 FIELD CONDITIONS

A. Missouri School for the Blind is occupied and will remain operational during Construction. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Coordinate Owner’s schedule, access and use of Selective Demolition areas.

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

C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

D. Hazardous Materials: It is expected that at least some hazardous materials may be encountered in existing buildings and structures to be selectively demolished. The Owner has completed an initial hazardous material survey. Documentation of this effort is available within this Project Manual under Division 02 section "Hazardous Materials Survey" the Owner upon written request.

1. A hazardous material survey has been completed and is included in this Project Manual.
2. If additional suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.
3. Abatement of hazardous materials shall be conducted by the Contractor.
4. Contractors discovering hazardous materials in the course of the Work are to suspend operations in the immediate area and notify the Owner and Architect. Do not resume work in the area until all materials are removed or contained in a manner acceptable to authorities having jurisdiction.
5. Contractor will dispose of hazardous materials in an approved manner off-site.

6. The Architect and Architect's Consultants shall have no responsibility for the identification, discovery, presence, handling, removal or disposal of, or exposure of person to, hazardous materials in any form at the Project Site.

F. Storage or sale of removed items or materials on-site is not permitted.

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

1. Maintain fire-protection facilities in service during selective demolition operations.
2. Maintain all utilities and building systems to occupied portions of the campus. Confirm and coordinate any disruptions with Owner. Reference MEPFT documents.

H. Damages: Promptly repair damage caused to adjacent facilities by demolition work. Repairs shall conform to requirements of Division 01 section "Cutting and Patching".

1.10 WARRANTY

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

B. Notify warrantor on completion of selective demolition, and obtain documentation verifying that existing system has been inspected and warranty remains in effect. Submit documentation at Project closeout.

1.11 COORDINATION

A. Arrange selective demolition schedule so as not to interfere with Owner's operations.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

B. Standards: Comply with ASSE A10.6 and NFPA 241.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped before starting selective demolition operations.

B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

C. Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during selective building demolition operations.

D. When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.

E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs and/or preconstruction video.

1. Comply with requirements specified in Owner General Requirements.

3.2 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Coordinate Selective Demolition with Project-specific 'Site Utilization Plan', required Protection Measures, and Temporary Controls with Owner Operations.

C. Coordinate shoring, bracing, or other required support to prevent movement, settlement, or collapse of areas to be demolished and adjacent facilities to remain.

D. Follow guidelines and requirements outlined in 'Control of Construction Vibrations'.

3.3 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services / Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.

B. Existing Services / Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off utility services and mechanical/electrical systems serving areas to be selectively demolished.

1. Owner will arrange to shut off indicated services/systems when requested by Contractor. Contractor to provide written request and advance notice as defined by Owner.

2. If services / systems are required to be removed, relocated, or abandoned, provide temporary services / systems that bypass area of selective demolition and that maintain continuity of services / systems to other parts of building.

3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. If services / systems are required to be removed, relocated, or abandoned, provide temporary services / systems that bypass area of selective demolition and that maintain continuity of services / systems to other parts of the building in operation.

    b. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.

    c. Piping to Be Abandoned in Place: Not permitted.

d. Equipment to Be Removed: Disconnect and cap services and remove equipment.

e. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.

C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

3.4 PROTECTION

A. Temporary Protection: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.

   a. Erect temporary covered passageways where overhead work is required.

2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.

3. Provide and maintain temporary dust-proof partitions and enclosures as required to prevent spread of dust, noise, or fumes to occupied portions of the building.

4. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

5. Cover and protect furniture, furnishings, and equipment that have not been removed.

6. Comply with requirements for temporary enclosures, dust control, noise control, vibration control, heating, and cooling specified in Division 01 section "Temporary Facilities and Controls."

B. Temporary Shoring: Engineer, provide, and maintain shoring, bracing, and structural supports as required to preserve stability and prevent movement, settlement, or collapse of construction and finishes to remain, and to prevent unexpected or uncontrolled movement or collapse of construction being demolished.

1. Strengthen or add new supports when required during progress of selective demolition.
2. Engage a qualified, State of Missouri licensed engineer to determine adequate shoring requirements.

C. Remove temporary barricades and protections where hazards no longer exist.

3.5 SELECTIVE DEMOLITION, GENERAL

A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.

2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping. Whenever possible, use tools that will reduce noise or vibration as building will remain

occupied. Temporarily cover openings to remain or provide temporary guards and/or guardrails as required at all openings.

3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
4. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.
5. Maintain fire watch during and for at least two (2) hours after flame-cutting operations.
6. Maintain adequate ventilation when using cutting torches.
7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
10. Dispose of demolished items and materials promptly.

B. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

Removed and Salvaged Items:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until delivery to Owner.
4. Transport items to Owner's storage area designated by Owner.
5. Protect items from damage during transport and storage.

D. Removed and Reinstalled Items:

1. Clean and repair items to functional condition adequate for intended reuse.
2. Pack or crate items after cleaning and repairing. Identify contents of containers.
3. Protect items from damage during transport and storage.
4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.In "Existing Items to Remain" Paragraph below, option adds cost. Revise to suit Project.

E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and reinstalled in their original locations after selective demolition operations are complete.

F. If unanticipated systems are encountered -- including but not limited to mechanical, electrical, or structural components -- investigate and measure both nature and extent of the condition. Submit written report to Architect and Owner. Pending receipt of resolution or directive, adjust selective demolition schedule as necessary to continue overall job progress without undue delay.

3.6 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, and then remove concrete between saw cuts.

C. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, and then remove masonry between saw cuts.

D. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, and then break up and remove.

E. Resilient Floor Coverings: Remove floor coverings and adhesive according to recommendations in RFCI's "Recommended Work Practices for the Removal of Resilient Floor Coverings." Do not use methods requiring solvent-based adhesive strippers.

F. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight.

G. Flooring: Remove all flooring, wall base, substrates, and mastic. Protect adjacent surfaces to remain and prep for final finish.

H. Tile/Tiling: Remove all tile flooring, tile base, and setting beds / sub-floor. Protect adjacent surfaces to remain.

I. Doors: Remove all interior doors, frames, and hinges as indicated in the Drawings. Protect adjacent surfaces to remain.

J. Window Treatments: Remove all window treatments. Protect windows, window frames and adjacent surfaces.

K. Openings: Remove all interior doors, frames, and hinges as indicated in the Drawings. Protect adjacent surfaces.

L. Plumbing: Remove all plumbing fixtures including toilets, lavatories, and showers including curbs. Protect adjacent surfaces where applicable.

3.7 DISPOSAL OF DEMOLISHED MATERIALS

A. Remove demolition waste materials from Project site and dispose of them in an EPA-approved construction and demolition waste landfill acceptable to authorities having jurisdiction.

1. Do not allow demolished materials to accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
4. Comply with requirements specified in Section 017400 "Cleaning".

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations.

B. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119

SECTION 028000 – FACILITY REMEDIATION, ABATEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Abatement will consist of the removal and disposal of asbestos-containing materials (ACMs), presumed asbestos-containing materials (PACMs), and lead-based paint materials.
2. The Work shall include but not be limited to the removal of the materials indicated in the Hazardous Materials Survey provided within Division 02 of the project manual.
3. The Contractor shall be aware of all conditions of the Project and is responsible for verifying quantities and locations of all Work to be performed. Failure to do so shall not relieve the Contractor of its obligation to furnish all labor and materials necessary to perform the Work.
4. All Work shall be performed in strict accordance with the Project Documents and all governing codes, rules, and regulations. Where conflicts occur between the Project Documents and applicable codes, rules, and regulations, the more stringent shall apply.
5. Working hours shall be as required and approved by the Owner. Abatement activities including, but not limited to, work area preparation, gross removal activities, cleaning activities, waste removal, etc. may need to be performed during ‘off-hours’ (including nights and weekends). In addition, multiple mobilizations may be required to perform the work identified in this project. The Contractor shall coordinate and schedule all Work with the facility and Owner’s representative.

B. Related Requirements:

1. Division 01 section "Unit Prices" for abatement and removal materials not indicated in Hazardous Materials Survey.
2. Division 02 section "Hazardous Materials Survey – Missouri School for the Blind – Saint Louis, Missouri" dated 15 December 2025 by SITEX.
3. Division 02 section "Selective Demolition" for selective removal of items not containing asbestos or other hazardous materials.
4. Division 23 section "Mechanical Insulation" for re-insulation of piping.

1.3 SUBMITTALS

A. Progress Schedule:

1. Show the complete sequence of abatement activities for each work area and the sequencing of Work within each building or building section.

2. Show the dates and hours of work for the beginning and completion of each major element of Work and work areas including substantial completion dates for each Work Area, building, or phase.

B. Abatement Work Plan and Drawing(s): Provide a written work plan and drawing(s) that clearly address all requirements.

C. Asbestos Abatement:

1. General: The following will be submitted by Contractor, in electronic format or paper copy, a minimum of ten (10) days prior to commencement of work for approval by the Owner's Representative. Owner's Representative may provide comments that must be addressed before concurrence and, otherwise, will provide concurrence that documents received are acceptable:

a. One copy of Safety Data Sheets (SDS) for products to be used by the Contractor in the performance of his work. Contractor will also maintain copies of SDS's on site per OSHA.

b. One copy of the notifications to, or any correspondence with, the regulatory agencies.

c. Documentation that the regulatory authority has approved of the planned abatement.

d. Submit a listing of all prior regulatory violations.

D. Friable ACM Abatement Operations:

1. In addition to the General Requirements, submit the following:

a. A summary of project personnel, job titles, and contact phone numbers.

b. Name, address, and contact person's name of testing laboratory or laboratories to be utilized analyzing samples for bulk analysis or air samples. The laboratory(ies) must be certified through the National Voluntary Laboratory Accreditation Program (NVLAP).

c. A detailed plan of the procedures proposed for use in complying with requirements of this specification, the Missouri Air Conservation Law, and 29 CFR 1926.1101. Include in the plan the layout and location of barriers, decontamination units, routes of ingress and egress for work area, methods used to assure safety of building occupants and visitors, methods used to isolate or closing out of HVAC system, personal air monitoring strategy, method of removal of material, and engineering controls utilized to prevent emissions from the work area.

d. A disposal plan to detail type of disposal container, method of transportation to disposal site, waste hauler, and disposal site.

e. Copy of the Emergency Protection Plan that includes notifications.

E. Non-Friable ACM Abatement Operations:

1. In addition to the General Requirements, submit the following:

a. A summary of project personnel, job titles, and contact phone numbers.

b. A detailed plan of the procedures proposed to minimize emissions and to prevent the material from becoming friable during removal.

c. Copy of the Emergency Protection Plan that includes notifications (to be used if the nonfriable material should become friable during removal).

d. One copy of the Negative Initial Exposure Assessment.

F. Post-Abatement:

1. Upon completion of the abatement work, the Contractor shall provide the following information to the Owner's Abatement Representative within ten (10) working days.

    a. Waste disposal receipts and waste shipment records on all asbestos waste removed from the project.

2. Upon completion of the abatement work, the Owner shall provide the following information to the Contractor.

    a. Air sampling test results of final clearance air samples taken under the supervision of Owner's Air Sampling Professional will be provided to both the Contractor and Owner Representative. Results must be in written report form. Electronic transmittal is acceptable.

    b. Written certification from the Project Manager that abatement is complete. Electronic transmittal is acceptable.

G. Universal Waste/Hazardous Building Materials Removal:

1. Pre-Removal:

    a. General Requirements The following will be submitted by Contractor ten (10) days prior to commencement of work for approval by Owner's Representative. Owner's Representative may provide comments that must be addressed before concurrence or, otherwise, will provide concurrence that documents received are acceptable:

    b. One copy of any Safety Data Sheets (SDS) for products to be used by the Contractor in the performance of his work. Contractor will also maintain copies of SDS’s on site per OSHA.

    c. A list of project personnel and contact phone numbers.

    d. A detailed plan of the procedures proposed for use in complying with requirements of this specification. Include in the plan the layout and location of work areas, routes of ingress and egress for the work areas, methods to be used to assure safety of building occupants and visitors, method(s) of removal of material, and disposal container requirements for the wastes anticipated to be removed for disposal lead based paint waste to be disposed.

    e. Proposed disposal site for all materials including a disposal plan to detail type of disposal container, method of transportation to disposal site, and waste hauler.

    f. Any other submittals as required by Owner.

2. Post-Removal

    a. Upon completion of universal waste/hazardous building materials removal operations, the Contractor shall submit to the Owner’s Abatement Representative, copies of all shipping records, disposal receipts, recycling documentation, etc., for all materials removed from the project site by Contractor for disposal.

    b. Upon completion of the universal waste/hazardous building materials removal operations, the Owner’s Representative will provide written certification to the Contractor that all applicable universal waste/hazardous building materials wastes have been removed from the facility. Electronic transmittal is acceptable.

1.4 PRE-CONSTRUCTION CONFERENCE

A. Prior to start of preparatory Work under this Contract, the Contractor shall attend a pre-construction conference attended by Owner, Facility Personnel, and requested project Consultant(s).

B. Agenda for this conference shall include but not necessarily be limited to:

1. Contractor's scope of Work, Work plan, and schedule to include number of workers and shifts.
2. Contractor's safety and health precautions including protective clothing and equipment and decontamination procedures.
3. Environmental Consultant's duties, functions, and authority.
4. Contractor's Work procedures including:
    a. Methods of job site preparation and removal methods.
    b. Respiratory protection.
    c. Disposal procedures.
    d. Cleanup procedures.
    e. Fire exits and emergency procedures.
5. Contractor’s required pre-work and on-site submittals, documentation, and postings.
6. Contractor's plan for twenty-four (24) hour Project security both for prevention of theft and for barring entry of unauthorized personnel into Work Areas.
7. Temporary utilities.
8. Handling of furniture and other movable objects.
9. Storage of removed asbestos-containing materials.
10. Waste disposal requirements and procedures, including use of the Owner supplied Waste Shipment Record and Waste Shipment Record Log.

C. In conjunction with the conference the Contractor shall accompany the Owner Representative on a pre-construction walk-through documenting existing condition of finishes and furnishings, reviewing overall Work plan, location of fire exits, fire protection equipment, water supply and temporary electric tie-in.

1.5 DEFINITIONS

A. Asbestos Abatement

1. **Abatement** – Procedures to decrease or eliminate the source of fiber release from asbestos containing building materials. Includes encapsulation, enclosure, and removal.
2. **Adequately Wet** – To sufficiently mix or penetrate with liquid to prevent the release of particulate.
3. **Aggressive Air Sampling** – Sweeping of floors, ceilings and walls and other surfaces with the exhaust of a minimum of one (1) horsepower leaf blower or equivalent immediately prior to air monitoring.
4. **Approved Waste Disposal Site** – A solid waste disposal area that is authorized to receive asbestos containing solid wastes by the appropriate designated regulatory agency for the

state in which the site is located. (For Missouri, the agency is the Missouri Department of Natural Resources.)

5. **Asbestos** – Includes chrysotile, amosite, crocidolite, tremolite asbestos, anthophyllite asbestos, actinolite asbestos, and any of these minerals that have been chemically treated and/or altered. (Additionally, it has been shown that vermiculite insulation is often contaminated with tremolite and may be managed as asbestos out of an abundance of caution.)

6. **Asbestos Abatement Supervisor** – An individual who directs, controls, or supervises others in asbestos abatement projects.

7. **Asbestos Containing Building Material (ACBM)** – Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

8. **Asbestos Containing Material (ACM**) – Any material containing more than one percent (1%) asbestos by weight.

9. **Barrier** – Any surface that seals off the work area to inhibit the movement of asbestos fibers during abatement. Barrier may also refer to an engineering control to restrict unauthorized access to the work area.

10. **Category I Nonfriable ACM** – Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one percent (1%) asbestos as determined using the method specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy.

11. **Category II Nonfriable ACM** – Any material, excluding Category I Nonfriable ACM, containing more than one percent (1%) asbestos as determined using the methods specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

12. **Competent Person** – one who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32(f). In addition, for Class I, II, III, and IV work, one who is specially trained in training courses, which meet the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for project designer or supervisor, or its equivalent.

13. **Containment** – Area where asbestos abatement project is conducted. Area must be enclosed either by a glove bag or plastic sheeting barrier. The process of sealing off and containing asbestos-contaminated areas to prevent the spread of asbestos fibers. This can include using enclosures, plastic sheeting, and decontamination systems.

14. **Contractor's Competent Person (Qualified Person)** – One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f). In addition, for Class I, II, III, and IV work, one who is specially trained in training courses which meet the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for project designer or supervisor, or its equivalent.

15. **Decontamination Area** – Enclosed area adjacent and connected to the regulated area which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos. (See also Remote Decontamination Area)

16. **Demolition** – The wrecking or taking out of all material not being reused including any load bearing structural member of a facility together with any related handling operations.

17. **Disposal Bag** – A properly labeled six (6) mil thick leak-tight plastic bag used for transporting asbestos waste from work area to disposal site.

18. **Encapsulant (Sealant)** – A liquid material which can be applied to asbestos-containing material and which prevents the release of asbestos fibers from the material either by creating a membrane over the surface or by penetrating the material and binding its components together.

19. **Encapsulation** – Treatment of asbestos containing materials with an encapsulant.

20. **Enclosure** – The construction of an airtight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.

21. **Friable Asbestos Material** – Any material containing more than one percent (1%) asbestos as determined using the method specified in Appendix A, Subpart F, 40 CFR Part 763 Section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

22. **Glove Bag** – A manufactured or fabricated device, typically constructed of six (6) mil transparent polyethylene or polyvinyl chloride plastic. This device consists of two (2) inward projecting long sleeves, an internal tool pouch and an attached, labeled receptacle for asbestos waste.

23. **HEPA Vacuum Equipment** – High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining hazardous particulates. Filters should be of 99.97% efficiency for retaining particulates greater than 0.3 microns.

24. **Homogeneous Work Site** – Continuous areas with the same type of ACM and in which one type of abatement process is performed.

25. **Negative Initial Exposure Assessment** – An assessment by a "Competent Person" in which it is concluded that employee exposures during the job are likely to be consistently below the Permissible Exposure Levels; that non-friable asbestos will be removed and maintained in a non-friable condition.

26. **Outside Air** – Air outside of the containment.

27. **Owner's Air Monitoring Firm** – An entity who is not under the direct control of the asbestos abatement contractor and who has been selected by the Owner to conduct air monitoring. Use of third-party monitoring and/or sampling professionals is optional and at Owner’s discretion.

28. **Personal Monitoring** – Sampling of the asbestos fiber concentrations within the breathing zone in a manner consistent with abatement operation regulations, i.e., sample 25% of each job description of the work force plus one peak (excursion) sample per shift.

29. **Regulated Asbestos Containing Material (RACM)** – Friable asbestos material; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; Category II nonfriable ACM that has a high probability of becoming, or has become, crumbled, pulverized, or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

30. **Remote Decontamination Area** – Enclosed or controlled area which is used for decontamination of workers performing Class I, II, or IV asbestos abatement activities. A designated space, often a mobile unit, located away from the immediate work area where workers can decontaminate themselves and their equipment after exposure to asbestos, typically when it’s not feasible to have a decontamination area directly adjacent to the regulated abatement zone due to location or accessibility constraints; essentially a shower and change area situated at a distance from the asbestos removal site.

31. **Remove** – To take out RACM or facility components that contain or are covered withRACM from any facility.

32. **Renovation** – Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component.

33. **Repair** – The restoration of asbestos material that has been damaged. Repair consists of the application of rewettable glass cloth, canvas, cement or other suitable material. It may also involve filling damaged areas with non-asbestos substitutes and re- encapsulating or painting previously encapsulated materials.

34. **Strip** – To take off RACM from any part of a facility or facility components.

35. **Waste Shipment Record** – The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos containing waste material.

36. **Wet Cleaning/Wiping** – The process of eliminating contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by, afterwards, properly disposing of these cleaning tools as necessary.

37. **Work Area** – A specific isolated area, other than the space enclosed within a glove bag, in which asbestos-containing materials is required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.

B. UNIVERSAL WASTE/HAZARDOUS BUILDING MATERIALS REMOVAL

~~1.~~ **Approved Waste Disposal** Site – A solid waste disposal area that is authorized to receive construction and demolition (C/D) wastes by the appropriate designated regulatory agency for the state in which the site is located. (For Missouri, the agency is the Missouri Department of Natural Resources.)

2. **Authorized Visitor** – The Owner, the Owner's Representative, or a representative of any regulatory or other agency having jurisdiction over the project and properly trained.

3. **Building Owner** – A designated representative from the State of Missouri.

4. **Disposal Container** – A properly labeled container for universal waste, hazardous building materials, reclaimed/recycled materials, or, potentially, any regulated paint debris. Disposal containers will be provided by Contractor.

5. **Hazardous Building Material** – Materials such as PCB-containing waste or radioactive sources (smoke detectors, etc.), that are not considered Universal Waste, but that the Owner will rely upon a Hazardous Waste Shipment Record for documentation to support proper disposal.

6. **Hazardous Waste Shipment Record/Disposal Receipt** – The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of universal waste, hazardous wastes, and specific hazardous building materials.

7. **HEPA Vacuum Equipment** – High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining hazardous particulates. Filters should be of 99.97% efficiency for retaining particulates greater than 0.3 microns.

8. **Universal Waste** – EPA's universal waste regulations streamline the hazardous waste management standards for certain categories of hazardous waste that are commonly generated by a wide variety of establishments. The streamlined regulations:

    a. Promote the collection and recycling of universal waste,

    b. Ease the regulatory burden on retail stores and other generators that wish to collect these wastes and transporters of these wastes, and

    c. Encourage the development of municipal and commercial programs to reduce the quantity of these wastes going to municipal solid waste landfills or combustors.

9. **Work Area** – A specific isolated area in which universal waste/hazardous building materials are required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.

1.6 PERFORMANCE REQUIREMENTS

A. General Provisions:

1. The Contractor shall inform him/herself of the conditions for the project and is responsible for verifying the quantities and locations of all work to be performed as outlined in this technical specification. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract.

2. Contractor shall assume full responsibility and liability for compliance with all codes, ordinances, rules, regulations, orders and other legal requirements of Federal, State, and Local public authorities including, but not limited to, the U.S. Environmental Protection Agency (EPA), Occupational Health and Safety Administration (OSHA), and the Missouri Department of Natural Resources (MDNR), which bear on performance work. Where conflicts occur between these specifications and/or the above-mentioned regulatory agencies, the more stringent shall govern. The Contractor shall hold the Owner and Owner's air monitoring firm harmless for failure to comply with any applicable work, hauling, safety, health, or other regulations on the part of the Contractor, Contractor's employees, or Contractor's subcontractors.

3. Contractor affirms and shall be solely responsible for ensuring all personnel involved in asbestos abatement and/or universal waste/hazardous building material removal operations are adequately trained, appropriately certified, and qualified for the duties and responsibilities they are conducting. Further, any personnel required to don a respirator shall be medically cleared by a physician to wear such respirator, must be participating in a medical monitoring program, and have a current, acceptable respirator fit test. Contractor further affirms that all certifications, training, qualifications, fit testing results, physician's clearance statement, etc., shall be provided upon demand to the Owner's Abatement Representative.

4. If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify the Owner in writing, and any necessary changes shall be accomplished by appropriate modification. It is not the Contractor's responsibility to make certain that the Contract Documents are in accordance with applicable laws, statutes, ordinances, building codes, rules or regulations. If the Contractor performs any work knowing it to be contrary to such laws, statutes, ordinances, building codes, rules or regulations, and without such notice to the Owner, he shall assume full responsibility therefore and shall bear all costs attributable thereto.

5. The use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the Contractor.

6. Contractor will confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed.

7. Contractor shall assume full responsibility for protection and safekeeping of products stored on premises.

8. Contractor shall move any stored products which interfere with operations of Owner or other contractors.

9. Contractor shall utilize only those areas designated by the Owner for the storage of equipment and the placement of dumpsters/transport containers.

10. Contractor shall take all precautions necessary to ensure there is no asbestos containing materials or lead-based-paint building material contamination to those areas not included in work area. Should areas outside the work area become contaminated with hazardous wastes, the Contractor shall immediately clean them utilizing the wet cleaning and HEPA vacuum methods specified herein. The Contractor is responsible for the proper cleanup of all items in the work areas to maintain a clean and safe environment.

11. Owner reserves the right to unrestricted access of the work area by qualified and trained individuals, as designated by the Owner, for the purposes of monitoring, evaluating, or otherwise inspecting the condition of the work area and/or progress of work being performed by Contractor. No access shall be granted to untrained personnel and the Contractor shall ensure site security to prevent unauthorized access by untrained personnel.

B. Asbestos-Containing Materials Removal And Disposal:

1. The work specified herein shall be the abatement of asbestos containing materials (ACM) by certified and registered persons who are knowledgeable, qualified and trained in the abatement, handling, and disposal of ACM, and subsequent cleaning of the affected environment.

2. The Contractor shall furnish all labor, material, equipment, testing, services, permits, insurance, notifications, necessary or required to perform the work for the abatement of ACM and for other work as specified in this section or as indicated in associated drawings, sketches, or reports of the work.

3. All fees required for notification requirements, renotifications, and/or inspections by the regulatory agencies shall be paid by the Contractor. Bulk sample analysis information required by the Missouri Department of Natural Resources (MDNR), U.S. Environmental Protection Agency (EPA), or local authority having jurisdiction in conjunction with the notification shall also be provided by the Contractor unless provided within this section.

4. Based upon a survey conducted by SITEX on Owner's behalf, the Work shall include the removal and legal disposal of all Friable and/or Non-friable ACM.

C. Universal Waste/Hazardous Building Materials Removal:

1. The Contractor shall be responsible for the coordination of the universal waste/hazardous building materials removal for this project. The Contractor shall coordinate with the Owner's Representative, all other on-site contractors, and all subcontractors working under separate contracts so as to facilitate the general progress of the work. Each trade shall afford all trades every reasonable opportunity for the installation/completion of their work.

2. For all universal waste/hazardous building materials designated for removal, the default process will be that the Contractor shall provide appropriate containers, the Contractor shall remove and place materials in their respective containers, and the Contractor shall arrange for proper disposal of all containerized universal waste/hazardous building materials. Any deviations from this process need to be identified and agreed upon between the Owner and Contractor prior to implementation.

3. Based upon a survey conducted by SITEX on Owner's behalf, the Work shall include the removal of the following types and quantities of universal waste/hazardous building materials:

a. Building Materials Painted with Regulated Heavy Metals (Lead-based Paint): These materials shall be disposed with Construction/Demolition debris in an approved waste disposal site authorized by the appropriate designated regulatory agency for the state in which the site is located.

D. Contractor Operations:

1. Materials With RCRA-Metals Paint (Intact): It is anticipated that demolition debris with regulated paint that is intact (not peeling/chipping/flaking) will be removed as part of the demolition process and will be hauled away and disposed by the Contractor at an approved waste disposal site authorized by the appropriate designated regulatory agency for the state in which the site is located to accept construction and demolition waste.

1.7 CODES AND REGULATIONS

A. Contractor Responsibility: The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to work practices, hauling/disposal of regulated materials, and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold the Owner harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulations on the part of the Contractor, Contractor's employees, or Contractor's subcontractors.

B. Asbestos Abatement:

1. General Applicability of Codes, Regulations and Standards: All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

2. Federal and State requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials include, but are not limited to, the following:

a. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:

- 29 CFR 1910.1001 and 29 CFR 1926.1101.
- Respiratory Protection, 29 CFR 1910.134.
- Construction Industry, 29 CFR 1926.1101
- Access to Employee Exposure and Medical Records, 29 CFR 1910.2.
- Hazard Communication, 29 CFR 1910.1200.
- Specifications for Accident Prevention Signs and Tags, 29 CFR 1910.145.

b. U.S. Environmental Protection Agency (EPA) including but not limited to:

- National Emission Standards for Hazardous Air Pollutants (NESHAP) 40 CFR, Part 61, Subpart M.

c. U.S. Department of Transportation (DOT) including but not limited to:

- 49 CFR, Part 172, Section 101.

3. State of Missouri including but not limited to:

a. Missouri Air Conservation Law Chapter 643. (643.225-643.250 RSMo)

b. Missouri Department of Natural Resources, Division 10, Chapter 6 of the Code of State Regulations as follows:

- (1) 10 CSR 10-6.020, Definitions
- (2) 10 CSR 10-6.080, Emission Standards for Hazardous Air Pollutants
- (3) 10 CSR 10-6.230, Administrative Penalties
- (4) 10 CSR 10-6.250, Asbestos Abatement Projects - Certification, Accreditation,

and Business Exemption Requirements

C. Universal Waste/Hazardous Building Materials Removal:

1. All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

2. Federal and State requirements which govern universal waste and hazardous waste removal work or hauling and disposal of such waste materials include, but are not limited to, the following:

3. U.S. Department of Labor, Occupational Health and Safety Administration (OSHA), 29 CFR 1910 and 29 CFR 1926.

- Construction Industry - 29 CFR 1926.1101
- Respiratory Protection – 29 CFR 1910.134
- Hazard Communication – 29 CFR 1910.1200
- Accident Prevention Signs – 29 CFR 1910.145

4. U.S. Environmental Protection Agency (EPA)

- Resource Conservation and Recovery Act (RCRA), 40 CFR Parts 239-282 [Hazardous Waste includes Universal Waste]
- Toxic Substances Control Act (TSCA), 40 CFR Parts 700-761

5. Missouri Department of Natural Resources

- Hazardous Waste Management Law, Chapter 260, Sections 350-433, RSMo
- 10 CSR 25, includes MO Universal Waste Rule (Pub 2058), Ch 16

1.8 RESPIRATORY PROTECTION

A. Select respirators from those approved by the National Institute for Occupational Safety and Health (NIOSH).

B. Respirators shall be individually fit-tested to personnel under the direction of an Industrial Hygienist on a yearly basis. Fit-tested respirators shall be permanently marked to identify the individual fitted, and use shall be limited to that individual. Fit-test records shall be maintained on site for each employee.

C. Where fiber levels permit, and in compliance with regulatory requirements, Powered Air Purifying Respirators (PAPRs) are the minimum allowable respiratory protection permitted to be utilized during gross removal operations of OSHA Class I or OSHA Class II friable ACM.

D. No respirators shall be issued to personnel without such personnel participating in a respirator training program.

E. High Efficiency Particulate Air (HEPA) respirator filters shall be approved by NIOSH and shall conform to the OSHA requirements in 29 CFR 1910.134 and 29 CFR 1926.1101.

F. A storage area for respirators shall be provided by the Contractor in the clean room side of the personal decontamination enclosure where they will be kept in a clean environment.

G. The Contractor shall provide and make available a sufficient quantity of respirator filters so that filter changes can be made as necessary during the work day. Filters will be removed and

discarded during the decontamination process. Filters cannot be reused. Filters must be changed if breathing becomes difficult.

H. Filters used with negative pressure air purifying respirators shall not be used any longer than one eight (8) hour work day. Any loose respirator filters found within the regulated area, must be disposed of as RACM asbestos waste.

I. Any authorized visitor, worker, or supervisor found in the Work Area not wearing the required respiratory protection shall be removed from the Project site and shall not be permitted to return.

J. The Contractor shall have at least two (2) Powered Air Purifying Respirators stored on site designated for authorized visitors use. Appropriate respirator filters for authorized visitors shall be made available by the Contractor.

1.9 NOTIFICATIONS (ASBESTOS ABATEMENT ONLY)

A. Notifications meeting the requirements of Missouri's Air Conservation Law shall be completed and sent by the Contractor not less than ten (10) days before the intended starting date of the project. Contractors with annual abatement notifications must provide at least twenty-four (24) hours notification before the intended starting date of the project. Send notification to:

MDNR/Air Pollution Control Program (Asbestos Unit)
P.O. Box 176
Jefferson City, Missouri 65102
573-751-4817 / 800-361-4827

Completed and signed notifications may be sent electronically to:
asbestosnotifications@dnr.mo.gov

B. Provide a copy to the Owner's Representative. Five (5) day notification to the Owner's Representative is required on jobs less than the reportable quantity ("Courtesy Notifications").

C. If the project is within the jurisdiction of the St. Louis City's Division of Air Pollution Control send additional required notification directly to the appropriate local agency.

St. Louis City, Division of Air Pollution Control
1520 Market St., Room 4051
St. Louis, MO 63103
314-657-1479

1.10 DELIVERY, STORAGE, AND HANDLING

A. All materials shall be delivered in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

B. Contractor shall store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

C. Damaged or deteriorating materials shall not be used and shall be removed from the premises.

PART 2 - GENERAL

2.1 DAILY PROJECT LOG & WORK AREA ENTRY/EXIT LOG

A. Provide a bound Daily Project Log. The log shall contain on title page the Project name, project number, name, address and phone number of Owner; name, address and phone number of Abatement Contractor; emergency numbers including, but not limited to local Fire/Rescue department and all other regulatory requirements.

B. All entries into the log shall be made in non-washable, permanent ink and such pen shall be strung to or otherwise attached to the log to prevent removal from the log-in area. Under no circumstances shall pencil entries be permitted.

C. All persons entering and exiting the Work Area shall sign the Work Area and include name, certification number, and time.

D. The Project Supervisor shall document all work performed daily and note all regulatory required inspections, maintain entry log records and ensure that they are recorded in accordance with the provisions of all applicable regulations.

2.2 MATERIALS

A. General: Provide new materials. If acceptable to the Owner, the Contractor may use undamaged, previously used materials in serviceable condition. Provide materials suitable for use intended.

B. Contractor shall provide suitable materials for asbestos abatement and universal waste/hazardous building materials removal operations including, but not limited to:

1. Protective Clothing: As required to accomplish the work and meet all applicable safety regulations.
2. Plastic Sheeting: A minimum 6-mil (or as specified).
3. Tape: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water, duct tape, poly prep tapes or approved equal.
4. Adhesives: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water. Adhesives will not be used on any property without prior written approval from the Owner’s Representative.
5. Impermeable Containers: Suitable to receive and retain any universal waste/hazardous building materials until disposal by Contractor. The containers shall be labeled as required. Containers must be resistant to damage and rupture.
6. Warning Labels and Signage: As required by law and/or Owner.
7. Other Materials: Provide all other materials, such as, but not limited to, lumber, plywood, nails, and hardware, which may be required to properly prepare and complete this project.

2.3 TOOLS AND EQUIPMENT

A. General: Provide suitable tools for asbestos abatement and universal waste/hazardous building material removal operations including, but not limited to:

1. Water Sprayer: Airless or a low-pressure sprayer for amended water application as applicable.
2. Air-Purifying Equipment: High Efficiency Particulate Air Filtration Systems (HEPA) shall comply with ANSI Z9.2-91. No air movement system or air equipment should discharge particulates outside the work area. Thus, the negative air unit shall be equipped with a three filter bank with the last being the HEPA filter capable of removing 99.97% of fibers/particulates >0.3 microns.
3. Scaffolding and Ladders: As required to accomplish the work and meet all applicable safety regulations.
4. Vacuums: Use HEPA type from a known manufacturer.
5. Other tools and equipment as necessary.

PART 3 - GENERAL

3.1 SUPERVISION: ASBESTOS ABATEMENT

A. The Contractor shall designate a competent Supervisor subject to the approval of the Owner's Representative. The Supervisor shall be the Contractor's representative on the project, shall meet the requirements of all applicable laws and regulations, and meet/perform the following tasks, at a minimum:

1. Be certified by the State of Missouri as an Asbestos Abatement Supervisor, have a minimum of one (1) year prior full-time experience in asbestos abatement work, a minimum of two (2) years' experience as a supervisor, and be qualified as a Competent Person in accordance with OSHA regulation 1926.1101.
2. Be on-site and supervise all abatement work in accordance with all applicable laws and regulations.
3. Conduct all OSHA-required personal exposure air monitoring during abatement operations.
4. Maintain a daily log on the project documenting events, visitations, problems, equipment failures, accidents, and inspections.
5. Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.
6. Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner's Representative. Inspection shall be documented.

3.2 SUPERVISION: UNIVERSAL WASTE/HAZARDOUS BUILDING MATERIALS REMOVAL

A. The Contractor shall designate a competent Supervisor subject to the approval of the Owner's Representative. The Supervisor shall be the Contractor's representative on the project, shall meet the requirements of all applicable laws and regulations, and meet/perform the following tasks, at a minimum:

1. Be knowledgeable in all aspects of removal, cleanup, and proper handling of universal waste/ hazardous building materials as listed in the Scope of Work.
2. Be on-site and supervise all removal, cleanup and handling of universal waste/hazardous building materials as listed in the Scope of Work.
3. Maintain a daily log on the project documenting events, violations, problems, equipment failures, accidents, and inspections.
4. Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.
5. Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner's Representative. Inspection shall be documented.

3.3 NEGATIVE INITIAL EXPOSURE ASSESSMENT (ASBESTOS ABATEMENT ONLY)

A. When not starting removal with Type C protection, the Contractor must conduct a Negative Initial Exposure Assessment (non-friable asbestos) prior to removal of the asbestos material. The Negative Initial Exposure Assessment shall be performed by a "Competent Person" to determine whether the material may be removed and maintained in a non-friable condition. If the material cannot be removed without becoming friable then the Contractor shall comply with all legal and regulatory requirements for managing friable asbestos at no additional cost to the Owner.

B. The method of removal is the Contractor's option. However, in the event of any of the following:
1. Visible emissions are observed
2. Sanding, grinding, cutting, or abrading of the material
3. Air samples exceed 0.1 f/cc (fibers per cubic centimeter)

C. The Contractor shall immediately stop work, implement corrective work practices, make any necessary notifications to all regulatory agencies of the changes in work practices and material conditions, and comply with the requirements as set forth in this specification.

3.4 WORKER PROTECTION & TRAINING: ASBESTOS ABATEMENT

A. The Contractor shall be responsible for providing their employees with proper respiratory protection, respiratory training, a written respiratory program, medical monitoring program (medical examinations, maintaining medical records), and protective clothing and equipment to comply with OSHA requirements.

B. The Contractor shall be responsible for all testing and costs incurred for complying with requirements of OSHA regulations for Personal Air Sampling.

C. All workers shall be trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and protective measures.

D. All workers shall be certified as accredited Asbestos Abatement Workers as required by 10 CSR 10-6.250.

3.5 WORKER PROTECTION & TRAINING: UNIVERSAL WASTE/HAZARDOUS BUILDING MATERIALS REMOVAL

A. The Contractor shall be responsible for providing their employees with proper respiratory protection, respiratory training, a written respiratory program, medical examinations, maintaining medical records, protective clothing and equipment to comply with OSHA requirements, if applicable and necessary.

B. All workers shall be trained in the dangers inherent in handling universal waste/hazardous building materials, in proper work procedures, and personal protective measures.

C. Prior to commencement of work, the workers shall be instructed and shall be knowledgeable on the hazards of the universal waste/hazardous building materials involved and other environmental exposures, use and fitting of respirators, protective clothing, decontamination procedures, and all aspects of removal work procedures.

D. The Contractor acknowledges that he alone is responsible for enforcing personnel protection requirements and that these specifications provide only a minimum acceptable standard for each phase of operation.

E. If required or requested of the workers, provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA.

F. Where required or if requested by the workers, provide workers with sufficient sets of disposable protective full-body clothing. Such clothing shall consist of full-body coveralls, footwear, and head gear, one-piece coveralls or equal. Provide eye protection and hard hats as required by applicable safety regulations. Disposable clothing shall not be allowed to accumulate and shall be disposed of as contaminated waste.

G. No visitors shall be allowed in work areas, except as authorized.

H. Provide authorized visitors with suitable protective clothing, headgear, footwear, and gloves as described above whenever they are required to enter the work area.

3.6 INDEPENDENT TESTING LABORATORY (ASBESTOS ABATEMENT ONLY)

A. General: Testing laboratories utilized by the Contractor for sample analysis during the project shall meet the following minimum requirements and be approved by the Owner's Representative. This information shall be submitted to the Owner's Representative for review.

1. All air monitoring samples shall be analyzed by a testing laboratory accredited by the American Industrial Hygiene Association (AIHA) or by an individual who is currently on the Asbestos Analyst Registry.

2. All bulk samples shall be analyzed by a testing laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

B. Asbestos Bulk Sample Analytical Methods:

1. Friable Materials:

a. Asbestos Analysis of Bulk Materials via AHERA Method 40 CFR 763, Subpart E, Appendix E supplemented with EPA 600/R-93/116 (Calibrated Visual Estimate, reporting limit to <1%) using Polarized Light Microscopy

2. Non-Friable (caulking):

a. Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 (Calibrated Visual Estimate, reporting limit to <1%) using Polarized Light Microscopy

3. Non-Friable (mastics, adhesives):

a. Asbestos Analysis of Non-Friable Organic Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 (Calibrated Visual Estimate, reporting limit to <1%) using Polarized Light Microscopy

4. Non-Friable (vinyl floor tile):

a. Asbestos Analysis of Non-Friable Organically Bound Materials by TEM via EPA/600/R-93/116 Section 2.5.5.1 (target reporting limit 0.5%) with Gravimetric Reduction)

C. Asbestos Air Monitoring Analytical Methods:

1. PCM – Air:

a. Use NIOSH 7400

2. PCM – Air That Fails:

a. Using NIOSH 7400. Reclean area and retest. If area fails a third time, retest using AHERA (40 CFR Part 763 Appx. A subpart E) or NIOSH 7402

3.7 SEPARATION OF WORK AREAS FROM NON-WORK AREAS

A. In addition to other physical barriers/controls required to isolate work areas and prevent unauthorized access/entry, universal waste/hazardous building materials removal operations work areas shall integrate visual separation. Visual separation shall be accomplished at all "see-through" locations using opaque polyethylene. This separation shall not be incorporated within the other seals involved on this project.

3.8 EMERGENCY PROTECTION PLAN

A. The Contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan on site. The plan shall include considerations of asbestos and/or universal waste/hazardous building material releases, fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injuries. All employees shall be instructed and trained in the procedures.

B. The Emergency Protection Plan shall include written notification procedures for police, fire and medical personnel of the planned abatement activities, work schedule, and layout of work area, particularly barriers that may affect response capabilities.

C. The Contractor shall designate and maintain emergency and fire exits from the work area(s) in accordance with local codes and regulations. All exits shall be clearly marked with fluorescent tape or red paint and shall be clearly visible from any part of the work area.

3.9 LOCAL AREA PROTECTION & SITE SECURITY

A. The Contractor shall be responsible for all areas of the building used by them and/or subcontractors in the performance of the work. Contractor shall exert full control over the

actions of all its employees and other persons with respect to the use and preservation of the existing building, except such controls as may be specifically reserved to the Owner.

B. Contractor shall secure the work areas to make sure of no inadvertent entry. Any breach to the exterior of the building shall be secured by the Contractor. The Contractor shall be responsible for maintaining security of the remediation area throughout the contract period.

C. Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection and shall require all persons in the work area to observe the same regulations required of Contractor's employees.

D. The Contractor shall have control of site security during abatement operations in order to protect work environment and equipment. Contractor shall have the Owner’s assistance in notifying building occupants of impending activity and enforcement of restricted access by Owner’s employees.

E. The Contractor shall keep a minimum of two (2) 10 lb., Type-ABC fire extinguishers on-site. One shall be maintained outside the work area and one inside the work area. Contractor’s employees shall be trained in the operation of extinguishers.

F. Where remediation areas cannot be isolated by existing walls and doors from building occupants, employees, students, or the public, barriers must be constructed of 1/2" plywood sheeting over 2"x4", 16” on-center framing to isolate the area. The barriers must be installed in a manner to prevent damage to existing walls, floors, or ceilings. Barrier(s) may have a lockable door.

G. The Contractor shall maintain the work area free from rubbish, debris, and dirt and keep a clean, safe working area.

H. The Contractor shall provide warning signage around the regulated remediation area as required by OSHA. Owner reserves the authority to require additional signage, if it is deemed appropriate.

I. If applicable, the Contractor shall isolate any and all air supply and returns to the abatement space as required by OSHA. Contractor shall coordinate these efforts with the Owner's Representative.

J. If applicable, the Contractor shall keep all areas where adhesive stripper is in use (such as mastic removal) under negative pressure and exhausted to the outside ambient air.

3.10 FINAL CLEARANCE REQUIREMENTS (FRIABLE ASBESTOS ABATEMENT ONLY)

A. Upon completion of the abatement work, the Contractor’s Asbestos Abatement Supervisor shall perform a visual inspection of the work area. If satisfactory, the Supervisor shall then request the Owner's Representative and/or Air Sampling Professional to perform a visual inspection. When the Owner's Representative and/or Air Sampling Professional deems the area is ready based on the results of their visual inspection, the Contractor shall apply a lockdown encapsulant. Following application of lockdown encapsulant, the Owner's Air Sampling Professional shall perform the final clearance sampling for airborne fiber concentrations.

B. The Owner's Air Sampling Professional will perform final clearance testing per the following requirements:

1. Aggressive sampling shall be required for all areas where removal has taken place with the exception of glove bag projects where nonaggressive sampling is permitted.

2. Phase contrast microscopy (PCM) samples analyzed on-site shall be counted by an accredited registered microscopist.

3. For areas specifically designated for clearance by Transmission Electron Microscopy, the method shall be NIOSH 7402.

C. Any work areas failing to meet the clearance requirements of this section shall be recleaned and retested at the Contractor's expense until satisfactory levels are obtained.

D. The Owner's Representative and/or Air Sampling Professional shall provide a written report of the air monitoring activities to the Contractor within seven (7) days after the final clearance testing. Electronic transmittal is acceptable.

3.11 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

A. Reestablishment of the work area shall only occur after the Contractor has received final clearance in writing from the Owner's Representative. Electronic transmission is acceptable.

B. Any damages to finishes, equipment, and/or the area affected by the abatement shall be repaired by the Contractor to equal or better condition as it was prior to the work, at no cost to the Owner.

3.12 WASTE DISPOSAL

A. All asbestos-containing waste and/or asbestos-contaminated debris shall, at a minimum, be adequately wet, double bagged in approved 6-mil polyethylene leakproof disposal bags or containers. Each bag or container shall be tagged to meet requirements of NESHAP with an asbestos caution label and a source identification label.

B. Transportation shall meet the requirements of all regulatory agencies for asbestos containing materials and shall be transported in an enclosed truck.

C. The waste disposal site shall be approved by the designated regulatory agency for the state in which the site is located (Missouri Department of Natural Resources in Missouri) for asbestos disposal. A chain-of-custody letter/waste shipment record and disposal receipts shall be provided to the Owner for all ACM and contaminated debris disposed.

D. Dispose of all other waste, materials and debris in an approved waste disposal site authorized by the appropriate designated regulatory agency for the state in which the site is located.

3.13 DRAWINGS

A. Drawings, when provided, are not intended to be used for anything but a "reference" to the work area. Information is not specific to quantities or to exact location of ACM and/or universal waste/hazardous building materials unless explicitly noted. Contractor will be required to field verify the conditions and quantities.

3.14 REPORTS

A. Reports, when provided, are intended to be used as a basis for the type and composition of the asbestos and/or universal waste/hazardous building materials present for both bidding purposes and for the information required for the notifications to the governing agencies.

END OF SECTION 028000

SECTION 032000 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

B. Related Requirements:

1. Section 321313 "Concrete Paving" for reinforcing related to concrete pavement and walks.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Construction contraction and isolation joints.
c. Steel-reinforcement installation.

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Each type of steel reinforcement.
2. Bar supports.
3. Mechanical splice couplers.

B. Shop Drawings: Comply with ACI SP-066:

1. Include placing drawings that detail fabrication, bending, and placement.
2. Include bar sizes, lengths, materials, grades, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, location of splices, lengths of lap splices, details of mechanical splice couplers, details of welding splices, tie spacing, hoop spacing, and supports for concrete reinforcement.

C. Construction Joint Layout: Indicate proposed construction joints required to build the structure.

1. Location of construction joints is subject to approval of Architect.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

B. Material Test Reports: For the following, from a qualified testing agency:

1. Steel Reinforcement:

a. For reinforcement to be welded, mill test analysis for chemical composition and carbon equivalent of the steel in accordance with ASTM A706/A706M.

2. Mechanical splice couplers.

C. Minutes of preinstallation conference.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Reinforcing Bars: ASTM A615/A615M, Grade 60, deformed.

B. Low-Alloy Steel Reinforcing Bars: ASTM A706/A706M, deformed.

C. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, plain, fabricated from as-drawn steel wire into flat sheets.

2.2 REINFORCEMENT ACCESSORIES

A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded-wire reinforcement in place.

1. Manufacture bar supports from steel wire, plastic, or precast concrete in accordance with CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

a. For concrete surfaces exposed to view, where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire, all-plastic bar supports, or CRSI Class 2 stainless steel bar supports.

B. Mechanical Splice Couplers: ACI 318 Type 1, same material of reinforcing bar being spliced; tension-compression type.

C. Steel Tie Wire: ASTM A1064/A1064M, annealed steel, not less than 0.0508 inch in diameter.

1. Finish: Plain.

2.3 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

PART 3 - EXECUTION

3.1 PREPARATION

A. Protection of In-Place Conditions:

1. Do not cut or puncture vapor retarder.
2. Repair damage and reseal vapor retarder before placing concrete.

B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that reduce bond to concrete.

3.2 INSTALLATION OF STEEL REINFORCEMENT

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

B. Accurately position, support, and secure reinforcement against displacement.

1. Locate and support reinforcement with bar supports to maintain minimum concrete cover.
2. Do not tack weld crossing reinforcing bars.

C. Preserve clearance between bars of not less than 1 inch, not less than one bar diameter, or not less than 1-1/3 times size of large aggregate, whichever is greater.

D. Provide concrete coverage in accordance with ACI 318.

E. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

F. Splices: Lap splices as indicated on Drawings.

1. Bars indicated to be continuous, and all vertical bars to be lapped not less than 36 bar diameters at splices, or 24 inches, whichever is greater.
2. Stagger splices in accordance with ACI 318.
3. Mechanical Splice Couplers: Install in accordance with manufacturer's instructions.
4. Weld reinforcing bars in accordance with AWS D1.4/D 1.4M, where indicated on Drawings.

G. Install welded-wire reinforcement in longest practicable lengths.

1. Support welded-wire reinforcement in accordance with CRSI "Manual of Standard Practice."

a. For reinforcement less than W4.0 or D4.0, continuous support spacing to not exceed 12 inches.

2. Lap edges and ends of adjoining sheets at least one wire spacing plus 2 inches for plain wire and 8 inches for deformed wire.
3. Offset laps of adjoining sheet widths to prevent continuous laps in either direction.
4. Lace overlaps with wire.

3.3 JOINTS

A. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement.
2. Continue reinforcement across construction joints unless otherwise indicated.
3. Do not continue reinforcement through sides of strip placements of floors and slabs.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector to perform field inspections and prepare inspection reports.

B. Testing Agency: Engage a qualified testing agency to perform tests and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement mechanical splice couplers.
3. Steel-reinforcement welding.

END OF SECTION 032000

SECTION 033000 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 032000 "Concrete Reinforcing" for steel reinforcing bars and welded-wire reinforcement.

1.2 DEFINITIONS

A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash, slag cement, and other pozzolans; materials subject to compliance with requirements.

B. Water/Cement Ratio (w/cm): The ratio by weight of water to cementitious materials.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site before the first structural pour.

1. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

a. Contractor's superintendent.
b. Independent testing agency responsible for concrete design mixtures.
c. Ready-mix concrete manufacturer.
d. Concrete Subcontractor.
e. Special concrete finish Subcontractor.

2. Review the following:

a. Special inspection and testing and inspecting agency procedures for field quality control.
b. Anchor rod and anchorage device installation tolerances.
c. Cold and hot weather concreting procedures.
d. Concrete finishes and finishing.
e. Curing procedures.
f. Forms and form-removal limitations.
g. Concrete repair procedures.
h. Concrete protection.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Aggregates.
4. Admixtures:

    a. Include limitations of use, including restrictions on cementitious materials, supplementary cementitious materials, air entrainment, aggregates, temperature at time of concrete placement, relative humidity at time of concrete placement, curing conditions, and use of other admixtures.
5. Curing materials.
6. Repair materials.

B. Design Mixtures: For each concrete mixture, include the following:

1. Mixture identification.
2. Minimum 28-day compressive strength.
3. Durability exposure class.
4. Maximum w/cm.
5. Slump limit.
6. Air content.
7. Nominal maximum aggregate size.
8. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.
9. Intended placement method.
10. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

C. Concrete Schedule: For each location of each Class of concrete indicated in "Concrete Mixtures" Article, including the following:

1. Concrete Class designation.
2. Location within Project.
3. Exposure Class designation.
4. Formed Surface Finish designation and final finish.
5. Curing process.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.

B. Material Certificates: For each of the following, signed by manufacturers:

1. Cementitious materials.
2. Admixtures.
3. Curing compounds.
4. Bonding agents.
5. Adhesives.

6. Repair materials.

C. Research Reports:

1. For concrete admixtures in accordance with ICC's Acceptance Criteria AC198.

D. Preconstruction Test Reports: For each mix design.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

1.6 QUALITY ASSURANCE

A. Ready-Mixed Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Comply with ASTM C94/C94M and ACI 301.

1.8 FIELD CONDITIONS

A. Cold-Weather Placement: Comply with ACI 301 and ACI 306.1 and as follows.

1. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
2. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
3. Do not use frozen materials or materials containing ice or snow.
4. Do not place concrete in contact with surfaces less than 35 deg F, other than reinforcing steel.
5. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.

B. Hot-Weather Placement: Comply with ACI 301 and ACI 305.1, and as follows:

1. Maintain concrete temperature at time of discharge to not exceed 95 deg F.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

A. ACI Publications: Comply with ACI 301 unless modified by requirements in the Contract Documents.

2.2 CONCRETE MATERIALS

A. Source Limitations:

1. Obtain all concrete mixtures from a single ready-mixed concrete manufacturer for entire Project.
2. Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant.
3. Obtain aggregate from single source.
4. Obtain each type of admixture from single source from single manufacturer.

B. Cementitious Materials:

1. Portland Cement: ASTM C150/C150M, Type I/II, gray.
2. Fly Ash: ASTM C618, Class C or F.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3S coarse aggregate or better, graded. Provide aggregates from a single source.

1. Alkali-Silica Reaction: Comply with one of the following:

   a. Expansion Result of Aggregate: Not more than 0.04 percent at one-year when tested in accordance with ASTM C1293.
   b. Expansion Results of Aggregate and Cementitious Materials in Combination: Not more than 0.10 percent at an age of 16 days when tested in accordance with ASTM C1567.
   c. Alkali Content in Concrete: Not more than 4 lb./cu. yd. for moderately reactive aggregate or 3 lb./cu. yd. for highly reactive aggregate, when tested in accordance with ASTM C1293 and categorized in accordance with ASTM C1778, based on alkali content being calculated in accordance with ACI 301.

2. Maximum Coarse-Aggregate Size: 1 inch nominal.
3. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

D. Air-Entraining Admixture: ASTM C260/C260M.

E. Chemical Admixtures: Certified by manufacturer to be compatible with other admixtures that do not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride in steel-reinforced concrete.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
2. Retarding Admixture: ASTM C494/C494M, Type B.
3. Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
5. High-Range, Water-Reducing and -Retarding Admixture: ASTM C494/C494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C171, polyethylene film burlap-polyethylene sheet.

1. Color:

a. Ambient Temperature Below 50 deg F: Black.
b. Ambient Temperature between 50 deg F and 85 deg F: Any color.
c. Ambient Temperature Above 85 deg F: White.

D. Curing Paper: 8-feet-wide paper, consisting of two layers of fibered kraft paper laminated with double coating of asphalt.

E. Water: Potable or complying with ASTM C1602/C1602M.

2.4 RELATED MATERIALS

A. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

B. Epoxy Bonding Adhesive: ASTM C881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade and class to suit requirements, and as follows:

1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.

2.5 CONCRETE MIXTURES, GENERAL

A. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:

1. Fly Ash or Other Pozzolans: 25 percent by mass.
2. Slag Cement: 50 percent by mass.

B. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing, high-range water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
2. Use water-reducing and -retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
3. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.6 CONCRETE MIXTURES

A. Class A: Normal-weight concrete used for footings.

1. Exposure Class: ACI 318 F2 S0 W1 C1.
2. Minimum Compressive Strength: 4500 psi at 28 days.
3. Maximum w/cm: 0.50.

4. Slump Limit: 5 inches, plus or minus 1 inch.
5. Air Content:

    a. Exposure Classes F2: 6.0 percent, plus or minus 1.5 percent at point of delivery for concrete containing 1-inch nominal maximum aggregate size.

6. Limit water-soluble, chloride-ion content in hardened concrete to 0.30 percent by weight of cement.

2.7 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete in accordance with ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.

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

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verification of Conditions:

1. Before placing concrete, verify that installation of concrete forms, accessories, and reinforcement, and embedded items is complete and that required inspections have been performed.
2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Provide reasonable auxiliary services to accommodate field testing and inspections, acceptable to testing agency, including the following:

1. Daily access to the Work.
2. Incidental labor and facilities necessary to facilitate tests and inspections.
3. Secure space for storage, initial curing, and field curing of test samples, including source of water and continuous electrical power at Project site during site curing period for test samples.
4. Security and protection for test samples and for testing and inspection equipment at Project site.

3.3 INSTALLATION OF EMBEDDED ITEMS

A. Place and secure anchorage devices and other embedded items required for adjoining Work that is attached to or supported by cast-in-place concrete.

1. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
2. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of ANSI/AISC 303.
3. Install reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.

3.4 JOINTS

A. Construct joints true to line, with faces perpendicular to surface plane of concrete.

B. Construction Joints: Coordinate with floor slab pattern and concrete placement sequence.

1. Install so strength and appearance of concrete are not impaired, at locations indicated on Drawings or as approved by Architect.
2. Place joints perpendicular to main reinforcement.

    a. Continue reinforcement across construction joints unless otherwise indicated.

3. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.
4. Locate joints for beams, slabs, joists, and girders at third points of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
5. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
6. Space vertical joints in walls as indicated on Drawings. Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
7. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

3.5 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items are complete and that required inspections are completed.

B. Notify Architect and testing and inspection agencies 24 hours prior to commencement of concrete placement.

C. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect in writing, but not to exceed the amount indicated on the concrete delivery ticket.

D. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301, but not to exceed the amount indicated on the concrete delivery ticket.

E. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete is placed on concrete that has hardened enough to cause seams or planes of weakness.

1. If a section cannot be placed continuously, provide construction joints as indicated.
2. Deposit concrete to avoid segregation.
3. Deposit concrete in horizontal layers of depth not to exceed formwork design pressures and in a manner to avoid inclined construction joints.
4. Consolidate placed concrete with mechanical vibrating equipment in accordance with ACI 301.

    a. Do not use vibrators to transport concrete inside forms.
    b. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer.
    c. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity.
    d. At each insertion, limit duration of vibration to time necessary to consolidate concrete, and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

3.6 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. ACI 301 Surface Finish SF-1.0: As-cast concrete texture imparted by form-facing material.

    a. Patch voids larger than 1-1/2 inches wide or 1/2 inch deep.
    b. Remove projections larger than 1 inch.
    c. Tie holes do not require patching.
    d. Surface Tolerance: ACI 117 Class D.
    e. Apply to concrete surfaces not exposed to public view.

2. ACI 301 Surface Finish SF-2.0: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams.

    a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
    b. Remove projections larger than 1/4 inch.
    c. Patch tie holes.
    d. Surface Tolerance: ACI 117 Class B.
    e. Locations: Apply to concrete surfaces exposed to public view, to receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.

B. Rubbed Finish: Apply the following to as cast surface finishes where indicated on Drawings:

1. Smooth-Rubbed Finish:

    a. Perform no later than one day after form removal.
    b. Moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture.
    c. If sufficient cement paste cannot be drawn from the concrete by the rubbing process, use a grout made from the same cementitious materials used in the in-place concrete.

d. Maintain required patterns or variances as shown on Drawings or to match design reference sample or mockups.

2. Grout-Cleaned Rubbed Finish:

a. Clean concrete surfaces after contiguous surfaces are completed and accessible.
b. Do not clean concrete surfaces as Work progresses.
c. Mix 1 part portland cement to 1-1/2 parts fine sand, complying with ASTM C144 or ASTM C404, by volume, with sufficient water to produce a mixture with the consistency of thick paint. Add white portland cement in amounts determined by trial patches, so color of dry grout matches adjacent surfaces.
d. Wet concrete surfaces.
e. Scrub grout into voids and remove excess grout. When grout whitens, rub surface with clean burlap, and keep surface damp by fog spray for at least 36 hours.
f. Maintain required patterns or variances as shown on Drawings or to match design reference sample or mockups.

C. Related Unformed Surfaces:

1. At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a color and texture matching adjacent formed surfaces.
2. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.7 INSTALLATION OF MISCELLANEOUS CONCRETE ITEMS

A. Filling In:

1. Fill in holes and openings left in concrete structures after Work of other trades is in place unless otherwise indicated.
2. Mix, place, and cure concrete, as specified, to blend with in-place construction.
3. Provide other miscellaneous concrete filling indicated or required to complete the 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:

1. Coordinate sizes and locations of concrete bases with actual equipment provided.
2. Construct concrete bases 4 inches high unless otherwise indicated on Drawings, and extend base not less than 6 inches in each direction beyond the maximum dimensions of supported equipment unless otherwise indicated on Drawings, or unless required for seismic anchor support.
3. Minimum Compressive Strength: 4500 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
5. Prior to pouring concrete, place and secure anchorage devices.

a. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
b. Cast anchor-bolt insert into bases.

c. Install anchor bolts to elevations required for proper attachment to supported equipment.

3.8 CONCRETE CURING

A. Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

1. Comply with ACI 301 and ACI 306.1 for cold weather protection during curing.
2. Comply with ACI 301 and ACI 305.1 for hot-weather protection during curing.
3. Maintain moisture loss no more than 0.2 lb/sq. ft. x h, calculated in accordance with ACI 305.1, before and during finishing operations.

B. Curing Formed Surfaces: Comply with ACI 308.1 as follows:

1. Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces.
2. Cure concrete containing color pigments in accordance with color pigment manufacturer's instructions.
3. If forms remain during curing period, moist cure after loosening forms.
4. If removing forms before end of curing period, continue curing for remainder of curing period, as follows:

a. Continuous Fogging: Maintain standing water on concrete surface until final setting of concrete.
b. Continuous Sprinkling: Maintain concrete surface continuously wet.
c. Absorptive Cover: Pre-dampen absorptive material before application; apply additional water to absorptive material to maintain concrete surface continuously wet.

3.9 TOLERANCES

A. Conform to ACI 117.

3.10 CONCRETE SURFACE REPAIRS

A. Defective Concrete:

1. Repair and patch defective areas when approved by Architect.
2. Remove and replace concrete that cannot be repaired and patched to Architect's approval.

B. Patching Mortar: Mix dry-pack patching mortar, consisting of 1 part portland cement to 2-1/2 parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.

C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.

1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete.

a. Limit cut depth to 3/4 inch.
b. Make edges of cuts perpendicular to concrete surface.
c. Clean, dampen with water, and brush-coat holes and voids with bonding agent.
d. Fill and compact with patching mortar before bonding agent has dried.
e. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.

2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement, so that, when dry, patching mortar matches surrounding color.

a. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching.
b. Compact mortar in place and strike off slightly higher than surrounding surface.

3. Repair defects on concealed formed surfaces that will affect concrete's durability and structural performance as determined by Architect.

D. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

E. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.11 FIELD QUALITY CONTROL

A. Special Inspections: Contractor will engage a special inspector to perform field inspections and prepare inspection reports.

B. Batch Tickets: For each load delivered, submit three copies of batch delivery ticket to testing agency, indicating quantity, mix identification, admixtures, design strength, aggregate size, design air content, design slump at time of batching, and amount of water that can be added at Project site.

C. Inspections:

1. Headed bolts and studs.
2. Verification of use of required design mixture.
3. Concrete placement, including conveying and depositing.
4. Curing procedures and maintenance of curing temperature.
5. Verification of concrete strength before removal of shores and forms from beams and slabs.
6. Batch Plant Inspections: On a random basis, as determined by Architect.

D. Concrete Tests: Testing of composite samples of fresh concrete obtained in accordance with ASTM C 172/C 172M to be performed in accordance with the following requirements:

1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd., but less than 25 cu. yd., plus one set for each additional 50 cu. yd. or fraction thereof.

a. When frequency of testing provides fewer than five compressive-strength tests for each concrete mixture, testing to be conducted from at least five randomly selected batches or from each batch if fewer than five are used.

2. Slump: ASTM C143/C143M:

    a. One test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture.
    b. Perform additional tests when concrete consistency appears to change.

3. Air Content: ASTM C231/C231M pressure method, for normal-weight concrete;.

    a. One test for each composite sample, but not less than one test for each day's pour of each concrete mixture.

4. Concrete Temperature: ASTM C1064/C1064M:

    a. One test hourly when air temperature is 40 deg F and below or 80 deg F and above, and one test for each composite sample.

5. Compression Test Specimens: ASTM C31/C31M:

    a. Cast and laboratory cure two sets of three 6-inch by 12-inch or 4-inch by 8-inch cylinder specimens for each composite sample.

6. Compressive-Strength Tests: ASTM C39/C39M.

    a. Test one set of two laboratory-cured specimens at seven days and one set of two specimens at 28 days.
    b. A compressive-strength test to be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

7. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength, and no compressive-strength test value falls below specified compressive strength by more than 500 psi if specified compressive strength is 5000 psi, or no compressive strength test value is less than 10 percent of specified compressive strength if specified compressive strength is greater than 5000 psi.

8. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

9. Additional Tests:

    a. Testing and inspecting agency to make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
    b. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C42/C42M or by other methods as directed by Architect.

        1) Acceptance criteria for concrete strength to be in accordance with ACI 301, Section 1.6.6.3.

10. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
11. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.12 PROTECTION

A. Protect concrete surfaces as follows:

1. Protect from petroleum stains.
2. Diaper hydraulic equipment used over concrete surfaces.
3. Prohibit vehicles from interior concrete slabs.
4. Prohibit use of pipe-cutting machinery over concrete surfaces.
5. Prohibit placement of steel items on concrete surfaces.
6. Prohibit use of acids or acidic detergents over concrete surfaces.

END OF SECTION 033000

SECTION 040120 - MASONRY REPAIR & REPOINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Repairing and maintenance of unit masonry, including removing and replacing toothed units at select locations including the following unit masonry types:

    a. Face Brick
    b. Concrete masonry units (CMUs)

2. Repointing joints.
3. Select areas of masonry toothed infill.
4. Select areas of masonry cleaning.

B. Related Requirements:

1. Division 01 section "Unit Prices" for bidding requirements.
2. Division 01 section "Execution" for cutting and patching.

1.3 DEFINITIONS

A. Low-Pressure Spray: 100 to 400 psi; 4 to 6 gpm.

1.4 SEQUENCING AND SCHEDULING

A. Order sand and gray portland cement for pointing mortar immediately after approval of mockups. Take delivery of and store at Project site enough quantity to complete Project.

B. Work Sequence: Perform brick masonry repointing work in the following sequence, which includes work specified in this and other Sections:

1. Remove plant growth.
2. Inspect masonry for open mortar joints and permanently or temporarily point them before cleaning to prevent the intrusion of water and other cleaning materials into the wall.
3. Remove paint.
4. Clean masonry.
5. Rake out mortar from joints surrounding masonry to be replaced and from joints adjacent to masonry repairs along joints.
6. Repair masonry, including replacing existing masonry with new masonry materials.
7. Rake out mortar from joints to be repointed.
8. Point mortar and sealant joints.
9. After repairs and repointing have been completed and cured, perform a final cleaning to remove residues from this work.

10. Where water repellents are to be used on or near masonry work, delay application of these chemicals until after pointing and cleaning.

C. As scaffolding is removed, patch anchor holes used to attach scaffolding. Patch holes in masonry units "Masonry Patching" Article. Patch holes in mortar joints according to "Repointing Masonry" Article.

1.5 ACTION SUBMITTALS

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

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

2. Include recommendations for product application and use. Include test data substantiating that products comply with requirements.

B. Shop Drawings: For the following:

1. Include plans, elevations, sections, and locations of repointing work on the structure.
2. Show provisions for expansion joints or other sealant joints.
3. Show locations of scaffolding and points of scaffolding in contact with masonry. Include details of each point of contact or anchorage.

C. Samples: For each exposed product and for each color and texture specified.

D. Repointing Samples for Initial Selection: For the following:

1. Pointing Mortar: Submit sets of mortar for pointing in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.

a. Have each set contain a close color range of at least three Samples of different mixes of colored sands and cements that produce a mortar matching existing, cleaned mortar when cured and dry.
b. Submit with precise measurements on ingredients, proportions, gradations, and source of colored sands from which each Sample was made.

2. Sand Type Used for Pointing Mortar: Minimum 8 oz. of each in plastic screw-top jars.
3. Sealant materials.
4. Include similar Samples of accessories involving color selection.

E. Repointing Samples for Verification: For the following:

1. Each type, color, and texture of pointing mortar in the form of sample mortar strips, 6 inches long by 1/2 inch wide, set in aluminum or plastic channels.

a. Include with each Sample a list of ingredients with proportions of each. Identify sources, both supplier and quarry, of each type of sand and brand names of cementitious materials and pigments if any.

2. Sealant materials.
3. Accessories: Each type of accessory and miscellaneous support.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For brick masonry repointing specialist, including field supervisors and workers and testing service.

B. Preconstruction Test Reports: For existing masonry units and mortar.

C. Quality-control program.

1.7 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of material for repointing brick masonry (cement, sand, etc.) from single source with resources to provide materials of consistent quality in appearance and physical properties.

B. Brick Masonry Repointing Specialist Qualifications: Engage an experienced brick masonry repointing 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 in only installing masonry is insufficient experience for masonry repointing work.

1. Field Supervision: Brick masonry repointing specialist firms shall maintain experienced full-time supervisors on Project site during times that brick masonry repointing work is in progress.

C. Qualifications: Engage an experienced mason 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.

D. Mockups: Prepare mockups of repair 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. 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 masory units replaced.

2) Patching: Three (3) small holes at least 1-inch in diameter for each type of masonry material indicated to be patched, so as to leave no evidence of repair.

2. Repointing: Rake out joints in two (2) separate areas for each type of repointing required and repoint one of the areas.

3. Cleaning: Clean an area for each type of masonry and surface condition.

E. Preinstallation Conference: Conduct conference at Project site.

1.8 PRECONSTRUCTION TESTING

A. Preconstruction Testing Service: Engage a qualified testing agency to perform preconstruction testing on masonry units as follows:

1. Existing Brick: Test each type of existing masonry unit indicated for replacement, according to testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).

Carefully remove five existing units from locations designated by Architect. Take testing samples from these units.

2. Existing Mortar: Test according to ASTM C295, modified as agreed by testing service and Architect for Project requirements, to determine proportional composition of original ingredients, sizes and colors of aggregates, and approximate strength. Use X-ray diffraction, infrared spectroscopy, and differential thermal analysis as necessary to supplement microscopical methods. Carefully remove existing mortar from within joints at five locations designated by testing service.
3. Temporary Patch: As directed by Architect, provide temporary materials at locations from which existing samples were taken.
4. Replacement Brick: Test each proposed type of replacement masonry unit, according to sampling and testing methods in ASTM C67 for compressive strength, 24-hour cold-water absorption, 5-hour boil absorption, saturation coefficient, and initial rate of absorption (suction).
5. Concrete Masonry Unit Test: For each type of unit required, according to ASTM C140 for compressive strength.
6. Mortar Test (Property Specification): For each mix required, according to ASTM C109/C109M for compressive strength.
7. Mortar Test (Property Specification): For each mix required, according to ASTM C780 for compressive strength.
8. Grout Test (Compressive Strength): For each mix required, according to ASTM C1019.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver packaged materials to Project site in manufacturer's original and unopened containers, labeled with manufacturer's name and type of products.

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 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.

D. Store sand where grading and other required characteristics can be maintained and contamination avoided.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit repointing work to be performed according to product manufacturers' written instructions and specified requirements.

B. Temperature Limits, General: Repoint mortar joints only when air temperature is between 40 and 90 deg F and is predicted to remain so for at least seven days after completion of the Work unless otherwise indicated.

C. Cold-Weather Requirements: Comply with the following procedures for mortar-joint pointing unless otherwise indicated:

1. When air temperature is below 40 deg F, heat mortar ingredients and existing masonry walls to produce temperatures between 40 and 120 deg F.
2. When mean daily air temperature is below 40 deg F, provide enclosure and heat to maintain temperatures above 32 deg F within the enclosure for seven days after pointing.

D. Hot-Weather Requirements: Protect mortar-joint pointing when temperature and humidity conditions produce excessive evaporation of water from mortar 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 and above unless otherwise indicated.

PART 2 - PRODUCTS

2.1 MASONRY MATERIALS

A. Face Brick: Provide face brick, including specially molded, ground, cut, or sawed shapes where required to complete masonry repair work.

1. Provide units with physical properties, colors, color variation within units, surface texture, size, and shape to match existing brickwork.

a. For existing brickwork that exhibits a range of colors or color variation within units, provide brick that proportionally matches that range and variation rather than brick that matches an individual color within that range.

2. Special Shapes:

a. Provide specially molded, 100 percent solid shapes for applications where core holes or "frogs" could be exposed to view or weather when in final position and where shapes produced by sawing would result in sawed surfaces being exposed to view.

b. Mechanical chopping or breaking brick, or bonding pieces of brick together by adhesive, are not acceptable procedures for fabricating special shapes.

B. Building Brick: Provide building brick complying with ASTM C62, Grade SW where in contact with earth, Grade SW, MW, or NW for concealed backup; and of same vertical dimension as face brick, for masonry work concealed from view.

C. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
2. Density Classification: Normal weight unless otherwise indicated.

2.2 MORTAR MATERIALS

A. Portland Cement: ASTM C150, Type I or Type II, to match exposed mortar.

1. Provide cement containing not more than 0.60 percent total alkali when tested according to ASTM C114.

B. Hydrated Lime: ASTM C207, Type S.

C. Portland Cement-Lime Mix: Packaged blend of portland cement complying with ASTM C150, Type I or Type III, and hydrated lime complying with ASTM C207, Type S.

D. Mortar Aggregate: ASTM C144 unless otherwise indicated.

1. Existing Conditions: Match size, texture, and gradation of existing mortar aggregates as closely as possible. Blend several sands if necessary to achieve suitable match.

a. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.

2. Color: Provide natural sand or ground marble, granite, or other sound stone of color necessary to produce required mortar color.

3. Pointing Mortar: For pointing mortar, provide sand with rounded edges.

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

F. Water: Potable.

2.3 ACCESSORY MATERIALS

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

2.4 MORTAR MIXES

A. 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.

B. 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.

C. Do not use admixtures in mortar unless otherwise indicated.

D. Mortar Proportions: Mix mortar materials to match existing.

2.5 REINFORCEMENT (CMU)

A. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

1. Exterior and Interior Walls: Hot-dip galvanized, carbon steel.

2.6 CHEMICAL CLEANING SOLUTIONS

A. Dilute chemical cleaners with water to produce solutions not exceeding concentration recommended by chemical-cleaner manufacturer.

B. Acidic Cleaner Solution for Brick: Dilute with water to produce hydrofluoric acid content of three (3%) percent or less, but not greater than that recommended by chemical-cleaner manufacturer.

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.

B. Comply with chemical-cleaner manufacturer's written instructions for protecting building and other surfaces against damage from exposure to its products. Prevent chemical-cleaning solutions from coming into contact with people, motor vehicles, landscaping, buildings, and other surfaces that could be harmed by such contact.

1. Cover adjacent surfaces with materials that are proven to resist chemical cleaners used unless chemical cleaners being used will not damage adjacent surfaces. Use materials that contain only waterproof, UV-resistant adhesives. Apply masking agents to comply with manufacturer's written instructions. When no longer needed, promptly remove masking to prevent adhesive staining.
2. Keep wall wet below area being cleaned to prevent streaking from runoff.

3.2 MASONRY REMOVAL AND REPLACEMENT

A. At locations indicated, remove masonry 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. Tooth replacement units into area of repair; maintain joint pattern of surrounding wall / area.

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 units as possible.

1. Remove mortar, loose particles, and soil from masonry by cleaning with hand chisels, brushes, and water.
2. Remove sealants by cutting close to masonry with utility knife and cleaning with solvents.

E. Clean masonry surrounding removal areas by removing mortar, dust, and loose particles in preparation for replacement.

F. Replace removed damaged masonry with other removed units in good quality, where possible, or with new masonry matching existing units, including size. Do not use broken units unless they can be cut to usable size.

G. Install replacement units into bonding and coursing pattern of existing masonry. 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 units 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 masonry that have ASTM C67 initial rates of absorption (suction) of more than 30 g/30 sq. in. 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 masonry work.

2. Rake out mortar used for laying units 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 MASONRY PATCHING

A. Patching Units:

1. Remove loose material from masonry surface. Carefully remove additional material so patch will not have feathered edges but will have square or slightly undercut edges on area to be patched and will be at least 1/4-inch thick, but not less than recommended by patching compound manufacturer.

2. Mask adjacent mortar joint or rake out for repointing if patch will extend to edge of masonry unit.

3. Mix patching compound in individual batches to match each unit being patched.

4. Rinse surface to be patched and leave damp, but without standing water.

5. Brush-coat surfaces with slurry coat of patching compound according to manufacturer's written instructions.

6. Place patching compound in layers as recommended by patching compound manufacturer, but not less than 1/4-inch or more than 2-inches thick. Roughen surface of each layer to provide a key for next layer.

7. Trowel, scrape, or carve surface of patch to match texture and surrounding surface plane or contour of the masonry unit. Shape and finish surface before or after curing, as determined by testing, to best match existing masonry unit.

8. Keep each layer damp for 72 hours or until patching compound has set.

3.4 CLEANING MASONRY, GENERAL

A. Proceed with cleaning in an orderly manner; work from [bottom to top] [top to bottom] of each scaffold width and from one end of each elevation to the other. Ensure that dirty residues and rinse water will not wash over cleaned, dry surfaces.

B. Use only those cleaning methods indicated for each masonry material and location.

1. Do not use wire brushes or brushes that are not resistant to chemical cleaner being used. Do not use plastic-bristle brushes if natural-fiber brushes will resist chemical cleaner being used.
2. Use spray equipment that provides controlled application at volume and pressure indicated, measured at spray tip. Adjust pressure and volume to ensure that cleaning methods do not damage masonry.
    a. Equip units with pressure gauges.
3. For chemical-cleaner spray application, use low-pressure tank or chemical pump suitable for chemical cleaner indicated, equipped with cone-shaped spray tip.
4. For water-spray application, use fan-shaped spray tip that disperses water at an angle of 25 to 50 degrees.
5. For heated water-spray application, use equipment capable of maintaining temperature between 140 and 160 deg F at flow rates indicated.

C. Perform each cleaning method indicated in a manner that results in uniform coverage of all surfaces, including corners, moldings, and interstices, and that produces an even effect without streaking or damaging masonry surfaces.

D. Water-Spray Application Method: Unless otherwise indicated, hold spray nozzle at least 6-inches from surface of masonry and apply water in horizontal back and forth sweeping motion, overlapping previous strokes to produce uniform coverage.

E. Chemical-Cleaner Application Methods: Apply chemical cleaners to masonry surfaces to comply with chemical-cleaner manufacturer's written instructions; use brush or spray application. Do not spray apply at pressures exceeding 50 psi. Do not allow chemicals to remain on surface for periods longer than those indicated or recommended by manufacturer.

F. Rinse off chemical residue and soil by working upward from bottom to top of each treated area at each stage or scaffold setting. Periodically during each rinse, test pH of rinse water running off of cleaned area to determine that chemical cleaner is completely removed.
    1. Apply neutralizing agent and repeat rinse if necessary to produce tested pH of between 6.7 and 7.5.

3.5 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 by a knife blade 0.027 inch thick.
    4. Cracked joints where cracks are 1/8-inch 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 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 joint width plus 1/8-inch, but not less than 1/2-inch 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.

    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.

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 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. 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.

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.

3.6 FINAL CLEANING

A. After mortar has fully hardened, thoroughly clean exposed masonry surfaces of excess mortar and foreign matter; use wood scrapers, stiff-nylon or -fiber brushes, and clean water, spray applied at low pressure.

1. Do not use metal scrapers or brushes.

2. Do not use acidic or alkaline cleaners.

B. Clean adjacent non masonry surfaces. Use detergent and soft brushes or cloths.

C. Clean mortar and debris from roof; remove debris from gutters and downspouts. Rinse off roof and flush gutters and downspouts.

D. Remove masking materials, leaving no residues that could trap dirt.

END OF SECTION 040120

SECTION 051200 - STRUCTURAL STEEL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Structural-steel materials.
2. Shrinkage-resistant grout.

B. Related Requirements:

1. Section 099100 "Painting" and Section 099600 "High-Performance Coatings" for painting requirements.

1.2 DEFINITIONS

A. Structural Steel: Elements of the structural frame indicated on Drawings and as described in ANSI/AISC 303.

1.3 COORDINATION

A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.

B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

B. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:

1. Steel Stair Engineer of Record
2. Contractor's superintendent.
3. Fabricator

1.5 ACTION SUBMITTALS

A. Product Data:

1. Structural-steel materials.
2. High-strength, bolt-nut-washer assemblies.

3. Anchor rods.
4. Threaded rods.
5. Shop primer.
6. Galvanized-steel primer.
7. Etching cleaner.
8. Galvanized repair paint.
9. Shrinkage-resistant grout.

B. Shop Drawings: Show fabrication of structural-steel components.

1. Include details of cuts, deleions, splices, camber, holes, and other pertinent data.
2. Include embedment Drawings.
3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical, high-strength bolted connections.
5. Identify members not to be shop primed.

C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide in accordance with AWS D1.1/D1.1M for each welded joint whether prequalified or qualified by testing, including the following:

1. Power source (constant current or constant voltage).
2. Electrode manufacturer and trade name, for demand-critical welds.

D. Delegated Design Submittal: For structural-steel stairs and guardrails/handrails indicated on Drawings to comply with design loads, include analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.6 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

C. Mill test reports for structural-steel materials, including chemical and physical properties.

D. Product Test Reports: For the following:

1. Bolts, nuts, and washers, including mechanical properties and chemical analysis.
2. Direct-tension indicators.
3. Tension-control, high-strength, bolt-nut-washer assemblies.

E. Survey of existing conditions.

1.7 QUALITY ASSURANCE

A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category BU or is accredited by the IAS Fabricator Inspection Program for Structural Steel (Acceptance Criteria 172).

1. If the Contractor does not participate in the AISC Quality Certification Program required in 1.7.A, it is the responsibility of the Contractor to hire a special inspector to conduct special inspections for steel fabrication in shop and prepare reports. The Owner and Contractor shall take this into account when evaluating steel fabrication bids, both from a cost and scheduling standpoint.

B. Shop-Painting Applicator Qualifications: Qualified in accordance with AISC's Sophisticated Paint Endorsement P1 or to SSPC-QP 3.

C. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.1/D1.1M.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.

1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.

B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.

1. Fasteners may be repackaged provided Owner's inspecting agency observes repackaging and seals containers.
2. Clean and relubricate bolts and nuts that become dry or rusty before use.
3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F3125/F3125M, Grade F1852 bolt assemblies and for retesting bolt assemblies after lubrication.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Comply with applicable provisions of the following specifications and documents:

1. ANSI/AISC 303.
2. ANSI/AISC 360.
3. RCSC's "Specification for Structural Joints Using High-Strength Bolts."

B. Construction: System of moment frames.

2.2 STRUCTURAL-STEEL MATERIALS

A. W-Shapes: ASTM A992/A992M.

B. Channels, Angles, M-Shapes: ASTM A36/A36M.

C. Plate and Bar: ASTM A572/A572M, Grade 50.

D. Cold-Formed Hollow Structural Sections: ASTM A500/A500M, Grade C structural tubing.

E. Steel Pipe: ASTM A53/A53M, Type E or Type S, Grade B.

1. Weight Class: Standard.
2. Finish: Black except where indicated to be galvanized.

F. Welding Electrodes: Comply with AWS requirements.

2.3 BOLTS AND CONNECTORS

A. High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers; all with plain finish.

1. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with plain finish.

B. Zinc-Coated High-Strength A325 Bolts, Nuts, and Washers: ASTM F3125/F3125M, Grade A325, Type 1, heavy-hex steel structural bolts; ASTM A563, Grade DH, heavy-hex carbon-steel nuts; and ASTM F436/F436M, Type 1, hardened carbon-steel washers.

1. Finish: Hot-dip or mechanically deposited zinc coating.
2. Direct-Tension Indicators: ASTM F959/F959M, Type 325-1, compressible-washer type with mechanically deposited zinc coating finish.

2.4 RODS

A. Unheaded Anchor Rods: ASTM F1554, Grade 36.

1. Configuration: Straight.
2. Nuts: ASTM A563 heavy-hex carbon steel.
3. Plate Washers: ASTM A36/A36M carbon steel.
4. Washers: ASTM F436, Type 1, hardened carbon steel.
5. Finish: Mechanically deposited zinc coating, ASTM B695, Class 50.

B. Threaded Rods: ASTM A36/A36M.

1. Nuts: ASTM A63 heavy-hex carbon steel.
2. Washers: ASTM F436, Type 1, hardened carbon steel.
3. Finish: Mechanically deposited zinc coating, ASTM B695, Class 50.

2.5 PRIMER

A. Steel Primer:

1. Comply with Section 099100 "Painting." And Section 099600 "High-Performance Coatings."

2.6 SHRINKAGE-RESISTANT GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C1107/C1107M, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.7 FABRICATION

A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate in accordance with ANSI/AISC 303 and to ANSI/AISC 360.

1. Camber structural-steel members where indicated.
2. Fabricate beams with rolling camber up.
3. Identify high-strength structural steel in accordance with ASTM A6/A6M and maintain markings until structural-steel framing has been erected.
4. Mark and match-mark materials for field assembly.
5. Complete structural-steel assemblies, including welding of units, before starting shop-priming operations.

B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.

1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.

C. Bolt Holes: Cut, drill,or punch standard bolt holes perpendicular to metal surfaces.

D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.

E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted in accordance with SSPC-SP 2.

F. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel members.

1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.8 SHOP CONNECTIONS

A. High-Strength Bolts: Shop install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for type of bolt and type of joint specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

2.9 SHOP PRIMING

A. Shop prime steel surfaces, except the following:

1. Surfaces embedded in concrete or mortar. Extend priming of partially embedded members to a depth of 2 inches.
2. Surfaces to be field welded.
3. Surfaces of high-strength bolted, slip-critical connections.
4. Surfaces to receive sprayed fire-resistive materials (applied fireproofing).
5. Galvanized surfaces unless indicated to be painted.
6. Surfaces enclosed in interior construction.

B. Surface Preparation of Steel: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces in accordance with the following specifications and standards:

1. SSPC-SP 2.
2. SSPC-SP 3.

C. Surface Preparation of Galvanized Steel: Prepare galvanized-steel surfaces for shop priming by thoroughly cleaning steel of grease, dirt, oil, flux, and other foreign matter, and treating with etching cleaner or in accordance with SSPC-SP 16.

D. Priming: Immediately after surface preparation, apply primer in accordance with manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.

1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection. Change color of second coat to distinguish it from first.

2.10 SOURCE QUALITY CONTROL

A. Testing Agency: Contractor will engage a qualified testing agency to perform shop tests.

1. Allow testing agency access to places where structural-steel work is being fabricated or produced to perform tests.
2. Bolted Connections: Test shop-bolted connections in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts."
3. Welded Connections: Visually test shop-welded connections in accordance with AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:

    a. Liquid Penetrant Inspection: ASTM E165/E165M.
    b. Magnetic Particle Inspection: ASTM E709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration are not accepted.
    c. Ultrasonic Inspection: ASTM E164.
    d. Radiographic Inspection: ASTM E94/E94M.

4. Prepare test reports.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify, with certified steel erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.

1. Prepare a certified survey of existing conditions. Include bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.

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

3.2 PREPARATION

A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated on Drawings.

3.3 ERECTION

A. Set structural steel accurately in locations and to elevations indicated and in accordance with ANSI/AISC 303 and ANSI/AISC 360.

B. Baseplates, Bearing Plates, and Leveling Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.

1. Set plates for structural members on wedges, shims, or setting nuts as required.
2. Weld plate washers to top of baseplate.
3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
4. Promptly pack shrinkage-resistant grout solidly between bearing surfaces and plates, so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for grouting.

C. Maintain erection tolerances of structural steel within ANSI/AISC 303.

D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that are in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure. Slope roof framing members to slopes indicated on Drawings.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.

E. Splice members only where indicated.

F. Do not use thermal cutting during erection.

G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

3.4 FIELD CONNECTIONS

A. High-Strength Bolts: Install high-strength bolts in accordance with RCSC's "Specification for Structural Joints Using High-Strength Bolts" for bolt and joint type specified.

1. Joint Type: Snug tightened.

B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

1. Comply with ANSI/AISC 303 and ANSI/AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
2. Remove backing bars or runoff tabs, back gouge, and grind steel smooth.
3. Assemble and weld built-up sections by methods that maintain true alignment of axes without exceeding tolerances in ANSI/AISC 303 for mill material.

3.5 REPAIR

A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing, and repair galvanizing to comply with ASTM A780/A780M.

B. Touchup Painting:

1. Immediately after erection, clean exposed areas where primer is damaged or missing, and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.

a. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.

2. Cleaning and touchup painting are specified in Section 099100 "Painting" and Section 099600 "High-Performance Coatings."

C. Touchup Priming: Cleaning and touchup priming are specified in Section 099600 "High-Performance Coatings."

3.6 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform the following special inspections:

1. Verify structural-steel materials and inspect steel frame joint details.
2. Verify weld materials and inspect welds.
3. Verify connection materials and inspect high-strength bolted connections.

END OF SECTION 051200

SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Section Includes:

1. Miscellaneous framing and supports.
2. Miscellaneous steel trim.
3. Steel framing and supports for mechanical and electrical equipment.
4. Steel framing and supports for applications where framing and supports are not specified in other Sections.
5. Loose steel lintels.
6. Loose bearing and leveling plates.
7. Steel weld plates and angles
8. Steel handrail support plate.
9. Roof paver system support plates, if required.
10. Metal screening system at stair tower.
11. Handrail and guardrail for stair tower and porch terrace

C. Products furnished, but not installed, under this Section include the following:

1. Loose steel lintels.
2. Anchor bolts, steel pipe sleeves, and wedge-type inserts indicated to be cast into concrete or built into unit masonry.
3. Drilled-In concrete expansion anchors.
4. Roof paver roof drain support plates.

D. Related Requirements:

1. Division 03 section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts, handrails, guardrails, and other items indicated to be cast into concrete.
2. Division 04 section "Unit Masonry" for installing loose lintels, anchor bolts, and other items indicated to be built into unit masonry.
3. Division 05 Metals for structural coordination.
4. Division 06 section "Rough Carpentry" for metal framing anchors.
5. Division 07 section "Roof Paver System" for coordination of roof drain support plate provision.
6. A-Series and S-Series drawings for scope of delegated design at stair tower and terrace.
7. Sheet A-600 Finish Legend for specific product numbers and finish information.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Design stair, landings, treads, handrails, guardrails and enclosure screen, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated on the architectural and structural drawings.

B. Thermal Movements: Provide exterior metal fabrications that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.3 SUBMITTALS

A. Product Data: For the following:

1. Fasteners.
2. Slotted channel framing.
3. Shop primers.
4. Paint products.
5. Grout.

B. Shop Drawings: Show fabrication and installation details for metal fabrications.

1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.
2. Provide templates for anchors and bolts specified for installation under other Sections.
3. For installed products indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
4. Include all components of the stair tower.

C. Samples: Not Used

D. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

E. Certificates:

1. Welding certificates.
2. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers, certifying that shop primers are compatible with topcoats.

F. Qualification Data: For professional engineer.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: Fabricator of products.

B. Welding Qualifications: Qualify procedures and personnel in accordance with the following welding codes:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum."
3. AWS D1.6/D1.6M, "Structural Welding Code - Stainless Steel."

1.5 PROJECT CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication and indicate measurements on Shop Drawings.

1. Established Dimensions: Where field measurements cannot be made without delaying the Work, establish dimensions and proceed with fabricating metal fabrications without field measurements. Coordinate wall and other contiguous construction to ensure that actual dimensions correspond to established dimensions.
2. Provide allowance for trimming and fitting at site.

1.6 COORDINATION

A. Coordinate installation of anchorages for metal fabrications. 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.

B. Coordinate installation of steel weld plates and angles for casting into concrete that are specified in this Section but required for work of another Section. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Metal screen: Subject to compliance with requirements, the following fabricator is listed for reference only.

1. Basis of design: **Construction Specialties**
   Martin Read
   martin.read@c-sgroup.com
   P: (908) 540-0319

B. Metal stair components including guardrail and handrails: Subject to compliance with requirements, the following local shop fabricators are listed for reference only.

1. Basis of design: **Sentry Steel, Inc**
   Contact: Eric Caudill
   eric@sentrysteelinc.com
   P: (502) 361-5445

2.2 METALS, GENERAL

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

2.3 FERROUS METALS

A. Steel Plates, Shapes, and Bars: ASTM A36 / A36M.

B. Stainless-Steel Sheet, Strip, and Plate: ASTM A666, Type 304.

C. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.

D. Stainless-Steel Sheet, Strip, Plate, and Flat Bars: ASTM A666, Type 304.

E. Stainless-Steel Bars and Shapes: ASTM A276, Type 304.

F. Rolled-Steel Floor Plate: ASTM A786 / A786M, rolled from plate complying with ASTM A36 / A36M or ASTM A283 / A283M, Grade C or D.

G. Rolled-Stainless-Steel Floor Plate: ASTM A793.

H. Steel Tubing: ASTM A500, cold-formed steel tubing.

I. Steel Pipe: ASTM A53 / A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads.

J. Slotted Channel Framing: Not required.

K. Cast Iron: ASTM A48 / A48M, Class 30, unless another class is indicated or required by structural loads.

2.4 NONFERROUS METALS

A. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

B. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

C. Aluminum-Alloy Rolled Tread Plate: ASTM B632 / B632M, Alloy 6061-T6.

D. Aluminum Castings: ASTM B26 / B26M, Alloy 443.0-F.

2.5 FASTENERS

A. General: Unless otherwise indicated, provide Type 304 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B633, Class Fe/Zn 5, at exterior walls. Provide stainless-steel fasteners for fastening aluminum. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A; with hex nuts, ASTM A563; and, where indicated, flat washers.

C. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, nuts and, where indicated, flat washers; ASTM F593 for bolts and ASTM F594 for nuts.

D. Aluminum Plate and Sheet: ASTM B209, Alloy 6061-T6.

E. Aluminum Extrusions: ASTM B221, Alloy 6063-T6.

F. Aluminum-Alloy Rolled Tread Plate: ASTM B632 / B632M, Alloy 6061-T6.

G. Aluminum Castings: ASTM B26 / B26M, Alloy 443.0-F.

H. Anchor Bolts: ASTM F1554, Grade 36.

1. Provide hot-dip or mechanically deposited, zinc-coated anchor bolts where item being fastened is indicated to be galvanized.

I. Eyebolts: ASTM A489.

J. Machine Screws: ASME B18.6.3.

K. Lag Bolts: ASME B18.2.1.

L. Wood Screws: Flat head, ASME B18.6.1.

M. Plain Washers: Round, ASME B18.22.1.

N. Lock Washers: Helical, spring type, ASME B18.21.1.

O. Cast-in-Place Anchors in Concrete: Anchors capable of sustaining, without failure, a load equal to four times the load imposed, as determined by testing according to ASTM E488, conducted by a qualified independent testing agency.

1. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 / A47M malleable iron or ASTM A27 / A27M cast steel. Provide bolts, washers, and shims as needed, hot-dip galvanized per ASTM A153 / A153M.

P. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B633 or ASTM F1941, Class Fe/Zn 5, unless otherwise indicated.
2. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F593, and nuts, ASTM F594.

Q. Expansion Anchors: Anchor bolt and sleeve assembly with capability to sustain, 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 Anchors in Interior Locations: Carbon-steel components zinc-plated to comply with ASTM B633, Class Fe/Zn 5.
2. Material for Anchors in Exterior Locations: Alloy Group 1 stainless-steel bolts complying with ASTM F593 and nuts complying with ASTM F594.

R. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8- by 7/8-inches by length indicated with anchor straps or studs not less than 3-inches-long at not more than 8-inches on center. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B633, Class Fe/Zn 5, as needed for fastening to inserts.

2.6 MISCELLANEOUS MATERIALS

A. Low-Emitting Materials: Paints and coatings shall 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."

B. Shop Primers: Provide primers that comply with Division 09 sections "Painting" and "High-Performance Coatings".

1. High Performance Coatings: Provide shop primer that is designed to accept a two-component, solvent-based high performance coating.

C. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

D. Zinc-Rich Primer: Complying with SSPC-Paint 20 or SSPC-Paint 29 and compatible with topcoat.

1. Acceptable Product: Tnemec Company, Inc.; Tneme-Zinc 90-97.

E. Galvanizing Repair Paint: High-zinc-dust-content paint for regalvanizing welds in steel, complying with SSPC-Paint 20.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C1107, specifically recommended by manufacturer for heavy-duty loading applications.

H. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.

I. Concrete Materials and Properties: Comply with requirements in Division 03 Section "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi, unless otherwise indicated.

2.7 FABRICATION, GENERAL

A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32-inch, unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.

C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

D. Form exposed work true to line and level with accurate angles and surfaces and straight edges.

E. Weld corners and seams continuously 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

F. 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.

G. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

1. Where units are indicated to be cast into concrete or built into masonry, equip with integrally welded steel strap anchors, 1/8- by 1-1/2-inches, with a minimum 6-inch embedment and 2-inch hook, not less than 8-inches from ends and corners of units and 24-inches on center, unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.

B. Fabricate units from steel shapes, plates, and bars of welded construction, unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction retained by framing and supports. Cut, drill, and tap units to receive hardware, hangers, and similar items.

C. Galvanize miscellaneous framing and supports where indicated.

D. Prime miscellaneous framing and supports with zinc-rich primer where indicated.

2.9 LOOSE STEEL LINTELS

A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Weld adjoining members together to form a single unit where indicated.

B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span but not less than 8-inches, unless otherwise indicated.

C. Galvanize loose steel lintels located in exterior walls.

2.10 LOOSE BEARING AND LEVELING PLATES

A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction. Drill plates to receive anchor bolts and for grouting.

B. Galvanize plates after fabrication.

C. Prime plates with zinc-rich primer.

2.11 STEEL WELD PLATES AND ANGLES

A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with not less than two integrally welded steel strap anchors for embedding in concrete.

2.12 MISCELLANEOUS STEEL TRIM

A. Unless otherwise indicated, fabricate units from steel shapes, plates, and bars of profiles shown with continuously welded joints and smooth exposed edges. Miter corners and use concealed field splices where possible.

B. Provide cutouts, fittings, and anchorages as needed to coordinate assembly and installation with other work.

1. Provide with integrally welded steel strap anchors for embedding in concrete or masonry construction.

C. Galvanize exterior miscellaneous steel trim.

D. Prime interior miscellaneous steel trim with zinc-rich primer.

2.13 UNISTRUT FRAMING

A. Not required.

2.14 FINISHES, GENERAL

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Finish metal fabrications after assembly.

2.15 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items as indicated to comply with applicable standard listed below:

1. ASTM A123 / A123M, for galvanizing steel and iron products.

B. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:

1. Exteriors (SSPC Zone 1B) and Items Indicated to Receive Zinc-Rich Primer: SSPC-SP 6/NACE No. 3, "Commercial Blast Cleaning."
2. Interiors (SSPC Zone 1A): SSPC-SP 3, "Power Tool Cleaning."

C. Shop Priming: Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes and those to be embedded in concrete, sprayed-on fireproofing, 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.

2.16 STAINLESS-STEEL FINISHES

A. Remove tool and die marks and stretch lines or blend into finish.

B. Grind and polish surfaces to produce uniform, directionally textured, polished finish indicated, free of cross scratches. Run grain with long dimension of each piece.

C. Directional Satin Finish: No. 4.

D. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

2.17 ALUMINUM FINISHES

A. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

B. As-Fabricated Finish: AA-M10 (Mechanical Finish: as fabricated, unspecified).

C. High-Performance Organic Finish (HPC):

1. Utilize coating with a spray-applied fluorocarbon resin with 70% Kynar® 500 resins.
2. Number of Coats: Three (3) coat system. Coating shall consist of a 0.2 mil prime coat, a 0.75 mil barrier coat, a 0.75 mil metallic/color coat containing 70% Kynar resins, and a 0.5 mil clear coat containing 70% Kynar resins (Note mil thickness is approximate.)
3. Relevant to the color selected, material to be painted in accordance with either AAMA specification 2605.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.

B. 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.

C. Field Welding: Comply with the following 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.

D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag bolts, wood screws, and other connectors.

E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.

3.3 INSTALLATION OF MISCELLANEOUS STEEL TRIM

A. Anchor to concrete construction to comply with manufacturer's written instructions.

3.4 INSTALLING BEARING AND LEVELING PLATES

A. Clean concrete and masonry bearing surfaces of bond-reducing materials and roughen to improve bond to surfaces. Clean bottom surface of plates.

B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.

1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations, unless otherwise indicated.

2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the 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 dry film thickness.

B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A780.

END OF SECTION 055000

SECTION 061000 - ROUGH CARPENTRY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Wood blocking, cants, and nailers.
2. Wood furring and grounds.
3. Plywood backing panels.

B. Related Requirements:

1. Division 06 section "Sheathing" for material coordination.
2. Division 09 section "Gypsum Board Assemblies" for substrate and blocking coordination.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Lumber grading agencies, and the abbreviations used to reference them, include the following:

1. NeLMA: Northeastern Lumber Manufacturers' Association.
2. NLGA: National Lumber Grades Authority.
3. RIS: Redwood Inspection Service.
4. SPIB: The Southern Pine Inspection Bureau.
5. WCLIB: West Coast Lumber Inspection Bureau.
6. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
3. For fire-retardant treatments specified to be High-Temperature (HT) type, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.

4. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

5. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

B. Fastener Patterns: Full-size templates for fasteners in exposed framing.

1.5 INFORMATIONAL SUBMITTALS

A. Research/Evaluation Reports: For the following, showing compliance with building code in effect for Project:

1. Wood-preservative-treated wood.
2. Fire-retardant-treated (FRT) wood.
3. Power-driven fasteners.
4. Powder-actuated fasteners.
5. Expansion anchors.

1.6 QUALITY ASSURANCE

A. Source Limitations for Engineered Wood Products: Obtain each type of engineered wood product through one source from a single manufacturer.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.

2. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.

3. Provide dressed lumber, S4S, unless otherwise indicated.

B. Maximum Moisture Content of Lumber: 19 percent unless otherwise indicated.

C. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.

1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

D. Application: Treat items indicated on Drawings, 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, and similar concealed members in contact with masonry or concrete.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: Comply with performance requirements in AWPA C20 (lumber) and AWPA C27 (plywood).

1. Use Exterior type for exterior locations and where indicated.

2. Use Interior Type A, High Temperature (HT) for enclosed roof framing, framing in attic spaces, and where indicated.

B. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

C. Application: Treat items indicated on Drawings, and the following:

1. Concealed blocking.
2. Roof construction.
3. Plywood backing panels.

2.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Grounds.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber with 15 percent maximum moisture content of any species.

C. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

2.5 PLYWOOD BACKING PANELS

A. Backing Panels: DOC PS 1, Exposure 1, AC, fire-retardant treated, in thickness indicated or 3/4-inch if not indicated on Drawings.

2.6 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A153 or Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Bolts: Steel bolts complying with ASTM A307, Grade A; with ASTM A563 hex nuts and, where indicated, flat washers.

G. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry assemblies and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.

1. Material: Carbon-steel components, zinc plated to comply with ASTM B633, Class Fe/Zn 5.

2. Material: Stainless steel with bolts and nuts complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

1. Provide metal clips for fastening gypsum board or lath at corners and intersections where framing or blocking does not provide a surface for fastening edges of panels. Space clips not more than 16-inches on center.

D. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

E. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

F. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's International Building Code.

G. Use common wire nails, unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; do not countersink nail heads, unless otherwise indicated.

H. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Comply with fastener patterns where applicable.

3.2 WOOD GROUND, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated.

C. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work. Paint exposed edges, color selection by Architect.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal size furring horizontally at 24-inches on center.

C. Furring to Receive Gypsum Board or Plaster Lath: Install 1-by-2-inch nominal size furring vertically at 16-inches on center.

3.4 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000

SECTION 061600 – SHEATHING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior roof sheathing.
2. Interior wall sheathing.
    a. FRT plywood backer units for electrical panels.
3. Composite nail base insulated roof sheathing.

B. Related Requirements:

1. Division 04 section "Unit Masonry" for exterior enclosure coordination.
2. Division 06 section "Rough Carpentry" for sheathing provision (plywood backing panels) specified under separate section.
3. Division 07 section "Formed Metal Roof Panel System" for sheathing provision (composite nail base) specified under separate section.
4. Division 07 section "Thermal Insulation" for coordination of continuous insulation requirement.
5. Division 09 section "Gypsum Board Assemblies" for sheathing provision (cement backer boards) specified under separate section.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.

1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.
2. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated plywood complies with requirements.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers beneath and between each bundle to provide air circulation. Protect sheathing from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 EXTERIOR SOFFIT SHEATHING

A. Glass-Mat Gypsum Wall Sheathing: ASTM C1177.

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

   a. CertainTeed Corporation; GlasRoc.
   b. G-P Gypsum Corporation; Dens-Glass Gold.
   c. National Gypsum Company; Gold Bond e(2)XP.
   d. Temple-Inland Inc.; GreenGlass
   e. United States Gypsum Co.; Securock.

2. Type and Thickness: Type X, 5/8 inch unless otherwise indicated on Drawings.

2.2 INTERIOR WALL SHEATHING

A. Cementitious Backer Units: ASTM C1325, Type A.

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

   a. Custom Building Products.
   b. United States Gypsum Company.

2. Thickness: As indicated on Drawings or minimum 5/8-inch if not indicated.

2.3 COMPOSITE NAIL BASE INSULATED ROOF SHEATHING

A. Oriented-Strand-Board-Surfaced, Polyisocyanurate-Foam Sheathing: Reference ‘Related Requirements’.

2.4 FIRE-RETARDANT-TREATED PLYWOOD

A. General: Where fire-retardant-treated materials are indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.

B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.

1. Exterior Type: Treated materials shall comply with requirements specified above for fire-retardant-treated plywood by pressure process after being subjected to accelerated weathering according to ASTM D2898. Use for exterior locations and where indicated.

2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D3201 at 92 percent relative humidity. Use where exterior type is not indicated.

3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according ASTM D5516 and design value adjustment factors shall be calculated according to ASTM D6305. Span ratings after treatment shall be not less than span ratings specified.

   a. For roof sheathing and where high-temperature fire-retardant treatment is indicated, span ratings for temperatures up to 170 deg F shall be not less than span ratings specified.

C. Kiln-dry material after treatment to a maximum moisture content of 15 percent.

D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.

E. Application: Treat all plywood unless otherwise indicated.

2.5 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

1. For wall sheathing, provide fasteners with hot-dip zinc coating complying with ASTM A153.

B. Nails, Brads, and Staples: ASTM F1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

E. Screws for Fastening Wood Structural Panels to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.

1. For wall sheathing panels, provide screws with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

F. Screws for Fastening Gypsum Sheathing to Cold-Formed Metal Framing: Steel drill screws, in length recommended by sheathing manufacturer for thickness of sheathing board to be attached, with organic-polymer or other corrosion-protective coating having a salt-spray resistance of more than 800 hours according to ASTM B117.

1. For steel framing less than 0.0329-inch thick, attach sheathing to comply with ASTM C1002.

2. For steel framing from 0.033- to 0.112-inch thick, attach sheathing to comply with ASTM C954.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections. Install fasteners without splitting wood.

E. Coordinate wall sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

3.2 GYPSUM SHEATHING INSTALLATION

A. Comply with GA-253 and with manufacturer's written instructions.

1. Fasten gypsum sheathing to cold-formed metal framing with screws.
2. Install boards with a 3/8-inch gap where non-load-bearing construction abuts structural elements.
3. Install boards with a 1/4-inch gap where they abut masonry or similar materials that might retain moisture, to prevent wicking.

B. Apply fasteners so heads bear tightly against face of sheathing boards but do not cut into facing.

C. Vertical Installation: Install board vertical edges centered over studs. Abut ends and edges of each board with those of adjacent boards. Attach boards at perimeter and within field of board to each stud.

1. Space fasteners approximately 8-inches on-center and set back a minimum of 3/8-inch from edges and ends of boards.

3.3 CEMENTITIOUS BACKER UNIT INSTALLATION

A. Install panels and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.4 WOOD STRUCTURAL PANEL INSTALLATION

A. General: Comply with applicable recommendations in APA Form No. E30, "Engineered Wood Construction Guide," for types of structural-use panels and applications indicated.

B. Coordinate roof sheathing with structural requirements.

C. Fastening Methods: Fasten panels as indicated below:

1. Wall and Roof Sheathing:

a. Nail to wood framing. Apply a continuous bead of glue to framing members at edges of wall sheathing panels.
b. Screw to cold-formed metal framing.
c. Space panels 1/8-inch apart at edges and ends.

END OF SECTION 061600

SECTION 074113 - FORMED METAL ROOF PANEL SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exposed-fastener, lap-seam, pre-formed metal roof panels.
2. Snow retention system.

B. Related Requirements:

1. Division 07 section "Sheet Metal Flashing & Trim" for miscellaneous roof flashings.
2. Division 07 section "Roof Specialties" for metal fascia, gutters and downspouts.

1.3 COORDINATION

A. Coordinate interface with all gutter assemblies and snow retention system to maintain full roof warranty.

B. Coordinate metal panel installation with rain drainage work, flashing, trim, construction of soffits, and other adjoining work to provide a leak proof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, metal panel Installer, metal panel manufacturer's representative, and installers whose work interfaces with or affects metal panels, including installers of roof accessories and roof-mounted equipment.
2. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
3. Review methods and procedures related to metal panel installation, including manufacturer's written instructions.
4. Examine support conditions for compliance with requirements, including alignment between and attachment to structural members.
5. Review structural loading limitations of deck during and after roofing.
6. Review flashings, special details, drainage, and condition of other construction that affect metal panels.
7. Review governing regulations and requirements for insurance, certificates, and tests and inspections if applicable.

8. Review temporary protection requirements for metal panel systems during and after installation.

9. Review procedures for repair of metal panels damaged after installation.

10. Document proceedings, including corrective measures and actions required, and furnish copy of record to each participant.

1.5 ACTION SUBMITTALS

A. Product Data: For formed metal roof panels. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of panel and accessory.

B. Shop Drawings:

1. Include fabrication and installation layouts of metal panels; details of edge conditions, downspouts, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, snow guards, and accessories; and special details.

2. Accessories: Include details of flashing, trim, and anchorage systems, at a scale of not less than 1-1/2 inches per 12-inches.

3. Include roof plans showing layouts and attachment details of snow guards.

C. Samples for Initial Selection: For each type of metal panel indicated with factory-applied color finishes.

1. Include similar Samples of trim and accessories involving color selection.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below.

1. Metal Panels: 12-inches-long by actual panel width. Include clips, fasteners, closures, and other metal panel accessories.

E. Delegated-Design Submittal: For snow guards, include analysis reports signed and sealed by the qualified professional engineer responsible for their preparation.

1. Include calculation of number and location of snow guards.

F. Other Samples:

1. Rail-Type Snow Guards: Bracket, 12-inch-long rail, and installation hardware.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer's experience with providing delegated design engineering services of the kind indicated, including documentation that the engineer is licensed in the state in which the Project is located.

B. Qualification Data: For Installer.

C. Product Test Reports: For tests performed by a qualified testing agency.

D. Field quality-control reports.

E. Sample Warranties: For special warranties.

F. Product Test Reports: For snow guard, for tests performed by a qualified testing agency, indicating load at failure of attachment to roof system identical to roof system used on this Project.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data.

1.8 QUALITY ASSURANCE

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

1.9 MOCKUPS

A. Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Build mockup of typical roof area and eave, including perimeter gutter and snow guard; approximately 12-feet-square, including attachments, and accessories.
2. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, metal panels, and other manufactured items so as not to be damaged or deformed. Package metal panels for protection during transportation and handling.

B. Unload, store, and erect metal panels in a manner to prevent bending, warping, twisting, and surface damage.

C. Stack metal panels horizontally on platforms or pallets, covered with suitable weathertight and ventilated covering. Store metal panels to ensure dryness, with positive slope for drainage of water. Do not store metal panels in contact with other materials that might cause staining, denting, or other surface damage.

D. Retain strippable protective covering on metal panels during installation.

1.11 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit assembly of metal panels to be performed according to manufacturers' written instructions and warranty requirements.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including rupturing, cracking, or puncturing.
b. Deterioration of metals and other materials beyond normal weathering.

2. Warranty Period: Two (2) years from date of Substantial Completion.

B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Thirty (30) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design snow guards, including attachment to roofing material and roof deck, as applicable for attachment method, based on the following:

1. Roof snow load.
2. Snow drifting.
3. Roof slope.
4. Roof type.
5. Roof dimensions.
6. Roofing substrate type and thickness.
7. Snow guard type.
8. Snow guard fastening method and strength.
9. Snow guard spacing.
10. Coefficient of Friction Between Snow and Roof Surface: 0.
11. Factor of Safety: 2.

B. Structural Performance: Provide metal panel systems capable of withstanding the effects of the following loads, based on testing according to ASTM E1592:

1. Wind Loads: As indicated on Structural Drawings.

C. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. when tested according to ASTM E1680 at the following test-pressure difference:

1. Test-Pressure Difference: 1.57 lbf/sq.

D. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E1646 at the following test-pressure difference:

1. Test-Pressure Difference: 6.24 lbf/sq. ft.

E. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.

1. Uplift Rating: UL 90.

F. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail Resistance: SH.

G. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 EXPOSED-FASTENER, LAP-SEAM, METAL ROOF PANELS

A. Provide factory-formed metal roof panels designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Include accessories required for weathertight installation.

1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E1514.

B. Corrugated Profile, Exposed-Fastener Metal Roof Panels: Formed with alternating curved ribs spaced evenly across width of panel.

1. Basis of Design: Subject to compliance with requirements, provide **7/8" Corrugated Metal Roofing Panels** by **PAC-CLAD**; Petersen Aluminum Corporation; a Carlisle company.
2. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A653, G90 coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A792, Class AZ50 coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A755.
    a. Nominal Thickness: 24-gauge.
    b. Exterior Finish: Metallic fluoropolymer.
    c. Color: Dark Bronze (Kynar 500 or Hylar 5000).
        1) Reference 'MATERIAL LEGEND' on Drawing sheet A-600.
3. Panel Coverage: 34.6-inches (two lapped ribs for roofing).
4. Panel Height: 7/8-inches (0.875-inch).

2.3 MISCELLANEOUS MATERIALS

A. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, gutters, downspouts, fascia, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.

2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.

3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

B. Miscellaneous Metal Sub-Framing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653, G90 (Z275 hot-dig galvanized) coating designation or ASTM A 792, Class AZ50 (Class AZM150) aluminum-zinc alloy coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.

C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fascia, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.

D. Gutters and Downspouts: Reference Division 07 section "Roof Accessories".

E. Panel Fasteners: Self-tapping screws designed to withstand design loads. Provide exposed fasteners with heads matching color of metal panels by means of plastic caps or factory-applied coating. Provide EPDM or PVC sealing washers for exposed fasteners.

F. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.

1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch-wide and 1/8-inch-thick.

2. Joint Sealant: ASTM C920; elastomeric polyurethane or silicone sealant; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended in writing by metal panel manufacturer.

3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C1311.

G. Metal Protection: When dissimilar metals contact each other or corrosive substrates, protect against galvanic.

2.4 FABRICATION

A. Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.

B. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.

C. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.

D. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

1. Form exposed sheet metal accessories that are without excessive oil canning, buckling, and tool marks and that are true to line and levels indicated, with exposed edges folded back to form hems.

2. Seams for Other Than Aluminum: Fabricate nonmoving seams in accessories with flat-lock seams. Tin edges to be seamed, form seams, and solder.

3. Sealed Joints: Form non-expansion, but movable, joints in metal to accommodate sealant and to comply with SMACNA standards.

4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of accessories exposed to view.

5. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal recommended in writing by metal panel manufacturer.

a. Size: As recommended by SMACNA's "Architectural Sheet Metal Manual" or metal panel manufacturer for application, but not less than thickness of metal being secured.

2.5 FINISHES

A. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in same piece are unacceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

C. Steel Panels and Accessories:

1. Metallic Fluoropolymer: AAMA 621. Three-coat fluoropolymer finish with suspended metallic flakes containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. Basis of Design: Reference ‘MATERIAL LEGEND’ on Drawing sheet A-600.

D. Transition Membrane: Manufacturer’s recommended transition membrane, of type required for application for air/vapor barrier continuity.

E. Felt Underlayment: ASTM D 226, Type II (No. 30), asphalt-saturated organic felts.

F. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

2.6 RAIL-TYPE SNOW GUARDS

A. Rail-Type, Bracket-Mounted Snow Guards:

1. Basis of Design: **S-5 COLORGARD SNOW BAR System** with CorruBracket by Metal Roof Innovations, 500 W. Highway St., Iowa Park, TX 76367, 888-825-3432, support@s-5.com, www.s-5.com.
2. Finish: Match metal roof panels.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Examine primary and secondary roof framing to verify that rafters, purlins, angles, channels, and other structural panel support members and anchorages have been installed within alignment tolerances required by metal roof panel manufacturer.
2. Examine solid roof sheathing to verify that sheathing joints are supported by framing or blocking, and that installation is within flatness tolerances required by metal roof panel manufacturer.
    a. Verify that air or water-resistive barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

B. Examine roughing-in for components and systems penetrating metal panels to verify actual locations of penetrations relative to seam locations of metal panels before installation.

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

3.2 PREPARATION

A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C754 and metal panel manufacturer's written recommendations.

3.3 INSTALLATION OF FORMED METAL ROOF PANELS

A. General: Install metal panels according to manufacturer's written instructions in orientation, sizes, and locations indicated. Install panels perpendicular to supports unless otherwise indicated. Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement. Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Shim or otherwise plumb substrates receiving metal panels.
2. Flash and seal metal panels at perimeter of all openings. Fasten with self-tapping screws. Do not begin installation until air or water-resistive barriers and flashings that will be concealed by metal panels are installed.
3. Install screw fasteners in predrilled holes.
4. Locate and space fastenings in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

5. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads, or panels. Install screws in pre-drilled holes.

6. Install flashing and trim as metal panel work proceeds.

7. Locate panel splices over, but not attached to, structural supports. Stagger panel splices and end laps to avoid a four-panel lap splice condition.

8. Align bottoms of metal panels and fasten with blind rivets, bolts, or self-tapping screws. Fasten flashings and trim around openings and similar elements with self-tapping screws.

9. Provide weathertight escutcheons for pipe- and conduit-penetrating panels.

B. Fasteners:

1. Steel Panels: Use stainless steel fasteners for surfaces exposed to the exterior; use galvanized-steel fasteners for surfaces exposed to the interior.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action as recommended in writing by metal panel manufacturer.

D. Lap-Seam Metal Panels: Fasten metal panels to supports with fasteners at each lapped joint at location and spacing recommended by manufacturer.

1. Lap ribbed or fluted sheets one full rib. Apply panels and associated items true to line for neat and weather tight enclosure.

2. Provide metal backed washers under heads of exposed fasteners bearing on weather side of metal panels.

3. Locate and space exposed fasteners in uniform vertical and horizontal alignment. Use proper tools to obtain controlled uniform compression for positive seal without rupture of washer.

4. Install screw fasteners with power tools having controlled torque adjusted to compress washer tightly without damage to washer, screw threads or panels. Install screws in predrilled holes.

5. Flash and seal pans with weather closures at perimeter of all openings.

E. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting and provide for thermal expansion. Coordinate installation with flashings and other components.

1. Install components required for a complete metal panel system including trim, corners, flashings, gutters, downspouts, sealants, gaskets, fillers, closure strips, and similar items. Provide types indicated by metal roof panel manufacturers; or, if not indicated, types recommended by metal roof panel manufacturer.

F. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

1. Install exposed flashing and trim that is without buckling and tool marks, and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and achieve waterproof and weather-resistant performance.

2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner

or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1-inch-deep, filled with mastic sealant (concealed within joints).

G. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to metal roof panels as recommended by manufacturer.

3.4 INSTALLATION OF SNOW RETENTION SYSTEM

A. Install snow guards according to manufacturer's written instructions.

1. Space rows as recommended by manufacturer or as required by certified calculation.

B. Attachment for Exposed Fastened Metal Roofing:

1. Do not use fasteners that will void metal roofing finish warranty.
2. Rail-Type, Flat-Mounted Snow Guards:
    a. S-5 CorruBracket compatible with 7/8” corrugated roof panel. Manufactured from 6000-series alloy and temper-aluminum extrusions conforming to ASTM B221 and AA Aluminum Standards and Data.
    b. Screws for attachment of brackets to roof: As specifically tested to the substrate used on the Project, and furnished by snow guard manufacturer. All fastener portions exposed to the weather shall be stainless steel or Zinc/Aluminum cap.
    c. Install brackets in straight row(s) at spacing as required by certified calculation.
    d. Install cross members to brackets.

3.5 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align metal panel units within installed tolerance of 1/4-inch in 20-feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.6 FIELD QUALITY CONTROL

A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect metal roof panel installation, including accessories. Report results in writing.

B. Remove and replace applications of metal roof panels where tests and inspections indicate that they do not comply with specified requirements.

C. Additional tests and inspections, at Contractor's expense, are performed to determine compliance of replaced or additional work with specified requirements.

D. Prepare test and inspection reports.

3.7 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of

metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

B. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 074113

SECTION 075423 - THERMOPLASTIC-POLYOLEFIN (TPO) ROOFING SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Fully adhered, gray thermoplastic polyolefin (TPO) roofing membrane system.
2. Roof insulation, flat and tapered.
3. Underlayment and transition membranes.
4. Roof sheathing.
5. Protective cover board.
6. Vapor retarder.
7. Roof protection slip sheets for Roof Paver System (furnish only).
8. Coordination.
9. All labor, materials, components, tools, equipment, and services needed to furnish and install a complete, weathertight system.

B. Related Requirements:

1. Division 06 section "Rough Carpentry" for wood nailers, curbs, and blocking; and for wood-based, structural-use roof deck panels.
2. Division 06 section "Sheathing" for coordination of roof sheathing provision.
3. Division 07 section "Sheet Metal Flashing and Trim" for metal roof flashings and counter-flashings.
4. Division 07 section "Vapor Retarders" for coordination of vapor barrier provision.
5. Division 07 section "Roof Specialties" for manufactured copings and roof edge flashings.
6. Division 07 section "Roof Paver System" for coordination of related work.
7. Division 07 section "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS

A. Roofing Terminology: Definitions in ASTM D1079 and glossary in NRCA's "The NRCA Roofing Manual: Membrane Roof Systems" apply to Work of this Section.

B. Design Uplift Pressure: The uplift pressure, calculated according to procedures in SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems," before multiplication by a safety factor.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Roofing Conference: Conduct conference at Project site.

1. Meet with Owner, Architect, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, deck

Installer, air barrier Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.

2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. For insulation and roof system component fasteners.

B. Shop Drawings: Include roof plans, sections, details, and attachments to other work, including the following:

1. Layout and thickness of insulation.
2. Base flashings and membrane termination details.
3. Flashing details at penetrations.
4. Tapered insulation layout, thickness, and slopes.
5. Roof plan showing orientation of steel roof deck and orientation of roof membrane, fastening spacings, and patterns for mechanically fastened roofing system.
6. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
7. Tie-in with adjoining air barrier.

C. Samples for Verification: For the following products, nominal 12-inch-square in size of color required.

1. Roof membrane.
2. Fascia and flashings.

D. Wind Uplift Resistance Submittal: For roofing system, indicating compliance with wind uplift performance requirements.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturer and testing agency.

B. Manufacturer Certificates:

1. Performance Requirement Certificate: Signed by roof membrane manufacturer, certifying that roofing system complies with requirements specified in "Performance Requirements" Article.

a. Submit evidence of compliance with performance requirements.

2. Special Warranty Certificate: Signed by roof membrane manufacturer, certifying that all materials supplied under this Section are acceptable for special warranty.

C. Product Test Reports: For roof membrane and insulation, for tests performed by a qualified testing agency, indicating compliance with specified requirements.

D. Evaluation Reports: For components of roofing system, from ICC-ES.

E. Field quality-control reports.

F. Sample Warranties: For manufacturer's special warranties.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive manufacturer's special warranty.

1. With minimum five (5) years documented experience.
2. Extend manufacturer's No Dollar Limit guarantee.

B. Source Limitations: Obtain components for roofing system from roof membrane manufacturer or manufacturers approved by roof membrane manufacturer.

C. Preliminary Roofing Conference: Before starting construction, conduct conference at Project site. Comply with requirements for preinstallation conferences in Division 01 section "Coordination". Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:

1. Meet with Owner’s Representative, Owner's insurer if applicable, roofing installer, HVAC subcontractor, Sheet metal Subcontractor, roofing system manufacturer's representative, deck repair installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
2. Review insurance requirements and certificates of insurance.
3. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
4. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
5. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.

1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

1. Store products in weather protected environment, clear of ground and moisture.

a. Shipping shrink wrap is not acceptable protection. Materials must be stored at least 6-inches from the ground on wood or other non-porous material. Shipping dunnage will not be accepted for storing materials on the ground. Damaged material is not accepted and will be rejected.

D. Comply with all Project requirements to prevent overloading or disturbance of the structure when loading materials onto the roof.

E. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

B. Proceed with work so new roofing materials are not subject to construction traffic as work progresses.

1.11 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of roofing system that fail in materials or workmanship within specified warranty period.

1. Special warranty includes roof membrane, base flashings, roof insulation, fasteners, and other components of roofing system.

2. Manufacturer Warranty Period: Twenty (20) years from date of Substantial Completion.

B. Special Project Warranty: Submit roofing Installer's warranty, on warranty form at end of this Section, signed by Installer, covering the Work of this Section, including all components of roofing system such as roof membrane, base flashing, roof insulation, fasteners, and walkway products, for the following warranty period:

1. Installer Warranty Period: Two (2) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Installed roofing system and flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Roof system and flashings shall remain watertight.

1. Accelerated Weathering: Roof membrane shall withstand 2000 hours of exposure when tested according to ASTM G152, ASTM G154, or ASTM G155.
2. Impact Resistance: Roof membrane shall resist impact damage when tested according to ASTM D3746, ASTM D4272, or the "Resistance to Foot Traffic Test" in FM Approvals 4470.
3. Roofing System Design: Provide a membrane roofing system that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist the factored design uplift pressures calculated according to SPRI's "Wind Load Design Guide for Fully Adhered and Mechanically Fastened Roofing Systems".

B. Material Compatibility: Roofing materials shall be compatible with one another and adjacent materials under conditions of service and application required, as demonstrated by roof membrane manufacturer based on testing and field experience.

C. Wind Uplift Resistance: Design roofing system to resist the following wind uplift pressures when tested according to FM Approvals 4474, UL 580, or UL 1897:

1. Zone 1 (Roof Area Field): 60 lbf/sq. ft.
2. Zone 2 (Roof Area Perimeter): 75 lbf/sq. ft.
3. Zone 3 (Roof Area Corners): 75 lbf/sq. ft.

D. FM Approvals' RoofNav Listing: Roof membrane, base flashings, and component materials shall comply with requirements in FM Approvals 4450 or FM Approvals 4470 as part of a roofing system, and shall be listed in FM Approvals' RoofNav for Class 1 or noncombustible construction, as applicable. Identify materials with FM Approvals Certification markings.

1. Fire/Windstorm Classification: Class 1A-90.
2. Hail-Resistance Rating: FM Global Property Loss Prevention Data Sheet 1-34 SH.

E. Exterior Fire-Test Exposure: ASTM E108 or UL 790, Class A for application and roof slopes indicated; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

2.2 THERMOPLASTIC POLYOLEFIN (TPO) ROOFING MEMBRANE

A. TPO Sheet: ASTM D6878, internally fabric- or scrim-reinforced, TPO sheet.

1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   a. Carlisle Syntec Systems
   b. Firestone Building Product
   c. Johns Manville
2. Thickness: 60 mils, nominal.

3. Exposed Face Color: Gray.

2.3 AUXILIARY ROOFING MATERIALS

A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with other roofing components.

1. Adhesive and Sealants: Comply with VOC limits of authorities having jurisdiction.

B. Sheet Flashing: Manufacturer's standard unreinforced TPO sheet flashing, 55 mils thick, minimum, of same color as TPO sheet.

C. Protection Sheet: Epichlorohydrin or neoprene nonreinforced flexible sheet, 55 to 60 mils thick, recommended by TPO manufacturer for resistance to hydrocarbons, non-aromatic solvents, grease, and oil.

D. Prefabricated Pipe Flashings: As recommended by roof membrane manufacturer.

E. Bonding Adhesive: Manufacturer's standard.

F. Slip Sheet: Manufacturer's standard, of thickness required for application.

G. Metal Termination Bars: Manufacturer's standard, predrilled stainless steel or aluminum bars, approximately 1- by 1/8-inch-thick; with anchors.

H. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roofing components to substrate, and acceptable to roofing system manufacturer.

I. Miscellaneous Accessories: Provide pourable sealers, preformed cone and vent sheet flashings, preformed inside and outside corner sheet flashings, T-joint covers, lap sealants, termination reglets, and other accessories.

2.4 SUBSTRATE BOARDS

A. Substrate Board: ASTM C1177, glass-mat, water-resistant gypsum board or ASTM C1278, fiber-reinforced gypsum board.

1. Basis of Design: DensDeck Prime Roof Board by Georgia-Pacific Building Products.
2. Thickness:1/2 inch thick.
3. Surface Finish: Factory primed.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening substrate board to roof deck.

2.5 VAPOR RETARDER

A. Self-Adhering-Sheet Vapor Retarder: ASTM D1970, 40-mil composite consisting of 35 mils of self-adhering rubberized asphalt laminated to a 5-mil woven polypropylene film; cold applied, with slip-resisting surface and release paper backing. Provide primer when recommended by vapor retarder manufacturer.

1. Basis of Design: VapAir Seal 725TR Air and Vapor Barrier by Carlisle Syntec Systems.

B. Transition Membrane: Manufacturer's recommended transition membrane, of type required for application for air/vapor barrier continuity.

2.6 ROOF INSULATION

A. General: Preformed roof insulation boards manufactured or approved by TPO roof membrane manufacturer, approved for use in FM Global Approved roof assemblies.

B. Polyisocyanurate Board Insulation: ASTM C1289, Type II, Class 1, Grade 2 felt or glass-fiber mat facer on both major surfaces.

1. Basis of Design: Polyiso HP-H by Carlisle SynTec Incorporated.
2. Compressive Strength: 25 psi.
3. Size: 48- by 96-inches.
4. Thickness: Minimum three (3) layers = R30 as indicated in Drawings.
    a. Base Layer: 1 inch (or as indicated on drawings).
    b. Upper Layer: Minimum 1 inch plus additional thickness as indicated on drawings.

C. Tapered Insulation: Provide factory-tapered insulation boards.

1. Material: Match roof insulation.
2. Minimum Thickness: 1/2-inch.

2.7 INSULATION ACCESSORIES

A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with other roofing system components.

B. Fasteners: Factory-coated steel fasteners with metal or plastic plates complying with corrosion-resistance provisions in FM Approvals 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:

1. Bead-applied, low-rise, one-component or multi-component urethane adhesive.

D. Protection Mat: Woven or nonwoven polypropylene, polyolefin, or polyester fabric; water permeable and resistant to UV degradation; type and weight as recommended by roofing system manufacturer for application.

2.8 COVER BOARD (PROTECTION BOARD)

A. Cover Board: ASTM C1177, glass-mat, water-resistant gypsum board or ASTM C1278 fiber-reinforced gypsum board.

1. Thickness: 1/2-inch.
2. Surface Finish: Factory primed.
3. Basis of Design: DensDeck Prime Roof Board by Georgia-Pacific Building Products.

2.9 UNDERLAYMENT MATERIALS (ICE & WATER SHIELD - IWS)

A. Self-Adhering, High-Temperature Roof Underlayment: ASTM D1970 / D1970M, polymer-film laminated to layer of rubberized asphalt adhesive, minimum 40-mil-total thickness; maximum permeance rating of 0.1 perm; cold applied, with slip-resisting surface and release paper backing.

1. Thermal Stability: Stable after testing at 240 deg F; ASTM D1970.
2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F; ASTM D1970.

B. Transition Membrane: Manufacturer's recommended transition membrane, of type required for application for air/vapor barrier continuity.

C. Priming: Provide as recommended by underlayment manufacturer for substrate.

2.10 PROTECTIVE SLIP SHEETS

A. Protective Slip Sheet Membrane: 12-inch x 12-inch pre-cut pieces of membrane roof material.

1. General: Coordinate with and furnish to Roof Paver Installer for installation. Coordination is a requirement of this section of work.

2.11 WALKWAYS

A. Flexible Walkways: Not required.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. Verify that surfaces and site conditions are ready to receive work.
2. Verify that roofing substrate is clean and smooth, flat, free of depressions, waves, or projections, properly sloped, and suitable for installation of roof system.
3. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
4. Verify that wood blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
5. Metal Deck Substrates: Verify that surface plane flatness and fastening of roof deck complies with requirements.
6. Concrete Substrates: Verify that concrete substrate is visibly dry and free of moisture, and that minimum concrete internal relative humidity is not more than 75 percent, or as recommended by roofing system manufacturer, when tested according to ASTM F 2170.
7. Wood Deck Substrates: Verify flatness and tightness of joints of wood decking. Verify that all wood decking edges are supported.
8. Wood-Fiber / Cementitious Substrates: Verify any damaged sections of cementitious wood-fiber decks have been repaired or replaced, and any adjacent cementitious wood-fiber panels are vertically aligned to within 1/8 inch at top surface.

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

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, compounds, and other substances detrimental to roofing system installation according to roofing system manufacturer's written instructions.

1. Remove sharp projections and objects.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Perform fastener-pullout tests according to roof system manufacturer's written instructions.

1. Submit test result within 24 hours after performing tests.

a. Include manufacturer's requirements for any revision to previously submitted fastener patterns required to achieve specified wind uplift requirements.

D. Wood Deck Preparation: Fill knot holes with latex filler or completely cover with securely nailed sheet metal.

E. Concrete Deck Preparation: Fill surface honeycomb and variations with latex filler.

F. Metal Deck Preparation: Install deck sheathing on metal deck:

1. Lay with long side at right angle to flutes; stagger end joints; provide support at ends.
2. Cut sheathing cleanly and accurately at roof breaks and protrusions to provide smooth surface.

3.3 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions, FM Approvals' RoofNav assembly requirements, and FM Global Property Loss Prevention Data Sheet 1-29.

B. Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system at end of workday or when rain is forecast. Remove and discard temporary seals before beginning Work on adjoining roofing.

C. Do not apply roofing membrane during unsuitable weather. Do not apply roofing membrane when ambient temperature is outside the temperature range recommended by manufacturer or as specifically noted herein. Do not apply roofing membrane to damp or frozen deck surface or when precipitation is expected or occurring. Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed the same day.

D. Install roof membrane and auxiliary materials to tie in to existing roofing or adjacent building enclosure components to maintain weathertightness of transition.

E. Coordinate installation and transition of roofing system component serving as an air barrier with air barrier specified under Division section "Fluid-Applied Membrane Air Barriers."

3.4 SUBSTRATE BOARD INSTALLATION

A. Install substrate board with long joints in continuous straight lines, with end joints staggered not less than 24 inches in adjacent rows.

1. At steel roof decks, install substrate board at right angle to flutes of deck.

a. Locate end joints over crests of steel roof deck.

2. Tightly butt substrate boards together.

3. Cut substrate board to fit tight around penetrations and projections, and to fit tight to intersecting sloping roof decks.

3.5 VAPOR RETARDER INSTALLATION

A. Self-Adhering-Sheet Vapor Retarder: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2 and 6 inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.6 INSULATION INSTALLATION

A. Coordinate installation of roofing system components so insulation is not exposed to precipitation or left exposed at end of workday.

B. Comply with roofing system and roof insulation manufacturer's written instructions for installing roof insulation.

C. Installation Over Metal Decking:

1. Install base layer of insulation with joints staggered not less than 24-inches in adjacent rows end joints staggered not less than 12-inches in adjacent rows and with long joints continuous at right angle to flutes of decking.

a. Locate end joints over crests of decking.
b. Where installing composite and noncomposite insulation in two or more layers, install noncomposite board insulation for bottom layer and intermediate layers, if applicable, and install composite board insulation for top layer.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4-inch-width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24-inches.

1) Trim insulation so that water flow is unrestricted.

f. Fill gaps exceeding 1/4-inch with insulation.
g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
h. Loosely lay base layer of insulation units over substrate.

i. Mechanically attach base layer of insulation and substrate board using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to metal decks.

1) Fasten insulation according to requirements in FM Approvals' RoofNav for specified Windstorm Resistance Classification.
2) Fasten insulation to resist specified uplift pressure at corners, perimeter, and field of roof.

2. Install upper layers of insulation and tapered insulation with joints of each layer offset not less than 12 inches from previous layer of insulation.

a. Staggered end joints within each layer not less than 24-inches in adjacent rows.
b. Install with long joints continuous and with end joints staggered not less than 12-inches in adjacent rows.
c. Trim insulation neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
d. Make joints between adjacent insulation boards not more than 1/4-inch in width.
e. At internal roof drains, slope insulation to create a square drain sump with each side equal to the diameter of the drain bowl plus 24-inches.

1) Trim insulation so that water flow is unrestricted.

f. Fill gaps exceeding 1/4-inch with insulation.
g. Cut and fit insulation within 1/4-inch of nailers, projections, and penetrations.
h. Adhere each layer of insulation to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification, as follows:

1) Set each layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.7 COVER BOARDS INSTALLATION

A. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6-inches in each direction.

1. Trim cover board neatly to fit around penetrations and projections, and to fit tight to intersecting sloping roof decks.
2. At internal roof drains, conform to slope of drain sump.

a. Trim cover board so that water flow is unrestricted.

3. Cut and fit cover board tight to nailers, projections, and penetrations.
4. Adhere cover board to substrate using adhesive according to FM Approvals' RoofNav assembly requirements and FM Global Property Loss Prevention Data Sheet 1-29 for specified Windstorm Resistance Classification.

a. Set cover board in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.

3.8 ADHERED MEMBRANE ROOFING INSTALLATION

A. Adhere roof membrane over area to receive roofing according to roofing system manufacturer's written instructions.

B. Unroll roof membrane and allow to relax before installing.

C. Start installation of roofing in presence of roofing system manufacturer's technical personnel.

D. Accurately align roof membrane, and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

E. Bonding Adhesive: Apply to substrate and underside of roof membrane at rate required by manufacturer, and allow to partially dry before installing roof membrane. Do not apply to splice area of roof membrane.

F. Fabric-Backed Roof Membrane Adhesive: Apply to substrate at rate required by manufacturer, and install fabric-backed roof membrane.

G. In addition to adhering, mechanically fasten roof membrane securely at terminations, penetrations, and perimeter of roofing.

H. Apply roof membrane with side laps shingled with slope of roof deck where possible.

I. Seams: Clean seam areas, overlap roof membrane, and hot-air weld side and end laps of roof membrane and sheet flashings, to ensure a watertight seam installation.

1. Test lap edges with probe to verify seam weld continuity. Apply lap sealant to seal cut edges of roof membrane and sheet flashings.
2. Verify field strength of seams a minimum of twice daily, and repair seam sample areas.
3. Repair tears, voids, and lapped seams in roof membrane that do not comply with requirements.

J. Spread sealant bed over deck-drain flange at roof drains, and securely seal roof membrane in place with clamping ring.

3.9 BASE FLASHING INSTALLATION

A. Install sheet flashings and preformed flashing accessories, and adhere to substrates according to roofing system manufacturer's written instructions.

B. Apply bonding adhesive to substrate and underside of sheet flashing at required rate, and allow to partially dry. Do not apply to seam area of flashing.

C. Flash penetrations and field-formed inside and outside corners with cured or uncured sheet flashing.

D. Clean seam areas, overlap, and firmly roll sheet flashings into the adhesive. Hot-air weld side and end laps to ensure a watertight seam installation.

E. Terminate and seal top of sheet flashings and mechanically anchor to substrate through termination bars.

3.10 UNDERLAYMENT INSTALLATION

A. Self-Adhering-Sheet Underlayment: Prime substrate if required by manufacturer. Install self-adhering-sheet vapor retarder over area to receive vapor retarder, side and end lapping each sheet a minimum of 3-1/2- and 6-inches, respectively.

1. Extend vertically up parapet walls and projections to a minimum height equal to height of insulation and cover board.
2. Seal laps by rolling.

B. Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into roofing system.

3.11 WALKWAY INSTALLATION

A. Flexible Walkways: Not required.

3.12 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and to inspect substrate conditions, surface preparation, roof membrane application, sheet flashings, protection, and drainage components, and to furnish reports to Architect.

1. Perform the following tests: Two (2) weld samples per day of welding operation.

B. Repair or remove and replace components of membrane roofing system where test results or inspections indicate that they do not comply with specified requirements. Defective or non-conforming conditions defined as follows, unless more stringent criteria are required by roofing system manufacturer:

1. Blister, Bubble, Capillaries, or Voids: A spongy raised portion of roofing membrane resulting from improper surface preparation, pressure of entrapped air, entrapped water vapor, inadequate adhesive, adhesive bonding failure, improper attachment method, or resulting from climatic installation conditions. Such conditions shall not exceed four-inches in individual diameter, multiple occurrences be spaced less that 48-inches on center, or multiple occurrences exceeding 16 square inches within 144 square feet of surface area.
2. Fishmouth: Opening or void in lapped edge or seam.
3. Punctures or Holes: Condition compromising system watertight effectiveness.
4. Seam or Joint Separations: Unbonded edge condition where probing tool penetrates lapped area under firm pressure.
5. Slope, Drainage, or Ponding (Standing Water): Criteria for judging proper slope for drainage is no ponding water on roof surface 48 hours after precipitation event during conditions conducive to drying.
6. Wrinkles or Distortions: Surface condition that impedes the proper flow of water drainage.
7. Insulation and/or Cover Board Joints: Butt joints exceeding 1/4-inch wide or uneven surfaces exceeding 1/4-inch vertically measured in transition plane.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion, in presence of Architect, and to prepare inspection report.

1. Notify Project Team in advance of date and time of inspection.
2. Repair or remove and replace components of roofing system where inspections indicate that they do not comply with specified requirements.

D. Additional testing and inspecting, at Contractor's expense, will be performed to determine if replaced or additional work complies with specified requirements.

3.13 CLEANING AND PROTECTION

A. Remove wrappings, empty containers, paper, and other debris from the roof daily. Dispose of debris in compliance with local, State, and Federal regulations.

B. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing system, inspect roofing system for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.

1. Remove all debris including fasteners, metal shavings and other sharp objects that may compromise the roofing system.

C. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

D. Clean areas where finished surfaces are soiled by work of this section, consult manufacturer of surfaces for cleaning recommendations and conform to manufacturer's written instructions.

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

3.14 ROOFING INSTALLER'S WARRANTY

END OF SECTION 075423

SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Manufactured reglets with counterflashing.
2. Formed sheet metal flashing and counterflashing fabrications.
3. Formed sheet metal closures.
4. Underlayment accessories and miscellaneous materials.
5. Manufactured drip edges.

B. Related Requirements:

1. Division 06 section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 section "Metal Plate Panel System" for coordination of bay window cap provision.
3. Division 07 section "Joint Sealants" for sealing of flashings and counter-flashings.
4. Division 07 section “TPO Roofing System” for flashing and accessories integral with roofing membrane as part of roofing membrane system work.

1.3 COORDINATION

A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.

B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials,

1.4 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Comply with requirements and recommendations of SMACNA.

C. Comply with ANSI/SPRI ES-1 as outlined by building code.

D. Comply with requirements, recommendations, and tested assemblies of roofing system manufacturer.

E. Size roofing metal per section 1-49 of the FM Global loss prevention data sheets for roofing contractors.

F. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:

1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of special conditions.
7. Details of connections to adjoining work.
8. Detail formed flashing and trim at a scale of not less than 1-1/2-inches per 12-inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12-inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12-inches long and in required profile. Include fasteners and other exposed accessories.
3. Finish: For each type of exposed finish required. Color by Architect from Manufacturer’s full range.
4. Accessories and Miscellaneous Materials: Full-size Sample.
5. Reglets: Masonry reglets (coordinate with masonry repair provisions).
6. Other Samples: Drip Edge / Plate (approximately 6in in length).

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified fabricator.

B. Product Test Reports: For each product, for tests performed by a qualified testing agency.

C. Evaluation Reports: For copings and roof edge flashing, from an agency acceptable to authority having jurisdiction showing compliance with ANSI/SPRI/FM 4435/ES-1.

D. Warranty: Sample of special warranty.

1.7 CLOSEOUT SUBMITTALS

A. Maintenance Data: For sheet metal flashing, trim, and accessories to include in maintenance manuals.

B. Warranty: Special warranty.

1.8 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage.

1. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
2. Protect stored sheet metal flashing and trim from contact with water.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.10 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:

a. Color fading more than 5 Delta E units when tested according to ASTM D2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Stainless-Steel Sheet: ASTM A240/A240M, Type 304, dead soft, fully annealed.

1. Finish: ASTM 480/A480M, No. 2D (dull, cold rolled).

2. Surface: Smooth, flat.
3. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

C. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required; with smooth, flat surface.

1. Exposed Coil-Coated Finish:

a. Three-Coat Fluoropolymer: AAMA 2605. Fluoropolymer finish containing not less than 70 percent polyvinylidene fluoride (PVDF) resin by weight in both color coat and clear topcoat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

2. Surface: Smooth, flat.
3. Color: As selected by Architect from Manufacturer’s full range.
4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with minimum total dry film thickness of 0.5 mil.

D. Metallic-Coated Steel Sheet: Restricted flatness steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
2. Surface: Smooth, flat.
3. Exposed Coil-Coated Finish:

a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1) Color: As selected by Architect from Manufacturer’s full range.

4. PVC Clad G-90 Steel: 24 ga minimum as recommended by the roofing system manufacturer where watertight tie-ins are required. (ie scuppers and drip edges).

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

C. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2-inch-wide and 1/8-inch-thick.

D. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

E. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.

F. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

G. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required for application.

H. Other Reglets: Not applicable.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
2. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
3. Verify shapes and dimensions of surfaces to be covered and obtain field measurementsfor accurate fit before shop fabrication.
4. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
5. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Fabrication Tolerances:

1. Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4-inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
2. Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified.

C. Sealed Joints: Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

D. Expansion Provisions: Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with butyl sealant concealed within joints.

E. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

F. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual" and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

G. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use.

H. Do not use graphite pencils to mark metal surfaces.

2.4 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight. Shop fabricate interior and exterior corners.

1. Coping Profile: As indicated on Drawings.
2. Joint Style: Butted with expansion space and 6-inch-wide, concealed backup plate.
3. Fabricate from the Following Materials:

    a. Aluminum: 0.050-inch thick.
    b. Galvanized Steel: 0.040-inch thick.

B. Flashing: Fabricate from the following materials:

1. Aluminum: 0.040-inch thick.
2. Galvanized Steel: 0.028-inch-thick.

C. Counterflashings: Shop fabricate interior and exterior corners. Fabricate from the following materials:

1. Aluminum: 0.032-inch thick.
2. Galvanized Steel: 0.022-inch thick.

2.5 WALL SHEET METAL FABRICATIONS

A. Through-Wall Flashing: Fabricate continuous flashings in minimum 96-inch-long, but not exceeding 12-foot-long, sections, under copings, at shelf angles, at sill conditions, and where indicted in Drawings. Fabricate discontinuous lintel, sill, and similar flashings to extend 6-inches beyond each side of wall openings; and form with 2-inch-high, end dams. High performance coating finish as scheduled or where indicated on Drawings. Fabricate from the following materials:

1. Stainless Steel: 26ga (0.018-inch) thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.
3. Verify that air- or water-resistant barriers have been installed over sheathing or backing substrate to prevent air infiltration or water penetration.

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

3.2 UNDERLAYMENT INSTALLATION

A. Self-Adhering Sheet Underlayment: Install self-adhering sheet underlayment, wrinkle free. Prime substrate if recommended by underlayment manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation; use primer for installing underlayment at low temperatures. Apply in shingle fashion to shed water, with end laps of not less than 6-inches staggered 24-inches between courses. Overlap side edges not less than 3-1/2 inches. Roll laps and edges with roller. Cover underlayment within 14 days.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to provide complete sheet metal flashing and trim system.
2. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
3. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
4. Space cleats not more than 12-inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
5. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
6. Install sealant tape where indicated.
7. Torch cutting of sheet metal flashing and trim is not permitted.
8. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10-feet with no joints allowed within 24-inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1-inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate wood sheathing not less than 1-1/4-inches for nails and not less than 3/4-inch for wood screws or metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1-inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

3.4 INSTALLATION OF ROOF FLASHINGS

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual."

1. Provide concealed fasteners where possible, set units true to line, and level as indicated.
2. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing:

1. Install roof edge flashings in accordance with ANSI/SPRI/FM 4435/ES-1.
2. Anchor to resist uplift and outward forces in accordance with recommendations in FM Global Property Loss Prevention Data Sheet 1-49 for FM Approvals' listing for required windstorm classification.

C. Copings: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.

1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing.

1. Insert counterflashing in reglets or receivers and fit tightly to base flashing.
2. Extend counterflashing 4-inches over base flashing.
3. Lap counterflashing joints a minimum of 4-inches and bed with sealant.
4. Secure in a waterproof manner.

E. Install reglet mounted counterflashings where specified. Cut in new reglet joints. Install to accommodate weeps and through wall flashings.

F. PVC coated metal: Install as required for the roofing application. Follow the roofing system manufacturer’s printed recommendations.

3.5 INSTALLATION OF WALL FLASHINGS

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 INSTALLATION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

3.8 PROTECTION

A. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

B. On completion of installation, remove unused materials and clean finished surfaces as recommended in writing by sheet metal flashing and trim manufacturer.

C. Maintain in a clean condition during construction.

D. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200

SECTION 077100 - ROOF SPECIALTIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Factory-formed roof-edge drainage systems (gutters & downspouts).
2. All labor, materials, equipment, tools, services, components, trim, supports, and attachments required to furnish and install a complete and secure system.

B. Related Requirements:

1. Division 06 section "Rough Carpentry" for wood nailers, curbs, and blocking.
2. Division 07 section "Sheet Metal Flashing and Trim" for custom fabricated sheet metal flashing and trim.
3. Division 07 section "Thermoplastic-Polyolefin (TPO\) Roofing System" for coordination of related roofing components, performance and warranty requirements.
4. Division 07 section "Formed Metal Roof Panel System" for coordination of related roofing components, performance and warranty requirements.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For roof specialties.

1. Include plans, elevations, expansion-joint locations, keyed details, and attachments to other work. Distinguish between plant- and field-assembled work.
2. Include details for expansion and contraction; locations of expansion joints, including direction of expansion and contraction.
3. Indicate profile and pattern of seams and layout of fasteners, cleats, clips, and other attachments.
4. Detail termination points and assemblies, including fixed points.
5. Include details of special conditions.

C. Samples for Verification:

1. Include Samples of each type of roof specialty to verify finish and color selection, in manufacturer's standard sizes.
2. Include copings made from 12-inch lengths of full-size components in specified material, and including fasteners, cover joints, accessories, and attachments.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Certificates: For each type of roof specialty.

C. Product Test Reports: For copings for tests performed by a qualified testing agency.

D. Sample Warranty: For manufacturer's special warranty.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For roofing specialties to include in maintenance manuals.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain roof specialties approved by manufacturer providing roofing-system warranty specified in Section 075423 - Thermoplastic Polyolefin (TPO) Roofing.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Do not store roof specialties in contact with other materials that might cause staining, denting, or other surface damage. Store roof specialties away from uncured concrete and masonry.

B. Protect strippable protective covering on roof specialties from exposure to sunlight and high humidity, except to extent necessary for the period of roof-specialty installation.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify profiles and tolerances of roof-specialty substrates by field measurements before fabrication and indicate measurements on Shop Drawings.

B. Coordination: Coordinate roof specialties with flashing, trim, and construction of parapets, roof deck, roof and wall panels, and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.9 WARRANTY

A. Roofing-System Warranty: Roof specialties are included in warranty provisions in Division 07 section - Thermoplastic Polyolefin (TPO) Roofing.

B. Special Warranty on Painted Finishes: Manufacturer agrees to repair finish or replace roof specialties that show evidence of deterioration of factory-applied finishes within specified warranty period.

1. Fluoropolymer Finish: Deterioration includes, but is not limited to, the following:

    a. Color fading more than 5 Hunter units when tested according to ASTM D2244.
    b. Chalking in excess of a No. 8 rating when tested according to ASTM D4214.
    c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Roof specialties shall withstand exposure to weather and resist thermally induced movement without failure, rattling, leaking, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

B. FM Approvals' Listing: Manufacture and install copings that are listed in FM Approvals' "RoofNav" and approved for windstorm classification, Class 1-90. Identify materials with FM Approvals' markings.

C. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, hole elongation, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Provide clips that resist rotation and avoid shear stress as a result of thermal movements. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.2 ROOF-EDGE SPECIALTIES

A. Roof-Edge Fascia and Gravel Stop: Not required.

B. Tapered Parapet Coping: Not required.

2.3 ROOF-EDGE DRAINAGE SYSTEMS

A. Manufacturers: Subject to compliance with requirements, provide products by **Berger** an **Omnimax Portfolio Brand** or APPROVED comparable product by one of the following:

1. Andreas Renner KG.
2. Architectural Products Company.
3. ATAS International, Inc.
4. Berger Building Products, Inc. www.bergerbp.com (Basis of Design)
5. Castle Metal Products.
6. Cheney Flashing Company.
7. CopperCraft by FABRAL; a Euramax company.
8. Hickman Company, W. P.
9. Klauer Manufacturing Company.
10. Merchant & Evans, Inc.
11. Metal-Era, Inc.
12. Metal-Fab Manufacturing, LLC.
13. MM Systems Corporation.
14. National Sheet Metal Systems, Inc.
15. Perimeter Systems; a division of Southern Aluminum Finishing Company, Inc.

B. Gutters: Manufactured in uniform section lengths not exceeding 12-feet, with matching corner units, ends, outlet tubes, and other accessories. Elevate back edge at least 1-inch above front

edge. Furnish flat-stock gutter straps, gutter brackets, expansion joints, and expansion-joint covers fabricated from same metal as gutters.

1. Material - Formed Aluminum: 0.027-inch thick.
2. Gutter Profile: 6-inch Half-Round.
3. Gutter Supports: Hidden Hanger for reverse bead gutters [HIDHA6]
4. Finish: Dark Bronze (DB)

C. Gutter Accessories: Furnish with same material and finish as gutters.

1. End Caps: Half-Round Style [CEN_6]
2. Leaf Guard: Continuous hinged, screened half-round leaf guard [GGAR-6].

D. Downspouts: Plain round complete with machine-crimped elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Material - Formed Aluminum: 0.019 inch thick.
2. Finish: Dark Bronze (DB)
3. Elbow Angle: 45°.

E. Downspout Accessories: Furnish with same material and finish as gutters.

1. Plain Round Aluminum Downspout Brackets by KM Sheet Metal.

    a. Size: 3-inch.
    b. Thickness: 0.063-inch.
    c. Spacing: Typical one (1) bracket at each downspout w/ boot; two (2) brackets at each downspout w/o boot.
    d. Color: Dark Bronze [Kynar].

2. Round Downspout Cleanouts:

    a. Material – Formed Aluminum: 22ga.
    b. Size: 3-inch.
    c. Color: Dark Bronze [Kynar].
    d. Location(s): One cleanout at each downspout w/o boot.

3. Downspout Boots:

    a. Basis of Design: A-Series Angle Outlet 3-inch Round Top Bell [A-R34A] by Downspoutboots a Division of J. R. Hoe.
    b. Material: Cast Iron (ASTM A48 Class 30 CI).
    c. Length: 24-inch.
    d. Inlet Diameter: 3-1/4 inch.
    e. Outlet Diameter: 4-1/2 inch.
    f. Integral Cleanout: Yes, Left-Facing.
    g. Color: Dark Bronze [Kynar].

F. Parapet Scuppers: Not required.

G. Conductor Heads: Not required.

H. Aluminum Finish: Two-coat fluoropolymer & Polyester, reference Materials.

1. Color: Dark bronze, typical.

2.4 MATERIALS

A. Galvanized Steel Sheet: Pre-Finished sheet metal coating of 70% polyvinylidene fluoride (PVDF) Kynar finish applied to G-90 galvanized steel as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

B. Aluminum Sheet: ASTM B209, alloy as standard with manufacturer for finish required, with temper to suit forming operations and performance required.

1. Surface: Smooth, flat finish.

2. Exposed Coil-Coated Finishes: Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

a. .65 - .70 mil polyester and phosphatized finish

b. Two-Coat Fluoropolymer: AAMA 620. System consisting of primer and fluoropolymer color topcoat containing not less than 70 percent PVDF resin by weight.

2.5 MISCELLANEOUS MATERIALS

A. Fasteners: Manufacturer's recommended fasteners, suitable for application and designed to meet performance requirements. Furnish the following unless otherwise indicated:

1. Fasteners for galvanized steel: Series 300 stainless steel.

B. Elastomeric Sealant: ASTM C920, elastomeric silicone polymer sealant of type, grade, class, and use classifications required by roofing-specialty manufacturer for each application.

C. Butyl Sealant: ASTM C1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type joints with limited movement.

D. Bituminous Coating: Cold-applied asphalt emulsion complying with ASTM D1187.

2.6 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical and painted finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

C. Appearance of Finished Work: Noticeable variations in same piece are unacceptable. Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

1. Color: Dark Bronze unless otherwise indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions, and other conditions affecting performance of the Work.

B. Verify that substrate is sound, dry, smooth, clean, sloped for drainage where applicable, and securely anchored.

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

3.2 INSTALLATION, GENERAL

A. Install roof specialties according to manufacturer's written instructions. Anchor roof specialties securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete roof-specialty systems.

1. Install roof specialties level, plumb, true to line and elevation; with limited oil-canning and without warping, jogs in alignment, buckling, or tool marks.
2. Provide uniform, neat seams with minimum exposure of solder and sealant.
3. Install roof specialties to fit substrates and to result in weathertight performance. Verify shapes and dimensions of surfaces to be covered before manufacture.
4. Torch cutting of roof specialties is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Protect metals against galvanic action by separating dissimilar metals from contact with each other or with corrosive substrates by painting contact surfaces with bituminous coating or by other permanent separation as recommended by manufacturer.

1. Coat concealed side of uncoated aluminum roof specialties with bituminous coating where in contact with wood, ferrous metal, or cementitious construction.
2. Bed flanges in thick coat of asphalt roofing cement where required by manufacturers of roof specialties for waterproof performance.

C. Expansion Provisions: Allow for thermal expansion of exposed roof specialties.

1. Space movement joints at a maximum of 12 feet with no joints within 18 inches of corners or intersections unless otherwise indicated on Drawings.
2. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures.

D. Fastener Sizes: Use fasteners of sizes that penetrate less substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal concealed joints with sealant as required by roofing-specialty manufacturer.

F. Seal joints as required for weathertight construction. Place sealant to be completely concealed in joint. Do not install sealants at temperatures below 40 deg F.

3.3 ROOF-EDGE SPECIALITIES INSTALLATION

A. Install cleats, cants, and other anchoring and attachment accessories and devices with concealed fasteners.

B. Anchor roof edgings with manufacturer's required devices, fasteners, and fastener spacing to meet performance requirements.

3.4 CLEANING AND PROTECTION

A. Remove temporary protective coverings and strippable films as roof specialties are installed. On completion of installation, clean finished surfaces, including removing unused fasteners, metal filings, pop rivet stems, and pieces of flashing. Maintain roof specialties in a clean condition during construction.

B. Replace roof specialties that have been damaged or that cannot be successfully repaired by finish touchup or similar minor repair procedures.

END OF SECTION 077100

SECTION 077600 – ROOF PAVER SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Architectural pavers.
2. Architectural wood deck tiles / pavers.
3. Industrial-grade adjustable pedestals and leveling accessories.
4. Floating insulation bases.
5. Paver tray units.
6. Integral snow melt.
7. Integral wind uplift lock down.
8. Integral bracing.
9. Installation of roof protection slip-sheets furnished by others.
10. All labor, materials, components, accessories, fasteners, tools, equipment, and services needed to provide and install a complete roof paver system.

B. Related Requirements:

1. Division 00 section "Roof Warranty" for roof warranty requirements.
2. Division 01 section "References" for regulatory standards.
3. Division 05 section "Metal Fabrications" for products furnished by others.
4. Division 07 section "TPO Roofing System" for substrate coordination and products furnished by others.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product and system indicated.

B. Samples:

1. Architectural Roof Pavers / Tiles: Submit samples for type, color and texture required.
2. Pedestals: Submit sample of each pedestal component.
3. Accessories.

C. Shop Drawings: Layout of all roof paver system areas. Include plans, sections, details, and dimensions. Show installation details, mountings, attachments to other work, clearances, and relationship to adjoining work.

1. Include all components required for the complete system including pavers, pedestals, components, and all accessories.
2. Include deck materials, patterns, grid layout, starting point, and finished elevation.

D. Fire Resistance Ratings: As required for exterior pedestal supported deck systems by the presiding jurisdiction.

E. Delegated Design Submittal: For pedestal support system and perimeter containment system installation, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

F. Wind Uplift Ratings: As required for exterior air permeable pedestal supported deck systems by the presiding jurisdiction.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Written reports based on evaluation of comprehensive tests performed by qualified testing agency indicating that each product complies with requirements.

B. Sample Warranty.

C. Qualification Statements: For delegated design engineer.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For roof paver units and pedestal support system to include in operation and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS (ATTIC STOCK)

A. Furnish one (1) percent of products as maintenance materials from same lot as materials installed and enclosed in protective packaging with appropriate identifying labels.

1.8 COORDINATION

A. Coordinate snow melt system with electrical scope and related work.

1.9 QUALITY ASSURANCE

A. Source Limitations: Obtain roof paver system and accessories from single manufacturer.

B. Manufacturer Qualifications: Products covered under this Section shall be produced by a single manufacturer unless otherwise specified with a minimum of ten (10) years of proven production experience.

C. Installer Qualifications: Installer shall have a minimum of three (3) years demonstrated experience installing products of same type and scope as specified including capability of estimating, building from plans and details, determining elevations, proper material handling, and compliance with manufacturer’s written installation procedures.

D. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 450 or less.

E. Delegated Design Engineer: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated.

1.10 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
2. Mockups shall include all performance and aesthetic related components.
3. With advance written approval and subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

B. Location: Minimum 6-foot x 6-foot area that incorporates each paver/tile type or as indicated in Drawings.

DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and products in accordance with the manufacturer's instructions and recommendations and industry standards.

B. Protect pavers and pedestal system components during shipment, storage, and construction against damage.

C. Deliver materials in manufacturer's original packaging.

1. Deliver and store pavers, pedestals, and system components with labels intact and legible.
2. Inspect all delivered materials to ensure they are undamaged and in good condition.

D. Store materials and products in an enclosed area protected from the elements with no exposure to sunlight.

1. Store all materials and products in the manufacturer’s original packaging until 24 hours prior to installation.
2. Store a minimum of 4-inches off the ground in a dry location and cover to protect from contact with materials or activities which would cause staining or discoloration.

E. Store and dispose of solvent-based materials such as construction adhesive and materials used with solvent-based materials in accordance with requirements of local authorities having jurisdiction.

1.12 FIELD CONDITIONS

A. Environmental Limitations: There are no pedestal installation temperature restriction guidelines other than the practical considerations of working in any unsafe condition or inclement weather.

B. Containment: Roof access and existing perimeter roof parapet construction available for observation during pre-bid walk-through or by appointment to confirm roof paver perimeter restraint requirements.

C. Decks over Roofing and Waterproofing:

1. Floating Insulation Bases required over any insulation less than 60psi or with low density polystyrene (bead board) insulation.

D. Decks on Grade: Not required.

E. Planters: Not required.

1.13 WARRANTY

A. Manufacturer Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of system that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **PAV** - Basis of Design: Subject to compliance with requirements, provide product system by **Tile Tech Inc.** as indicated in 'Material Legend' on Drawing sheet A600 and as specified herein or an APPROVED comparable product manufactured by one of the following:

1. Bison Innovative Products. www.bisonip.com
2. Hanover Architectural Products. www.hanoverpavers.com
3. Tile Tech Inc. www.tiletechpavers.com (Basis of Design)
4. Wausau Tile, Inc. www.wausautile.com

B. System Performance Criteria:

1. Perimeter Containment: Capable of resisting lateral forces in pedestal roof paver support system without displacement exceeding 1/8-inch.
2. Wind Uplift: Comply with IBC 1504.4 – ANSI/SPRI RP 4 and FMGlobal.
3. Portland Cement (ASTM C150): Specifications for Portland Cement,
4. Aggregates (ASTM C127, C128 & C136): All aggregates are tested in accordance with with specified standards and blended to meet individual project requirements.
5. Coloring: Pigments used shall be inorganic, alkali resistant, and used per manufacturer's recommendations.
6. Factory Applied Sealer: Colorless slip and stain resistant penetrating or acrylic sealer.

C. System components follow.

2.2 ARCHITECTURAL ROOF PAVERS

A. General: Provide a fully-restrained system of impervious vitreous roof paver units with a water-absorption rate of 0.5 percent or less when tested in accordance with ASTM C373; resistant to freezing and thawing when tested in accordance with ASTM C1026; abrasion-, chemical-, and stain-resistant; intended for exterior use with roof paver support system.

1. Basis of Design: **Earthtone-Series Porcelain Pavers**.
2. Color: **FLAT-BONE** (Light – SRI 78) & **FLAT-SMOKE** (Dark – SRI 35).
3. Size: 24-inch x 24-inch x 3/4 inch nominal.
4. Weight: 9.3 lbs per square foot.

B. Performance Requirements:

1. Rectified: Yes.
2. Frost Resistant (ASTM C1026): Yes, resistant.
3. Slip Resistance (ASTM E303): R11 (DIN51130).
4. Water Absorption (ASTM C373): 0.05 percent.
5. Bending Strength (ASTM C648 / EN1339): 3,300 lbs (Clas 14).
6. Breaking Strength (ISO 10545-4): 2200 lbf/sq. ft. (1.053 MPa), minimum.
7. Modulus of Rupture (ISO 10545-4): 7000 lbf/sq. in. (0.335 MPa), minimum.
8. Distributed Load (EN 12825): 2,500 lbs.
9. Coefficient of Friction (ANSI C1028): Wet > 0.60, Dry >0.60.
10. Abrasion Resistance (ASTM C1027): Resistant – Class 5.
11. Stain Resistance (ASTM C1378): Resistant – Class 5.
12. Chemical Resistance (ASTM C650): Resistant – UA ULA UHA.

2.3 WOOD DECK TILES

A. General: Provide a fully-restrained system of kiln-dried wood face slats, secured to wood support runners (battens) using corrosion-resistant stainless steel screws; intended for exterior use with roof paver support system.

1. Basis of Design: Ipê Wood Deck Tiles.
2. Color: Natural Dark Brown.
3. Finish: Smooth.
4. Size: 24-inch x 24-inch x 1-5/8 inch nominal.
5. Grade: ‘A’ kiln-dried, premium.
6. Weight: 6 lb/sqft.
7. Fire Rating (ASTM E108): Class A.

B. Performance Requirements:

1. Fire Resistant (ASTM E84): Class A.
2. Fire Resistant – Roof Covering (ASTM E108): Class A.
3. Breaking Strength – Concentrated Load (ASTM C293): 3,000 lbs.
4. Breaking Strength – Uniform Load: 15,000 lbs.
5. Coefficient of Friction (ANSI C1028): Wet > 0.60, Dry >0.60.
6. Hardness (Janka): 3700 very hard.
7. Modulus of Elasticity: 21 GPa
8. Durability: Class 1 (minimum 25-year life)

C. Cut, reinforce and reassemble at perimeter to accommodate roof paver system layout.

2.4 PEDESTAL SUPPORT SYSTEM

A. General: Furnish and install a complete continuously-variable, adjustable-height pedestal paver system to accommodate system components, meet roof elevation(s) indicated on Drawings, and provision of base pads to evenly distribute loads to membrane roof system.

1. System Range: Accommodate height adjustments from 1/2- to 52-inches to provide level paver installation.
2. System Tolerance: Maintain 1/8- to 1/4-inch paver joint width and alignment of pavers while allowing for drainage, air circulation, and prevention of water accumulation.

B. Adjustable Industrial Grade Pedestal System:

1. Basis of Design: Uni-Deck ‘screw-adjustment type’ Pedestal System (no pvc inserts).
2. General: Pedestals, Base Levelers, Couplers, Spacers and accessories to meet system requirements.
3. Pedestal Details: Provide pedestals that accommodate various pitches and height changes of the Project area.
4. Material: High-density, high-impact copolymer polypropylene.

C. Pedestal Inserts: Uni-Inserts.

1. Description: Free-spinning insert maintains spacing while allowing for pedestal height adjustments under load.

D. Low-Height Pedestals: Provide Fixed Height Pedestals, Stackable Pedestals, Slope Compensators, and accessories to meet system requirements.

1. Basis of Design: Stack-Cap or as recommended by manufacturer.

E. Base Pads:

1. Basis of Design: Floating Insulation Base / Foundation Pad with Buffer Pad.
    a. Description: Provide pedestal base pads beneath all pedestals to disperse loads over roofing system.
    b. Size: Minimum 10-inch x 10-inch base bearing surface.

F. Roof Paver Lock-Down System: Pedestal and cap plate mounting components.

1. Basis of Design Product: Wind-Lock.

G. Accessories & Other System Components:

1. Lock Rings.
2. Ipe Lock Disks.
3. Lateral Bracing System.
4. Shims and Spacers.
5. Self-leveling handles.

2.5 FASTENER KITS

A. General: Fastening Kits

1. Description: Secures Wood Deck Tiles to adjustable pedestals without penetrating or damaging the Wood Deck Tiles.
2. Components: Washer, long screw, and short screw.

a. Use the long screw with adjustable pedestals
b. Use the short screw with fixed height pedestals.

3. Material: Nylon

2.6 SNOW MELT SYSTEM & SAFETY TRAY UNITS

A. General: Provide snow melting system with channels, heat transfer plate and insulation for integration of electric-based heating systems and engineered to be used in conjunction with roof deck pavers & adjustable pedestals. Include provision of wind-uplift prevention mechanism(s).

1. Basis of Design: **Hex-Tray Snow Melt System.**
2. Size: 24-inch x 24-inch nominal.
3. Thickness: 1-1/2-inch.
4. Weight: 1.25 lbs/sqft.
5. Safety Tray Type: Honeycomb grid structural tray with integral channels / tracks.
6. Heat Type: Electric.

B. Accessories & Other System Components:

1. Electrical heating cable.
2. Pre-cut, foam insulation panels.
3. Heat transfer plates.
4. Locking disks with fasteners.
5. Spacer joint pegs.
6. Roofing adhesive.

2.7 PLANTERS

A. Basis of Design: Not Required.

2.8 ACCESSORIES

A. Shims & Wedges: Provide shims and wedges as required to provide complete level & true system installation.

1. Flexible Shim: 1/16-inch.

a. Use no more than two (2) shims per pedestal. If using a segment, adhere it to the pedestal with construction adhesive. Ensure the adhesive does not contact the roofing membrane.
b. Material: Thermoplastic Elastomer.

2. Rigid Shim: 1/8-inch.

a. Use no more than two (2) shims per pedestal. If using a segment, adhere it to the pedestal with construction adhesive. Ensure the adhesive does not contact the roofing membrane.
b. Material: Mineral Filled High Density Copolymer Polypropylene.

3. Wedge:

a. Description: Spacing Wedge.
b. Components: Two wedge pieces and one screw.
c. Material: Mineral Filled High Density Copolymer Polypropylene.

B. Perimeter Containment System: Materials and components provided by Installer to restrain pedestal roof paver support system.

1. Restraint Perimeter: Provide additional wood deck material (of same species as basis of design) sufficient to maintain continuous perimeter attachment to underside of tile as indicated on Drawings. Cut and fasten to accommodate existing conditions and manufacturer perimeter restraint requirements.

a. At perimeter, maintain full-width of Wood Deck Tile boards; always cut at joints.

C. Roof Drain Support Plates: Not required.

D. Protective Slip Sheet Membrane: 12-inch x 12-inch pre-cut pieces of membrane roof material.

1. General: Install protective slip sheets under each pedestal and/or floating insulation base; material furnished by others.

a. Manufacturer Note: Membrane may be used as a separate protective slip sheet underneath each pedestal.

2. Materials to be furnished by others. Coordination and installation is a requirement of this section of work.

E. Installation Handles:

1. Basis of Design: Tile Tech Paver Handles.

2. Description: Provide handles that accommodate paver sizes of 24-inches to 36-inches nominally, allowing installing contractor to set units into proper location with 3/16-inch or 1/8-inch joint between units. Also allows for removal and reinstallation without causing any damage to units or adjacent units, thus allowing inspection of utilities or drains at any time.

2.9 MATERIALS

A. ABS Plastic: Complying with ASTM F2806.

B. High-Density Polypropylene: Having a self-ignition temperature of 650 deg F (343 deg C) or greater when tested in accordance with ASTM D1929.

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 the Work.

B. Examine substrates to receive pedestals and verify slope, provide positive, and adequate drainage in accordance with good building practice and applicable building codes.

C. Examine and cull architectural pavers and wood deck tiles from complete material order and organize generally into similar colors to minimize variation within the installation area.

1. Install darker, more consistent tiles closest to windows and areas exposed to view.

2. Install lighter tiles that exhibit more variation furthest from windows and areas exposed to view.

D. Verify all elevations, required pedestal heights, insulation density, and deck dimensions before commencing work.

3.2 PREPARATION

A. Reference written manufacturer's instructions, installation details, and documentation for recommended preparations.

B. All membrane waterproofing, roofing and protection board surfaces to receive pedestals shall be broom clean, frost free, and free of dirt, oil or any rough foreign matter, which may impair the waterproofing / roofing manufacturers guarantee or protection requirements.

C. Prior to starting work inspect the substrate to ensure that it has been properly prepared to accept the Roof Paver System. The substrate and or surface shall be clean and free of any projections and debris which may impair the performance of the pedestal and/or the deck system. Commencement of work shall imply acceptance of surfaces & deck conditions.

D. Establish accurate lines, levels, and patterns as indicated on Drawings.

E. If preparation is the responsibility of another installer, notify Architect and Owner in writing of deviations from manufacturer's recommended installation tolerances and conditions.

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

3.3 INSTALLATION, GENERAL

A. Install in accordance with manufacturer's written instructions.

B. Reference approved Shop Drawings which shall indicate paver and/or tile type, pattern, grid layout, starting point, and finished elevation.

3.4 INSTALLATION OF PEDESTAL PAVER SYSTEM

A. Install in accordance with manufacture written instructions:

1. Inspection of deck and fixed elevation locations. All height or location problems to be corrected before installation.
2. Compare layout of deck to shop drawings or architectural drawings. All variances of field conditions to drawings to be reviewed and corrected prior to starting installation.
3. Set pedestal unit as a set of grid patterns.
4. Level surface installation using screw-top pedestal to follow manufacturer's installation procedures. No variances to system allowed.
5. Tabs and shim plates are placed, maximum of one shim per location, at intersection of grid line if finished surface is to follow slope of substrates. Paver size centerlines must be adhered to.
6. Minor height and pitch adjustments to pedestal are handled with 1/16-inch rubber shim plates.

B. Placement Tolerance:

1. Maximum of 1/16-inch height variation between adjacent pavers.

2. Individual pressed pavers shall not vary more than 1/16 inch from level across width of the pressed paver.

3. Paved areas shall not vary more than 1/4-inch in a distance of 10-feet measured at any location and in any direction.

4. The surface elevation of pavers shall be 1/8-inch to 1/4-inch above adjacent drainage inlets, concrete collars or channels.

5. Joints between pavers to be greater than 1/16-inch.

3.5 PEDESTAL ADJUSTMENT

A. Ensure pedestals have been shimmed/adjusted for rocking, uneven, or un-level pavers prior to substantial completion.

B. Reference manufacturer Installation Details documentation for adjustment procedures such as shimming a pedestal or adjusting the slope compensation on the pedestal.

C. Pedestal height installation in excess of sixteen (16) inches shall be braced in accordance with manufacturer written instructions.

3.6 SNOWMELT & SAFETY TRAY INSTALLATION

A. Install in accordance with manufacturer's written instructions and accepted Shop Drawings. Accurately set pedestal supports in locations coordinated with approved safety tray, snowmelt and pedestal system layout.

1. DO NOT WALK ON THE TRAYS as not to crush the eight (8) spacer tabs built on the trays until porcelain pavers are installed.

2. The safety tray and foam insulation are pre-assembled and held together with included plastic foam screw.

3. The pedestals grid is laid out using chalk lines and pedestals are assembled and tuned to the correct heights using string lines and laser level.

4. Using carpenter’s level make final in-place level adjustments using manufacturer's furnished tool to adjust pedestal support heights. Shims can be used for fine adjustment is necessary.

5. Lay out tray units to avoid less than half-width units at perimeter or other terminations. Cut tray to fit at termination points and walls and can be cut parallel or perpendicular to the direction of the tubing / cable channels or tracks using regular table saw.

6. The safety tray and foam insulation assembly is then placed on top of pedestals and after three (3) units are installed the lock disk washer is inserted into the curf-cut corners of the three (3) trays and the 4th tray is installed.

7. Once level, screw down the lock disk washer with 1-1/2” long black corrosion resistant deck screw, locking down the four (4) tray corners to the pedestal and ensure a safe, secure and level surface.

8. Trays can also be screwed together at side to side for additional stability when needed.

9. The aluminum heat transfer plate is installed on top of the safety tray and can be cut back at wall terminations to expose the safety tray U-bends to allow loop back of heating element. Flat, self-tapping screws can be used to hold the heat plate to the trays. For Wind-

uplift use Pre-die-cut manufacturer's aluminum heat transfer plate to secure pavers directly to trays for wind uplift at 4 corners and middle edges.

10. ELECTRICAL heating cable (provided under Division 26 – Electrical) is laid in the channels/tracks and run the full length of area to be heated and returned to a common electrical connection point. Provide aluminum tape to secure cable or tubing in place.

3.7 WOOD DECK TILE INSTALLATION

A. General Safety Precautions: Respirators shall be worn if the ambient concentration of airborne contaminants exceeds Prescribed Exposure Limits (PEL). Dust masks should also be worn to avoid the inhalation of nuisance hardwood dust, which according to the State of California, can lead to long-term health effects. Dust masks are not adequate protection in environments above the Occupational Safety & Health Administration's (OSHA) exposure limits. Refer to product SDS Section 8 for more information.

B. Cutting: Wood Deck Tiles have a very high density, and a slower feed rate is recommended when cutting; carbide saw blades are highly recommended. Remove any screws that fall in the path of the cut. To minimize checking or small cracks, the installer should consider sealing any cut ends with an appropriate glue or end sealer such as PVA Wood Glue by Elmer's or Gorilla specifically designed for use on exterior wood. Apply sealer with a foam brush to the cut ends only. CAUTION: Be very careful to not get any on the top surface of the wood, as a glossy discoloration will appear.

C. Reassembly: To reassemble Wood Deck Tiles after cutting, remove a bottom runner from the portion to be discarded, being careful to not strip the screw heads. Using the removed bottom runner to align the holes, pre-drill holes accordingly with a carbide drill bit on the portion to be installed. Exercise caution to not drill through the top surface. Maintain consistent screw depth and spacing between the planks. After pre-drilling, screw the runner into place on the portion to be installed, re-using the screws whenever possible. Use manufacturer recommended stainless steel fasteners. Do not use iron-based or galvanized screws as they will cause discoloration as the wood weathers.

D. Fastening: Utilize Fastening Kits to secure Wood Deck Tiles to Pedestals and rotate to remove individual pavers after installation.

1. Select correct fastener length for adjustable or fixed height pedestal.
2. Insert washer into continuous kerf in the corner of three wood tiles.
3. Leave the notch in the washer facing outwards in order to leave room to place the fourth wood tile. Insert the fourth paver and turn the washer to secure all four corners. Drive the screw through the center of the washer and into the center of the pedestal top.
4. Tighten until all four wood tiles are securely fastened to the pedestal.
5. Use correct fastener length to avoid damage to roof membrane.
6. Do not overtighten fasteners.

3.8 PORCELAIN PAVERS INSTALLATION

A. Install porcelain pavers over safety tray & pedestal support system in accordance with manufacturer's written instructions and accepted Shop Drawings. Align joint patterns parallel in each direction.

1. Install porcelain pavers using paver lift-up tool to carefully position and install pavers on top of safety tray system and center using the spacer tabs built on the trays.

2. Set porcelain pavers in place using placement methods that result in stable installation free from rocking, using sound safety tray with no edge or surface damage.

3.9 PERIMETER CONTAINMENT

A. Any area of the pedestal deck that is not restrained by a parapet or foundation wall must be 'boxed-in' and contained. The tray panels will move if all sides are not adequately restrained. Perimeter framing and edging boards located at the outside of the deck perimeter must be installed to provide restraint. No movement should be allowed at the perimeter of the deck system greater than one tab width.

3.10 FIELD QUALITY CONTROL

A. During Installation: Inspect construction progress regularly to ensure that grid lines and spacing are being maintained in a straight and consistent manner, lateral motion is restricted by perimeter containment, and the Architectural Pavers, Wood Deck Tiles and Pedestals are level and not rocking; shim as required. Particular attention should be paid to pedestrian entrances or access points to eliminate potential trip hazards.

1. Inspect to ensure that all perimeter sides of the deck system are securely contained to restrain all sides of the deck. Surface materials must fit tightly against all pedestal spacing tabs, and the gap or space at all perimeter edges must not exceed one tab width or 3/16". Install/Adhere partial tab sets as required to maintain proper spacing.
2. Clear work area clean and free of metal shavings, metal filings, and other debris to avoid damage and/or discoloration.

B. Immediately Following Installation: Contractor shall carefully inspect the deck system to verify:

1. The new deck system is adequately blocked on all sides to contain and prevent lateral movement of the surface decking and related components.
2. There is no more than one tab width spacing between any pavers or from perimeter containment not to exceed 3/16-inch.
3. Wood Tiles do not rock when walking across the deck surface.
4. All required spacer tabs and fastening kits are installed and secure.
5. Wood Deck Tiles are swept of any wood debris.
6. The installed Wood Deck Tiles are protected from damage which may occur as a result of continued construction.

END OF SECTION 077600

SECTION 078446 – FIRESTOPPING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes firestopping for the following:

1. Penetrations through fire-resistance-rated floors, walls, partitions, and roof construction including both empty openings and openings containing cables, pipes, ducts, conduits, and other penetrating items.
2. Sealant joints in fire-resistance-rated construction.

B. Related Requirements:

1. Division 07 section "Joint Sealers" for non-fire-resistive-rated joint sealants.
2. Division 07 section "Acoustic Sealants" for non-fire-resistive-rated acoustic joint sealants.
3. Divisions 22 and 23 sections specifying ducts and piping penetrations.
4. Division 26 sections specifying cable and conduit penetrations.

1.3 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 E814, 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 E814, 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 in construction containing doors required to have a temperature-rise rating.
2. Where firestop systems protect penetrating items larger than a 4-inch-diameter nominal pipe or 16 sq. in. in overall cross-sectional area.

D. Fire-Resistive Joint Sealants: Provide joint sealants with fire-resistance ratings indicated, as determined per ASTM E119 and UL 2079, 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 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 E84 and are capable of being painted.

1.4 ACTION SUBMITTALS

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

1. Certification by firestopping manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs) and are nontoxic to building occupants.

B. Shop Drawings: Provide shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item. Include firestop design designation of qualified testing and inspecting agency evidencing compliance with requirements for each condition indicated.

1. 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.
2. Engineering Judgments: 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. Do not install modified systems until approval is granted by the Project Team and the Authority Having Jurisdiction (AHJ). Engineering judgements must include both the name of the Project and the Installer who will carry out the work.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer.

B. Product Test Reports: For each firestopping system based on tests performed by a qualified testing and inspecting agency evidencing compliance of firestopping with requirements based on comprehensive testing of current products.

1.6 CLOSEOUT SUBMITTALS

A. Installer Certificates: From Installer indicating that penetration firestopping systems have been installed in compliance with requirements and manufacturer's written instructions.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: A firm that has been approved by FM Global according to FM Global 4991, "Approval of Firestop Contractors," or been evaluated by UL and found to comply with its "Qualified Firestop Contractor Program Requirements", with no less than three years of experience with firestopping installation.

B. Fire-Test-Response Characteristics: Provide firestopping that complies with the following requirements and those specified under the "System Performance Requirements" article.

C. Through-penetration firestop systems are identical to those tested per ASTM E814 under conditions where positive furnace pressure differential of at least 0.01-inch of water is maintained at a distance of 0.78-inch below the fill materials surrounding the penetrating items in the test assembly. Provide rated systems complying with the following requirements:

1. 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.

D. Fire-resistive joint sealant systems are identical to those tested for fire-response characteristics per ASTM E119 under conditions where the positive furnace pressure differential is at least 0.01-inch of water, as measured 0.78-inch from the face exposed to furnace fire. Provide systems complying with the following requirements:

1. 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.

E. 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.

F. Firestopping Systems do not reestablish the structural integrity of load-bearing partitions / assemblies or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load-bearing assembly.

G. Single-Source Responsibility: Obtain through-penetration firestop systems for each kind of penetration and construction condition indicated from a single manufacturer.

H. 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."

I. Coordinating Work: Coordinate construction of openings and installation of penetrating items to ensure that designated through-penetration firestop systems are installed per specified requirements.

J. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."

K. Owner will employ and pay a qualified inspection agency to check installed firestopping systems for compliance with requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver firestopping products to Project site in original, unopened containers or packages with intact and legible manufacturers' labels identifying product and manufacturer; date of manufacture; lot number; shelf life and expiration date; qualified testing and inspecting agency's classification marking applicable to Project; curing time; and mixing instructions for multi-component materials. Coordinate delivery of materials with scheduled installation date to allow minimum storage time at the jobsite.

B. Store and handle firestopping materials to prevent their deterioration or damage due to moisture, temperature changes, contaminants, or other causes.

C. Comply with recommended procedures, precautions, or remedies described in the Material Data Safety Sheets as applicable. Do not use damaged or expired materials.

1.9 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. Verify existing conditions and substrates prior to starting the Work. Correct unsatisfactory conditions before proceeding with the Work.

C. Ventilation: Ventilate firestopping per firestopping manufacturers' instructions by natural means or, where this is inadequate, forced air circulation.

1.10 COORDINATION

A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping systems can be installed according to specified firestopping system design.

B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping systems.

C. Notify Owner's inspection agency at least **seven (7) business days** in advance of firestopping installations; confirm dates and times on days preceding each series of installations.

D. Do not cover up those firestopping installations that will become concealed behind other construction until Owner's inspection agency and authorities having jurisdiction have examined each installation.

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. Sealants used in combination with other forming/damming materials to prevent leakage of fill materials in liquid state.
   c. Joint fillers for joint sealants.

2. Temporary forming materials.

   a. Substrate primers.
   b. Collars.
   c. 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. Intumescent, Latex Sealant: Single-component, intumescent, latex formulation.

B. Intumescent Putty: Nonhardening, dielectric, water-resistant putty containing no solvents, inorganic fibers, or silicone compounds.

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

D. Silicone Sealant: Moisture-curing, single-component, silicone-based, neutral-curing elastomeric sealant of grade indicated below:

1. Grade for Horizontal Surfaces: Nonsag or Pourable (self-leveling) grade for openings in floors and other horizontal surfaces.

E. Solvent-Release-Curing Intumescent Sealant: Solvent-release-curing, single-component, synthetic-polymer-based 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.

F. (Firestop) Pillows: Monolithic, mineral fiber, core-sealed, water-resistant, intumescent membrane.

G. Composite Sheets: Rigid aluminum foil-faced sheets with galvanized steel sheet backer.

H. Plastic Collar Devices: Flexible, pre-moulded, factory fabricated, highly intumescent, collars.

2.3 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide the following:

1. Firestopping is application and rating dependent. Systems indicated and detailed are based on **Hilti Firestop Systems**.
2. Subject to compliance with requirements, APPROVED comparable products of equal application type and rated performance will be considered by the following:

    a. Hilti Firestop Systems (Basis of Design).
    b. Specified Technologies Inc. (STI).
    c. 3M.

2.4 SYSTEMS BY APPLICATION:

A. Cast-in place firestop devices: for use with noncombustible and combustible pipes (closed and open systems), conduit, and cable bundles penetrating concrete floors, the following products are acceptable:

1. Hilti CP 680 Cast-In Place Firestop Device

    a. Add Aerator adaptor when used in conjunction with aerator (“sovent”) system.

2. Hilti CP 682 Cast-In Place Firestop Device for use with noncombustible penetrants.
3. Sealants, caulking materials, or foams for use with non-combustible items including steel pipe, copper pipe, rigid steel conduit and electrical metallic tubing (EMT), the following products are acceptable:

    a. Hilti FS-ONE MAX Intumescent Firestop Sealant
    b. Hilti CP 604 Self-leveling Firestop Sealant
    c. Hilti CP 620 / CP 660 Fire Foam
    d. Hilti CP 606 Flexible Firestop Sealant
    e. Hilti CP 601s Elastomeric Firestop Sealant

B. Intumescent, Silicon Compounds: (Horizontal use)

1. Hilti CP 601s Elastomeric Firestop Sealant

C. Intumescent Latex Sealant:

1. Hilti FS-ONE MAX Intumescent Firestop Sealant

D. Intumescent Putty:

1. Hilti CP 618 Firestop Putty Stick
2. Hilti CFS-PL Firestop Plug
3. Hilti CP 617 Firestop Putty Pad

E. Intumescent Wrap Strips:

1. Hilti 648-E/648-S Wrap Strips

F. Perimeter Slab Spray Fire BarrierSystem

1. Hilti CP 604 Self-Leveling Firestop Sealant

G. Head of Wall Spray Fire Barrier System

1. Hilti CP 672 Speed Spray
2. Hilti CP 601s Elastomeric Firestop Sealant
3. Hilti CP 606 Flexible Firestop Sealant
4. Hilti CP 604 Self-Leveling Firestop Sealant

H. Intumescent Pillows:

1. Hilti FS 657 FIRE BLOCK
2. Hilti CFS-PL Firestop Plug

I. Composite Sheets:

1. CS-195+; 3-M Corporation

J. Collars:

1. Hilti CP 643N Firestop Collar
2. Hilti CP 644 Firestop Collar

K. Fire Safing Insulation: Fire safing insulation shall be Thermafiber Safing Insulation as manufactured by United States Gypsum Company or approved comparable product conforming to all requirements specified herein.

1. Fire safing insulation shall conform to fire test requirement of ASTM E119 for not less than 2 hours of fire, smoke and toxic gas resistance at 1850 deg. F.
2. The insulation shall conform to the following fire hazard classification, in accordance with ASTM E84.
    a. Flame Spread: 15
    b. Fuel Contributed: 0
    c. Smoke Developed: 0
3. The fire safing insulation, in place, shall be of sufficient depth and width to provide a fire resistance at least equal to the floor or other construction into which it is installed, and without reducing the fire rating of the adjacent floors or other constructions.

2.5 FIRE-RESISTIVE ELASTOMERIC JOINT SEALANTS

A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealants of base polymer indicated that complies with ASTM C920 and UL 2079 requirements, including those referenced for Type, Grade, Class, and Uses, and requirements specified in this Section applicable to fire-resistive joint sealants.

B. Single-Component, Neutral-Curing Silicone Sealant: Type S; Grade NS; Class 25; exposure-related Use NT, and joint-substrate-related Uses M, G, A, and (as applicable to joint substrates indicated) O.

1. Additional Movement Capability: Provide sealant with the capability to withstand the following percentage changes in joint width existing at time of installation, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C719 and UL 2079, and remain in compliance with other requirements of ASTM C920 for uses indicated:
    a. 50 percent movement in both extension and compression for a total of 100 percent movement.
    b. 100 percent movement in extension and 50 percent movement in compression for a total of 150 percent movement.

2.6 MIXING

A. For those products requiring mixing prior to application, comply with firestopping manufacturer's directions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other procedures needed to produce firestopping products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 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.
3. Remove laitance and form release agents from concrete.

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 of Work 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.

3.3 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.

3.4 INSTALLING FIRE-RESISTIVE JOINT SEALANTS

A. General: Comply with the "System Performance Requirements" article in Part 1, with ASTM C1193, 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.

3.5 INSTALLATION OF SAFING INSULATION

A. Install safing insulation to fill gap between edge of concrete floor slab and back of exterior spandrel panels on safing clips spaced as needed to support insulation, but not further apart than 24-inches on center. Cut safing insulation as per the requirements of the UL Listed system used to ensure compression fit and seal joint between insulation and edge of slab. Leave no voids in completed installation.

3.6 IDENTIFICATION

A. Wall Identification: Permanently label walls containing penetration firestopping systems with the words "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS," using lettering not less than 3-inches high and with minimum 3/8-inch strokes.

1. Locate in accessible concealed floor, floor-ceiling, or attic space at 15-feet from end of wall and at intervals not exceeding 30-feet.

B. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6-inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:

1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
2. Contractor's name, address, and phone number.
3. System Number.
4. Designation of applicable testing and inspecting agency.

5. Date of installation.
6. Manufacturer's name.
7. Installer's name.

3.7 FIELD QUALITY CONTROL

A. Inspecting agency employed and paid by Owner will examine completed firestopping to determine, in general, if it is being installed in compliance with requirements.

B. Inspecting agency will report observations promptly and in writing to Contractor and Architect.

C. Do not proceed to enclose firestopping with other construction until reports of examinations are issued.

D. Where deficiencies are found, repair or replace firestopping so that it complies with requirements.

3.8 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 resulting from construction operations or other causes so that they are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated firestopping immediately and install new materials to produce firestopping complying with specified requirements.

END OF SECTION 078446

SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.
4. Acoustical joint sealants.

B. Related Requirements:

1. Division 04 section "Unit Masonry" for masonry control and expansion joint fillers and gaskets.
2. Division 07 section "Firestopping" for maintaining fire-rated construction requirements at penetrations.
3. Division 07 section "Flashing and Sheet Metal" for sealing joints related to flashing and sheet metal for roofing.
4. Division 08 section "Glazing" for glazing sealants.
5. Division 09 section "Gypsum Board" for sealing perimeter joints.
6. Division 09 section "Tiling" for sealing tile joints.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.

C. Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.
3. Joint-sealant formulation.
4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

D. Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.

2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

C. Product Testing: Test joint sealants using a qualified testing agency.

1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS

A. Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or below 40 degrees F.

2. When joint substrates are wet.

3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.

4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.7 WARRANTY

A. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.

2. Disintegration of joint substrates from natural causes exceeding design specifications.

3. Mechanical damage caused by individuals, tools, or other outside agents.

4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C1248 and have not stained porous joint substrates indicated for Project.

E. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.

F. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.

B. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.

C. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use T.

D. Multicomponent, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type M, Grade NS, Class 50, for Use NT.

E. Mildew-Resistant, Single-Component, Nonsag, Acid-Curing Silicone Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 100/50, for Use NT.

B. Single-Component, Nonsag, Urethane Joint Sealant: ASTM C920, Type S, Grade NS, Class 25, for Use NT.

C. Single-Component, Pourable, Traffic Grade, Urethane Joint Sealant: ASTM C920, Type M, Grade P, Class 25, for Use T and I.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C834, Type OP, Grade NF.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard non-sag, paintable, non-staining latex sealant complying with ASTM C834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E90.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C1330, Type C (closed-cell material with a surface skin), and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent non-porous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Non-staining, non-absorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

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

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

    a. Concrete.
    b. Masonry.
    c. Unglazed surfaces of ceramic tile.
    d. Exterior insulation and finish systems.

3. Remove laitance and form-release agents from concrete.

4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:

    a. Metal.
    b. Glass.
    c. Porcelain enamel.
    d. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.

1. Do not leave gaps between ends of sealant backings.
2. Do not stretch, twist, puncture, or tear sealant backings.
3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:

1. Place sealants so they directly contact and fully wet joint substrates.
2. Completely fill recesses in each joint configuration.
3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of Non-Sag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1. Extent of Testing: Test completed, and cured sealant joints as follows:

   a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.

2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.

3. Inspect tested joints and report on the following:

   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.

4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.

5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.

B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT SEALANT SCHEDULE

A. Joint Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Locations:

   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. Other joints as indicated or required.

2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, non-sag, traffic grade.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces subject to water immersion.

1. Joint Locations:

   a. Expansion and control joints in concrete paving.
   b. Other joints as indicated or required.

2. Urethane Joint Sealant: Immersible, single component, non-sag, traffic grade.
3. Joint-Sealant Color: As selected by Architect from manufacturer’s full range of colors to blend with concrete paving.

C. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Control and expansion joints in unit masonry.
    b. Joints in exterior insulation and finish systems.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and frames of doors.
    f. Control and expansion joints in ceilings.
    g. Other joints as indicated or required.

2. Silicone Joint Sealant: Single component, non-sag, neutral curing, Class 100/50.
3. Urethane Joint Sealant: Single component, non-sag, Class 100/50.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

D. Joint-Sealant Application: Interior joints in horizontal traffic surfaces.

1. Joint Locations:

    a. Isolation joints in cast-in-place concrete slabs.
    b. Control and expansion joints in tile flooring.
    c. Other joints as indicated or required.

2. Silicone Joint Sealant: Single component, non-sag, traffic grade, neutral curing.
3. Urethane Joint Sealant: Single component, non-sag, traffic grade.
4. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Perimeter joints of exterior openings where indicated.
    b. Other joints as indicated or required.

2. Joint Sealant: Latex.

F. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant Location:

    a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    b. Tile control and expansion joints where indicated.
    c. Other joints as indicated.

2. Joint Sealant: Single component, non-sag, mildew resistant, acid curing.

G. Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Sealant: Acoustical sealant.
2. Joint Location:

    a. Acoustical joints where indicated.
    b. Other joints as indicated.

END OF SECTION 079200

SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Exterior framing transoms and sidelites with thermal break.
2. Exterior manual-swing entrance doors and frames.
3. Extruded aluminum accessories.
4. Entrance closures and trim.
5. Extruded-aluminum sill cover plates.
6. All labor, materials, equipment, tools, services, components, trim, supports, and attachments required to furnish and install a complete and secure system.

B. Related Requirements:

1. Division 01 section "Summary" for mockup coordination and requirements.
2. Division 01 section "Project Management and Coordination" for special coordination requirements of related enclosure work.
3. Division 01 section "References" for definition of Installer.
4. Division 07 section "Joint Sealers" for coordination of building enclosure requirements.
5. Division 08 section "Glazing" for glazing requirements.
6. Division 08 section "Door Hardware" for entrance door system related requirements.
7. Divisions 26-28 for Electrical & Systems coordination of door access control.

1.3 DEFINITIONS

A. ADA/ABA Accessibility Guidelines: U.S. Architectural & Transportation Barriers Compliance Board's "Americans with Disability Act (ADA) and Architectural Barriers Act (ABA) Accessibility Guidelines for Buildings and Facilities."

B. Water Penetration: Appearance of uncontrolled water other than condensation, on inboard surfaces of system.

C. Excessive Condensation: Defined as visible water, ice or frost on more than 5% of the area of any module of the glazed curtain wall, or the accumulation of uncontrolled condensation flowing from the glazed wall at any location.

D. Excessive Fading: Change in appearance which is perceptible and objectionable to the architect when viewed in comparison with original acceptable color range.

E. Excessive Non-Uniformity of Color or Shade: Non-uniform fading during warranty period to the extent that adjacent panels have color difference greater than original acceptable color range.

F. Color Fade: Not to exceed 5 E units (National Bureau of Standards) calculated in accordance with ASTM D2244 on exposed surfaces cleaned with clean water and soft cloth.

G. Cracking, Peeling, Pitting or Corroding: Defects discernible from a distance of five (5) feet resulting from exposure to natural elements.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For aluminum-framed systems. Include job-specific plans, elevations, sections, details, and attachments to other work.

1. Include details of provisions for system expansion and contraction and for drainage of moisture in the system to the exterior.

2. Include full-size isometric details of each vertical-to-horizontal intersection depicting:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.
f. Perimeter seal.

3. Include point-to-point wiring diagrams showing the following:

a. Power requirements for each electrically operated door hardware.
b. Location and types of switches, signal device, conduit sizes, and number and size of wires.
c. For entrance doors, include hardware schedule and indicate operating hardware types, functions, quantities, and locations.

4. Delegated Design: Shop Drawings shall reflect testing and comprehensive engineering analysis prepared by delegated design professional engineer.

C. Samples for Verification: For each type of exposed finish required, in manufacturer's standard sizes.

A. Delegated-Design Submittal: For aluminum-framed systems, provide comprehensive engineering analysis data and report signed and sealed by the qualified professional engineer responsible for their preparation.

1. Systems shall comply with performance requirements and design criteria indicated.
2. Include design calculations.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: Certificate or signed letter on company letterhead acknowledging Installer is approved by the manufacturer with all requisite training and meets experience requirements.

B. Qualification Data for Delegated Design Professional Engineer: Signed letter on company letterhead indicating experience with providing delegated-design engineering services of the kind

indicated, including documentation that engineer is licensed and in good standing with the State of Missouri.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for aluminum-framed systems, indicating compliance with performance requirements.

D. Energy Performance: For glazed aluminum-framed entrance and strorefront system from manufacturer.

E. Seismic Qualification Certificates: For aluminum-framed systems**,** accessories, and components, from manufacturer.

1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.

F. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed systems to include in maintenance manuals.

B. Maintenance Data for Structural Sealant: For structural-sealant-glazed aluminum-framed system to include in maintenance manuals. Include ASTM C1401 recommendations for post-installation-phase quality-control program.

1.7 MOCKUPS

A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for fabrication and installation.

1. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

2. In-Place mockup permitted. Subject to compliance, approved mock-ups may become part of the completed work.

3. Coordinate with interior Studio Interface mockup requirement as indicated in Division 01 section ‘Summary’.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Engineering Responsibility: Prepare data for aluminum-framed systems, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in systems similar to those indicated for this Project.

C. Product Options: Information on Drawings and in Specifications establishes requirements for system aesthetic effects and performance characteristics. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction. Performance characteristics are

indicated by criteria subject to verification by one or more methods including preconstruction testing, field testing, and in-service performance.

1. Do not revise intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If revisions are proposed, submit comprehensive explanatory data to Architect for review.

D. Source Limitations for Aluminum-Framed Systems: Obtain from single source from single manufacturer.

E. Accessible Entrances: Comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guideline and ICC/ANSI A117.1.

F. Welding Qualifications: Qualify procedures and personnel according to AWS D1.2, "Structural Welding Code - Aluminum."

G. Structural-Sealant Glazing: Not applicable.

H. Structural-Sealant Joints: Not applicable.

I. Mockups: As indicated under dedicated article within this specification.

J. Preinstallation Conference: Conduct conference at Project site.

1. Verify project requirements, substrate conditions, manufacturer’s installation instructions, and manufacturer’s warranty requirements.
2. Include installers of other construction that interface with glazed aluminum curtain wall, including but not limited to: flooring, weather barriers, rain screens, sun shades, copings, etc.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver glazed aluminum frames and miscellaneous components and other manufactured items so as not to be damaged or deformed. Protect materials during transportation and handling. Schedule jobsite deliveries to allow for immediate installation of exterior materials.

B. Handling: Unload and erect materials to prevent bending, warping, twisting, and surface damage.

C. Stack miscellaneous components and materials to ensure dryness. Do not store in contact with other materials that might cause staining, denting, or other surface damage.

D. Protect glazing and frame components from adverse job conditions before, during, and after installation including but not limited to:

1. Direct exposure to sun.
2. The work of other trades.

1.10 PROJECT CONDITIONS

A. Field Measurements: Verify actual field conditions, openings, and locations of structural supports for aluminum-framed systems by field measurements before fabrication and indicate measurements on Shop Drawings.

1.11 PERFORMANCE REQUIREMENTS

A. General Performance: Aluminum-framed systems shall withstand the effects of the following performance requirements without exceeding performance criteria or failure due to defective manufacture, fabrication, installation, or other defects in construction:

1. Movements of supporting structure indicated on Drawings including, but not limited to, story drift and deflection from uniformly distributed and concentrated live loads.
2. Dimensional tolerances of building frame and other adjacent construction.
3. Failure includes the following:

    a. Deflection exceeding specified limits.
    b. Thermal stresses transferring to building structure.
    c. Framing members transferring stresses, including those caused by thermal and structural movements to glazing.
    d. Glazing-to-glazing contact.
    e. Noise or vibration created by wind and by thermal and structural movements.
    f. Loosening or weakening of fasteners, attachments, and other components.
    g. Sealant failure.

B. Delegated Design: Design aluminum-framed systems, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Structural Loads:

1. Wind Loads: As indicated on Structural Drawings.
2. Other Design Loads: As indicated on Structural Drawings.

D. Deflection of Framing Members:

1. Deflection Normal to Wall Plane: Limited to 1/175 of clear span for spans up to 13 feet 6 inches and to 1/240 of clear span plus for spans greater than 13 feet 6 inches or an amount that restricts edge deflection of individual glazing lites to 3/4 inch, whichever is less.
2. Deflection Parallel to Glazing Plane: Limited to L/360 of clear span or 1/8 inch, whichever is smaller.

E. Structural-Test Performance: Test according to ASTM E330 as follows:

1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
2. When tested at 150 percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, and permanent deformation of main framing members exceeding 0.2 percent of span.
3. Test Durations: As required by design wind velocity, but not less than 10 seconds.

F. Seismic Performance: Glazed aluminum storefront system shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

G. Energy Performance: Certified and labeled by manufacturer for energy performance as follows:

1. Air Leakage:

    a. Fixed Glazing and Framing Areas: Air leakage for the system of not more than 0.06 cfm/sq. ft. at a static-air-pressure differential of 6.24 lbf/sq. ft. when tested according to ASTM E283.

2. Condensation Resistance Factor (CRF):

   a. Fixed Glazing and Framing Areas: CRF for the system of not less than 55 as determined according to AAMA 1503.

H. Water Penetration under Static Pressure: No evidence of water penetration through fixed glazing and framing areas when tested according to ASTM E331 at a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 15 lbf/sq. ft.

I. Water Penetration under Dynamic Pressure: Provide aluminum-framed systems that do not evidence water leakage through fixed glazing and framing areas when tested according to AAMA 501.1 under dynamic pressure equal to 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

J. Thermal Movements: Provide aluminum-framed systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.

   1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.12 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of aluminum-framed systems that do not comply with requirements or that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Structural failures including, but not limited to, excessive deflection.
      b. Noise or vibration caused by thermal movements.
      c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
      d. Adhesive or cohesive sealant failures.
      e. Water leakage through fixed glazing and framing areas.
      f. Failure of operating components.

   2. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Special Finish Warranty, Factory-Applied Finishes: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.

   1. Deterioration includes, but is not limited to, the following:

      a. Color fading more than 5 Delta E units when tested in accordance with ASTM D2244.
      b. Chalking in excess of a No. 8 rating when tested in accordance with ASTM D4214.
      c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

   2. Warranty Period: Twenty (20) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **AL** - Basis of Design: Subject to compliance with requirements, provide **Tuffline Series Entrances & Trifab VersaGlaze 451T Framing System** by **Kawneer North America** or an APPROVED comparable product by one of the following:

1. Boyd Aluminum Storefront
2. EFCO Corporation
3. Old Castle Building Envelope
4. Tubelite
5. Wasau
6. YKK AP America, Inc.

2.2 MATERIALS

A. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

1. Sheet and Plate: ASTM B209.
2. Extruded Bars, Rods, Profiles, and Tubes: ASTM B221.
3. Extruded Structural Pipe and Tubes: ASTM B429.
4. Structural Profiles: ASTM B308.
5. Welding Rods and Bare Electrodes: AWS A5.10.

B. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer, complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM and prepare surfaces according to applicable SSPC standard.

1. Structural Shapes, Plates, and Bars: ASTM A36.
2. Cold-Rolled Sheet and Strip: ASTM A1008.
3. Hot-Rolled Sheet and Strip: ASTM A1011.

2.3 ENTRANCE DOOR SYSTEMS

A. Basis of Design: Subject to compliance with requirements, provide **TuffLine 350** entrance door system by **Kawneer Company, Inc.** or an APPROVED comparable product.

B. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing or automatic operation.

1. Door Construction: 2-inch overall thickness, with minimum 0.188-inch thick, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    a. Thermal Construction: High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior.
2. Door Design: As indicated on Drawings.
    a. Accessible Doors: Smooth surfaced for width of door in area within 10-inches above floor or ground plane.
3. Glazing Stops and Gaskets: Square, snap-on, extruded-aluminum stops and preformed gaskets.

a. Provide non-removable glazing stops on outside of door.

C. Entrance Door Hardware: Hardware not specified in this Section is specified in Division 08 section "Door Hardware."

D. Sill Cover Plates:

1. Basis of Design: PCS2G Series by Construction Specialties
2. General: 1/8-inch continuous extruded aluminum cover plate.
3. Location(s): At each entrance.
4. Other: Reference Drawing sheet A-601 for additional information.

2.4 GLAZING

A. Glazing: As specified in Division 08 section "Glazing."

B. Glazing Gaskets: Manufacturer's standard compression types; replaceable, molded or extruded, of profile and hardness required to maintain watertight seal.

C. Spacers and Setting Blocks: Manufacturer's standard elastomeric type.

D. Bond-Breaker Tape: Manufacturer's standard TFE-fluorocarbon or polyethylene material to which sealants will not develop adhesion.

E. Weatherseal Sealant:

1. ASTM C920 for Type S, Grade NS, Class 25, Uses NT, G, A, and O.
2. Single-component neutral-curing formulation that is compatible with the structural sealant and other system components with which it comes in contact.
3. Recommended by structural-sealant, weatherseal-sealant, and aluminum-framed-system manufacturers.
4. Color: By Architect.

F. Structural Glazing Sealants: Not applicable.

2.5 FRAMING SYSTEMS

A. Framing Members: Manufacturer's standard extruded-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. General: Supplement to Entrance System for sidelites and other supplemental framing as needed to provide a complete, framed opening.

2. Glazing System - Typical: Retained mechanically with gaskets on four sides.

a. Construction: Thermally Broken (two-part with dual nominal 1/4-inch separation).
b. Frame Depth: 4-1/2-inches.
c. Perimeter Sight Line: 2-inches.
d. Glazing Plane: Center, Captured.
e. Steel Reinforcement: Not required.
f. Finish: Reference ‘Aluminum Finishes’
g. Location(s): Exterior Sidelites & Windows.

3. Glazing System: Retained mechanically with gaskets on two sides and structural sealant SSG mullion on two sides.

a. Location(s): Not required.

4. Glazing System: Retained mechanically with gaskets on two sides and structural sealant only (butt-glazed) on two sides.

a. Location(s): Not required.

B. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.

C. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.
2. Reinforce members as required to receive fastener threads.

D. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts, complying with ASTM A123 or ASTM A153.

E. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

F. Framing System Gaskets and Sealants: Manufacturer's standard, recommended by manufacturer for joint type.

1. Provide sealants for use inside of the weatherproofing system that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

G. Locations and Sizes: Reference Drawings and Schedules.

2.6 SOUND BARRIER CLOSURE SYSTEM

A. Extruded Aluminum Storefront Sound Barrier Closure System: Not applicable.

2.7 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding fasteners and accessories compatible with adjacent materials.

1. Use self-locking devices where fasteners are subject to loosening or turning out from thermal and structural movements, wind loads, or vibration.

2. Reinforce members as required to receive fastener threads.

B. Anchors: Three-way adjustable anchors with minimum adjustment of 1-inch that accommodate fabrication and installation tolerances in material and finish compatible with adjoining materials and recommended by manufacturer.

1. Concrete and Masonry Inserts: Hot-dip galvanized cast-iron, malleable-iron, or steel inserts complying with ASTM A123 or ASTM A153 requirements.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, nonstaining, nonbleeding flashing compatible with adjacent materials.

D. Bituminous Paint: Cold-applied, asphalt-mastic paint complying with SSPC-Paint 12 requirements except containing no asbestos; formulated for 30-mil thickness per coat.

E. Closure Trim: Continuous perimeter formed aluminum sheet metal closures with mitered corners. Seal as indicated on Drawings.

a. Aluminum: 0.050-inch thick (16 gauge).
b. Finish: Aluminum-framed entrance and storefronts manufacturer BLACK.

F. Subsills: Thermally broken extruded-aluminum subsills in configuration indicated on Drawings.

G. Interior Trim & Back Dams: Extruded-aluminum profiles in sizes, finish and configuration indicated on Drawings.

H. Panning Trim: Aluminum profiles in sizes, finish and configuration indicated on Drawings.

I. Engineered Transition Assembly (ETA): Not required.

J. Channel Sash: Not required.

2.8 FABRICATION

A. Form or extrude aluminum shapes before finishing.

B. Weld in concealed locations to greatest extent possible to minimize distortion or discoloration of finish. Remove weld spatter and welding oxides from exposed surfaces by descaling or grinding.

C. Framing Members, General: Fabricate components that, when assembled, have the following characteristics:

1. Profiles that are sharp, straight, and free of defects or deformations.
2. Accurately fitted joints with ends coped or mitered.
3. Means to drain water passing joints, condensation within framing members, and moisture migrating within the system to exterior.
4. Physical and thermal isolation of glazing from framing members.
5. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
6. Provisions for field replacement of glazing from interior.
7. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.

D. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.

E. Structural-Sealant-Glazed Framing Members: Include accommodations for using temporary support device to retain glazing in place while structural sealant cures.

F. Storefront Framing: Fabricate components for assembly using manufacturer’s standard installation instructions.

G. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.

1. At exterior doors, provide compression weather stripping at fixed stops.
2. At interior doors, provide silencers at stops to prevent metal-to-metal contact. Install three silencers on strike jamb of single-door frames and two silencers on head of frames for pairs of doors.

H. Entrance Doors: Reinforce doors as required for installing entrance door hardware.

1. At pairs of exterior doors, provide sliding-type weather stripping retained in adjustable strip and mortised into door edge.
2. At exterior doors, provide weather sweeps applied to door bottoms.

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

J. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

2.9 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M10C21A41, Architectural Class I.

1. Basis of Design - Factory Finish: Clear #14.
2. Thickness: 0.7 mils minimum.
3. Locations: Typical

B. High-Performance Organic Finish, Two-Coat PVDF: Fluoropolymer finish complying with AAMA 2605 and containing not less than 70 percent PVDF resin by weight in color coat.

1. Basis of Design - Factory Finish: Black – UC109846 (to be confirmed from full range of available finishes).
2. Thickness: 1.2 mils minimum.
3. Locations: Closure trim.

C. Hardware and Accessory Finishes: Match typical basis of design.

D. Finish designations that are prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.

PART 3 - EXECUTION

3.1 EXAMINATION

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

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

3.2 PREPARATION

A. Prepare surfaces that are in contact with structural sealant according to sealant manufacturer's written instructions to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

3.3 INSTALLATION, GENERAL

A. Comply with manufacturer's written instructions.

B. Do not install damaged components.

C. Fit joints to produce hairline joints free of burrs and distortion.

D. Rigidly secure non-movement joints.

E. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration.

F. Seal joints watertight unless otherwise indicated.

G. Install door hardware in accordance with Division 08, Section 087100.

H. Metal Protection:

1. Where aluminum will contact dissimilar metals, protect against galvanic action by painting contact surfaces with primer or applying sealant or tape, or by installing nonconductive spacers as recommended by manufacturer for this purpose.

2. Where aluminum will contact concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

I. Install components to drain water passing joints, condensation occurring within framing members, and moisture migrating within the system to exterior.

J. Set continuous sill members and flashing in full sealant bed as specified in Division 07 section "Joint Sealants" to produce weathertight installation.

K. Install components plumb and true in alignment with established lines and grades, and without warp or rack.

L. Install glazing as specified in Division 08 section "Glass and Glazing."

M. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.

2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

N. Install perimeter joint sealants as specified in Division 07 section "Joint Sealants" to produce weathertight installation.

3.4 INSTALLATION OF STRUCTURAL GLAZING

A. Prepare surfaces that will contact structural sealant in accordance with sealant manufacturer's written instructions, to ensure compatibility and adhesion. Preparation includes, but is not limited to, cleaning and priming surfaces.

B. Set glazing into framing in accordance with sealant manufacturer and framing manufacturer's written instructions and standard practice. Use a spacer or backer as recommended by manufacturer.

C. Set glazing with proper orientation so that coatings face exterior or interior as specified.

D. Hold glazing in place using temporary retainers of type and spacing recommended by manufacturer, until structural sealant joint has cured.

E. Apply structural sealant to completely fill cavity, in accordance with sealant manufacturer and framing manufacturer's written instructions and in compliance with local codes.

F. Apply structural sealant at temperatures indicated by sealant manufacturer for type of sealant.

G. Allow structural sealant to cure in accordance with manufacturer's written instructions.

H. Clean and protect glass as indicated in Division 08 section "Glazing."

3.5 ERECTION TOLERANCES

A. Install aluminum-framed systems to comply with the following maximum erection tolerances:

1. Plumb: 1/8-inch in 10-feet; 1/4-inch in 40-feet.
2. Level: 1/8-inch in 20-feet; 1/4-inch in 40-feet.
3. Alignment:
    a. Where surfaces abut in line or are separated by reveal or protruding element up to 1/2-inch wide, limit offset from true alignment to 1/16-inch.
    b. Where surfaces are separated by reveal or protruding element from 1/2- to 1-inch wide, limit offset from true alignment to 1/8-inch.
    c. Where surfaces meet at corners, limit offset from true alignment to 1/32-inch.
4. Location: Limit variation from plane to 1/8-inch in 12-feet; 1/2-inch over total length.
5. Diagonal: Limit difference between diagonal measurements to 1/8-inch.

3.6 ADJUSTING

A. Entrance Door Hardware: Adjust operating entrance door hardware to function smoothly as recommended by manufacturer.

1. For entrance doors accessible to people with disabilities, adjust closers to provide a 3-second closer sweep period for doors to move from a 70-degree open position to 3-inches from the latch, measured to the leading door edge.

3.7 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Field Quality-Control Testing: Perform the following test on representative areas of aluminum-framed entrances and storefronts.

1. Water-Spray Test: Before installation of interior finishes has begun, areas designated by Architect shall be tested according to AAMA 501.2 and shall not evidence water penetration.

a. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

2. Air Infiltration: ASTM E783 at 1.5 times the rate specified for laboratory testing in "Performance Requirements" Article but not more than 0.09 cfm/sq. ft. at a static-air-pressure differential of 1.57 lbf/sq. ft.

   a. Perform tests in each test area as directed by Architect. Perform at least three tests, prior to 10, 35, and 70 percent completion.

3. Water Penetration: ASTM E1105 at a minimum uniform static-air-pressure differential of 0.67 times the static-air-pressure differential specified for laboratory testing in "Performance Requirements" Article, but not less than 6.24 lbf/sq. ft., and shall not evidence water penetration.

C. Structural-Sealant Adhesion: Test structural sealant according to recommendations in ASTM C1401, Destructive Test Method A, "Hand Pull Tab (Destructive)," Appendix X2.

1. Test a minimum of two areas on each building facade.
2. Repair installation areas damaged by testing.

D. Aluminum-framed entrances and storefronts will be considered defective if they do not pass tests and inspections.

1. Prepare test and inspection reports.

END OF SECTION 084113

SECTION 08 71 00 – DOOR HARDWARE

PART 1 - GENERAL

1.01 SUMMARY

A. Section includes:

1. Mechanical and electrified door hardware
2. Electronic access control system components

B. Section excludes:

1. Windows
2. Cabinets (casework), including locks in cabinets
3. Signage
4. Overhead doors

C. Related Sections:

1. Division 01 "General Requirements" sections for Allowances, Alternates, Owner Furnished Contractor Installed, Project Management and Coordination.
2. Division 06 Section “Rough Carpentry”
3. Division 06 Section "Finish Carpentry”
4. Division 07 Section “Joint Sealants” for sealant requirements applicable to threshold installation specified in this section.
5. Division 08 Sections:
   a. "Metal Doors and Frames"
   b. "Interior Aluminum Doors and Frames"
   c. "Aluminum-Framed Entrances and Storefronts"
   d. "Entrances"
6. Division 26 “Electrical” sections for connections to electrical power system and for low-voltage wiring.
7. Division 28 “Electronic Safety and Security” sections for coordination with other components of electronic access control system and fire alarm system.

1.02 REFERENCES

A. UL, ULC

1. UL 305 - Panic Hardware

B. DHI - Door and Hardware Institute

1. Sequence and Format for the Hardware Schedule
2. Recommended Locations for Builders Hardware
3. Keying Systems and Nomenclature
4. Installation Guide for Doors and Hardware

C. NFPA – National Fire Protection Association

1. NFPA 70 – National Electric Code

2. NFPA 101 – Life Safety Code

D. ANSI - American National Standards Institute

1. ANSI A117.1 – 2017 Edition – Accessible and Usable Buildings and Facilities
2. ANSI/BHMA A156.1 - A156.29, and ANSI/BHMA A156.31 - Standards for Hardware and Specialties
3. ANSI/BHMA A156.28 - Recommended Practices for Keying Systems
4. ANSI/SDI A250.8 - Standard Steel Doors and Frames

1.03 SUBMITTALS

A. General:

1. Submit in accordance with Conditions of Contract and Division 01 Submittal Procedures.
2. Prior to forwarding submittal:
   a. Comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, “EXAMINATION” article, herein.
   b. Review drawings and Sections from related trades to verify compatibility with specified hardware.
   c. Highlight, encircle, or otherwise specifically identify on submittals: deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.

B. Action Submittals:

1. Product Data: Submit technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
   a. Wiring Diagrams: For power, signal, and control wiring and including:
      1) Details of interface of electrified door hardware and building safety and security systems.
      2) Schematic diagram of systems that interface with electrified door hardware.
      3) Point-to-point wiring.
      4) Risers.

3. Samples for Verification: If requested by Architect, submit production sample of requested door hardware unit in finish indicated and tagged with full description for coordination with schedule.
   a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.

4. Door Hardware Schedule:
   a. Submit concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work critical in Project construction schedule.
   b. Submit under direct supervision of a Door Hardware Institute (DHI) certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule published by DHI.
   c. Indicate complete designations of each item required for each opening, include:

1) Door Index: door number, heading number, and Architect's hardware set number.
2) Quantity, type, style, function, size, and finish of each hardware item.
3) Name and manufacturer of each item.
4) Fastenings and other pertinent information.
5) Location of each hardware set cross-referenced to indications on Drawings.
6) Explanation of all abbreviations, symbols, and codes contained in schedule.
7) Mounting locations for hardware.
8) Door and frame sizes and materials.
9) Degree of door swing and handing.
10) Operational Description of openings with electrified hardware covering egress, ingress (access), and fire/smoke alarm connections.

5. Key Schedule:
   a. After Keying Conference, provide keying schedule that includes levels of keying, explanations of key system's function, key symbols used, and door numbers controlled.
   b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
   c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
   d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
   e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion. Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
   f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.

C. Informational Submittals:

1. Provide Qualification Data for Supplier, Installer and Architectural Hardware Consultant.
2. Provide Product Data:
   a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
   b. Include warranties for specified door hardware.

D. Closeout Submittals:

1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
   a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
   b. Catalog pages for each product.
   c. Final approved hardware schedule edited to reflect conditions as installed.
   d. Final keying schedule
   e. Copy of warranties including appropriate reference numbers for manufacturers to identify project.
   f. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.

1.04 QUALITY ASSURANCE

A. Qualifications and Responsibilities:

1. Supplier: Recognized architectural hardware supplier with a minimum of 5 years documented experience supplying both mechanical and electromechanical door hardware similar in quantity, type, and quality to that indicated for this Project. Supplier to be recognized as a factory direct distributor by the manufacturer of the primary materials with a warehousing facility in the Project's vicinity. Supplier to have on staff, a certified Architectural Hardware Consultant (AHC) or Door Hardware Consultant (DHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
2. Installer: Qualified tradesperson skilled in the application of commercial grade hardware with experience installing door hardware similar in quantity, type, and quality as indicated for this Project.
3. Architectural Hardware Consultant: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
    a. For door hardware: DHI certified AHC or DHC.
    b. Can provide installation and technical data to Architect and other related subcontractors.
    c. Can inspect and verify components are in working order upon completion of installation.
    d. Capable of producing wiring diagram and coordinating installation of electrified hardware with Architect and electrical engineers.

4. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.

B. Certifications:

1. Electrified Door Hardware
    a. Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.

2. Accessibility Requirements:
    a. Comply with governing accessibility regulations cited in "REFERENCES" article 087100, 1.02.D3 herein for door hardware on doors in an accessible route. This project must comply with all Federal Americans with Disability Act regulations and all Local Accessibility Regulations.

C. Pre-Installation Meetings

1. Keying Conference
    a. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
        1) Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
        2) Preliminary key system schematic diagram.
        3) Requirements for key control system.
        4) Requirements for access control.
        5) Address for delivery of keys.

2. Pre-installation Conference
    a. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
    b. Inspect and discuss preparatory work performed by other trades.
    c. Inspect and discuss electrical roughing-in for electrified door hardware.
    d. Review sequence of operation for each type of electrified door hardware.

e. Review required testing, inspecting, and certifying procedures.
f. Review questions or concerns related to proper installation and adjustment of door hardware.

3. Electrified Hardware Coordination Conference:
   a. Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site. Promptly replace products damaged during shipping.

B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package. Deliver each article of hardware in manufacturer’s original packaging.

C. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.

D. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.

E. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.

1.06 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.

B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

D. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

1.07 WARRANTY

A. Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within published warranty period.

   1. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

2. Warranty Period: Beginning from date of Substantial Completion, for durations indicated in manufacturer's published listings.

    a. Mechanical Warranty
        1) Locks
            a) 10 years
        2) Exit Devices
            a) 10 years
        3) Closers
            a) 30 years
    b. Electrical Warranty
        1) Exit Devices
            a) 3 years

1.08 MAINTENANCE

A. Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

B. Turn over unused materials to Owner for maintenance purposes.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Approval of alternate manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category are only to be considered by official substitution request in accordance in section 01 25 00.

B. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.

C. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

2.02 MATERIALS

A. Fabrication

1. Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. provide screws according to manufacturer's recognized installation standards for application intended.
2. Finish exposed screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
3. Provide concealed fasteners wherever possible for hardware units exposed when door is closed. Coordinate with "Metal Doors and Frames", "Flush Wood Doors", "Stile and Rail Wood Doors" to ensure proper reinforcements. Advise the Architect where visible fasteners, such as thru bolts, are required.

B. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.

1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.

C. Cable and Connectors:

1. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with number and gage of wires enough to accommodate electric function of specified hardware.
2. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices.
3. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified continuous hinge, electrified pivot, and electric power transfer for connection to power supplies.

2.03 HINGES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Ives 5BB series

2. Acceptable Manufacturers and Products:
   a. Hager BB1191/1279 series
   b. Best FBB series

B. Requirements:

1. Provide hinges conforming to ANSI/BHMA A156.1.
2. Provide five knuckle, ball bearing hinges.
3. Provide hinge weights and sizes as specified in hardware sets.
4. Adjust hinge width for door, frame, and wall conditions to allow proper degree of opening.
5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
6. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   a. Steel Hinges: Steel pins
   b. Non-Ferrous Hinges: Stainless steel pins
   c. Out-Swinging Exterior Doors: Non-removable pins
   d. Out-Swinging Interior Lockable Doors: Non-removable pins
   e. Interior Non-lockable Doors: Non-rising pins

2.04 CONTINUOUS HINGES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Select
   b. ABH

B. Requirements:

1. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
2. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
3. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
4. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
5. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets.
6. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

2.05 ELECTRIC POWER TRANSFER

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Von Duprin EPT-10

2. Acceptable Manufacturers and Products:
   a. ABH PT1000
   b. Security Door Controls PTM

B. Requirements:

1. Provide power transfer with electrified options as scheduled in the hardware sets. Provide with number and gage of wires enough to accommodate electric function of specified hardware.
2. Locate electric power transfer per manufacturer’s template and UL requirements, unless interference with operation of door or other hardware items.

2.06 MORTISE LOCKS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage L9000 series

2. Acceptable Manufacturers and Products:
   a. Accurate 9000/9100 series
   b. Best 45H series

B. Requirements:

1. Provide mortise locks conforming to ANSI/BHMA A156.13 Series 1000, Grade 1, and UL Listed for 3-hour fire doors.
2. Provide locks manufactured from heavy gauge steel, containing components of steel with a zinc dichromate plating for corrosion resistance.
3. Provide lock case that is multi-function and field reversible for handing without opening case. Cylinders: Refer to “KEYING” article, herein.
4. Provide locks with standard 2-3/4 inches (70 mm) backset with full 3/4 inch (19 mm) throw stainless steel mechanical anti-friction latchbolt. Provide deadbolt with full 1-inch (25 mm) throw, constructed of stainless steel.
5. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
6. Lever Trim: Solid brass, bronze, or stainless steel, cast or forged in design specified, with wrought roses and external lever spring cages. Provide thru-bolted levers with 2-piece spindles.
   a. Lever Design: 07A.

2.07 EXIT DEVICES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Von Duprin 98 series

2. Acceptable Manufacturers and Products:
   a. Detex Advantex series
   b. Sargent 19-43-GL-80 series

B. Requirements:

1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
2. Cylinders: Refer to “KEYING” article, herein.
3. Provide smooth touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
6. Provide exit devices with weather resistant components that can withstand harsh conditions of various climates and corrosive cleaners used in outdoor pool environments.
7. Provide flush end caps for exit devices.
8. Provide exit devices with manufacturer’s approved strikes.

9. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
10. Mount mechanism case flush on face of doors or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
11. Provide cylinder dogging as specified at non fire-rated openings.
12. Provide electrified options as scheduled.
13. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.

2.08 POWER SUPPLIES

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. Schlage/Von Duprin PS900 Series

2. Acceptable Manufacturers and Products:
   a. Dynalock 5000 series
   b. Security Door Controls 600 series

B. Requirements:

1. Provide power supplies approved by manufacturer of supplied electrified hardware.
2. Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
4. Provide power supplies with the following features:
   a. 12/24 VDC Output, field selectable.
   b. Class 2 Rated power limited output.
   c. Universal 120-240 VAC input.
   d. Low voltage DC, regulated and filtered.
   e. Polarized connector for distribution boards.
   f. Fused primary input.
   g. AC input and DC output monitoring circuit w/LED indicators.
   h. Cover mounted AC Input indication.
   i. Tested and certified to meet UL294.
   j. NEMA 1 enclosure.
   k. Hinged cover w/lock down screws.
   l. High voltage protective cover.

2.09 CYLINDERS

A. Manufacturers:

1. Scheduled Manufacturer and Product:
   a. Best

2. Acceptable Manufacturers and Products:
   a. No Substitute

B. Requirements:

1. Provide cylinders for locking devices, whether called out in hardware sets or not.
2. Provide small format interchangeable cylinders/cores (SFIC) to match Owner's existing Best key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.

2.10 KEYING

A. Scheduled System:

1. Existing factory registered system:
   a. Provide cylinders/cores keyed into Owner's existing factory registered keying system. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.

B. Requirements:

1. Construction Keying:
   a. Replaceable Construction Cores.
      1) Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
         a) 3 construction control keys
         b) 6 construction change (day) keys.
      2) Owner or Owner's Representative will replace temporary construction cores with permanent cores.

2. Permanent Keying:
   a. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
      1) Master Keying system as directed by the Owner.
   b. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
   c. Provide keys with the following features:
      1) Material: Nickel silver; minimum thickness of .107-inch (2.3mm)
      2) Patent Protection: Keys and blanks protected by one or more utility patent(s).
   d. Identification:
      1) Mark permanent cylinders/cores and keys with applicable blind code for identification. Do not provide blind code marks with actual key cuts.
      2) Identification stamping provisions must be approved by the Architect and Owner.
      3) Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.
      4) Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
      5) Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
   e. Quantity: Furnish in the following quantities.
      1) Change (Day) Keys: 3 per cylinder/core.
      2) Permanent Control Keys: 3.
      3) Master Keys: 6.

2.11 DOOR CLOSERS

A. Manufacturers and Products:

1. Scheduled Manufacturer and Product:
   a. LCN 4040XP series

2. Acceptable Manufacturers and Products:
   a. Corbin-Russwin DC8000 series
   b. Sargent 281 series

B. Requirements:

1. Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. ISO 9000 certify closers. Stamp units with date of manufacture code.
2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
3. Cylinder Body: 1-1/2-inch (38 mm) diameter piston with 5/8-inch (16 mm) diameter double heat-treated pinion journal. QR code with a direct link to maintenance instructions.
4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards. Provide snap-on cover clip, with plastic covers, that secures cover to spring tube.
6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck. Provide graphically labelled instructions on the closer body adjacent to each adjustment valve. Provide positive stop on reg valve that prevents reg screw from being backed out.
7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers.
8. Pressure Relief Valve (PRV) Technology: Not permitted.
9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI Standard A156.4 and ASTM B117, and has special rust inhibitor (SRI).
10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.
11. Provide closers capable of being upgraded by adding modular mechanical or electronic components in the field.

2.12 DOOR TRIM

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Burns

B. Requirements:

1. Provide push plates, push bars, pull plates, pulls, and hands-free reversible door pulls with diameter and length as scheduled.

2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

A. Manufacturers:

1. Scheduled Manufacturers:
   a. Glynn-Johnson

2. Acceptable Manufacturers:
   a. Rixson
   b. ABH

B. Requirements:

1. Provide overhead stop at any door where conditions do not allow for a wall stop or floor stop presents tripping hazard.
2. Provide friction type at doors without closer and positive type at doors with closer.

2.14 DOOR STOPS AND HOLDERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Trimco
   b. Burns

B. Provide door stops at each door leaf:

1. Provide wall stops wherever possible. Provide concave type where lockset has a push button or thumbturn.
2. Where a wall stop cannot be used, provide an overhead stop.
3. Where wall or overhead stop cannot be used, provide floor stop.
4. Provide roller bumper where doors open into each other and overhead stop cannot be used.

2.15 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Zero International

2. Acceptable Manufacturers:
   a. National Guard
   b. Reese

B. Seals and Gasketing: Provide continuous gasketing on exterior openings, to the head and jambs, forming a continuous seal between the door and the frame. Provide smoke, light, or sound gasketing on interior doors where indicated.

1. Provide self-tapping fasteners for aluminum extruded gasketing being applied to hollow metal frames.
   a. Provide non-corrosive fasteners for all exterior applications.
   b. Provide security fasteners where indicated.

C. Door Sweeps or Shoes: Where indicated, apply to the bottom of the door to close the gap between the door bottom and finished floor or saddle threshold.

D. Thresholds: Provide threshold units not less than 4 inches wide, formed to accommodate change in floor elevation where indicated, and fabricated to accommodate door hardware and fit door frames.

1. Provide thresholds conforming to ANSI/BHMA A156.21

2.16 SILENCERS

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Ives

2. Acceptable Manufacturers:
   a. Steelcraft
   b. Republic
   c. Trimco

B. Requirements:

1. Provide "push-in" type silencers for hollow metal or wood frames.
2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
3. Omit where gasketing is specified.

2.17 DOOR POSITION SWITCHES

A. Manufacturers:

1. Scheduled Manufacturer:
   a. Schlage

2. Acceptable Manufacturers:
   a. GE-Interlogix
   b. Sentrol

B. Requirements:

1. Provide recessed or surface mounted type door position switches as specified.
2. Coordinate door and frame preparations with door and frame suppliers. If switches are being used with magnetic locking device, provide minimum of 4 inches (102 mm) between switch and magnetic locking device.

2.18 FINISHES

A. Finish: Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Provide quality of finish, including thickness of plating or coating (if any), composition, hardness, and other qualities complying with manufacturer's standards, but in no case less than specified by referenced standards for the applicable units of hardware.

PART 3 - EXECUTION

3.01 EXAMINATION

A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance. Verify doors, frames, and walls have been properly reinforced for hardware installation.

B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.

C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.

D. Submit a list of deficiencies in writing and proceed with installation only after unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Where on-site modification of doors and frames is required:

1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
2. Field modify and prepare existing doors and frames for new hardware being installed.
3. When modifications are exposed to view, use concealed fasteners, when possible.
4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

3.03 INSTALLATION

A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.

1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
2. Custom Steel Doors and Frames: HMMA 831.
3. Installation Guide for Doors and Hardware: DHI TDH-007-20

B. Install door hardware in accordance with NFPA 80, NFPA 101 and provide post-install inspection, testing as specified in section 1.03.E unless otherwise required to comply with governing regulations.

C. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.

D. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.

E. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.

F. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

G. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.

H. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated.

I. Lock Cylinders:

1. Install construction cores to secure building and areas during construction period.
2. Replace construction cores with permanent cores as indicated in keying section.
3. Furnish permanent cores to Owner for installation.

J. Wiring: Coordinate with Division 26, ELECTRICAL and Division 28 ELECTRONIC SAFETY AND SECURITY sections for:

1. Conduit, junction boxes and wire pulls.
2. Connections to and from power supplies to electrified hardware.
3. Connections to fire/smoke alarm system and smoke evacuation system.
4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
5. Connections to panel interface modules, controllers, and gateways.
6. Testing and labeling wires with Architect's opening number.

K. Continuous Hinges: Re-locate the door and frame fire rating labels where they will remain visible so that the hinge does not cover the label once installed.

L. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.

M. Overhead Stops/Holders: Mount overhead stops/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.

N. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.

O. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

P. Stops: Do not mount floor stops where they may impede traffic or present tripping hazard.

Q. Door Bottoms and Sweeps: Apply to bottom of door, forming seal with threshold when door is closed.

3.04 ADJUSTING

A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

   1. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.

B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, examine and readjust each item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

3.05 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items per manufacturer’s instructions to restore proper function and finish.

C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

3.06 DOOR HARDWARE SCHEDULE

A. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier’s responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.

B. Discrepancies, conflicting hardware, and missing items are to be brought to the attention of the architect with corrections made prior to the bidding process. Omitted items not included in a hardware set should be scheduled with the appropriate additional hardware required for proper application.

C. Hardware items are referenced in the following hardware schedule. Refer to the above specifications for special features, options, cylinders/keying, and other requirements.

D. Hardware Sets:

HARDWARE GROUP NO. 1

Provide each CO door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR

CASED OPENING - NO HARDWARE REQUIRED.

HARDWARE GROUP NO. 2

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1 4.5 X 4.5 NRP	652	IVE
1	EA	STOREROOM LOCK	L9080BDC 07A	626	SCH
1	EA	PERM. CYLINDER CORE	AS REQUIRED	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE GROUP NO. 3

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-NL-OP-110MD-CON 24 VDC	626	VON
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
1	EA	PERM. CYLINDER CORE	AS REQUIRED	626	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	DOOR SWEEP	39A	A	ZER
2	EA	THRESHOLD	268A-224	A	ZER
1	EA	THRESHOLD	675A-NH	A	ZER
1	EA	WIRE HARNESS	CON-6W		SCH
1	EA	WIRE HARNESS	CON-XX-P LENGTH AS REQUIRED FOR USE WITH DOOR		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS KL900 120/240 VAC	LGR	SCE
1	SET	WIRING DIAGRAMS	DOOR ELEVATION AND POINT-TO-POINT		SCE
			CARD READER BY OTHERS		
			SEALS BY DOOR SUPPLIER		

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. AUTHORIZED ACCESS BY KEY OR VALID CREDENTIAL, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RETRACTS EXIT DEVICE LATCHBOLT, ALLOWING DOOR TO BE PULLED OPEN. IMMEDIATE EGRESS ALWAYS ALLOWED. DEPRESSING INSIDE PUSH RAIL SHUNTS DOOR POSITION SWITCH FOR REQUEST TO EXIT (REX).

HARDWARE GROUP NO. 4

Provide each SGL door(s) with the following:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	224XY EPT	628	IVE
1	EA	POWER TRANSFER	EPT10	689	VON
1	EA	ELEC PANIC HARDWARE	RX-LC-QEL-98-NL-OP-110MD-CON 24 VDC	626	VON
1	EA	SFIC RIM CYLINDER	80-116	626	SCH
1	EA	PERM. CYLINDER CORE	AS REQUIRED	626	BES
1	EA	90 DEG OFFSET PULL	8190EZHD 10" O	630-316	IVE
1	EA	OH STOP	100S	630	GLY
1	EA	SURFACE CLOSER	4040XP EDA	689	LCN
1	EA	DOOR SWEEP	39A	A	ZER
2	EA	THRESHOLD	268A-224	A	ZER
1	EA	THRESHOLD	675A-NH	A	ZER
1	EA	WIRE HARNESS	CON-6W		SCH
1	EA	WIRE HARNESS	CON-XX-P LENGTH AS REQUIRED FOR USE WITH DOOR		SCH
1	EA	DOOR CONTACT	679-05HM	BLK	SCE
1	EA	POWER SUPPLY	PS902 BBK 900-2RS KL900 120/240 VAC	LGR	SCE
1	SET	WIRING DIAGRAMS	DOOR ELEVATION AND POINT-TO-POINT		SCE
			CARD READER BY OTHERS		
			SEALS BY DOOR SUPPLIER		

OPERATIONAL DESCRIPTION: DOOR NORMALLY CLOSED AND LOCKED. AUTHORIZED ACCESS BY KEY OR VALID CREDENTIAL, WHICH SHUNTS DOOR POSITION SWITCH AND MOMENTARILY RETRACTS EXIT DEVICE LATCHBOLT, ALLOWING DOOR TO BE PULLED OPEN. IMMEDIATE EGRESS ALWAYS ALLOWED. DEPRESSING INSIDE PUSH RAIL SHUNTS DOOR POSITION SWITCH FOR REQUEST TO EXIT (REX).

END OF SECTION

SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Glass for exterior glazed storefront and entrances.
   2. Glazing sealants and accessories.
   3. Glazing blackout film at select locations.

B. Related Requirements:
   1. Division 00 section "Alternates" for description of bid alternates.
   2. Division 01 section "Summary" for mockup coordination and requirements.
   3. Division 08 section "Hollow Metal Doors and Frames" for side lites and transoms.
   4. Division 08 section “Flush Wood Doors” for lites in doors.
   5. Division 08 section "Aluminum Framed Entrances and Storefronts" for exterior insulated glazing units.
   6. Division 08 section "Door Hardware" for coordination of door-related scope.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.

B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C1036.

C. IBC: International Building Code.

D. Interspace: Space between lites of an insulating-glass unit.

1.4 COORDINATION

A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

1.5 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Glass Samples: For each type of the following products, 12-inches square.
   1. Safety / Tempered glass.
   2. Insulating glass units.

3. Laminated insulating glass units.

C. Glazing Accessory Samples: For sealants and colored spacers, in 12-inch lengths. Install sealant Samples between two strips of material representative in color of the adjoining framing system.

D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

E. Delegated-Design Submittal: For glass indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer in the State of Missouri, responsible for their preparation.

F. Structural Sealant Joint Design: Provide calculations for structural bite, deadload support, glueline thickness, shear, and other parameters. Affidavit that drawings, specifications, and design data provided by Architect have been reviewed and are approved as acceptable application of manufacturer's structural silicone sealant and comply with manufacturer's warranty requirements.

1. Shop Drawings: Show details of proposed sealant joints, indicating dimensions, materials, structural bite, glueline thickness, joint profile, and support framing.

G. Samples for Color Selection: For each joint sealant type.

1.6 INFORMATIONAL SUBMITTALS

A. Qualification Data: For Installer, manufacturers of insulating glass units with low-E coatings and sealant testing agency.

B. Product Certificates: For glass.

C. Product Test Reports: For coated glass, insulating glass, and glazing sealants, for tests performed by a qualified testing agency.

1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
2. Preconstruction field-adhesion test reports.
3. Field quality control adhesion test reports.

D. Preconstruction adhesion and compatibility test report.

E. Sample Warranties: For special warranties.

F. For Structural Glazing Sealants: Manufacturer's instructions for installation and quality control testing.

1.7 MOCKUPS

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

2. Coordinate with mockup requirements outlined in Division 01 section "Summary".

1.8 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved and certified by coated-glass manufacturer.

B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.

C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.

D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C1021 to conduct the testing indicated.

E. Mockups: As indicated under dedicated article within this specification.

F. Single Source Responsibility: Obtain from single source from single manufacturer for each glass type.

G. Single Source Responsibility: Provide glazing sealants by a single manufacturer responsible for testing of Project substrates to verify compatibility and adhesion of joint sealants.

H. Preinstallation Conference: Conduct conference at Project Site.

1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review temporary protection requirements for glazing during and after installation.

1.9 PRECONSTRUCTION TESTING

A. Preconstruction Adhesion and Compatibility Testing: Test each glass product, tape sealant, gasket, glazing accessory, and glass-framing member for adhesion to and compatibility with elastomeric glazing sealants.

1. Use ASTM C794 to determine whether priming and other specific joint-preparation techniques are required to obtain adhesion of glazing sealants to glass and glazing substrates.
2. Use ASTM C1087 to determine compatibility between the glazing sealants and gaskets, setting blocks and other glazing accessories.
3. Submit no fewer than four samples of each type of material, including joint substrates, shims, sealant backings, secondary seals, and miscellaneous materials.
4. Schedule enough time for testing and analyzing results to prevent delaying the Work.
5. For materials failing tests, submit sealant manufacturer's written instructions for corrective measures including the use of specially formulated primers.

B. Preconstruction Field-Adhesion Testing: Prior to installing joint sealants, field test adhesion to joint substrates using ASTM C1193 Method A or method recommended by manufacturer. Verify adhesion is adequate. Modify joint preparation recommendations for failed joints and re-test. Submit written report to Architect.

C. Mockups: Provide glazing sealant and weather barrier transition application within mockups required in other sections identical to specified sealants and installation methods.

1.10 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written instructions for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.11 FIELD CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or are below 40 deg F (4.4 deg C), whichever is lower.

B. Do not install silicone sealants when shop conditions exceed temperature range limits or other non-standard dust or dirt conditions exist.

1.12 WARRANTY

A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: Ten (10) years from date of Substantial Completion.

D. Special Installer's Warranty: Original statement on Installer's letterhead in which Installer agrees to repair or replace joint sealants that demonstrate deterioration or failure within warranty period specified.

1. Warranty Period: Two (2) years from date of Substantial Completion.

E. Special Manufacturer's Sealant Warranty: Manufacturer's standard form in which joint sealant manufacturer agrees to furnish joint sealants to repair or replace those that demonstrate deterioration or failure under normal use within warranty period specified.

1. Warranty Period for Silicone Sealants: Ten (10) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design - Manufacturer: Subject to compliance with requirements, provide products by **Viracon, Inc.** or an APPROVED comparable product by one of the following:

1. Cardinal Glass Industries.
2. Guardian Industries Corp.; SunGuard.
3. Oldcastle BuildingEnvelope™.
4. PPG Industries, Inc.
5. Viracon, Inc. (Basis of Design)

2.2 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.

B. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design glazing. Glass manufacturer shall perform stress analysis to determine the proper glass thickness and treatment required to resist the structural and thermal stresses for each glazing condition and application, including the following:

1. Verify that glass thicknesses and strengths (annealed or heat-treated) as scheduled are capable of meeting the performance criteria so the worst-case probability of failure does not exceed 8 lites per 1,000 for lites set vertically or not over 15 degrees off vertical and under wind action, and 1 lite per 1,000 for lites set over 15 degrees off vertical and under action of wind and snow.
2. Determine whether glass lites making up the exterior insulated glass units (IGU) with low emissivity coating require full tempering to resist the structural and thermal stresses for each glazing condition.
3. Should the stress analysis show that glass of greater strength or thickness is required over that scheduled, then all such changes shall be anticipated in the final installation. Contractor shall not be entitled to any claims for additional compensation for their failure to meet these requirements.

C. Structural Performance: Glazing shall withstand the following design loads within limits and under conditions indicated determined according to the IBC and ASTM E1300.

1. Design Wind Pressures: As indicated on Contract Documents.
   a. Wind Design Data: As indicated on Contract Documents.
2. Design Snow Loads: As indicated on Contract Documents.

3. Maximum Lateral Deflection: For glass supported on all four edges, limit center-of-glass deflection at design wind pressure to not more than 1/50 times the short-side length or 1-inch (25 mm), whichever is less.
4. Differential Shading: Design glass to resist thermal stresses induced by differential shading within individual glass lites.

D. Safety Glazing: Where safety glazing is required, provide glazing that complies with 16 CFR 1201, Category II.

1. Contractor shall provide safety glazing as required by code, for applicable glazing types indicated.

E. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data, based on procedures indicated below:

1. For monolithic-glass lites, properties are based on units with lites of thickness indicated.
2. For laminated-glass lites, properties are based on products of construction indicated.
3. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.
4. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F (W/sq. m x K).
5. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.
6. Visible Reflectance: Center-of-glazing values, according to NFRC 300.

F. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components. Base engineering calculation on surface temperatures of material due to both solar heat gain and nighttime sky heat loss.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

2.3 GLASS PRODUCTS, GENERAL

A. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below unless more stringent requirements are indicated. See these publications for glazing terms not otherwise defined in this Section or in referenced standards.

1. GANA Publications: "Laminated Glazing Reference Manual" and "Glazing Manual."
2. AAMA Publications: AAMA GDSG-1, "Glass Design for Sloped Glazing," and AAMA TIR A7, "Sloped Glazing Guidelines."
3. IGMA Publication for Sloped Glazing: IGMA TB-3001, "Guidelines for Sloped Glazing."
4. IGMA Publication for Insulating Glass: SIGMA TM-3000, "North American Glazing Guidelines for Sealed Insulating Glass Units for Commercial and Residential Use."

B. Safety Glazing Labeling: Where safety glazing is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
1. Contractor shall provide safety glazing as required by code, for applicable glazing types indicated.

C. Fire-Protection Rated Glazing Labeling: Not required.

D. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

E. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass that complies with performance requirements and is not less than the thickness indicated.

1. Minimum Glass Thickness for Exterior Lites: 6 mm or as indicated.

F. Strength: Where annealed float glass is indicated, provide annealed float glass, heat-strengthened float glass, or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where heat-strengthened float glass is indicated, provide heat-strengthened float glass or fully tempered float glass as needed to comply with "Performance Requirements" Article. Where fully tempered float glass is indicated, provide fully tempered float glass.

2.4 GLASS PRODUCTS

A. Clear Annealed Float Glass: ASTM C1036, Type I, Transparent glass flat, Class 1 (clear), Quality-Q3 unless otherwise indicated;

B. Heat Treated Float Glass: ASTM C1048; Type I; Quality Q3, Class I unless otherwise indicated; of kind and condition indicated.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.
2. For uncoated glass, comply with requirements for condition A.
3. For coated vision glass, comply with requirements for condition C (other coated glass).

C. Fully Tempered Float Glass: ASTM C1048, Kind FT (fully tempered), Condition A (uncoated) or Condition C (coated) unless otherwise indicated, Type I, Class 1 (clear) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

D. Heat-Strengthened Float Glass: ASTM C1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.

1. Fabrication Process: By horizontal (roller-hearth) process with roll-wave distortion parallel to bottom edge of glass as installed unless otherwise indicated.

E. Low E Glass: Float type, heat strengthened, tempered, clear, as scheduled.

1. Coating shall be located as indicated in the glass schedule.

F. Ceramic-Coated Vision Glass: ASTM C1048, Condition C, Type I, Class 1 (clear) unless otherwise indicated, Quality-Q3; and complying with Specification No. 95-1-31 in GANA's "Engineering Standards Manual."

G. Ceramic-Coated Spandrel Glass: ASTM C1048, Type I, Condition B, Quality-Q3.

2.5 LAMINATED GLASS

A. Laminated Glass: Not required.

2.6 INSULATING GLASS

A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a dehydrated interspace, qualified according to ASTM E2190. Minimum requirements follow:

1. Outer 1/4-inch (6mm) thick and inner 1/4-inch (6mm) thick pane as scheduled.
2. Total unit thickness of 1-inch (25.2mm) unless otherwise indicated.
3. Shall comply with ASTM E546 Standard test method for frost point of sealed insulation glass units.
4. Shall comply with ASTM E576 Standard test method for frost point of sealed insulating glass units in the vertical position.
5. Sealed insulating units to be double sealed with a primary seal of polyisobutylene and a secondary seal of silicone (black unless otherwise indicated).
    a. Minimum thickness shall be 1/16-inch.
    b. Target width of primary seal shall be 5/32-inch.
    c. There shall be no voids or skips in the primary seal.
6. To provide a hermetically sealed and dehydrated space, lites shall be separated by a spacer with bent corners and straight butyl injected zinc plated steel straight key joints.
7. Spacer: Aluminum with black or mill finish as indicated in schedule.

2.7 INSULATING GLASS SCHEDULE

A. Glass Type **GL-1**: Low-E Coated, Low-Iron Insulating Glass Units.

1. Basis of Design Product: **Viracon VRE24-543**.
2. Overall Unit Thickness: 1-inch (25.2 mm).
3. Minimum Thickness of Each Glass Lite: 1/4-inch (6 mm).
4. Outdoor Lite: Low-E coated, fully-tempered glass – 100% heat soak.
5. Interspace Content: Argon-filled.
6. Coating: VRE-54 Surface #2
7. Indoor Lite: Fully-tempered glass – 100% heat soak.
8. Winter Nighttime U-Factor: 0.30 maximum.
9. Summer Daytime U-Factor: 0.27 maximum.
10. SHGC: 0.33 maximum.
11. VLT: 50%
12. Safety glazing as required by code.
13. Black finish spacer with black sealant.

B. Glass Type **GL-2**: Low-E Coated, Low-Iron Insulating Glass Units with Privacy Film.

1. Basis of Design Product: Match GL-1
2. Privacy Film: 3M White Blackout Privacy Film at locations indicated as GL-2 on Drawings.
    a. Size: 60in nominal (roll width).

C. Building Envelope Fenestration - For Reference Only: *0.34 U-Value & 0.36 SHGC 2024 IECC minimum requirement Table C402.5.*

2.8 INSULATING LAMINATED GLASS SCHEDULE

A. Glass Type: Not required.

2.9 INTERIOR MONOLITHIC GLASS SCHEDULE

A. Glass Type: Not required.

2.10 INTERIOR LAMINATED GLASS SCHEDULE

A. Glass Type: Not required.

2.11 STRUCTURAL GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.

B. Standard Compliance:

1. Joint Sealants: Comply with ASTM C920 and other specified requirements for each liquid-applied joint sealant.
2. Structural Glazing Sealants: Comply with ASTM C1184 and other specified requirements for each liquid-applied structural glazing sealant where indicated.

C. Two-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C920, Type M, Grade NS, Class 25, Use NT; ASTM C1184, Type M, Use NT.

2.12 GLAZING SEALANTS

A. General:

1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.

B. Stain Test Characteristics: Where sealants are required to be nonstaining, provide sealants tested per ASTM C1248 as non-staining on porous joint substrates indicated for Project.

1. Colors of Exposed Glazing Sealants as selected by Architect from manufacturer's full range.

C. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C920, Type S, Grade NS, Class 50, Use NT.

2.13 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tapes: Preformed, butyl-based, 100 percent solids elastomeric tape; nonstaining and nonmigrating in contact with nonporous surfaces; with or without spacer

rod as recommended in writing by tape and glass manufacturers for application indicated; and complying with ASTM C1281 and AAMA 800 for products indicated below:

1. AAMA 806.3 tape, for glazing applications in which tape is subject to continuous pressure.
2. AAMA 807.3 tape, for glazing applications in which tape is not subject to continuous pressure.

B. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:

1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

2.14 GLAZING GASKETS

A. Dense compression gaskets: Molded or extruded gaskets of profile and hardness required to maintain watertight seal, made from one of the following:

1. Neoprene complying with ASTM C864.
2. EPDM complying with ASTM C864.
3. Silicone complying with ASTM C1115 (required when in contact w/silicone).
4. Thermoplastic polyolefin rubber complying with ASTM C1115.

2.15 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, with requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Inorganic type material with a Shore, Type A durometer hardness of 85, plus or minus 5.

1. Acceptable materials include silicone, alcryn, polyurethane foam tape, and vinyl extrusions.
2. Test setting blocks and spacers for compatibility prior to installation.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

1. Acceptable materials include silicone, alcryn, polyurethane foam tape, and vinyl extrusions.
2. Test setting blocks and spacers for compatibility prior to installation.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

2.16 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product

manufacturer and referenced glazing publications, to comply with system performance requirements.

1. Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
    a. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:

1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
2. Presence and functioning of weep systems.
3. Minimum required face and edge clearances.
4. Effective sealing between joints of glass-framing members.
5. Verify surfaces to receive glazing are flat and smooth without slots, serrations, and other irregularities.
6. Verify aluminum framing has alodine, anodized, fluorocarbon paint, polyester powder coat finish, or other acceptable finish or material.

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

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings not firmly bonded to substrates.

B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that exterior and interior surfaces are readily identifiable. Do not use materials that leave visible marks in the completed Work.

C. Structural Silicone Joint Design: Install sealant in joint design configuration recommended by manufacturer and as follows:

1. Glueline thickness: 1/4-inch (6 mm) minimum and not to exceed 1/2-inch (13 mm).
2. Structural Bite: 1/4-inch (6 mm) minimum and equal to or greater than glueline thickness.
3. Bite-to-Glueline Ratio: 3:1 or less.
4. Design and fill joint using manufacturer's recommended sealant application procedures.

3.3 GLAZING, GENERAL

A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.

C. Joint Surface Cleaning: Clean joints prior to installing joint sealants using materials and methods recommended by sealant manufacturer.

1. Remove laitance, form-release agents, dust, and other contaminants.
2. Clean porous and nonporous surfaces utilizing chemical cleaners acceptable to sealant manufacturer.

D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.

E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.

F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.

G. Provide spacers for glass lites where length plus width is larger than 50-inches (1270 mm).

1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that have demonstrated ability to maintain required face clearances and to comply with system performance requirements.
2. Provide 1/8-inch (3-mm) minimum bite of spacers on glass and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.

J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.

K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 TAPE GLAZING

A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.

B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.

C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.

E. Do not remove release paper from tape until right before each glazing unit is installed.

F. Apply heel bead of elastomeric sealant where indicated.

G. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.

H. Apply cap bead of elastomeric sealant over exposed edge of tape where indicated.

3.5 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks, and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.6 SEALANT GLAZING (WET)

A. Masking: Mask adjacent surfaces to prevent staining or damage by contact with sealant or primer.

B. Joint Priming: Prime joint substrates when recommended by sealant manufacturer or when indicated by preconstruction testing or experience. Apply recommended primer using sealant manufacturer's recommended application techniques.

C. Joint Backing: Select joint backing materials recommended by sealant manufacturer to be compatible with sealant material. Install backing material at depth required to produce profile of joint sealant allowing optimal sealant movement. Install without gaps, twisting, stretching, or puncturing backing material. Use gage to ensure uniform depth to achieve correct profile, coverage, and performance.

1. Install bond breaker tape over substrates when sealant backings are not used.

D. Spacers and Setting Blocks: Install as indicated on drawings and reviewed shop drawings. Ensure joint openings and recesses are accurately sized.

E. Temporary Glass Support: Use temporary fasteners, clips, two-sided adhesive, and other means to retain glass panels while sealant is applied and allowed to cure as approved by the design professional.

F. Sealant Application: Install sealants using methods recommended by sealant manufacturer, in depths between 1/4- and 1/2-inch (6 and 13 mm) unless otherwise recommended for application. Apply in continuous operation from bottom to top of joint vertically and horizontally in a single direction. Apply using adequate pressure to fill and seal joint width.

1. Complete horizontal joints prior to vertical joints. Lap vertical sealant over horizontal joints.
2. Use sealant-dispensing equipment to push sealant bead into opening. Fill joint opening to full and proper configuration. Apply in continuous operation. Ensure sealant fills entire joint and firmly contacts all surfaces.
3. Tool sealants immediately with appropriately shaped tool to force sealants against joint backing and joint substrates, eliminating voids and ensuring full contact.
    a. Provide concave, smooth, uniform, sealant finish. Eliminate air pockets and ensure complete contact on both sides of joint opening.
    b. Tool joints with one continuous stroke.

G. Cleaning: Remove excess sealant using materials and methods approved by sealant manufacturer that will not damage joint substrate materials.

1. Remove masking tape immediately after tooling joint without disturbing seal.
2. Remove excess sealant from surfaces while still uncured.

H. Allow sealant to fully cure before adhesive is stressed. Use test specimens formed at time of sealant application to verify curing time. When cured, remove temporary glass supports.

I. Ensure installed sealant is not painted as part of other construction operations.

3.7 STRUCTURAL GLAZING

A. Install glazing tape as detailed, maintaining proper bond line for silicone adhesive, install tape with tight butt joints; no overlaps. Position glass uniformly sealing against tape. Mask adjoining surfaces as required to maintain a clean and neat appearance.

B. Apply specified silicone adhesive on both sides, between mullion and glass, completely filling cavity; tool joint with light pressure before a skin begins to form; tool adhesive to form straight surface with edge of glass.

C. Concealed assemblies: On back side, install sealant backer rod and apply specified silicone adhesive. Apply silicone adhesive with sufficient pressure to expel all air and provide a solid continuous bead. Tool joint immediately in one continuous stroke, leaving a slightly concave surface.

D. Structural sealant compatibility and adhesion: Structural sealant shall be tested according to recommendations in ASTM C1401.

3.8 CLEANING AND PROTECTION

A. Immediately after installation remove nonpermanent labels and clean surfaces.

B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.

1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.

C. Remove and replace glass that is damaged during construction period.

D. Wash glass on both exposed surfaces not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000

SECTION 092216 - NON-LOAD-BEARING METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum board ceilings and soffits.
3. Delegated Design Requirements: Minimum wall and ceiling steel framing size, height and material thickness requirements shall comply with SSMA (Steel Stud Manufacturers Association) limitations for height and gauge for walls, partitions, and ceilings indicated.

    a. Deflection Criteria: L/240.

B. Related Requirements:

1. Division 01 section "Summary" for mockup coordination and requirements.
2. Division 07 section "Thermal Insulation".
3. Division 09 section "Gypsum Board Assemblies".

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product and accessory.

B. Qualification Data for Engineering Professional: Required.

C. Delegated Design Submittal: Required.

1.4 INFORMATIONAL SUBMITTALS

A. Product Certificates: For each type of code-compliance certification for studs and tracks.

1.5 QUALITY ASSURANCE

A. Code-Compliance Certification of Studs and Tracks: Provide documentation that framing members are certified according to the product-certification program of the Certified Steel Stud Association, the Steel Framing Industry Association, or the Steel Stud Manufacturers Association.

1.6 PERFORMANCE REQUIREMENTS

A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: Not Applicable.

C. Delegated Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Box-in-Box Framing: Not required.
2. Barrier Ceilings: Not required.

D. Horizontal Deflection: For wall assemblies, limited to 1/240 of the wall height based on horizontal loading of 7.5 lbf/sq. ft.

PART 2 - PRODUCTS

2.1 NON-LOAD-BEARING STEEL FRAMING, GENERAL

A. Framing Members, General: Comply with ASTM C754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C645 requirements for metal, unless otherwise indicated.
2. Structural performance of steel stud assemblies: American Iron and Steel Institute AISI "Specification for the Design of Cold Formed Steel Structural Members," and by authorities having jurisdiction whichever is more restrictive.
3. Minimum steel stud framing size, height and material thickness requirements: Design and provide steel framing to comply with SSMA (Steel Stud Manufacturers Association) limitations for height and gauge for wall heights indicated.
    a. Deflection Criteria: L/240.
    b. Assemblies for wall exceeding height limitations for single studs shall be spliced and braced back to structure to provide an overall deflection limit of L/240 in all cases.
    c. 20 gauge (0.0329-inch) or heavier studs shall be used adjacent to all interior door frames, and at walls to receive ceramic tile finish.
    d. 18 gauge (0.0428-inch) or heavier studs shall be used at partition heights over 16-feet.
4. Protective Coating: Coating with equivalent corrosion resistance of ASTM A653 hot-dip galvanized, unless otherwise indicated.

B. At Contractor's Option; The following product may be used for framing members for non-load bearing partitions:

1. Dietrich UltraSTEEL® Framing
2. Protective Coating: G40 or equivalent per ASTM A1003.
3. Manufacturer to provide equivalent performing studs to meet span and gauge tables specified herein, and as needed to meet loading required.

2.2 SUSPENSION SYSTEM COMPONENTS

A. Tie Wire: ASTM A 641, Class 1 zinc coating, soft temper, 0.0625-inch- diameter wire, or double strand of 0.0475-inch- diameter wire.

B. Hanger Attachments to Concrete:

1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E488 by an independent testing agency.

    a. Type: Post-installed, expansion anchor.

2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E1190 by an independent testing agency.

C. Wire Hangers: ASTM A641, Class 1 zinc coating, soft temper, 0.162-inch diameter.

D. Carrying Channels: Cold-rolled, commercial-steel sheet with a base-metal thickness of 0.0538-inch and minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.

E. Furring Channels:

1. Cold-Rolled Channels: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges, 3/4-inch-deep.

2. Steel Studs: ASTM C645.

    a. Minimum Base-Metal Thickness: 0.0296-inch
    b. Depth: As indicated on Drawings, or where not indicated, minimum 4-inch nominal.

3. Hat-Shaped, Rigid Furring Channels: ASTM C645, 7/8-inch-deep and 1-1/2 inch deep.

    a. Minimum Base Metal Thickness: 0.0296-inch.

4. Resilient Furring Channels: Not required.

F. Grid Suspension System for Ceilings (Option): ASTM C645, direct-hung system composed of main beams and cross-furring members that interlock.

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

    a. Armstrong World Industries, Inc.; Drywall Grid Systems.
    b. Chicago Metallic Corporation; 640-C and Fire Front 650-C Drywall Furring System.
    c. USG Corporation; Drywall Suspension System.

2.3 STEEL FRAMING FOR FRAMED ASSEMBLIES

A. Steel Studs and Runners: ASTM C645.

1. Minimum Base-Metal Thickness: 0.0296-inch

    a. Minimum thickness for spliced/braced assemblies: 0.538-inch.

2. Depth: As indicated on Drawings

3. Deflection Criteria: L/240 under a lateral load of 7.5 lbf/sq. ft.
4. Other: Reference ‘General’ article for other minimum thickness requirements.

B. Slip-Type Head Joints: Where indicated, provide the following:

1. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.

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

1) Steel Network Inc. (The); VertiClip SLD Series.
2) Superior Metal Trim; Superior Flex Track System (SFT).

C. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.

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

a. Fire Trak Corp.; Fire Trak attached to studs with Fire Trak Slip Clip.
b. Metal-Lite, Inc.; The System.

D. Cold-Rolled Channel Bridging: 0.0538-inch bare-steel thickness, with minimum 1/2-inch-wide flanges.

1. Depth: 1-1/2 inches.
2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.

E. Hat-Shaped, Rigid Furring Channels: ASTM C645.

1. Minimum Base Metal Thickness: 0.0296-inch.
2. Depth: 7/8-inch and 1-1/2 inch.

F. Resilient Furring Channels: Not required.

G. (Non-acoustical assemblies) Z-Shaped Furring: With slotted or non-slotted web, face flange of 1-1/4 inches, wall attachment flange of 7/8-inch, minimum bare-metal thickness of 0.0179-inch, and depth required to fit insulation thickness indicated.

2.4 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards.

1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates.

B. Isolation Strip at Exterior Walls: Provide one of the following:

1. Asphalt-Saturated Organic Felt: ASTM D226, Type I (No. 15 asphalt felt), nonperforated.
2. Foam Gasket: Adhesive-backed, closed-cell vinyl foam strips that allow fastener penetration without foam displacement, 1/8-inch thick, in width to suit steel stud size.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames, cast-in anchors, and structural framing, for compliance with requirements and other conditions affecting performance.

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

3.2 PREPARATION

A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.

1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.

B. Coordination with Sprayed Fire-Resistive Materials: Not required.

3.3 INSTALLATION, GENERAL

A. Installation Standard: ASTM C754, except comply with framing sizes and spacing indicated.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C840 that apply to framing installation.

B. Install supplementary framing, and blocking to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction.

C. Install bracing at terminations in assemblies.

D. Do not bridge building control and expansion joints with non-load-bearing steel framing members. Frame both sides of joints independently.

3.4 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components in sizes and spacings indicated on Drawings, but not less than those required by referenced installation standards for assembly types and other assembly components indicated.

B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.

C. Suspend hangers from building structure as follows:

1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.

a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.

2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.

3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.

4. Do not attach hangers to steel roof deck.

5. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.

6. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.

7. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.

E. Seismic Bracing: Sway-brace suspension systems with hangers used for support.

F. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.

G. Installation Tolerances: Install suspension systems that are level to within 1/8-inch in 12-feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

3.5 INSTALLING FRAMED ASSEMBLIES

A. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

B. Install studs so flanges within framing system point in same direction.

1. Space studs as follows:

a. Single-Layer Application: 16-inches on center, unless otherwise indicated or as determined by delegated design.

b. Multilayer Application: 16-inches on center, unless otherwise indicated or as determined by delegated design.

c. Tile backing panels: 16-inches on center, unless otherwise indicated.

C. Install tracks (runners) at floors and overhead supports. Extend framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing around ducts penetrating partitions above ceiling.

1. Slip-Type Head Joints: Where framing extends to overhead structural supports, install to produce joints at tops of framing systems that prevent axial loading of finished assemblies.

2. Door Openings: Screw vertical studs at jambs to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.

a. Install two studs at each jamb, unless otherwise indicated.

b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.

c. Extend jamb studs through suspended ceilings and attach to underside of overhead structure.

3. Other Framed Openings: Frame openings other than door openings the same as required for door openings, unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.

4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.

a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.

5. Acoustic Partitions: Install framing to comply with sound-rated assembly indicated.

6. Curved (and Shaped) Partitions: Not required.

D. Direct Furring:

1. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24-inches on center.

E. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8-inch from the plane formed by faces of adjacent framing.

END OF SECTION 092216

SECTION 092900 - GYPSUM BOARD ASSEMBLIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Interior gypsum board systems for standard, acoustical, and fire rated applications.
2. Exterior gypsum board systems for ceilings and soffits.
3. Sound attenuation insulation for gypsum assemblies.

B. Related Requirements:

1. Division 01 section "Summary" for mockup coordination and requirements.
2. Division 06 section "Rough Carpentry" for plywood backing panels.
3. Division 06 Section "Interior Architectural Woodwork" for coordination of wall-mounted, heavy duty support brackets (including concealed brackets).
4. Division 07 section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
5. Division 07 section "Firestopping" for head-of-wall conditions and penetrations in rated gypsum board assemblies.
6. Division 07 section "Joint Sealants" for materials related to non-acoustic control joints in gypsum board assemblies.
7. Division 09 section "Painting" for primers and paint finishes applied to gypsum board surfaces.

1.3 SUBMITTALS

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

B. Shop Drawings: Elevations, reflected ceiling plans and typical details indicating location and type of all control joints.

C. Samples: For the following products:

1. Trim Accessories: Full-size Sample in 12-inch-long length for each trim accessory indicated.

1.4 MOCKUPS

A. Mockups: Build mockups to demonstrate aesthetic effects and to set quality standards for materials and execution.

1. Build mockups for the following:

a. Each level of gypsum board finish indicated for use in exposed locations.

2. Apply or install final finish indicated, including painting, wallcoverings, and/or wood panels on exposed surfaces for review of mockups.

3. Simulate finished lighting conditions for review of mockups.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 QUALITY ASSURANCE

A. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

B. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the same manufacturer that supplies gypsum board and products or from a manufacturer acceptable to gypsum board manufacturer.

C. Vapor Barrier Inspection: Where separate vapor barriers or faced batts are specified, a special inspection of the vapor barrier shall be performed prior to the installation of any gypsum board or other finishes that would conceal the vapor barrier materials. The cost of inspection shall be borne by the Contractor.

1. The inspection of the vapor barrier shall review the following:

   a. Visually inspect the membrane for correct lapping of seams, sealing and taping of joints, sealing of penetrations, flashing overlap at window and door openings, and overall vapor barrier coverage.

   b. Visually inspect the membrane for punctures, tears, or loose seams.

   c. Confirm the membrane is continuous and extends with overlap to all wall plane edges.

2. Vapor barriers shall be repaired or replaced to achieve a continuous, fully sealed membrane. Repairs shall conform to vapor barrier manufacturer's recommended materials and methods. Repaired areas shall be re-inspected prior to enclosure.

3. Repeat inspections shall be scheduled as needed to review all vapor barrier installations prior to enclosure. Inspector shall file a written report of observations and any repair procedures, in accordance with Division 01.

D. Mockups: As indicated under dedicated article within this specification.

1.6 COORDINATION

A. Coordinate provision of cement backer board with Division 06 section Sheathing.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in original packages, containers, or bundles bearing brand name and identification of manufacturer or supplier.

B. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E119 by an independent testing agency.

B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E90 and classified according to ASTM E413 by an independent testing agency.

2.2 GYPSUM BOARD, GENERAL

A. Size: Provide maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.3 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C36 or ASTM C1396, as applicable to type of gypsum board indicated and whichever is more stringent.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American Gypsum.
b. CertainTeed Corporation.
c. Continental Building Products, LLC.
d. Georgia-Pacific Building Products.
e. National Gypsum Company.
f. PABCO Gypsum.
g. Temple-Inland Building Products by Georgia-Pacific.
h. United States Gypsum Company.

B. Type X:

1. Thickness: For use throughout and as required by fire-resistance-rated assembly in single and multiple layer applications indicated on Drawings.
2. Long Edges: Tapered.

C. Flexible Gypsum Board: ASTM C1396. Manufactured to bend to fit radii and to be more flexible than standard regular-type gypsum board of same thickness.

1. Thickness: 1/4-inch.
2. Long Edges: Tapered.

D. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.

1. Thickness: 5/8-inch, regular core except Type X as required by fire-resistance-rated assembly indicated on Drawings.
2. Long Edges: Tapered.

E. Abuse-Resistant Gypsum Board: ASTM C1396 gypsum board, tested according to ASTM C1629 / C1629M.

1. Thickness: 5/8-inch, regular core except Type X as required by fire-resistance-rated assembly indicated on Drawings.
2. Surface Abrasion: ASTM C1629, meets or exceeds Level 3 requirements.
3. Indentation: ASTM C1629, meets or exceeds Level 1 requirements.
4. Soft-Body Impact: ASTM C1629, meets or exceeds Level 2 requirements.
5. Long Edges: Tapered.
6. Mold Resistance: ASTM D3273, score of 10 as rated according to ASTM D3274.
7. Locations: Reference Drawings and drawing sheet A600 ‘General Notes: Partitions’ including but not limited to the following:

    a. Stairs.
    b. Ramps.

F. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8-inch, Type X.
2. Long Edges: Tapered.
3. Acceptable products: Equivalent to Sheetrock® brand Mold Tough™ Firecode (Type X) by USG Corporation.
4. Locations: Reference Drawings and drawing sheet A600 ‘General Notes: Partitions’ including but not limited to the following:

    a. Toilet Rooms (where not cement board).
    b. Janitor Closets.

G. Cementitious Backer Units: ANSI A118.9.

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

    a. USG Corporation; DUROCK Cement Board.

2. Thickness: As indicated on Drawings, with minimum 5/8-inch.
3. Waterproof membrane ANSI A-2.1.8: At vertical face of studs behind backer board: 6 mil polyethylene sheet or 15 lb roofing felt to act as water resistant membrane when required by wall tile assembly.
4. Coordinate provision with Division 06 section "Sheathing".
5. Locations: Reference Drawings and drawing sheet A600 ‘General Notes: Partitions’.

2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

A. Interior / Exterior Soffit Board: 5/8-inch, Type X (ASTM C1396)

1. Locations: Entrance Vestibule Ceilings.

2.5 TRIM ACCESSORIES

A. Interior Trim: ASTM C1047.

1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
2. Shapes:

a. Cornerbead.
b. LC-Bead: J-shaped; exposed long flange receives joint compound.
c. L-Bead: L-shaped; exposed long flange receives joint compound.
d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
e. Control joint.
f. Curved-Edge Cornerbead: With notched or flexible flanges.

B. Aluminum Trim & Reglets: Not required.

C. Control Joints in long walls (max 30’ x 0” o.c.).

1. Type: Type D, Model 093 by USG or APPROVED comparable product.

2.6 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C475 / C475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
3. Fill Coat: For second coat, use setting-type, sandable topping compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer with reinforcing mesh.

2.7 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.

1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Steel Drill Screws: ASTM C1002, unless otherwise indicated.

1. Use screws complying with ASTM C954 for fastening panels to steel members from 0.033 to 0.112 inch thick.

2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

D. Thermal Insulation: As specified in Division 7 Section "Building Insulation."

2.8 SOUND ATTENUATION MATERIALS

A. ASTM C665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.

2. Use only in conjunction with acoustical sealants at perimeters and penetrations of sound rated assemblies.

B. Acoustical Sealant: As specified in Division 07 section "Joint Sealants".

C. Emseal: Not required.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

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

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than 1/16-inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered

edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.

1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
2. Fit gypsum panels around ducts, pipes, and conduits.
3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch-wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Acoustic Rated Partitions, Walls, and Ceilings: Seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C919 and with manufacturer's written recommendations for locating edge trim and closing off sound-flanking paths around or through assemblies, including sealing partitions above acoustical ceilings.

1. Install Thickness of unfaced sound attenuation insulation full heights of walls or to rated horizontal sound barriers so that walls to not allow flanking paths to develop across rated partitions.

J. Install sound attenuation blankets before installing gypsum panels unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Single-Layer Application:

1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

a. Stagger abutting end joints not less than one framing member in alternate courses of panels.

b. At stairwells and other high walls, install panels horizontally, unless otherwise indicated or required by fire-resistance-rated assembly.

3. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

B. Multilayer Application:

1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to

framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. Fastening Methods: Fasten base layers with screws; fasten face layers with adhesive and supplementary fasteners.

C. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

D. Curved Surfaces:

1. Install panels horizontally (perpendicular to supports) and unbroken, to extent possible, across curved surface plus 12-inch-long straight sections at ends of curves and tangent to them.

2. For double-layer (or multiple-layer) construction, fasten base layer to studs with screws 16 inches o.c. Center gypsum board face layer over joints in base layer, and fasten to studs with screws spaced 12-inches o.c.

3.4 APPLYING BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, where indicated and at locations indicated to receive tile.

B. Tape and seal joints as recommended by the panel manufacturer as base for bonding primers or adhesives/mortar applications.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.

B. Control Joints: Install control joints according to ASTM C840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners.
2. LC-Bead: Use at edges abutting dissimilar materials.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.
5. Curved-Edge Cornerbead: Use at curved openings.

D. Aluminum Trim Expansion Joints: Install in locations indicated on Drawings.

E. Aluminum specialty reveals and mouldings: Apply where indicated with end closures provided by moulding manufacturer for exposed end conditions. Closure shall conform to moulding shape and be finished to match moulding.

1. Installer shall align gypsum board reveals to reveals in adjacent surfaces where shapes are shown to run continuous through gypsum and dissimilar materials.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 2: Panels that are substrate for tile.
3. Level 4: Surfaces exposed to view.
4. Level 5: Where indicated on the Drawings.

a. Primer and its application to surfaces are specified in other Division 09 sections.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.

1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900

SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Resilient base.
2. Resilient moulding accessories.
3. Extent of resilient base and accessories is indicated in the Drawings, Finish Schedule(s), and Material Legend.

B. Related Requirements:

1. Division 09 section "Tiling" for transitions at tile.
2. Division 09 section "Resilient Tile Flooring" for related floor finishes.
3. Division 09 section "Carpet Tile" for related floor finishes.

1.3 ACTION SUBMITTALS

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

B. Samples for Initial Selection: For each type of product indicated.

C. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12-inches long, of each resilient product color, texture, and pattern required.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra maintenance materials (attic stock) that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10-linear-feet for every 500-linear-feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.

1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.7 PROJECT CONDITIONS

A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:

1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **RB-1** Basis of Design: Subject to compliance with requirements, provide products indicated in ‘Material Legend’ on drawing sheet A600 or an APPROVED comparable product.

2.2 RESILIENT BASE (RB)

A. Resilient Base: ASTM F1861

1. Material Requirement: Type TP (thermoplastic rubber)
2. Manufacturing Method: Group I (solid, homogeneous).
3. Style: As indicated in the ‘Material Legend’.

B. Minimum Thickness: 0.125-inch.

1. Height: As indicated in the ‘Material Legend’.
2. Lengths: Coils in manufacturer's standard length.
3. Outside Corners: Preformed.
4. Inside Corners: Preformed.
5. Finish: As selected by Architect from manufacturer's full range.
6. Colors and Patterns: As indicated in the ‘Material Legend’.

2.3 RESILIENT STAIR & LANDING ACCESSORIES

A. Not required.

2.4 RESILIENT MOULDING ACCESSORY

A. Description: Nosing for carpet, Reducer strips, Joiner for resilient tile and carpet Transition strips.

B. Material: Rubber.

C. Profile and Dimensions: Profile as indicated on Drawings and Transition / Threshold Details. Where not indicated, provide manufacturer’s standard rubber transition for the following applications:

1. Carpet to concrete, hardwood, or lower elevation floor finish: 1-9/32 inch wide flexible rubber reducer strip to transition from up to 1/4-inch glue down carpet to top of adjacent surface.

2. Indicated transition details supercede generic transitions specified here.

D. Color: As selected by Architect from full range of industry colors.

2.5 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

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

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

C. Do not install resilient products until they are same temperature as the space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.

D. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Moulding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet or resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:

1. Remove adhesive and other blemishes from exposed surfaces.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

SECTION 099100 - PAINTING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes: Applying paint coating systems to items and surfaces scheduled including surface preparation, prime coats and finish coats.

1. Types of painting systems required for the Project include the following as specified in this section and where indicated in Drawings, Finish Schedule(s) and Material Legend on drawing sheet A600 and elsewhere in these Specifications.

a. Material Legend identifies paint color only.

B. Summary Paint (PT) Schedule:

1.	PT-L	Acrylic latex paint for gypsum drywall or plaster walls, soffits and ceilings.
2.	PT-L	Acrylic latex paint for acoustical ceiling panels/tiles.
3.	PT-L	Acrylic latex paint for gypsum drywall, plaster, or CMU walls/partitions.
4.	PT-L	Acrylic latex paint for ‘Interior’ wood trim or panels.
5.	PT-E	Water-Based Epoxy paint for gypsum board or plaster walls/partitions.
6.	PT-E	Water-based epoxy paint for gypsum board noted as ‘LOW PERM’.
7.	PT-F	Coating for ferrous/galvanized metal exposed exterior and interior surfaces.
8.	PT-F	Coating for hollow metal doors and frames.
9.	PT-DF	Dry fall paint for exposed concrete roof/ceiling structure construction.

C. Related Requirements:

1. Division 05 section "Structural Steel" for shop priming structural steel.
2. Division 05 section "Metal Fabrications" for shop priming ferrous metal.
3. Division 08 section "Hollow Metal Doors and Frames" for shop priming steel doors and frames.
4. Division 09 section "High Performance Coatings" for priming and coatings of exterior metal frames, guardrails and structure.

1.3 PAINT, GENERAL

A. Paint exposed surfaces whether or not colors are designated in "schedules," except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.

1. Painting includes field painting areas scheduled to have walls and/or ceilings painted of all exposed bare and covered pipes and ducts, hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

B. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces (unless otherwise noted), operating parts, and labels.

1. Prefinished items not to be painted include the following factory-finished components:

a. Acoustic materials.
b. Architectural casework.
c. Finished mechanical and electrical equipment.
d. Light fixtures.
e. Switchgear.
f. Distribution cabinets.

2. Prefinished items to be painted under this section include the following:

a. Grilles or diffusers which occur in surfaces scheduled to be painted shall be painted to match adjacent surfaces.
b. Fire extinguisher cabinets - paint to match adjacent walls except "Fire Extinguisher" graphics as shown are to be painted in black unless otherwise directed by the Architect. Use of die cut lettering will not be acceptable.

3. Concealed surfaces not to be painted include wall or ceiling surfaces in the following generally inaccessible areas:

a. Foundation spaces.
b. Furred areas.
c. Utility tunnels.
d. Pipe spaces.
e. Duct shafts.

4. Non-ferrous metal surfaces not to be painted include:

a. Anodized aluminum.
b. Stainless steel.
c. Chromium plate.
d. Copper.
e. Bronze.
f. Brass.

5. Operating parts not to be painted include moving parts of operating equipment such as the following:

a. Valve and damper operators.
b. Linkages.
c. Sensing devices.
d. Motor and fan shafts.

C. Labels: Do not paint over Underwriter's Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.

1.4 DEFINITIONS

A. "Paint" includes coating systems materials, primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate, or finish coats.

1.5 ACTION SUBMITTALS

A. Product Data: Manufacturer's technical information, label analysis, and application instructions for each material proposed for use.

1. List each material and cross-reference the specific coating and finish system and application. Identify each material by the manufacturer's catalog number and general classification.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish maintenance materials (extra materials), from the same production run, (batch number) that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Attic Stock: A single, unopened five (5) gallon container of each material and color applied.

1.7 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide primers and undercoat paint produced by the same manufacturer as the finish coats.

B. Coordination of Work: Review other sections in which primers are provided to ensure compatibility of the total systems for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect of problems anticipated using the materials specified.

C. Mockups: For paints as noted in Finish Legend. Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Product Data submittals to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system.
2. Assume a total of eight (8) mockups for each paint color designated in Finish Legend. Provide area of at least 100 sq. ft. for each mockup.
3. Final approval of color selections will be based on mockups.
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. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label and the following information:

1. Product name or title of material.
2. Product description (generic classification or binder type).
3. Manufacturer's stock number and date of manufacture.
4. Contents by volume, for pigment and vehicle constituents.
5. Thinning instructions.
6. Application instructions.
7. Color name and number.

B. Store materials not in use in tightly covered containers in a well- ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue.

C. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.9 PROJECT CONDITIONS

A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F(10 deg C) and 90 deg F (32 deg C).

B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).

C. Do not apply paint in snow, rain, fog, or mist, when the relative humidity exceeds 85 percent, at temperatures less than 5 deg F (3 deg C) above the dew point, or to damp or wet surfaces.

1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. **PT** - Basis of Design: Subject to compliance with requirements, provide product by **SHERWIN WILLIAMS** indicated in 'Material Legend' on drawing sheet A600 or one of the listed comparable products.

2.2 MATERIALS

A. Paint Type Schedule:

PT-L ACRYLIC LATEX ENAMEL, FLAT: For Gypsum Board or Plaster walls, soffits, and ceilings. System: Primer plus two finish coats as specified below:

Sealer/Primer:

- Sherwin Williams: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
- Benjamin Moore: Ultra Spec 500 Primer (534)
- PPG Paints: 6-2 SPEEDHIDE Interior Latex Sealer Quick-Drying

Finish Coats: Two Finish Coats at 2 to 3 mils total DFT.

- Sherwin Williams: B30W2651 ProMar 200 Zero VOC Interior Latex Flat
- Benjamin Moore: Ultra Spec 500 Flat Finish (536)
- PPG Paints: 6-4110XI Speedhide Zero VOC Flat Interior Latex

PT-L ACRYLIC LATEX ENAMEL, LOW-SHEEN EGGSHELL: Where scheduled for Gypsum Board or Plaster. System: Sealer/primer plus two finish coats as specified below:

Sealer/Primer:

- Sherwin Williams: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
- Benjamin Moore: Ultra Spec 500 Primer (534)
- PPG Paints: 6-2 SPEEDHIDE Interior Latex Sealer Quick-Drying

Finish Coats: Two Finish Coats System at 2.5 to 4 mils total DFT.

- Sherwin Williams: B41W2651 ProMar 200 Zero VOC Interior Latex Low Gloss Eg-Shel or B20W2651 ProMar 200 Zero VOC Interior Latex Eg-Shel
- Benjamin Moore: Ultra Spec 500 Low Sheen Eggshell (537)
- PPG Paints: 6-4310XI Speedhide Zero VOC Eggshell Interior Latex

PT-L ACRYLIC LATEX ENAMEL, LOW-SHEEN EGGSHELL: Where scheduled for "CMU" or Concrete (Dry Areas Only). System: Filler plus two finish coats as specified below:

Primer: Filler at rate to provide PINHOLE-FREE SURFACES. (Spray-applied and back rolled).

- Sherwin Williams: B25W25 PrepRite Block Filler
- Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler (571)
- PPG Paints: 6-7 SPEEDHIDE Interior/Exterior Masonry Block Filler Latex

Finish Coats: Two Finish Coats at 2.5 to 4 mils total DFT.

- Sherwin Williams: B41W2651 ProMar 200 Zero VOC Interior Latex Low Gloss Eg-Shell or B20W2651 ProMar 200 Zero VOC Interior Latex Eg-Shel
- Benjamin Moore: Ultra Spec 500 Low Sheen Eggshell (537)
- PPG Paints: 4-4310XI Speedhide Zero VOC Eggshell Interior Latex

PT-L ACRYLIC LATEX ENAMEL, SEMI-GLOSS: Where scheduled for "CMU" or Concrete (Dry Areas Only). System: Filler plus two finish coats as specified below:

Primer: Filler at rate to provide PINHOLE-FREE SURFACES. (Spray-applied and back rolled).

- Sherwin Williams: B25W25 PrepRite Block Filler
- Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler (571)
- PPG Paints: 6-7 SPEEDHIDE Interior/Exterior Masonry Block Filler Latex

Finish Coats: Two Finish Coats at 2.5 to 4 mils total DFT.

- Sherwin Williams: B31W2651 ProMar 200 Zero VOC Interior Latex Semi-Gloss
- Benjamin Moore: Ultra Spec 500 Semi-Gloss (539)
- PPG Paints: 4-4510XI Speedhide Zero VOC Semi-Gloss Interior Latex

PT-L LATEX SYSTEM, INTERIOR/ EXTERIOR BLOCK FILLER: Where scheduled for "CMU" (MPI #4). System: Two continuous coats, applied paint-rolled or brushed (spray-on application not allowed), as specified below:

Finish Coats: Two Finish Coats at 2.5 to 4 mils total DFT.

- Sherwin Williams: B25W25 PrepRite Int-Ext Latex Block Filler
- Benjamin Moore: Ultra Spec Hi-Build Masonry Block Filler (571) (MPI INT 4.)
- PPG Paints: Approved comparable product.

PT-E WATER BASE EPOXY, SEMI-GLOSS: Where scheduled for Gypsum Board or Plaster. System: Sealer/primer plus two finish coats as specified below:

Sealer/Primer:

- Sherwin Williams: B28W2600 ProMar 200 Zero VOC Interior Latex Primer
- Benjamin Moore: Ultra Spec 500 Primer (534)
- PPG Paints: 6-2 SPEEDHIDE Interior Latex Sealer Quick-Drying

Finish Coats: Two Finish Coats at 5 to 6 mils total DFT.

- Sherwin Williams: K46W2151 Pro Industrial PreCatalyzed Waterbased Epoxy Sem-Gloss
- Benjamin Moore: Corotech Pre-Cat Waterborne Epoxy Semi-Gloss (V341)
- PPG Paints: 16-551 Pitt-Glaze WB Water-Borne Acrylic Epoxy

Note: These primers and finish coats are recommended for non-direct water contact such as in toilet rooms.

PT-E WATER BASE EPOXY, EG-SHEL: Where scheduled for Gypsum Board or Plaster and noted as LOW PERM PT. System: Two finish coats as specified below:

Sealer/Primer: Not required.

Finish Coats: Two Finish Coats at 5 to 6 mils total DFT.

- Sherwin Williams: B73W00361 Pro Industrial Water-based Cataylzed Epoxy – Eg Shel

PT-F FERROUS METAL, SEMI-GLOSS: Paint all exposed ferrous metal surfaces -- including exterior hollow metal doors & frames -- other than exposed roof/ceiling construction.

Primer Coat:

- Sherwin Williams: B66W1 DTM Acrylic Primer/Finish
- Benjamin Moore: Ultra Spec HP Acrylic Metal Primer (HP04)
- PPG Paints: 4020 Pitt Tech Plus Int. /Ext. Primer/Finish DTM Enamel

First Coat:

- Sherwin Williams: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

Interior - Second Coat:

- Sherwin Williams: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

Exterior - Second Coat:

- Sherwin Williams: B66W211 DTM Acrylic Coating Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

PT-F NEW GALVANIZED METAL, SEMI-GLOSS: Paint all exposed surfaces – including exterior hollow metal doors & frames -- other than at roof/ceiling construction.

If galvanized surfaces are factory primed, apply the following:

Barrier Coat:

- Sherwin Williams: B66W1 DTM Acrylic Primer/Finish
- Benjamin Moore: Ultra Spec HP Acrylic Metal Primer (HP04)
- PPG Paints: 4020 Pitt Tech Plus Int. /Ext. Primer/Finish DTM Enamel

Note: spot prime bare areas only.

Finish Coat:

- Sherwin Williams: B66W211 DTM Acrylic Coating Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

If galvanized surfaces are not shop primed apply the following:

Prime Coat:

- Sherwin Williams: B66W1 DTM Acrylic Primer/Finish
- Benjamin Moore: Ultra Spec HP Acrylic Metal Primer (HP04)
- PPG Paints: 4020 Pitt Tech Plus Int. /Ext. Primer/Finish DTM Enamel

Finish Coat:

- Sherwin Williams: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

PT-P HOLLOW METAL DOORS & FRAMES, SEMI-GLOSS:

Barrier Coat:

- Sherwin Williams: B66W1 DTM Acrylic Primer/Finish
- Benjamin Moore: Ultra Spec HP Acrylic Metal Primer (HP04)
- PPG Paints: 4020 Pitt Tech Plus Int. /Ext. Primer/Finish DTM Enamel

Finish Coat:

- Sherwin Williams: B66W1151 Pro Industrial DTM Acrylic Semi-Gloss
- Benjamin Moore: HP29 Ultra Spec HP D.T.M. Acrylic Semi-Gloss
- PPG Paints: 4216HP Pitt Tech Plus Int. /Ext. DTM Semi-Gloss

PT-DF DRY FALL PAINT: Where scheduled for exposed steel or concrete roof/ceiling structure use dry fall paints.

Dry Fall: Finish structure, deck, joists, coffers/pans, beams, hangers and conduit with TWO coats 3 to 4 mils DFT at rate required for full coverage and uniform sheen.

- Sherwin Williams: B75WF1200 ProDry Acrylic Dryfall Flat
- Benjamin Moore: Benjamin Moore Latex Dry Fall Flat (395)
- PPG Paints: 6-725XI Speedhide Interior Super Tech WB Dry-Fog Latex

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions under which painting will be performed for compliance with requirements for application of paint. Do not begin paint application until unsatisfactory conditions have been corrected.

1. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

3.2 PREPARATION

A. General Procedures: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items in place that are not to be painted or provide surface-applied protection prior to surface preparation and painting. Remove these items if necessary for complete painting of the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

1. Clean surfaces before applying paint or surface treatments. Remove oil and grease prior to cleaning. Schedule cleaning and painting so that dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

B. Surface Preparation: Clean and prepare surfaces to be painted in accordance with the manufacturer's instructions for each particular substrate condition and as specified.

1. Provide barrier coats over incompatible primers or remove and reprime.

C. Cementitious Materials: Prepare concrete, and concrete masonry block, surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

1. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.

2. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

D. Wood: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

E. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer before application of primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

F. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.

G. When transparent finish is required, backprime with spar varnish.

H. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.

I. Unprimed Ferrous Metal: Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale and other foreign substances. Use solvent or mechanical cleaning methods that comply with the recommendations of the Steel Structures Painting Council.

1. Blast-clean steel surfaces as recommended by the coating system manufacturer and according to the requirements of SSPC Specification SSPC-SP 6.

J. Primed Ferrous Metal: Touch-up shop-applied prime coats that have been damaged and bare areas. Wire-brush, solvent clean, and touch-up with the same primer as the shop coat.

K. Nonferrous Metal Surfaces: Clean nonferrous and unprimed, galvanized surfaces according to the manufacturer's instructions for the type of service, metal substrate, and application required.

1. Use Oakite Pretreatment (Oakite 33) for cleaning of nonferrous metal surfaces.

L. Galvanized Surfaces: Clean galvanized surfaces with nonpetroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

M. Materials Preparation: Carefully mix and prepare paint materials in accordance with manufacturer's directions.

1. Maintain containers used in mixing and application of paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

3. Use only thinners approved by the paint manufacturer, and only within recommended limits.

N. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

A. Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

B. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.

1. Paint colors, surface treatments, and finishes are indicated in the Color and Finish Schedules located on the Drawings.

2. Provide finish coats that are compatible with primers used.

3. The number of coats and film thickness required is the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce an even smooth surface in accordance with the manufacturer's directions.

4. Apply additional coats when undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to

ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.

5. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convector covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas as required to maintain the system integrity and provide desired protection.

6. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently fixed equipment or furniture with prime coat only before final installation of equipment.

7. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.

8. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.

9. Sand lightly between each succeeding enamel or varnish coat.

10. Omit primer on metal surfaces that have been shop-primed and touch up painted.

C. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.

1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure and where application of another coat of paint does not cause lifting or loss of adhesion of the undercoat.

D. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the entire system as recommended by the manufacturer.

E. Prime Coats: Before application of finish coats, apply a prime coat of material as recommended by the manufacturer to material that is required to be painted or finished and has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to assure a finish coat with no burn through or other defects due to insufficient sealing.

F. Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

G. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

3.4 CLEANING

A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.5 PROTECTION

A. Protect work of other trades, whether to be painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

B. Provide "wet paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others for protection of their work after completion of painting operations.

1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

END OF SECTION 099100

SECTION 099611 - HIGH-PERFORMANCE COATINGS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes surface preparation and application of high-performance coating systems on the following substrates:

1. Exterior Substrates: Coatings for ferrous / galvanized metal columns, frames, fabrications and exposed exterior surfaces.
2. Interior Substrates: Steel.

B. Related Requirements:

1. Division 05 section "Structural Steel Framing" for shop priming of structural steel and metal fabrications with primers specified in this Section.
2. Division 09 section "Painting" for general field painting.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

1. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Samples for Verification: For each type of coating system and each color and gloss of topcoat indicated.

1. Submit Samples on actual substrate material to be coated, 8 inches square.
2. Apply coats on Samples in steps to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.3 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same production run, (batch number) that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: 5 percent, but not less than 1 gal. of each material and color applied.

1.4 QUALITY ASSURANCE

A. Mockups: Apply mockups of each coating system indicated to verify preliminary selections made under Sample submittals, to demonstrate aesthetic effects, and to set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each coating system.

a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft.
b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on mockups.

a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.

4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide specified products by **Sherwin Williams** or an APPROVED comparable product by the following

1. Tnemec Company, Inc.

2.2 HIGH-PERFORMANCE COATINGS

A. Material Compatibility:

1. Materials for use within each paint system shall be compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

2. For each coat in a paint system, products shall be recommended in writing by topcoat manufacturers for use in paint system and on substrate indicated.

3. Products shall be of same manufacturer for each coat in a coating system.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 EXTERIOR GALVANIZED STEEL – FACTORY/SHOP PRIMED

A. Barrier Coat: Sherwin Williams; **B65W351 Hi-Solids Polyurethane Semi-Gloss.**

B. Finish Coat: Sherwin Williams; **B65W351 Hi-Solids Polyurethane Semi-Gloss.**

Note: The Factory/Shop Primer must be a Universal Type of Shop Primer that is designed to accept solvent based two component topcoats. If not, the bare steel should be primed with B58W610 Macropoxy 646 Fast Cure Epoxy.

2.4 EXTERIOR GALVANIZED STEEL

A. Prime Coat: Sherwin Williams; **B58W610 Macropoxy 646 Fast Cure Epoxy**

B. Finish Coat: Sherwin Williams; **B65W351 Hi-Solids Polyurethane Semi-Gloss.**

2.5 INTERIOR STEEL

A. Prime Coat: Sherwin Williams; **B58W610 Macropoxy 646 Fast Cure Epoxy**.

B. Intermediate Coat: Sherwin Williams; **B58W610 Macropoxy 646 Fast Cure Epoxy.**

C. Finish Coat: Sherwin Williams; **B65W351 Hi-Solids Polyurethane Semi-Gloss.**

2.6 SOURCE QUALITY CONTROL

A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:

1. Owner will engage services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency will perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying coatings if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, both coatings are incompatible.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

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

C. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions applicable to substrates and coating systems indicated.

B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

C. Steel Substrates: Remove rust, loose mill scale, and shop primer if any.

1. Clean using methods recommended in writing by manufacturer but not less than the following:

a. SSPC-SP 7/NACE No. 4.
b. SSPC-SP 11.
c. SSPC-SP 6/NACE No. 3.
d. SSPC-SP 10/NACE No. 2.
e. SSPC-SP 5/NACE No. 1.

D. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and areas where shop paint is abraded. Paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

3.3 APPLICATION

A. Apply high-performance coatings in accordance with manufacturer's written instructions.

1. Use applicators and techniques suited for coating and substrate indicated.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.

1. Contractor shall touch up and restore coated surfaces damaged by testing.

2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written instructions, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written instructions.

3.5 CLEANING AND PROTECTION

A. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

B. Protect work of other trades against damage from coating operation. Correct damage to work of other trades by cleaning, repairing, replacing, and recoating, as approved by Architect, and leave in an undamaged condition.

C. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION 099611

SECTION 104416 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Portable, hand-carried fire extinguishers including:

a. General Purpose – Class ABC.
b. Mounting Brackets

B. Related Requirements:

1. Division 10 section "Fire Extinguisher Cabinets" for storage cabinets.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.

B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.

C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

1. Provide fire extinguishers approved, listed, and labeled by FMG.

1.5 COORDINATION

A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six (6) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

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

a. J. L. Industries, Inc.
b. Larsen's Manufacturing Company.
c. Potter Roemer LLC.

2. Valves: Manufacturer's standard.
3. Handles and Levers: Manufacturer's standard.
4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.

B. Multi-Purpose Dry-Chemical Type: UL-rated extinguisher unit containing a fluidized and siliconized mono ammonium phosphate powder; nonconductive and nontoxic.

1. Construction: Heavy duty steel cylinder with metal valve and siphon tube, O-ring seal, replaceable valve stem seal, visual pressure gage, pull pin and upright squeeze grip.
2. Finish: Factory powder-coated; Red.
3. Effectiveness (Rating): Class A, B, and C fires.
4. Model & Capacity: Cosmic 10E; 10-lb nominal capacity (basis of design).

2.2 MOUNTING BRACKETS

A. Mounting Brackets: Manufacturer's standard galvanized steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated or red baked-enamel finish.

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

a. J. L. Industries, Inc.
b. Larsen's Manufacturing Company.
c. Potter Roemer LLC.

B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.

1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.
    a. Orientation: Vertical.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine fire extinguishers for proper charging and tagging.
    1. Remove and replace damaged, defective, or undercharged fire extinguishers.

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

3.2 INSTALLATION

A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
    1. Mounting Brackets: 54-inches above finished floor to top of fire extinguisher.

B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416

SECTION 116800 - PLAYFIELD EQUIPMENT AND STRUCTURES

PART 1 - GENERAL

1.1 Related Documents

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

B. Section includes freestanding and composite structure playground equipment.

C. Related Requirements:
1. Sheet A-103 for Playground Equipment schedule and Architectural Site Plan.
2. Division 01 section ‘Alternates’ for bid requirements.
3. Division 02 section ‘Core Drill Report’ and ‘Geotechnical Report’
4. Division 03 section "Cast-in-Place Concrete" for installing anchor bolts, steel pipe sleeves, wedge-type inserts, handrails, guardrails, and other items indicated to be cast into concrete.
5. Division 32 section ‘Playground Protective Surfacing’ for turf and poured in place surfacing.

1.2 ACTION SUBMITTALS

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

B. Shop Drawings: For playground equipment and structures. Include plans, elevations, sections, details, and attachments to other work.

C. Delegated Design: Design structural footings as required for each equipment type, including comprehensive engineering analysis by a qualified structural engineer.
1. Existing concrete slab (to remain) may be utilized in lieu of new footings for some equipment. Reference Drawings for extent of slab and Core Drill report.

D. Samples: For each exposed product and for each color and texture specified.

1.3 INFORMATIONAL SUBMITTALS

A. Product test reports.

B. Field quality-control reports.

C. Warranty: Sample of special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A firm whose playground equipment components have been certified by IPEMA's third-party product certification service.

B. Installer Qualifications: For each playground equipment type, equipment to be installed by certified installer.

C. Safety Standards: Provide playground equipment complying with or exceeding requirements in ASTM F 1487 and CPSC No. 325.

D. Preinstallation Conference: Conduct conference prior to installation of new work on the playground, including but not limited to play surface, footings and equipment.

1.6 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of playground equipment that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Minimum of five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Aluminum: Reference basis-of design equipment for minimum quality standards for each type of equipment.

B. Steel: Reference basis-of design equipment for minimum quality standards for each type of equipment.

C. Stainless-Steel Sheet: Reference basis-of design equipment for minimum quality standards for each type of equipment.

D. Wood: Reference basis-of design equipment for minimum quality standards for each type of equipment.

E. Softwood Plywood: Reference basis-of design equipment for minimum quality standards for each type of equipment.

F. Transparent Plastic: Reference basis-of design equipment for minimum quality standards for each type of equipment.

G. Chain and Fittings: Reference basis-of design equipment for minimum quality standards for each type of equipment.

H. Castings and Hangers: Reference basis-of design equipment for minimum quality standards for each type of equipment.

I. Post Caps: Reference basis-of design equipment for minimum quality standards for each type of equipment.

J. Platform Clamps and Hangers: Reference basis-of design equipment for minimum quality standards for each type of equipment.

K. Hardware: Manufacturer's standard; commercial-quality; corrosion-resistant; hot-dip galvanized steel and iron, stainless steel, or aluminum; of a secure and vandal-resistant design.

L. Fasteners: Manufacturer's standard; corrosion-resistant; hot-dip galvanized or plated steel and iron, or stainless steel; permanently capped, and theft resistant.

2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment: Pressure-treat wood according to AWPA U1 and the following:

1. Use preservative chemicals acceptable to authorities having jurisdiction and containing no arsenic or chromium. Use chemical formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
2. Kiln-dry lumber and plywood after treatment to a maximum moisture content, respectively, of 19 and 15 percent. Do not use materials that are warped or do not comply with requirements for untreated materials.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Comply with manufacturer's written installation instructions unless more stringent requirements are indicated. Anchor playground equipment securely, positioned at locations and elevations indicated.

1. Maximum Equipment Height: Coordinate installed heights of equipment and components with finished elevations of protective surfacing. Set equipment so fall heights and elevation requirements for age group use and accessibility are within required limits. Verify that playground equipment elevations comply with requirements for each type and component of equipment.

3.2 FIELD QUALITY CONTROL

A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

C. Tests and Inspections: For playground and playground equipment and components **during installation and** at final completion and to certify compliance with **ASTM F 1487** and **CPSC No. 325**.

D. Prepare test and inspection reports.

E. Notify Architect and Owner 48 hours in advance of date and time of final inspection.

END OF SECTION 116800

SECTION 26 00 00 – ELECTRICAL WORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Provisions and conditions cited in this Section shall apply to Work for all other sections of Divisions 26 of these Specifications.

C. The following sections of the Specifications apply to Work under this Section:
   1. Division 27 - Communications
   2. Division 28 – Electronic Safety and Security

1.2 QUALITY ASSURANCE

A. Where work installed under this section of the specification tie-in to existing systems, Contractor shall verify existing for: sizes, voltage (via voltage meter reading, not labels), materials, and elevations before installing new work. Contractor shall notify Architect/Engineer upon discovery of discrepancy. Work performed prior to verification will be corrected at no cost to Owner.

1.3 ACTION SUBMITTALS

A. Refer to Division 1 and each section of Division 26.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Division 1 and each section of Division 26.

1.5 CLOSEOUT SUBMITTALS

A. Refer to Division 1 and each section of Division 26.

B. As-built drawings of underground work shall include dimensions from building walls/columns and elevations.

C. At the completion of the project, submit a letter stating all materials are asbestos free, and meet the specified ASTM E-84 flame/smoke rating of 25/50, and that all piping and duct penetrations are smoke or fire stopped as required by the Code.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 26 00 00

SECTION 26 05 19 – LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
1. Copper building wire rated 600V or less

B. Related Requirements:
1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MATERIAL

A. All wire and cable shall be new soft drawn copper and shall conform to all the latest requirements of the National Electrical Code IPCEA, and meet the specifications of the ASTM.

B. Control Conductors: Control circuit wiring shall be No. 12 AWG or smaller stranded wire. Stranded control wire shall be provided with crimp type spade terminators. Control circuit wiring shall be color-coded or numbered using an identical number on both ends of the conductor.

C. Type MC cable, if permitted, shall contain an insulated copper equipment grounding conductor. Type MC-AP cable is not permitted.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders:
1. Copper; solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits:
1. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. General
   1. Minimum conductor size is No. **12** AWG except for control circuits or low voltage wiring.
   2. Minimum insulation rating is 90°C
   3. Conductor rating:
      a. For 100 amps and below: Conductor shall be rated per the 60°C table
      b. For greater than 100 amps: Conductor shall be rated per the 75°C table
   4. All 120V and 277V single phase circuits require a dedicated neutral conductor. The neutral conductor shall be numbered and identified with associated phase conductor at the panelboard as well as all junction boxes.
   5. Where circuit runs are combined, upsize conduit and conductors to accommodate for conduit fill and conductor derating respectively.

B. Not Permitted
   1. Aluminum conductors
   2. Type MC (metal clad)
   3. Type BX/AC (armored cable) cable
   4. Type NM (nonmetallic-sheathed cable)

C. Application per the following:
   1. All locations, unless noted otherwise: Type THHN/THWN-2, single conductors
   1. Indoor feeder or branch circuit in raceway: Type THHN/THWN-2, single conductors
   2. Exterior feeder or branch circuit , above grade: Type THHN/THWN-2, single conductors
   3. Exterior feeder, below grade: Type XHHW-2, single conductors
   4. Exterior branch circuit, below grade: Type XHHW-2, single conductors

3.3 INSTALLATION, GENERAL

A. 20A Branch Circuit Homeruns shall be sized as follows:
   1. 120V:
      a. 0 – 100 feet shall be #12AWG wire minimum
      b. 101 – 200 feet shall be #10AWG wire minimum
      c. In excess of 200 feet shall be #8AWG wire minimum
   2. 277V:
      a. 0 – 250 feet shall be #12AWG wire minimum
      b. In excess of 250 feet shall be #10AWG wire minimum

B. Where conductors are upsized to account for deratings or voltage drop and are too large for the termination lugs, provide reducer pins equivalent to Burndy AYP or AYPO (offset pin). Reducer pins shall be compression type, dual rated for aluminum/copper conductors, and include an insulating cover.

C. Conceal cables in finished walls, ceilings, and floors unless otherwise indicated.

D. Complete raceway installation between conductor and cable termination points in accordance with Section 260533.13 "Conduits for Electrical Systems" prior to pulling conductors and cables.

E. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

F. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

G. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

H. Support cables according to Section 260529 "Hangers and Supports for Electrical Systems."

END OF SECTION 26 05 19

SECTION 26 05 26 – GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: System grounding
2. Equipment grounding

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Field quality-control reports.

1.4 CLOSEOUT SUBMITTALS

A. Operating and maintenance manuals.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MATERIAL

A. For renovations, extending an existing ground: Contractor shall extend the existing equipment grounding system in accordance with the National Electrical Code and shall use only UL listed grounding clamps and connectors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. The grounding system grounding electrode conductor shall be connected to the neutral bar inside the main panel.

B. The equipment grounding system shall consist of a continuous conduit installation and a green insulated equipment grounding conductor. This grounding conductor shall be installed in every conduit or raceway with the feeder or branch circuit conductors. **This grounding conductor shall be extended from the housing of every electrical load, through panelboard equipment grounding busses, to the equipment grounding bus in the main panel. The grounding bus shall be bonded to the grounded neutral bar inside the main panel using a System Bonding Jumper.**

C. When transformers are used to provide a separately derived system, the Contractor shall connect the grounding electrode conductor to the neutral bar (grounded system conductor) inside the transformer. The system bonding jumper shall also be installed inside the transformer.

D. The transformer cover shall not be installed until the Engineer has inspected the transformer grounding. Provide pictures to engineer if this does not work with project schedule.

3.2 FIELD QUALITY CONTROL FOR GROUNDING AND BONDING

A. Test completed grounding system at service disconnect enclosure grounding terminal and at individual ground rods. Make tests at ground rods before conductors are connected.
   1. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
   2. Perform tests by fall-of-potential method in accordance with IEEE Std 81.
   3. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

B. Prepare dimensioned Drawings locating each ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to record of tests and observations. Include number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.

END OF SECTION 26 05 26

SECTION 26 05 33 – RACEWAY FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
1. Electrical metallic tubing conduit (EMT)
2. Galvanized rigid steel conduit (GRS)
3. Polyvinyl chloride conduit (PVC)
4. Liquid-tight flexible metal conduit
5. Flexible metal conduit

B. Related Requirements:
1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data:
1. Conduit

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Not required

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Minimum conduit size shall be ¾” trade size for branch circuits.

B. A bushing shall be used where conduit enters a panel box or equipment enclosure.

C. Grounding Bushings shall be used to bond conduits entering a panel box or equipment that are not mechanically connected.

D. All raceways for equipment and devices located within or on the building are to be routed through the interior of the building. Do not route conduits on the roof, surface mounted on the building exterior walls or via exterior trenches or directional bores between areas of the building, unless noted otherwise or prior approval is provided by the Architect/Engineer. (Engineer note: Per NEC 300.7(B), expansion fitting is required for raceways exposed to different temperatures.)

E. Expansion fittings shall be provided at all conduits across building expansion joints. Fittings shall be Type “AX” or “TX” as made by O Z Electric Company, or approved equal. Provide copper bonding jumper at each expansion fitting.

F. Conduit bends shall be made with standard benders of proper size; radius of bends to be at least 6 times the diameter of the conduit. Runs between outlets shall not contain more than the equivalent of three 90-degree bends. Conduit runs shall be continuous from outlet to outlet, outlet to cabinet, etc.

G. All exposed conduits shall be installed parallel or perpendicular to the building walls or floors.

H. Conduits shall be securely fastened to or supported from the building structure. Conduits not fastened directly to building structure shall be supported by a rigid assembly, free of sway and adequately braced, connected directly to the building structure. The use of ‘pencil’ wire, ceiling wire, and cable hangers shall not be permitted.

I. Anchor or stake down all direct burial conduits to prevent shifting during grading and concrete pours. Spacers shall be provided for trenches with 2 or more conduits with any conduit 2” or larger.

J. Install #12AWG pull wires for tracing for all underground non-metallic empty conduits with a minimum of 12 inches of slack on each end. Pull strings shall be used for empty above grade or metallic conduits.

K. All raceways installed within 1½” of the roof deck shall be GRS or IMC. Boxes shall be offset below the 1½”.

L. All exposed raceways installed in a finished space will be painted to match the background, unless noted otherwise. Finished spaces include all areas open to the general public. Spaces such as storage, mechanical, IT, and electrical rooms and other similar areas only accessible to qualified personnel are considered unfinished.

M. All penetrations through not rated walls shall be sealed for draft stopping with caulk, putty, etc. designed for this use.

N. Fire / Smoke seals:
   1. All penetrations through fire rated walls and floors shall be fire sealed in accordance with ASTM E814/UL1479 or manufacturer’s recommendations.
   2. Materials and installation details shall be submitted for approval.

3.2 ELECTRICAL METALLIC TUBE CONDUIT (EMT)

A. EMT conduit shall be installed for all work concealed in partitions or in concrete block walls and for all conduits run in ceiling plenums and exposed runs, except where noted otherwise. Aluminum EMT is not approved. EMT conduit shall not be used outdoors, in wet locations, in floor crawl spaces, or below 5’ AFF.

B. EMT couplings and connectors shall be steel, set screw or compression type.

3.3 GALVANIZED RIGID STEEL CONDUIT (GRS)

A. Galvanized rigid steel conduits shall be installed for all exposed outdoor conduit, and for all indoor medium voltage cable runs, and for entry into underground building walls and manholes.

B. All GRS couplings and threaded hubs shall have no less than five threads of the coupling engaged. Running threads shall not be used. All GRS conduits shall be reamed.

C. All GRS conduits shall have two locknuts and a bushing at each termination outlet box, junction box, etc., except where terminated in a threaded hub.

A. POLYVINYL CHLORIDE CONDUIT (PVC) Conduits installed underground shall be schedule 40 PVC and a minimum size of ¾" trade size.

B. Where indicated in the documents to use below grade conduit within the building, conduits installed underground shall be schedule 40 PVC and a minimum size of ¾" trade size.

C. All PVC fittings shall be connected with PVC primer and glue.

3.5 LIQUID-TIGHT FLEXIBLE METAL CONDUIT

A. Liquid-tight flexible steel conduit ('Sealtite') shall be used in wet areas where flexible conduit connections are required and on all motorized equipment and motors in all locations.

B. Liquid-tight flexible metal conduit ('Sealtite') is not permitted for roof penetrations.

3.6 FLEXIBLE METAL CONDUIT

A. Flexible steel conduit ('Greenfield') shall be used where vibration isolation is required, including all transformers and uninterruptible power systems.

END OF SECTION 26 05 33

SECTION 26 05 34 – BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
1. Pull boxes
2. Junction boxes
3. Outlet boxes
4. Outdoor boxes

B. Related Requirements:
1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data including all accessories, parts, and components required for a complete installation:
1. Outdoor boxes

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Not required

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Mounting: Outlets must be centered with regard to paneling, furring, trim, etc. Outlets shall be set plumb or horizontal and shall extend to finished surface of wall, ceiling, or floor without projecting beyond or behind finished surface. Outlet boxes shall not be installed “back-to-back”. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.

1. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box, whether installed indoors or outdoors.
2. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
3. Locate boxes so that cover or plate will not span different building finishes.
4. Support boxes in recessed ceilings independent of ceiling tiles and ceiling grid.
5. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for purpose.
6. Fasten junction and pull boxes to, or support from, building structure. Do not support boxes by conduits.
7. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to ensure a continuous ground path.
8. Boxes and Enclosures in Areas or Walls with Acoustical Requirements:
    a. Seal openings and knockouts in back and sides of boxes and enclosures with acoustically rated putty.
    b. Provide gaskets for wallplates and covers.

B. Attaching: Boxes shall be attached by fastener designed for the purpose and shall provide adequate mechanical strength for future maintenance.
1. Boxes installed in metal stud partitions shall be secured to the metal studs using appropriate clips, fasteners, hangers, or supports as required, and shall provide adequate far side box support to fulfill the intent of all applicable codes.

C. In fire rated drywall walls, 24” spacing must be maintained between boxes on opposite sides of walls. Moldable fire protective putty pads, firestopping coverplate gaskets, internal fire rated pads or other acceptable fire sealing means shall be installed on outlet boxes where the 24” spacing cannot be maintained.

3.2 DEGREE OF PROTECTION

A. Indoors:
1. Type 1 unless otherwise indicated.
2. Damp or Dusty Locations: Type 12.

B. Exterior:
1. Type 3R unless otherwise indicated.
2. Locations Exposed to Hosedown: Type 4

3.3 OUTLET BOXES, JUNCTION BOXES, FITTINGS

A. Pull boxes and junction boxes shall be installed where indicated on the drawings or where required to facilitate wire installation.
1. Size: Outlet, junction, and pull boxes not dimensioned shall be 4-inch square by 2-1/8” deep minimum and comply with sizing as required by Article 314 of the National Electrical Code.

B. Steel faceplates must be used on fire rated drywall walls and painted to match device color. Faceplates shall be Mulberry Metal Products or equivalent.

C. All outdoor junction boxes and condulets shall be gasketed.

END OF SECTION 26 05 34

SECTION 26 05 43 – UNDERGROUND DUCTS AND RACEWAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:

1. Type PVC raceways and fittings.
2. Solvent cements.
3. Duct accessories.
4. Handholes and boxes for exterior underground wiring.
5. Duct sealing.

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 DEFINITIONS

A. Duct: A single raceway or multiple raceways, installed singly or as components of a duct bank.

B. Duct Bank: Two or more ducts installed in parallel, direct buried or with additional casing materials such as concrete.

C. Handhole: An underground chamber containing electrical cables, sized such that personnel are not required to enter in order to access the cables.

D. Manhole: An underground chamber containing electrical cables and equipment, sized to provide access with working space clearances.

E. Trafficways: Locations where vehicular or pedestrian traffic is a normal course of events.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS

A. Installation manual: For each type of product.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product.

B. Parts List: For each type of product that has replaceable parts.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 TYPE PVC RACEWAYS AND FITTINGS

A. Schedule 40 Rigid PVC Conduit (PVC-40) and Fittings:

B. Schedule 80 Rigid PVC Conduit (PVC-80) and Fittings:

2.3 DUCT ACCESSORIES

A. Duct Spacers: Factory-fabricated, rigid, PVC interlocking spacers; sized for type and size of duct with which used, and selected to provide minimum duct spacing indicated while supporting duct during concreting or backfilling.

2.4 HANDHOLES AND BOXES FOR EXTERIOR UNDERGROUND WIRING

A. Polymer Concrete Handholes and Boxes with Polymer Concrete Cover:
   1. Description: Molded of sand, concrete, and aggregate, bound together with polymer resin, and reinforced with steel or fiberglass or combination.
   2. Configuration: Units must be designed for flush burial and have open bottom unless otherwise indicated.
   3. Cover: Weatherproof, gasketed, secured by tamper-resistant locking devices and having structural load rating consistent with enclosure and installed location.
      a. Cover Finish: Nonskid finish must have minimum coefficient of friction of 0.50.
      b. Cover Legend: Molded lettering "ELECTRIC", “TELECOMM”, or as indicated on the drawings to match the system.

2.5 DUCT SEALING

A. Duct-Sealing Compound: Nonhardening, safe for contact with human skin, not deleterious to cable insulation, and workable at temperatures as low as 35 deg F. Compound must be capable of withstanding temperature of 300 deg F without slump and adhering to clean surfaces of plastic ducts, metallic conduit, conduit and duct coatings, concrete, masonry, lead, cable sheaths, cable jackets, insulation materials, and common metals. Duct sealing compound must be removable without damaging ducts or cables.

B. Inflatable Duct-Sealing System: Wraparound inflatable bladder that seals ducts that are empty or containing conductors against air and water infiltration. System is suitable for use in steel, plastic, or concrete ducts and penetrations.

PART 3 - EXECUTION

3.1 PREPARATION

A. Coordinate layout and installation of duct, duct bank, manholes, handholes, and boxes with final arrangement of other utilities, site grading, and surface features as determined in field.

B. Coordinate elevations of duct and duct-bank entrances into manholes, handholes, and boxes with final locations and profiles of duct and duct banks, as determined by coordination with other utilities, underground obstructions, and surface features. Revise locations and elevations as required to suit field conditions and to ensure that duct and duct bank will drain to manholes and handholes, and as approved by Engineer.

3.2 EARTHWORK

A. Excavation and Backfill: Comply with Section 312000 "Earth Moving," but do not use heavy-duty, hydraulic-operated, compaction equipment.

B. Cut and patch existing pavement in path of underground duct, duct bank, and underground structures as indicated on the Drawings.

C. Restore areas disturbed by trenching, storing of dirt, cable laying, and other work.

D. Restore turf and landscaped areas as indicated on the Drawings.

3.3 INSTALLATION OF DUCTS AND DUCT BANKS

A. Install duct, spacers, and accessories into duct-bank configuration shown.

B. Ducts: Schedule 40 Rigid PVC Conduit

C. Slope: Pitch duct minimum slope of 1:300 down toward manholes and handholes and away from buildings and equipment. Slope duct from high point between two manholes to drain in both directions.

D. Curves and Bends:
   1. Use 5-degree angle couplings for small changes in direction. Use manufactured long sweep bends both horizontally and vertically, at other locations unless otherwise indicated.
   2. Duct must have maximum of 270 degrees of bends between pull points.

E. Joints: Use solvent-cemented joints in nonmetallic duct and fittings and make watertight in accordance with manufacturer's published instructions. Stagger couplings so those of adjacent duct do not lie in same plane.

F. Spacers: Install per manufacturer’s instructions.

G. Direct-Buried Duct:
   1. Excavate trench bottom to provide firm and uniform support for duct. Comply with requirements in Section 312000 "Earth Moving" for preparation of trench bottoms for pipes less than 6 inch in nominal diameter.
   2. Place minimum 3 inch of sand as bed for duct. Place sand to minimum of 3 inch above top level of duct.

3. Stub ups to equipment: Concrete encase the elbow plus 36 inches of horizontal conduit. Terminate with coupling flush with the equipment pad.

H. Underground-Line Warning Tape: Bury conducting underground line specified in Section 260553 "Identification for Electrical Systems" no less than 12 inch above concrete-encased duct and duct bank and approximately 12 inch below grade. Align tape parallel to and within 3 inch of centerline of duct bank. Provide additional warning tape for each 12 inch increment of duct-bank width over nominal 18 inch. Space additional tapes 12 inch apart, horizontally across width of ducts.

I. Ground ducts and duct banks in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.4 INSTALLATION OF HANDHOLES AND BOXES OTHER THAN PRECAST CONCRETE

A. Install handholes and boxes level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Use box extension if required to match depths of duct, and seal joint between box and extension as recommended by manufacturer.

B. Unless otherwise indicated, support units on minimum 6” level bed of crushed stone or gravel, graded from 1/2 inch (12.5 mm) sieve to No. 4 (4.75 mm) sieve and compacted to same density as adjacent undisturbed earth.

C. Elevation: In paved areas and trafficways, set cover flush with finished grade. Set covers of other handholes 1 inch (25 mm) above finished grade.

D. Install handholes and boxes with bottom below frost line.

E. Handholes not dimensioned shall be 12 inch by 12 inch by 12” deep minimum with open bottom and comply with sizing as required by Article 314 of the National Electrical Code.

F. Handhole and handhole cover to be rated as follows:
1. Minimum ANSI Tier 15 Medium Duty unless indicated otherwise
2. ANSI Tier 22 Heavy Duty in Sidewalks and right of ways
3. AASHTO H20 in Roadways

G. Field cut openings for duct in accordance with enclosure manufacturer's published instructions. Cut wall of enclosure with tool designed for material to be cut. Size holes for terminating fittings to be used, and seal around penetrations after fittings are installed.

H. Ground handholes and boxes in accordance with Section 260526 "Grounding and Bonding for Electrical Systems."

3.5 CLEANING

A. Clean internal surfaces of manholes, including sump, and building interiors affected by Work.
1. Sweep floor, removing dirt and debris.
2. Remove foreign material.

END OF SECTION 26 05 43

SECTION 26 05 44 – SLEEVES AND SEALS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:

1. Sleeves without waterstop.
2. Sleeves with waterstop.
3. Modular link-seal systems.
4. Grout.
5. Silicone sealants.
6. Escutcheons.
7. Penetration firestop

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Sleeve Schedule

C. Penetration firestop Schedule: For each penetration firestopping system. Include location, illustration of firestopping system, and design designation of qualified testing and inspecting agency.

1.3 INFORMATIONAL SUBMITTALS

A. Installation manual: For each type of product.

B. Field quality-control reports.

PART 2 - PRODUCTS

2.1 SLEEVES WITHOUT WATERSTOP

A. Cast-Iron Pipe Sleeves: Cast or fabricated of cast or ductile iron and equivalent to ductile-iron pressure pipe, with plain ends.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, hot-dip galvanized, with plain ends.

C. Steel Sheet Sleeves: ASTM A653/A653M, 0.0239-inch minimum thickness; hot-dip galvanized, round tube closed with welded longitudinal joint.

D. PVC Pipe Sleeves: ASTM D1785, Schedule 40.

E. Molded-PVC Sleeves: With nailing flange for attaching to wooden forms.

F. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.

2.2 SLEEVES WITH WATERSTOP

A. Molded HDPE with integral waterstop, furnish with nailer end caps.

B. Steel Pipe Sleeves: ASTM A53/A53M, Type E, Grade B, Schedule 40, 2” steel collar, welded on both sides,hot-dip galvanized, with plain ends.

2.3 MODULAR LINK-SEAL SYSTEMS

A. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
   1. Designed to form a hydrostatic seal of 20 psig minimum.
   2. Sealing Elements: Material as indicated below, interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
      a. Normal, except noted below: EPDM-rubber
      b. Steam and other service temperatures between 200°F-450°F: High-temperature-silicone
      c. Non-metical piping: Low Durometer EPDM, Shore 40 ± 5
   3. Pressure Plates: Reinforced Nylon Polymer.
   4. Connecting Bolts and Nuts: Stainless steel, Type 316 of length required to secure pressure plates to sealing elements.

B. Sleeves and seals manufactured by Garlock-LINK-SEAL, Flexicraft Industries, Advance Products & Systems, Metraflex, or approved equivalent.

2.4 GROUT

A. Description: Nonshrink, for interior and exterior sealing openings in non-fire-rated walls or floors.

B. Standard: ASTM C1107/C1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

C. Design Mix: 5000 psi, 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

A. Silicone Sealant, S, P, T, NT: Single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant. b. Standard: ASTM C920.

2.6 ESCUTCHEONS

A. Escutcheon Types:

1. One-Piece, Stainless Steel Type: With polished stainless steel finish.
2. Split-Plate, Stamped-Steel Type: With polished, chrome-plated finish; concealed hinge; and spring-clip fasteners.

2.7 PENETRATION FIRE STOP

A. All penetrations through rated assemblies, walls, shafts, floors, roofs, etc., shall be firestopped in accordance with Local Building Codes, NFPA, U.L. Fire Resistant Directory, and manufacturer's instructions.

B. Obtain penetration firestopping systems for each type of opening indicated from single manufacturer.

C. Penetrations in Fire-Resistance-Rated Walls: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

D. Penetrations in Horizontal Assemblies: Penetration firestopping systems with ratings determined in accordance with ASTM E814 or UL 1479.

E. Penetrations in Smoke Barriers: Penetration firestopping systems with ratings determined in accordance with UL 1479.

F. Exposed Penetration Firestopping Systems: Flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested in accordance with ASTM E84 or UL 72

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions for partition types and execute work per the requirements herein.

3.2 INSTALLATION OF SLEEVES AND CORE DRILLING - GENERAL

A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes, except where noted. Prior to core drilling structure shall be scanned with X-ray, Redar, or other means to locate rebar and verify that conduit/pipes are not imbedded in the concrete, Submit scans with an overlay of the proposed core drills for approval.

C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
   1. Permanent sleeves are not required for holes in slabs formed by molded-PE or -PP sleeves.
   2. Cut sleeves to length for mounting flush with both surfaces.
      a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas **[2 inches] <Insert dimension>** above finished floor level.
   3. Using **[grout] [or] [silicone sealant],** seal the space outside of sleeves in slabs and walls without sleeve-seal system.

D. Install sleeves for pipes passing through interior partitions.

1. Cut sleeves to length for mounting flush with both surfaces.
2. Install sleeves that are large enough to provide 1/4-inch annular clear space between sleeve and pipe or pipe insulation.
3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.

E. Fire-Resistance-Rated Penetrations, Horizontal Assembly Penetrations, and Smoke Barrier Penetrations: Maintain indicated fire or smoke rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with fire- and smoke-stop materials. Comply with requirements for firestopping and fill materials specified in this section and in Section 078413 "Penetration Firestopping."

3.3 INSTALLATION OF SLEEVES WITH WATER STOP

A. Install sleeve with water stop as new walls and slabs are constructed.

B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position water stop flange to be centered in concrete slab or wall.

C. Secure nailing flanges to concrete forms.

3.4 INSTALLATION OF LINK-SEAL SYSTEMS

A. Install link-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building, and passing through exterior walls.

B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.
1. Locate the bolts in accessible position to allow tightening.

3.5 SLEEVE SCHEDULE

A. Use sleeves and sleeve seals for the following piping-penetration applications:
1. Existing Exterior Concrete Walls below Grade:
    a. Link seal system. Core drilled hole.
2. Existing Exterior Concrete Walls above Grade:
    a. Link seal system. Core drilled hole.
3. Existing Concrete Slabs-on-Grade:
    a. Sleeves with water stops.
        1) No Sleeve: Core drill to allow for 2-inch annular clear space between piping and sleeve for installing sleeve-seal system.
4. Existing Concrete Slabs above Grade:
    a. Dry areas: Core Drill
5. Interior Partitions:
    a. Masonry: Sheet steel
    b. Drywall: neatly field cut round holes with hole saws

3.6 INSTALLATION OF ESCUTCHEONS

A. Install escutcheons for piping penetrations of finished walls, ceilings, and finished floors.

B. Install escutcheons with ID to closely fit around pipe, tube, and insulation of insulated piping and with OD that completely covers opening.

C. Use one-piece escutcheons for all sizes available on new piping. Use spit type on existing piping and large piping where one-piece not available.

3.7 INSTALLATION OF PENETRATION FIRESTOP

A. Install penetration firestopping systems in accordance with manufacturer's written installation instructions and published drawings for products and applications.

B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not forming permanent components of firestopping.

C. Install fill materials by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items to achieve required fire-resistance ratings.
   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 the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.8 INSTALLATION OF DRAFTSTOP

A. All penetrations through non-rated walls, floors, etc., shall be sealed for draft stopping with sealant, grout, etc., designed for this use.

B. Accommodate movement, such as pipe vibration, water hammer, thermal expansion, and other normal building movement without damage.

END OF SECTION 26 05 44

SECTION 26 05 48 – SEISMIC RESTRAINT

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Seismic restraints for electrical systems.

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Seismic restraint submittals shall be provided for engineer review and include, but not be limited to, detailed drawings showing seismic restraint types, anchor type and attachment details, calculations and spacing requirements of unique equipment and conduit for this specific project. Submittals shall include floor plan drawings indicating equipment, ductwork and piping to be restrained, restraint locations and restraint component types. All submittals and floor plan drawings shall bear the seal of a licensed structural engineer of the State of Missouri **[Illinois]**.

1.3 INFORMATIONAL SUBMITTALS

A. Product Data: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. As-built and field modifications shall be submitted.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

B. All materials and workmanship shall specifically comply with the above listed Building Code with respect to seismic requirements for the support and anchorage of all electrical, communications and electronic safety and security systems and equipment as installed on this project. Lateral forces to be restrained shall be as required by IBC Section 1621 Architectural, Mechanical, and Electrical Component Seismic Design Requirements and ASCE 7-02 Section 9.6 Architectural, Mechanical, and Electrical Components and Systems with the following design parameters with the design parameters as shown on the drawings:

1. Site Class as Defined in the IBC: D.
2. In subparagraph below, retain Seismic Use Group or Building Category for Project structure from three classifications defined in the IBC.
3. Assigned Seismic Use Group or Building Category as Defined in the IBC: III.

C. All conduit support and restraint details and practices shall conform to the publication “Seismic Restraint Systems Guidelines” by Cooper B-line-TOLCO.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Submittals shall reflect the actual site conditions as verified by the Contractor.

B. Examine areas and equipment to receive seismic devices for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

C. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

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

3.2 INSTALLATION

A. Install all required seismic restraints per the provided submittals.

B. Install seismic restraint cables so they do not bend across edges of adjacent equipment or building structure.

C. Mechanical Anchor Bolts:
   1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
   2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
   3. Wedge-Type Anchor Bolts: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors to be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
   4. Adhesive-Type Anchor Bolts: Clean holes to remove loose material and drilling dust prior to installation of adhesive. Place adhesive in holes proceeding from the bottom of the hole and progressing toward the surface in such a manner as to avoid introduction of air pockets in the adhesive.
   5. Set anchors to manufacturer's recommended torque, using a torque wrench.
   6. Install zinc-coated steel anchors for interior and stainless steel anchors for exterior applications.

3.3 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in runs of raceways, cables, wireways, cable trays, and busways where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where connection is terminated to equipment that is anchored to a different structural element from the one supporting them as they approach equipment.

END OF SECTON 26 05 48

SECTION 26 05 53 – IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:

1. Labels.
2. Extruded insulating tubing.
3. Bands.
4. Tapes.

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Identification Schedule: For each piece of electrical equipment and electrical system components to be index of nomenclature for electrical equipment and system components used in identification signs and labels. Use same designations indicated on Drawings.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 LABELS

A. Plastic Labels for Indoor Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
2. Letter and Background Color: As indicated for specific application under Part 3.
3. Maximum Temperature: Able to withstand temperatures of up to 160 deg F.
4. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 1 inch.
5. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances of up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
6. Fasteners: Stainless steel rivets or self-tapping screws.

B. Metal Labels for Outdoor Equipment:

1. Material and Thickness: stainless steel, 0.025 inch
2. Letter and Background Color: Black filled lettering on brushed stainless steel.

3. Minimum Label Size: Length and width vary for required label content, but not less than 3 by 1 inch.
4. Fasteners: Stainless steel rivets or self-tapping screws.

C. UL PGDQ2 - Vinyl Wraparound Labels: Preprinted, flexible labels laminated with clear, weather- and chemical-resistant coating and matching wraparound clear adhesive tape for securing label ends.

2.3 EXTRUDED INSULATING TUBING

A. UL YDPU2 - Heat-Shrink Preprinted Tubes: Flame-retardant polyolefin tubes with machine-printed identification labels, sized to suit diameter and shrunk to fit firmly. Full shrink recovery occurs at maximum of 200 deg F.

2.4 BANDS

A. Snap-Around Labels: Slit, pretensioned, flexible, preprinted, color-coded acrylic sleeves, with diameters sized to suit diameters and that stay in place by gripping action.

2.5 TAPES

A. Floor Marking Tape: 2 inch wide, 5 mil pressure-sensitive vinyl tape, with yellow and black. stripes and clear vinyl overlay.

PART 3 - EXECUTION

3.1 PREPARATION

A. Self-Adhesive Identification Products: Before applying electrical identification products, clean substrates of substances that could impair bond, using materials and methods recommended by manufacturer of identification product.

3.2 SELECTION OF COLORS AND IDENTIFICATION MARKINGS

A. Comply with 29 CFR 1910.144 for color identification of hazards, and the following:
1. Fire-protection and fire-alarm equipment, including raceways, must be finished, painted, or suitably marked safety red.
2. Ceiling-mounted hangers, supports, cable trays, and raceways must be finished, painted, or suitably marked safety yellow where less than 7.7 feett above finished floor.

B. Color-Coding for Phase- and Voltage-Level Identification, 1000 V or Less: Use colors listed below.
1. Color must be factory applied.
2. Colors for 208Y/120 V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.
   c. Phase C: Blue.
3. Colors for 240 V Circuits:
   a. Phase A: Black.
   b. Phase B: Red.

4. Colors for 480Y/277 V Circuits:
    a. Phase A: Brown.
    b. Phase B: Orange.
    c. Phase C: Yellow.
5. Color for Neutral (Grounded Conductor): White
    a. Color for Equipment Ground: Bare copper or Green
    b. Color for Isolated Ground: Green with two or more yellow stripes.

C. Accessible Fittings for Raceways: Identify cover of junction and pull box of the following systems with wiring system legend and system voltage. System legends must be as follows:
1. Branch Circuits: Source panel designation, circuit numbers
2. Feeder: Source panel designation, item being fed
3. Service: “Service”, and voltage

D. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, pull points, and locations of high visibility. Identify by system and circuit designation.

E. Locations of Underground Lines: Underground-line warning tape for power and lighting.

F. Vaults, Manholes, Handholes, and Pull and Junction Boxes, More Than 1000 V: For conductors in vaults, pull and junction boxes, manholes, and handholes, use nonmetallic preprinted tags colored and marked to indicate phase, and separate tag with circuit designation.

G. Cover Plates: Label individual cover plates with self-adhesive labels. Label cover plate with the following information, in the order listed:
1. Panelboard designation.
2. Colon or dash.
3. Branch circuit number.
4. Location: Refer to 26 27 26 “Wiring Devices”.

H. Workspace Indication: In unfinished spaces apply floor marking tape or tape and stencil to finished surfaces. Show working clearances in direction of access to live parts. Workspace must comply with NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.

I. Equipment Identification Labels:
1. Black letters on white field, unless noted otherwise.
2. Fasteners: Stainless steel rivets or self-tapping screws.
3. Indoor Equipment: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, with predrilled holes for attachment hardware.
4. Outdoor Equipment: stainless steel, 0.025 inch. Black filled lettering on brushed stainless steel.
5. Lettering: Refer to specific equipment

3.3 INSTALLATION

A. Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment. Install access doors or panels to provide view of identifying devices.

B. Verify and coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and operation and maintenance manual. Use consistent designations throughout Project.

C. Install identifying devices before installing acoustical ceilings and similar concealment.

D. Verify identity of item before installing identification products.

E. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and operation and maintenance manual.

F. Apply identification devices to surfaces that require finish after completing finish work.

G. Install signs with approved legend to facilitate proper identification, operation, and maintenance of electrical systems and connected items.

H. Elevated Components: Increase sizes of labels, signs, and letters to those appropriate for viewing from floor.

I. Vinyl Wraparound Labels:
   1. Secure tight to surface of raceway or cable at location with high visibility and accessibility.
   2. Attach labels that are not self-adhesive type with clear vinyl tape, with adhesive appropriate to location and substrate.

J. Snap-Around Labels: Secure tight to surface at location with high visibility and accessibility.

K. Self-Adhesive Wraparound Labels: Secure tight to surface at location with high visibility and accessibility.

L. Snap-Around Color-Coding Bands: Secure tight to surface at location with high visibility and accessibility.

M. Heat-Shrink, Preprinted Tubes: Secure tight to surface at location with high visibility and accessibility.

N. Marker Tapes: Secure tight to surface at location with high visibility and accessibility.

O. Self-Adhesive Vinyl Tape: Secure tight to surface at location with high visibility and accessibility.
   1. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for minimum distance of 6 inch (150 mm) where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding.

P. Floor Marking Tape: Apply stripes to finished surfaces following manufacturer's instructions.

Q. Underground Line Warning Tape:
   1. During backfilling of trenches, install continuous underground-line warning tape not less than 12 inch directly above cables or raceways buried 18 inch or more below grade. Use multiple tapes where width of multiple lines installed in common trench or concrete envelope exceeds 36 inch overall.
   2. Install underground-line warning tape for direct-buried cables, cables in raceways, and duct banks.

END OF SECTION 26 05 33

SECTION 26 05 73 – ARC FLASH HAZARD ANALYSIS, SHORT CIRCUIT ANALYSIS, AND SELECTIVE COORDINATION

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
1. Arc flash hazard analysis
2. Short circuit analysis
3. Selective coordination

B. Related Requirements:
1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. The results of studies shall be summarized in a preliminary and final report. The preliminary report shall be provided prior to submitted equipment approval. Three (3) bound copies of the complete final report shall be submitted. Electronic PDF copies of the report shall be provided. The report shall include:
1. A One-line diagram shall be provided which clearly identifies individual equipment buses, bus numbers, device identification numbers and the maximum available short-circuit current at each bus when known.
2. Log-log plots shall be provided to indicate the degree of system protection and coordination by displaying the time-current characteristics of series connected overcurrent devices and other pertinent system parameters.
3. Adequacy of switchgear, motor control centers, and panelboard bus bars to withstand short-circuit stresses.
4. Results of the Arc-Flash Hazard Analysis shall be submitted in tabular form, and shall include device or bus name, bolted fault and arcing fault current levels, flash protection boundary distances, working distances, minimum personal-protective equipment AFIE rating and AFIE (Arc Flash Incident Energy) levels.
5. Arc Flash Labels shall be furnished and installed in accordance with NFPA 70E and all applicable local codes and standards.
6. Notify the engineer in writing, of any circuit protective devices improperly rated for the calculated available fault current, of any significant deficiencies in protection and/or coordination and of any significant deficiencies in protection and/or coordination.

B. The study shall include a separate, tabular printout containing the recommended settings of all adjustable overcurrent protective devices, the equipment designation where the device is located, and the device number corresponding to the device on the system one-line diagram.

1.3 INFORMATIONAL SUBMITTALS

A. Not required.

1.4 CLOSEOUT SUBMITTALS

A. Not required.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. The contractor shall furnish an Arc Flash Hazard Analysis Study for all panelboards with added load, including but not limited to control panels, starters, disconnects, etc. per the requirements set forth in the current version of NFPA 70E. The arc flash hazard analysis shall be performed according to the IEEE Standard 1584 – 2018.

B. The short-circuit, protective device coordination and arc flash hazard analysis studies shall be conducted under the responsible charge and approval of a Registered Professional Electrical Engineer, licensed in the State of Missouri, and skilled in performing and interpreting the power system studies.

C. The studies shall be performed using the latest version of SKM Systems Analysis PowerTools for Windows (PTW) software program.

PART 3 - EXECUTION

3.1 SHORT CIRCUIT ANALYSIS

A. Transformer design impedances shall be used when test impedances are not available.

B. Provide the following:
   a. Calculation methods and assumptions
   b. Selected base per unit quantities
   c. One-line diagram of the system being evaluated that clearly identifies individual equipment buses, bus numbers used in the short-circuit analysis, cable and bus connections between the equipment, calculated maximum short-circuit current at each bus location and other information pertinent to the computer analysis. Labeling of components shall match the one-line and floorplans.
   d. The study shall include input circuit data including electric utility system characteristics, source impedance data, conductor lengths, number of conductors per phase, conductor impedance values, insulation types, transformer impedances and X/R ratios, motor contributions greater than 5HP, and other circuit information as related to the short-circuit calculations.
   e. Tabulations of calculated quantities including short-circuit currents, X/R ratios, equipment short-circuit interrupting or withstand current ratings and notes regarding adequacy or inadequacy of the equipment rating.
   f. Results, conclusions, and recommendations. A comprehensive discussion section evaluating the adequacy or inadequacy of the equipment must be provided and include recommendations as appropriate for improvements to the system.

C. For solidly grounded systems, provide a bolted line-to-ground fault current study for applicable buses as determined by the engineer performing the study.

3.2 PROTECTIVE DEVICE COORDINATION ANALYSIS

A. Protective device coordination time-current curves (TCC) shall be displayed on log-log scale graphs.

B. Include on each TCC graph, a complete title with descriptive device names.

C. Terminate device characteristic curves at a point reflecting maximum symmetrical or asymmetrical fault current to which the device is exposed.

D. Identify the device associated with each curve by manufacturer type, function, and, if applicable, tap, time delay, and instantaneous settings recommended.

E. Plot the following characteristics on the TCC graphs, where applicable:
   1. Medium and low voltage fuses including manufacturer's minimum melt, total clearing, tolerance, and damage bands
   2. Low voltage equipment circuit breaker trip devices, including manufacturer's tolerance bands
   3. Transformer full-load current, magnetizing inrush current, inrush/full load current multiplier, and ANSI through-fault protection curves
   4. Medium voltage conductor damage curves
   5. Ground fault protective devices, as applicable
   6. Pertinent motor starting characteristics and motor damage points, where applicable
   7. The largest feeder circuit breaker in each motor control center and applicable panelboard.

F. Provide adequate time margins between device characteristics such that selective operation is provided, while providing proper protection.

G. Final overcurrent device settings as identified by the protective device coordination study shall be implemented by the installing contractor.

3.3 ARC FLASH HAZARD ANALYSIS

A. The arc flash hazard analysis shall be performed according to the IEEE 1584 equations that are presented in the latest version of NFPA70E, Annex D. The arc flash hazard analysis shall be performed in conjunction with the short-circuit analysis and the protective device time-current coordination analysis.

B. The flash protection boundary and the incident energy shall be calculated at significant locations in the electrical distribution system (switchboards, switchgear, motor-control centers, panelboards, busway and splitters) where work could be performed on energized parts.

C. Working distances shall be based on IEEE 1584. The calculated arc flash protection boundary shall be determined using those working distances.

D. When appropriate, the short circuit calculations and the clearing times of the phase overcurrent devices will be retrieved from the short circuit and coordination study model. Ground overcurrent relays should not be taken into consideration when determining the clearing time when performing incident energy calculations

E. The short-circuit calculations and the corresponding incident energy calculations for multiple system scenarios must be compared and the greatest incident energy must be uniquely reported for each equipment location in a single table. Calculations must be performed to represent the maximum and minimum contributions of fault current magnitude for normal and emergency operating conditions. The minimum calculation will assume that the utility contribution is at a minimum. Conversely, the maximum calculation will assume a maximum contribution from the utility. Calculations shall take into consideration the parallel operation of synchronous generators with the electric utility, where applicable as well as any stand-by generator applications.

F. The Arc-Flash Hazard Analysis shall be performed utilizing mutually agreed upon facility operational conditions, and the final report shall describe, when applicable, how these conditions differ from worst-case bolted fault conditions.

G. The incident energy calculations must consider the accumulation of energy over time when performing arc flash calculations on buses with multiple sources. Iterative calculations must take into account the changing current contributions, as the sources are interrupted or decremented with time. Fault contribution from motors should be decremented as follows:

H. Fault contribution from induction motors should not be considered beyond 5 cycles.

I. For each piece of ANSI rated equipment with an enclosed main device, two calculations shall be made. A calculation shall be made for the main cubicle, sides, or rear; and shall be based on a device located upstream of the equipment to clear the arcing fault. A second calculation shall be made for the front cubicles and shall be based on the equipment's main device to clear the arcing fault. For all other non-ANSI rated equipment, only one calculation shall be required, and it shall be based on a device located upstream of the equipment to clear the arcing fault.

J. When performing incident energy calculations on the line side of a main breaker (as required per above), the line side and load side contributions must be included in the fault calculation.

K. Mis-coordination should be checked amongst all devices within the branch containing the immediate protective device upstream of the calculation location and the calculation should utilize the fastest device to compute the incident energy for the corresponding location.

L. Arc Flash calculations shall be based on actual overcurrent protective device clearing time. A maximum clearing time of 2 seconds will be used based on IEEE 1584-2002 section B.1.2. Where it is not physically possible to move outside of the flash protection boundary in less than 2 seconds during an arc flash event, a maximum clearing time based on the specific location shall be utilized.

END OF SECTION 26 05 73

SECTION 26 09 23 – LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Occupancy sensors
2. Digital countdown timers
3. Dimmers

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data

B. Wiring Diagrams

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Operating Instructions: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 OCCUPANCY SENSORS

A. Ceiling mounted occupancy sensors shall be dual-technology and white in color unless otherwise noted: Watt Stopper #DT-300, Hubbell #OMNI-DT-1000, Leviton #OSC10-MOW, Sensorswitch #CM-PDT-9, Lutron LOS-LDT-1000-WH or approved equivalent.

1. Sensors shall be programmed to the following time delays:
   a. Open Offices/Classrooms – 30 minutes
   b. Bathrooms – 10 minutes
   c. Conference Rooms – 5 minutes
   d. Corridors – 5 minutes

B. Wall mounted occupancy sensors shall be dual-technology and white/ivory in color: Watt Stopper #DT-200, Hubbell #LODT, Leviton #OSW12-RMW, Sensorswitch #WV-PDT-16, Lutron LOS-WDT-WH or approved equivalent.
   1. Time delays – Refer to ceiling mount occupancy sensors.

C. Wallswitch occupancy sensors shall be white/ivory in color and be Watt-Stopper #DSW-301, Hubbell #LHMTS1, Leviton #OSSMD, Sensorswitch #WSD-PDT, Lutron MS-B102 or approved equivalent.
   1. Sensors shall be programmed to the following time delays:
      a. Offices – Adaptive if available, otherwise 30 seconds, walk-through enabled
      b. Conference Rooms – 5 minutes, walk-through enabled
      c. Storage Rooms – 30 seconds, walk-through enabled
      d. Wall Switch Occupancy Sensor Dimmer shall be white/ivory in color and be Wattstopper #DW-311, Lutron MS-Z101-XX or approved equivalent. Time delays – Refer to wallswitch occupancy sensors.

D. Dual relay wall switch occupancy sensors shall be white/ivory in color and be: Wattstopper #DW-302, Hubbell #LHMTD2, Leviton #OSSMD, Sensorswitch #WSD-PDT-2P, Lutron MS-B202 or approved equipment.
   1. Time delays – Refer to wall switch occupancy sensors.

E. Provide occupancy sensors with relay packs as required or shown on the drawings.

F. Occupancy sensors shall be programmed to ‘manual-on’ unless otherwise specified.

G. Provide open plenum rated wiring in accordance with manufacturer’s wiring diagrams.

H. Rooms or areas with multiple sensors shall be wired so that any sensor activates all lights.

I. Sensors shall be installed a minimum of 6’ from all diffusers.

J. Refer to wiring diagrams on drawings for additional requirements.

2.3 DIGITAL COUNTDOWN TIMERS

A. WattStopper TS-400, Leviton 61244 Digital Countdown Timer or approved equivalent.

B. Countdown Timer to be programmed to the following:
   1. Storage Rooms – 5 minutes with audio and visual options disabled.
   2. Mechanical/Electrical Rooms – 20 minutes with audio and visual options enabled.

2.4 DIMMERS

A. Provide dimmer switches as shown on drawings.

B. Contractor is responsible for providing and installing dimmer compatible with LED driver of fixtures.

C. Line Voltage Dimmers to be manufactured by WattStopper #RH703PTUTC, Lutron or approved equivalent. Devices shall be universal, selectable for forward or reverse phase loads.

D. Magnetic Line Voltage Dimmers to be manufactured by WattStopper #RHL1103PTC, Lutron or approved equivalent.

E. 0-10V dimmers to be manufactured by WattStopper #RH4FBL3PTC, Lutron or approved equivalent.

F. 0-10V LED dimmers requiring ‘manual-on’ shall be WattStopper #DCLV2, Lutron or approved equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer’s recommendations.

END OF SECTION 26 09 23

SECTION 26 09 43 – NETWORK/ADDRESSABLE LIGHTING CONTROLS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Lighting control system
2. Relays
3. Switches

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop drawings: Project specific connection diagrams and riser diagrams

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Operating Instructions:

1. Installation and programming instructions for all system components.
2. Operating instructions for all system components.
3. Relay schedule documentation.
4. Switch schedule documentation.
5. Time Clock schedule documentation.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 SYSTEM

A. Furnish and install a complete low voltage lighting control system consisting of relay control panels, switches and wiring to provide control as shown on the drawings.

B. System shall be a ‘Greenmax’ Lighting Control System as manufactured by Leviton or equivalent.

1. System shall be furnished with a handheld display unit for system programming and time clock functions.

C. System shall be networked to allow complete system control from any switch location.

D. Contractor shall program system as shown in contract documents.
   1. Contractor shall furnish panel directories indicating circuit designation, and area designation for each relay.

2.3 RELAYS

A. Relays shall be mounted in control panels containing terminal strips, transformers, rectifiers, all interconnecting wiring and switch interface modules for multiple relays. Relays shall maintain position during power outages.

B. Low Voltage Relays shall be Greenmax relay modules with manual by-pass or equal.

2.4 SWITCHES

A. Switches shall be 4-wire bus controlled. The 4-wire bus shall be designed for open topology.

B. Switches shall have typed labels indicating fixtures controlled per the drawings.

C. Switches shall have LEDs indicating on/off status.

D. Switches shall be capable of being configured to control a single relay, a group of relays, or pattern control.

E. Lighting Switches shall be Leviton Greenmax switches as indicated on the drawings, or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install per manufacturer’s recommendations.

3.2 WIRING

A. All wiring shall be as required by the equipment supplier.

B. Wiring may be run as concealed open-type plenum rated cable. Exposed or inaccessible wring shall be installed in conduit. Where possible wiring/conduit shall be concealed.

3.3 TESTING AND CHECKOUT

A. The Contractor shall provide a representative from the company to conduct a 4-hour training class at a time scheduled in advance with the Owner and shall occur during or immediately following system startup. These instructions are to be conducted during normal working hours. All pertinent costs shall be included in this contract.

END OF SECTION 26 09 43

SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:
1. Distribution panelboards
2. Circuit breaker panelboards

B. Related Requirements:
1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data

B. Shop Drawings

1.3 INFORMATIONAL SUBMITTALS

A. Installation manual

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For each type of product.

B. Parts List: For each type of product that has replaceable parts.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Schneider Electric

B. ABB

C. Siemens

D. Eaton Cutler Hammer.

2.3 CIRCUIT BREAKER PANELBOARDS

A. The circuit breakers shall be of the molded case, bolt on type suitable for voltage and ampere ratings indicated on drawings and in schedules and shall have a minimum interrupting capacity of 10,000 amperes (120/208V) or 14,000 amperes (277/480V) or as noted on the drawings.

B. Provide lockable red circuit breakers on all circuits serving the fire alarm system.

C. A directory frame shall be attached to inside face of hinged door.

D. Provide labeling indicating Available Fault Current with calculation date Per NEC 2020 408.6.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify actual conditions with field measurements prior to ordering panelboards to verify that equipment fits in allocated space in, and comply with, minimum required clearances specified in NFPA 70.

B. Receive, inspect, handle, and store circuit breakers in accordance with NEMA PB 1.1.

C. Examine circuit breakers before installation. Reject circuit breakers that are damaged, rusted, or have been subjected to water saturation.

D. Examine elements and surfaces to receive circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

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

3.2 INSTALLATION

A. Comply with requirements for seismic control devices specified in Section 260548 "Seismic Restraints".

B. Install overcurrent protective devices and controllers not already factory installed.
   1. Set field-adjustable, circuit-breaker trip ranges.
   2. Tighten bolted connections and circuit breaker connections using calibrated torque wrench or torque screwdriver in accordance with manufacturer's published instructions.

C. Make grounding connections and bond neutral for services and separately derived systems to ground. Make connections to grounding electrodes, separate grounds for isolated ground bars, and connections to separate ground bars.

D. Install filler plates in unused spaces.

E. Arrange conductors in gutters into groups and bundle and wrap with wire ties.

3.3 IDENTIFICATION

A. Identify field-installed conductors, interconnecting wiring, and components; install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems."

B. Provide labeling indicating Available Fault Current with calculation date Per NEC 2020 408.6.

C. Device Nameplates: Label each branch circuit device in power panelboards with nameplate complying with requirements for identification specified in Section 260553 "Identification for Electrical Systems."
   1. Provide a 3” wide x 1” high phenolic nameplate for each switch as follows:
      EQUIPMENT IDENTIFICATION (3/8” Lettering)
      __AS/__AF (XX AMPS WITH/XX AMP FUSE) (1/4” Lettering)

D. Install warning signs complying with requirements in Section 260553 "Identification for Electrical Systems" identifying source of remote circuit.

E. Circuit Directory:
   1. The directory card shall be neatly typed to identify circuits. A transparent plastic facing shall protect the directory card. Room numbers shall be included in directory descriptions. Furnish a copy of each panel directory to the Architect/Engineer. Where existing panelboard loads are modified, the panel directories shall be updated.

END OF SECTION 26 24 16

SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes:

1. General-use switches, dimmer switches, and fan-speed controller switches.
2. General-grade single straight-blade receptacles.
3. General-grade duplex straight-blade receptacles.
4. Receptacles with arc-fault and ground-fault protective devices.

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Refer to specific product paragraphs.

2.3 WIRING DEVICES

A. Furnish and install wiring devices as scheduled in Table 1 below, in types, characteristics, grades, colors, and electrical ratings for applications indicated which are UL listed and which comply with NEMA and FedSpec standards.

B. Provide white color devices and nylon wall plates except as otherwise indicated.

C. Modular Wiring versions of the wiring devices in Table 1 are permitted. (Hubbell SNAPConnect, Leviton Lev-Lok, Cooper ArrowLink, or P&S PlugTail)

D. Listings and Standards:

1. Switches UL20, FedSpec WS896 E
2. Receptacles UL948, FedSpec WC 596F, NEMA WD 1 and WD 6
3. GFI – UL943

TABLE NO. 1 (Note: Ivory catalog # is listed, provide unless specified otherwise.)

DEVICES

Receptacles	**Hubbell**	**Leviton**	**Cooper**	**P & S**
20A Duplex	HBL5362-I	5362A-I	5362V	5362A-I
20A GFI	GF20IL	7899-I	VGF20V	2095-I
20A Duplex w/ USB			TR7746	

Switches	**Hubbell**	**Leviton**	**Cooper**	**P & S**
20A Single	1221I	1221 2I	AH2221V	PS20ACI-I
20A 3 way	1223I	1223 2I	AH2223V	PS20AC3-I
20A 4 way	1224I	1224 2I	AH2224V	PS20AC4-I
20A 2 pole	1222I	1222 2I	AH2222V	PS20AC2-I
20A Momentary SPDT	HBL1557 I	1257 I	1995V	PS1251-I

Nylon Plates	**Hubbell**	**Leviton**	**Cooper**	**P & S**
Duplex	NP8I	80703 I	5132V	TP8-I
Quadplex	NP82I	80716 I	5150V	TP82-I
Single Toggle	NP1I	80701 I	5134V	TP1-I
2 Gang Toggle	NP2I	80709 I	5139V	TP2-I
GFI	NP26I	80401 N1	5151V	TP26-I

Weatherproof Plates	**Hubbell**	**Leviton**	**Cooper**	**P & S**
WP GFI	NWP26	6196 V	1966	WP26-I
WP In Use GFI	Bell MX4280(Z-bronze,WH-white,S-gray)			

PART 3 - EXECUTION

3.1 INSTALLATION

A. All receptacles and switches shall be identified with a Black-on-white printed adhesive label affixed to the back of the coverplate. A second label shall be affixed to the BACK of the device as well. These label(s) shall include the panel and branch circuit number supplying power to the receptacle.

END OF SECTION 26 27 26

SECTION 26 28 16 – DISCONNECT SWITCHES

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Disconnect Switches

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product include the following:

1. Enclosure types and details..
2. Current and voltage ratings.
3. Short-circuit current ratings (interrupting and withstand, as appropriate).

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Not required

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Siemens

B. Schneider Electric

C. Eaton Cutler Hammer

D. ABB

2.3 DISCONNECT SWITCHES

A. Type of Switch: Furnish and install disconnect switches as specified where shown on the drawings.

1. Provide service entrance rated disconnect were indicated on drawings.

B. All disconnect switches shall be classed Heavy Duty and enclosed as required by NEMA Standards. Switch sizes, fusing shall be as shown on the drawings.

C. Switch shall have a quick make, quick break mechanism operating through the box and not the cover. The switchblades shall be visible when the hinged door is open.

D. The cover shall be interlocked with the operating handle to prevent opening door when switch is “ON” and a means provided to lock switch in the “OFF” position. This mechanism shall be capable of being defeated.

E. Provide factory label indicating voltage and amperage ratings on the outside of the disconnect. Accessories:
   1. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open. Contact rating - 24 V(ac).
      a. Provide for all disconnects served by VFDs and those noted on contract documents.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.

3.2 INSTALLATION

A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

B. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.

C. Comply with mounting and anchoring requirements specified in Section 260548 "Seismic Restraint".

D. Temporary Lifting Provisions: Remove temporary lifting of eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.

E. Install fuses in fusible devices.

3.3 FIELD QUALITY CONTROL

A. Perform field tests and inspections.
   1. Visual and Mechanical Inspection:
      a. Inspect physical and mechanical condition.
      b. Inspect anchorage, alignment, grounding, and clearances.
      c. Verify that unit is clean.
      d. Inspect bolted electrical connections for high resistance using the following methods:

1) Verify tightness of accessible bolted electrical connections by calibrated torque-wrench method.

e. Verify lubrication of moving current-carrying parts and moving and sliding surfaces.

3.4 IDENTIFICATION

A. Comply with requirements in Section 260553 "Identification for Electrical Systems."

1. Identify field-installed interconnecting wiring, and components.
2. Service Disconnect
   a. Provide a 6” wide x 4” high phenolic nameplate reading the following for all service entrance disconnect switches:

      SERVICE DISCONNECT (1” Lettering)
      SERVES ‘EQUIPEMENT/BUILDING/AREA’ (1/2” Lettering)

   b. Provide a 4” wide x 1½” high phenolic nameplate reading the following

      EQUIPMENT IDENTIFICATION’ (3/8” Lettering)
      FED FROM ‘SOURCE NAME’ (1/4” Lettering)
      LOCATED IN ‘SOURCE LOCATION’ (1/4” Lettering)

3. Provide a 4” wide x 1½” high phenolic nameplate reading the following for all disconnect switches provided by Division 26 or Factory/Manufacturer:

   ‘EQUIPMENT SERVED’ DISCONNECT (3/8” Lettering)
   FED FROM ‘SOURCE NAME’ (1/4” Lettering)
   LOCATE IN ‘SOURCE LOCATION’ (1/4” Lettering)

END OF SECTION 26 27 13

SECTION 26 33 23 – EMERGENCY LIGHTING INVERTERS

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Emergency lighting inverters

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data:

1. Catalog data
2. Manufacturer’s spec sheet
3. Equipment Weights and other physical characteristics

B. Shop Drawing:

1. Wiring Diagrams
2. Battery Calculations
3. System layout drawings

1.3 INFORMATIONAL SUBMITTALS

A. Installation manual: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. After completion of the tests and adjustments listed above, the Subcontractor shall submit the following information to the Owner within two weeks after equipment acceptance date:

1. Complete as-built drawings.
2. Detailed catalog data on installed system components.
3. Operating and shop manuals
4. Field test reports
5. Parts list

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Refer to the Lighting Inverter Schedule on the drawings.

2.3 EMERGENCY LIGHTING INVERTER

A. Single-phase or three-phase (refer to Lighting Inverter Schedule on drawings) , solid state central battery inverter system complete with battery bank, battery circuit breaker and bypass/isolation switch shall be furnished to provide a reliable source of power and shall operate during a normal power deficiency without any interruptions of power supplied to the load. The transfer from normal power to battery power shall utilize a true no break, sine wave output system to maintain a zero transfer time. The system shall be capable of powering any combination of electronic ballast, power factor corrected ballast, LED driver and self-ballasted fluorescent, incandescent or HID lighting, building management systems, and any other critical voltage or frequency-sensitive electronic loads. The system shall operate from 0-100 percent loading and be rated to deliver its full kW rating at unity power factor.

B. Upon return of the normal power, the system shall recharge the batteries within 24 hours without any interruptions of power supplied to the load. Upon an inverter failure, the load shall automatically connect to normal power

C. The system shall conform to the following operating characteristics:
   1. Modes of Operation:
      a. Normal: The inverter shall continuously supply power to the critical load. The rectifier/battery charger shall derive power from the normal AC source, supply DC power to the inverter and simultaneously float charge the battery
      b. Abnormal Supply Conditions: When normal AC supply deviates from specified voltage, waveform or frequency limits, the battery supplies energy to maintain constant inverter output to the load.
      c. Battery (Emergency): Upon failure of normal AC power, the battery supplies energy through the inverter to the load without switching or disturbance
      d. Recharge: Upon restoration of normal AC power (prior to complete battery discharge) the rectifier/battery charger shall power the inverter and simultaneously recharge the battery.
      e. Bypass: The static bypass transfer switch shall be used to transfer the load to the bypass without interruption to the critical load. This shall be accomplished by turning the inverter off. Automatic re-transfer or transfer of the load shall be accomplished by turning the inverter on.
      f. Manual Bypass Switch: A manual make-before-break internal bypass switch shall be provided to isolate the inverter output and static bypass and connect the load directly to normal power to allow servicing of the equipment.
   2. Input Characteristics:
      a. Input Voltage: Refer to Lighting Inverter Schedule on drawings
      b. Input Power Factor: Up to 0.96 lagging
      c. Input Current Total Harmonic Distortion: 10% THD Maximum
      d. Power Walk-in: 0 to 100% over a 10 second period (Field Programmable).
      e. Inrush Current: 800% of full load current maximum for less than one cycle.
      f. Input Surge Protection: ANSI C62.41 Category A and B.
   3. Output Characteristics:
      a. Output Voltage: Refer to Lighting Inverter Schedule on drawings
      b. System Capacity: refer to Lighting Inverter Schedule on drawings (ratings at Unity Power Factor)
      c. Minimum Battery Duration: 90 minutes at full load
         1) Under steady-state or transient-load conditions the system shall remain within specified tolerances throughout the minimum duration when power is supplied

from the battery. Dynamic brown-out protection shall maintain the desired voltage without continuously switching to batteries in low-voltage situations.

d. Voltage Regulation: +/- 3% steady state for a static 100% unbalanced load
e. Voltage distortion: Maximum of 5% total (THD) at 100% linear loads.
f. Voltage transient (Step Load) response:
    1) +/- 5% for 50% step load change
    2) +/- 8% for 100% step load change
    3) +/- 3% for loss or return of AC input power or manual transfer at full load.
g. Voltage recovery time: Return to within 3% of normal value within 50 milliseconds
h. Non-linear load capacity: Output voltage total harmonic distortion shall be less than 8% when connected to a 100% non-linear load with a crest factor not to exceed 2.5%.
i. Slew rate: 1Hz/second maximum
j. Phase Displacement: 120 degrees +/- 3 degrees for 100% unbalanced load
k. Power Factor Unity
l. Overload Capability:
    1) 115% for 5 minutes
    2) 150% for 12 cycles

4. DC Bus:
    a. DC bus voltage: 2.3 VDC/cell nominal float level. The battery charger shall compensate for temperature changes in accordance with the battery manufacturer's requirements. Hardware and software shall be provided to monitor the battery condition and operation.
    b. The continuous run circuitry shall be designed to run as long as the batteries retain sufficient capacity. Units that shut down due to thermal runaway or programmed time limits are not acceptable
5. Operating Ambient Temperature: 0 – 40º C continuous, 5-95% RH non-condensing
6. Input Surge Protection: The inverter system shall be equipped with surge protection designed to withstand surges per IEEE 587/ANSI C62.41 and listed in UL 1449.

D. Warranty: Refer to Lighting Inverter Schedule on drawings with Start-Up included

E. Manual and programmable testing
1. The system shall incorporate a manual test function and three automatic test modes.
2. Manual testing shall be able to be performed at any time. The system shall also perform the following programmable tests:
3. Weekly self-diagnostic test of subsystems to insure the system will operate in an emergency condition.
4. Monthly test for a user-programmable discharge time of five (5) minutes.
5. Annual test for a complete runtime discharge of ninety (90) minutes.
6. The system shall record in memory the last twenty (20) inverter events, including all automatic weekly and programmable tests.

F. Batteries
1. Batteries shall be sealed, maintenance free, valve regulated, recombinant, lead-calcium (Type G) with a 20-year design life expectancy at 27 degrees C (80 degrees F).
2. Batteries shall provide sufficient power to maintain the output voltage of the inverter for a minimum duration of two (2) hours, maintaining 87.5 percent of nominal battery voltage.
3. Batteries shall be housed [in a common cabinet with the inverter system.] [in separate cabinets that match the inverter system cabinet in appearance.] Cabinets shall have provisions for draw-out removal of battery assembly to allow for inspection and testing.
4. The battery assembly shall be provided with a battery disconnect switch/circuit breaker.

G. Battery monitoring System
1. Provide a battery ground fault detector that initiates an alarm when resistance to ground of the positive or negative bus of the battery is less than 5000 ohms.

2. Provide protection against deep or excessive discharge and self-discharge.
3. Provide, in the battery compartment, a smoke/high temperature detector that initiates an alarm when smoke is sensed, or the temperature is greater than 75 degrees C within the compartment.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Factory testing
   1. Factory tests shall be performed on the complete inverter system, including battery, before shipment. Include the following tests:
      a. Functional test and demonstration of functions, controls, indicators, sensors and protective devices.
      b. Full load test.
      c. Transient load response test.
      d. Overload test.
      e. Power failure test.
   2. Factory test results to include the following data:
      a. Description of input source and output loads to be used. Describe actions required to simulate source load variation and various operating conditions and malfunctions.
      b. List of indications, parameter values and system responses considered satisfactory for each test action. Include tabulation of actual observations during testing.
      c. List of instruments and equipment required for performing a duplication of factory tests during field testing and commissioning.

B. Acceptance and energization
   1. Final acceptance shall depend upon the satisfactory test results as performed in accordance with the manufacturer's instructions.

C. Demonstration and testing
   1. A factory-authorized service representative shall train Owner personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing and preventative maintenance. Schedule training with the Owner with at least seven (7) days written notice.

END OF SECTION 26 33 23

SECTION 26 51 00 – LED INTERIOR LIGHTING

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: LED interior luminaires

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK
2. Section 26 09 23 "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
3. Section 26 09 43 “Network/Addessable Lighting Controls” for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
4. Drawings for Luminaire Schedule.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Arrange in order of luminaire designation.
2. Include data on features, accessories, and finishes.
3. Include physical description and dimensions of luminaires.
4. Include emergency lighting units, including batteries and chargers.
5. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
6. Include sample warranty.

B. Shop Drawings: For nonstandard or custom luminaires.

1. Submit factory drawings with the following additional information included:
   a. Plans, elevations, sections, and mounting and attachment details.
   b. Details of luminaire assemblies. Indicate dimensions of fixture including individual lens lengths, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
   c. Diagrams for power, signal, control wiring, and emergency lighting locations.
   d. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
   e. Product Certificates: for each type of Luminaire.
   f. Product Test Reports: For each luminaire, for test performed by a qualified testing agency.
   g. Sample warranty.

1.3 PRODUCT SUBSTITUTIONS

A. Product Substitutions shall be submitted 10 days in advance of bid-day. All products included in bid shall be of equal or better quality to the basis of design.

1.4 INFORMATIONAL SUBMITTALS

A. Not required.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For luminaires and lighting systems to include in operation and maintenance manuals.
   1. Provide a list of all Lamps/LED Light Bars & Drivers/Transformers used on Project; use ANSI and manufacturers' codes.

1.6 DEFINITIONS

A. CCT: Correlated color temperature.

B. CRI: Color Rendering Index.

C. Fixture: See "Luminaire."

D. IP: International Protection or Ingress Protection Rating.

E. LED: Light-emitting diode.

F. Lumen: Measured output of lamp and luminaire, or both.

G. Luminaire: Complete lighting unit, including lamp, reflector, and housing.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Refer to Luminaire Schedule on the drawings.

2.3 LED INTERIOR LIGHTING

A. Quality Assurance
   1. Luminaire Photometric Data Testing Laboratory Qualifications:
      a. Luminaire manufacturer's laboratory that is accredited under the NVLAP for Energy Efficient Lighting Products.
      b. Provided by an independent agency, with the experience and capability to conduct the testing indicated, that is an NRTL as defined by OSHA in 29 CFR 1910.7, accredited under the NVLAP for Energy Efficient Lighting Products, and complying with the applicable IES testing standards.
   2. Provide luminaires from a single manufacturer for each luminaire type.
   3. Each luminaire type shall be binned within a three-step MacAdam Ellipse or better to ensure color consistency among luminaires.

B. Warranty

1. Warranty: Manufacturer and Installer agree to repair or replace components of luminaires that fail in materials or workmanship within specified warranty period.
2. Warranty Period: From date of Substantial Completion.
    a. Manufacturer: Five years minimum, unless otherwise noted.
    b. Installer: One year minimum, unless otherwise noted.

C. Performance Requirements
1. Seismic Performance:
    a. Luminaires shall withstand the effects of earthquake motions determined in accordance with ASCE/SEI 7.
    b. Luminaires and lamps shall be labeled vibration and shock resistant.
    c. The term "withstand" means "the luminaire will remain in place without separation of any parts when subjected to the seismic forces specified.
2. Ambient Temperature: 41 to 104 deg F.
3. Relative Humidity: Zero to 95 percent.

D. Luminaire Requirements
1. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place. Labels shall include but not limited to CCT, CRI and Lumens.
3. CRI of minimum 80. CCT of 3500K (interior). 4000K (exterior)
4. Related minimum luminaire life of 100,000 hrs to L70.
5. Luminaire dimmable from 100 percent to 10 percent of maximum light output unless otherwise specified on Luminaire Schedule.
6. All recessed fixtures less than 3” in diameter have accessibility to driver without reaching into ceiling cavity.
7. Lens:
    a. Acrylic diffusers: 100% virgin acrylic plastic, with high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
    b. At least 0.125 inch minimum unless otherwise indicated on Luminaire schedule.
8. Housings: See luminaire schedule for exact requirements.
9. Recessed luminaires shall comply with NEMA LE 4.

E. Materials
1. Metal Parts:
    a. Free of burrs and sharp corners and edges.
    b. Sheet metal components shall be steel unless otherwise indicated.
    c. Form and support to prevent warping and sagging.
2. Steel:
    a. ASTM A36/A36M for carbon structural steel.
    b. ASTM A568/A568M for sheet steel.
3. Stainless Steel:
    a. Manufacturer's standard grade.
    b. Manufacturer's standard type, ASTM A240/240M.
4. Galvanized Steel: ASTM A653/A653M.
5. Aluminum: ASTM B209.
6. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions.
7. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidently during relamping and when secured in operating position

F. METAL FINISHES

1. Variations in finishes are unacceptable in the same piece. Variations in finishes of adjoining components are acceptable if they are within the range of approved Samples and if they can be and are assembled or installed to minimize contrast.

PART 3 - EXECUTION

3.1 DELIVERY, STORAGE, AND HANDLING

A. Protect finishes of exposed surfaces by applying a strippable, temporary protective covering before shipping.

3.2 EXAMINATION

A. Examine roughing-in for luminaire to verify actual locations of luminaire and electrical connections before luminaire installation. EC shall receive approval from engineer/lighting designer prior to luminaire installation when there is a layout change due to unforeseen conditions.

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

3.3 TEMPORARY LIGHTING

A. If approved by the Architect, Engineer and Lighting Designer, use selected permanent luminaires for temporary lighting. When construction is sufficiently complete, clean luminaires used for temporary lighting.

3.4 INSTALLATION

A. Comply with NECA 1.

B. Install luminaires level, plumb, and square with ceilings and walls unless otherwise indicated.

C. Install per manufacturer’s installation instructions.

D. Supports:
   1. Sized and rated for luminaire weight.
   2. Able to maintain luminaire position after cleaning and relamping.
   3. Provide support for luminaire without causing deflection of ceiling or wall.
   4. Luminaire-mounting devices shall be capable of supporting a horizontal force of 100 percent of luminaire weight and a vertical force of 400 percent of luminaire weight.

E. Flush-Mounted Luminaires:
   1. Secured to outlet box.
   2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire.
   3. Trim ring flush with finished surface.

F. Wall-Mounted Luminaires:
   1. Attached to structural members in walls
   2. Do not attach luminaires directly to gypsum board.

G. Suspended Luminaires:
   1. Ceiling Mount:
      a. Aircraft cable size and support locations per manufacturer's requirements. See drawings for exact length.
      b. Aircraft cable supports and quantity per manufacturer's requirements. See drawings for exact length.
      c. Hook mount.
   2. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
   3. Stem-Mounted, Single-Unit Luminaires: Suspend with twin-stem hangers. Support with approved outlet box and accessories that hold stem and provide damping of luminaire oscillations. Support outlet box vertically to building structure using approved devices.
   4. Continuous Rows of Luminaires: Use tubing or stem for wiring at one point and tubing, rod, or wire support for suspension for each unit length of luminaire chassis, including one at each end.
   5. Do not use ceiling grid as support for pendant luminaires. Connect support wires or rods to building structure. See seismic detail on drawings.

H. Ceiling-Grid-Mounted Luminaires:
   1. Secure to any required outlet box.
   2. Secure luminaire to the luminaire opening using approved fasteners in a minimum of four locations, spaced near corners of luminaire.
   3. Use approved devices and support components to connect luminaire to ceiling grid and building structure in a minimum of four locations, spaced near corners of luminaire.

I. Comply with requirements in Section 260519 "Low-Voltage Electrical Power Conductors and Cables" for wiring connections.

3.5 FIELD QUALITY CONTROL

A. Perform the following tests and inspections:
   1. After installing luminaires, lighting controls, and accessories, and after electrical circuitry has been energized, test luminaires with controls to confirm proper operation. Any defective component in the lighting systems shall be replaced and the system reprogrammed if necessary.
   2. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

B. Luminaire will be considered defective if it does not pass operation tests and inspections.

3.6 ADJUSTING

A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
   1. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
   2. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.

END OF SECTION 26 51 00

SECTION 26 52 13 – EMERGENCY LIGHTING TRANSFER DEVICES

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Emergency lighting transfer device (LTB)
2. Lighting transfer switch (LTS)

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Not required.

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 EMERGENCY LIGHTING TRANSFER DEVICE

A. Lighting Transfer/Bypass Device (LTB) with Remote Test Button

1. UL 924 listed.
2. Contact ratings:
   a. 20 amp magnetic ballast @ 277 Vac
   b. 16 amp electronic ballast @ 277 Vac
3. Bypasses local manual or automatic lighting controls so an emergency luminaire provides full brightness during a power outage. Normally downstream of a UL 1008 listed Automatic Transfer Switch (ATS) or Lighting Transfer Switch (LTS).
4. Includes a dry contact to interrupt 0-10V dimming control circuit.
5. Includes remote test input to be used with Functional Devices Remote Test Button #ESRTB (or equivalent). Provide and install the Remote Test Button in an accessible location flush in the ceiling or above 80”AFF on wall or where indicated on the drawings.
6. Functional Devices Automatic Load Control Relay #ESRN or equivalent.

2.3 LIGHTING TRANSFER SWITCH (LTS)

A. UL 1008 listed.

B. Contact ratings:
   1. 20 amp lighting load @120-277 Vac

C. Switches between a normal and emergency source/circuit.

D. Includes a dry contact to interrupt 0-10V dimming control circuit.

E. Myers Branch Circuit Emergency Lighting Transfer Switch #EPC-D-F-LS or equivalent.

PART 3 - EXECUTION

3.1 INSTALLATION
   1. Install per manufacturer's recommendation.

3.2 FIELD QUALITY CONTROL
   1. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery power and retransfer to normal.

END OF SECTION 26 52 13

SECTION 26 60 20 – ELECTRICAL SURFACE SNOW/ICE MELT SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

1. Section Includes: Electric SNOW/ICE MELT SYSTEM

B. Related Requirements:

1. Section 26 00 00 ELECTRICAL WORK

1.2 ACTION SUBMITTALS

A. Product Data

B. Installation/Design Drawings including details and cable lengths.

1.3 INFORMATIONAL SUBMITTALS

A. Installation Instructions

1.4 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data

B. Functional Test Results

C. Installation Photographs: Multiple photos required as necessary.

1. End seals
2. Power connections
3. Installed cable layout after complete circuiting and before concrete installation
4. Expansion joint connections
5. Sensors and all imbedded instrumentation

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Pentair/Raychem

B. Danfoss

C. Delta-Therm

2.3 ELECTRIC SURFACE SNOW/ICE MELT SYSTEM

A. Furnish and install an electric surface snow/ice melt protection system as indicated on the drawings.

B. Contractor shall verify snow/ice melt design for the system provided based upon the following criteria:
   1. Ambient temperature: -10°F
   2. Start-up temperature: -10°F
   3. Setpoint temperature: 40°F

C. Products (Raychem part numbers)
   1. Self-regulating heating cable
      a. EM2-XR (30/32/34 w/ft, 208/240/277V, polyolefin jacket)

D. Connection kits
   1. EMK-XP (connection and end seal)
   2. EMK-XS (splice)
   3. EMK-XEJ (expansion joint kit)
   4. EMK-XJB (junction box – max 2 circuits per box)

E. Accessories
   1. SMCS (snow melt caution sign, minimum 1 per system/location)
   2. EMK-XJR (jacket repair kit)

F. Instruments and Sensors
   1. SIT-6E (pavement mounted sensor for temperature & moisture)

G. Controllers
   1. APS-4C (1-phase & 3-phase controller, Type 3R)
   2. SC-40C (satellite contactor/power control for APS-4C for larger systems)

H. Power Distribution/Integrated Control Panels & Contactors
   1. SMPG1 (single phase power distribution panels with integrated controller)
   2. E104 (3-pole, 100Amp/pole, NEMA 4X contactor)
   3. E304 (3-pole, 40Amp/pole, NEMA 4X contactor)

I. Provide all accessories required for a complete installation.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine existing conditions prior to submitting shop drawings.

3.2 INSTALLATION

A. Install per manufacturer’s instructions and as follows:

1. All Cable Impedance Testing shall be witnessed and signed off by Owner or Owner's Representative.
2. Leave 3' of extra cable, at each end of the cable, at all junction boxes and connection points.

B. Take photographs noted in Submittal section prior to insulation installation.

3.3 TESTING

A. Functional testing

B. Cable Impedance Test Results: Document cable tested lengths with each report.
1. Pre-installation
2. Pre-encasement after installation
3. Post encasement

END OF SECTION 26 60 20

SECTION 27 00 00 – COMMUNICATIONS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

B. Provisions and conditions cited in this Section shall apply to Work for other sections of Divisions 27 of these Specifications.
   1. Section 27 05 28 – Pathways For Communications Systems
   2. Section 27 13 23 – Communications Optical Fiber Backbone Cabling
   3. Section 27 15 13 – Communications Copper Horizontal Cabling Systems

C. The following section of the Specifications apply to Work under this Section
   1. Division 26 - Electrical
   2. Division 28 – Electronic Safety and Security

1.2 SUMMARY

A. Section Includes:
   1. Rough in for communication systems.
   2. Communications cabling.

1.3 ACTION SUBMITTALS

A. Refer to Division 1 and each section of Division 27.

1.4 INFORMATIONAL SUBMITTALS

A. Refer to Division 1 and each section of Division 27.

1.5 CLOSEOUT SUBMITTALS

A. Refer to Division 1 and each section of Division 27.

1.6 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:
   1. Division 26 – Electrical
   2. Division 28 – Electronic Safety and Security

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 27 00 00

SECTION 27 05 28 – PATHWAYS FOR COMMUNICATIONS SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pathways
   2. Hangers and supports
   3. Conduit and bacboxes

A. Work Included:
   1. Furnish material, labor and services necessary for, and incidental to, installing the following systems where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications to provide for complete systems.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.
   1. If Div 27 contractor is the same as Div 26 contractor, duplicate submittals are not required for common products submitted under Div 26. Submit additional materials not used in Div 26.

1.3 CLOSEOUT SUBMITTALS

A. As-built drawings

1.4 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:
   1. Division 26 – Electrical
   2. Division 28 – Electronic Safety and Security

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 RACEWAYS

A. Comply with Section 26 05 33 "Raceway for Electrical Systems," Section 26 05 34 "Boxes for Electrical Systems," for installation.

PART 3 - EXECUTION

3.1 PATHWAYS

A. All cabling shall be as shown on plans, and per specifications.

B. Cabling may be run as open-type plenum rated cable concealed above lay-in ceiling spaces. Non plenum rated cabling shall be installed in conduit. Cabling shall be installed in conduit in all exterior locations and in all exposed or inaccessible locations including all open to structure, cloud ceilings, inside wall partitions or above drywall, wood, and other inaccessible ceilings.

C. Cabling may be run as open-type plenum rated cable concealed above lay-in ceiling space and exposed open to structure above or cloud type ceilings unless noted below. Cabling shall be installed above bar joist flanges to conceal cabling from view when routed through exposed ceiling. Non plenum rated cabling shall be installed in conduit. Cabling shall be installed in conduit in all exterior locations, all areas exposed below 8' A.F.F., and all inaccessible locations including inside wall partitions or above drywall, wood, and other inaccessible ceilings. Cabling shall be installed in conduit in the following spaces:
   1. Electrical, Mechanical Equipment Rooms
   2. Storage and Janitor Closets
   3. Stairwells
   4. Restrooms

D. Cables shall be continuous from outlet to termination equipment.

E. Cables shall be terminated using tools recommended by the termination manufacturer.

F. Provide 2" minimum sleeves in all walls which cable runs pass through.

G. Furnish and install a minimum of (1) one cable pathway device through fire rated partitions and floors, and where indicated on the drawings. Device shall be Specified Technologies, Inc. EZDP33FWS, 3M QuickPass, or equivalent.

H. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls.

I. Provide access panels as necessary for cable routing.

3.2 HANGERS AND SUPPORTS

A. Cables shall be supported with "J-Hooks" a minimum of every six feet. Bridal rings can be used when supporting (other than Cat 6) a maximum of six wires. Support devices are to be attached to existing permanent structure.

B. Cables shall be installed in cable tray where available.

C. Cables and supports shall be installed at a readily accessible location above ceilings.

3.3 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

A. Furnish and install conduit rough-ins at all outlets locations where shown on drawings. Rough-in shall consist of a two-gang outlet box, single gang trim ring, and a minimum 1" conduit stubbed

above an accessible ceiling. Plastic bushings shall be installed on both ends of conduit. Install blank covers on all unused rough-ins.

B. All conduits serving telephone/data communication outlets shall be 1” minimum. Conduits for all other system cable runs shall be sized for 40% maximum fill, or as shown on the drawings. Redundant paths shall be installed where fill exceeds 40%.

C. Provide pull strings in all conduits.

D. Conduit bends shall accommodate radius requirements of fiber cable as necessary.

END OF SECTION 27 05 28

SECTION 27 13 23 – COMMUNICATIONS OPTICAL FIBER BACKBONE CABLING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Optical fiber backbone cable
   2. Buffer tube fanout kits
   3. Optical fiber connectors
   4. Fiber enclosures

B. Related Requirements:
   1. Division 26 – Electrical
   2. Division 28 – Electronic Safety and Security

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturer’s installation instructions: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. As-built drawings providing identification and routing of all fiber cabling.

B. Quality assurance test reports.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Commscope or Approved equivalent

2.3 FIBER OPTIC CABLE SYSTEMS

A. Where indicated on the drawing fiber shall be Commscope Arid-core 6-Strand Multi-mode #O-006-LA-6F-F-OR.

B. Fiber cable shall be broken out into individual fibers by use of buffer tube fan-out kits and loose tube cable for furcation kits by Commscope.

C. Each strand shall be terminated with a Uni-Cam SC type ceramic connector, #MFC-SCU-29 for multi-mode, at each end as manufactured by Commscope.

D. Furnish and install Fiber Enclosures in the equipment racks in the telecom rooms as indicated on the drawings. Fiber Enclosures are to be Commscope #RFE-SLC-024-MFA-SC06

PART 3 - EXECUTION

3.1 INSTALLATION

A. Each strand shall be identified by a label at each end.

B. Coordinate location of fiber enclosures within racks with Owner's Representative.

C. All fibers shall be continuous, without splice, from end to end.

3.2 TESTING

A. Testing shall be of the optical link. An optical fiber link is defined as the passive cabling network between two optical cross-connects (patch panels or outlets). This includes cable, connectors and splices but does not include active components. The link test contains the representative connector loss at the patch panel associated with the mating of patch cords but does not include the performance of the connector at the equipment interface. All cabling not tested strictly in accordance with these procedures shall be re-tested at no additional cost to the Owner. 100% of the installed cabling must be tested. All tests must pass acceptance criteria defined herein.

B. Unless otherwise specified, multimode and single-mode fiber cable must meet the transmission performance parameters as specified in ANSI/TIA/EIA-568-B.3.

C. Link attenuation shall be tested in accordance with ANSI/TIA/EIA-526-14A. Reference measurements shall be made in accordance with method B or equivalent. Optical loss shall be measured on each fiber at 850 nm and 1300 nm. Loss shall be measured on each fiber from each direction (bi-directionally), unless it is known in advance which fibers shall transmit (T_X) and receive (R_X).

D. Link length shall be optically measured or calculated using cable sheath length markings.

E. Cabling shall meet the following loss and length.

Attenuation 850 nm:	≤ fiber length (km) x 3.75 dB/km
	+ number connector pairs x 0.75 dB
	+ number of splices x 0.3 dB
Attenuation 1300 nm:	≤ fiber length (km) x 1.5 dB/km
	+ number connector pairs x 0.75 dB
	+ number of splices x 0.3 dB
Length:	≤ 2000 m (6560 ft)

F. Test reports shall be submitted in electronic format. Hand-written test reports are not acceptable.

G. Electronic reports are to be submitted in PDF format organized with bookmarks Electronic reports must be accompanied by a Certificate signed by an authorized representative of the Contractor warranting the truth and accuracy of the electronic report. Certificate must reference traceable circuit numbers that match the electronic record.

H. Test reports shall include the following information for each cabling element tested:
   1. Actual measured and maximum allowable attenuation (loss) at the specified wavelengths and the margin. An individual test that fails the link criteria shall be marked as FAIL.
   2. Reference method.
   3. Number of mated connectors and number of splices (if any).
   4. Actual length and maximum allowable length per Part 2 Section 3. Any individual test that fails the link length criteria shall be marked as FAIL.
   5. Group refractive index (GRI) for the type of fiber tested, if length was optically measured.
   6. Tester manufacturer, model, serial number and software version.
   7. Circuit ID number and project/job name.
   8. Link criteria (Autotest) used.
   9. Overall pass/fail indication.
   10. Date and time of test.

I. Test reports shall be submitted within 7 business days of completion of testing.

J. Test equipment used under this contract shall be from manufacturers that have a minimum of 5 years experience in producing field test equipment. Manufacturers must be ISO 9001 certified. All test tools of a given type shall be from the same manufacturer, and have compatible electronic results output.

K. Test equipment shall be capable of measuring relative or absolute optical power in accordance with TIA/EIA-526-14A, "Optical Power Loss Measurement of Installed Multimode Fiber Cable Plant," and TIA/EIA-526-7 method A, "Measurement of Optical Power Loss of Installed Single-Mode Fiber Cable Plant, Insertion Loss Using An Optical Power Meter."

L. Test equipment shall not include the loss or length of the test jumpers in the cable plant measurements.

M. Multimode test equipment shall incorporate both 850 nm and 1300 nm sources in same unit. The coupled output power into multimode fiber shall be $\geq$ -20 dBm at each wavelength. Detectors shall have a dynamic range of at least +3 dB to –55 dB.

N. Sources and meters shall automatically synchronize wavelengths to prevent calibration-related errors.

O. The time-of-flight methodology shall be employed when optically measuring fiber length.

P. Test equipment capable of measuring a Tx/Rx fiber pair simultaneously is recommended to enhance productivity.

Q. Contractor must warrant in writing that 100% of the installation meets the requirements specified above.

R. Owner reserves the right to conduct, using Contractor equipment and labor, a random re-test of up to five (5) percent of the cable plant to confirm documented results. Any failing cabling shall be re-tested and restored to a passing condition. In the event more than two (2) percent of the cable plant fails during re-test, the entire cable plant shall be re-tested and restored to a passing condition at no additional cost to the Owner.

S. Acceptance shall be subject to completion of all work, successful post-installation testing which yields 100% PASS rating, and receipt of full documentation as described in Part 2, section 4.

T. Contractor shall warrant Installation against all product defects, and that all approved cabling components meet or exceed the requirements of this document.

END OF SECTION 27 13 23

SECTION 27 15 13 – COMMUNICATIONS COPPER HORIZONTAL CABLING SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Copper horizontal cable
   2. Modular jacks and faceplates
   3. Terminal blocks and patch panels
   4. Equipment racks

B. Related Requirements:
   1. Division 26 – Electrical
   2. Division 28 – Electronic Safety and Security

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Manufacturers installation instructions: For each type of product.

1.4 CLOSEOUT SUBMITTALS

A. Provide as-built drawings indicating cable routing and cable/jack/patch panel identification.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Homaco

B. Panduit

C. Hoffman

2.3 CABLING

A. One Four-pair category 6 23 gauge MPP/CMP plenum rated 100 ohm UTP cables to be designated as station voice to be wired at wall outlet on (UNJ600-BK) modules using T568B wiring scheme termination at wall outlet per manufactures specification and at the closet end on patch panels (part #UNP610-24P) using the T568B wiring scheme. These cables shall be designated as V1 along with the outlet number assigned. Place the ivory voice icon (UNJ-ICON-IV) in the designated area on jack.

B. One Four-pair category 6, 23 gauge MPP/CMP plenum rated UTP cables to be designated as station network to be wired at wall outlet on (UNJ600-BK) modules using T568B wiring scheme termination at wall outlet per manufactures specification and at the closet end on patch panels (part #UNP610-24P) using the T568B wiring scheme. These cables shall be designated as N1 along with the outlet number assigned. Place the ivory data icon (UNJ-ICON-IV) in designated area on jack.

C. Cable jacket color shall be in accordance with the building standards.

D. Cables shall not exceed 90 meters from termination location to wall outlet.

2.4 TELEPHONE/DATA CABLING SYSTEMS EQUIPMENT

A. Furnish and install faceplate and modular jacks at each Voice/Data outlet as described below:
   1. One Panduit single gang Sloped Modular Flush-Mount Faceplate (part #CFPSL4EIY).
   2. One Panduit Mini-Com modular jack to be designated as stations Voice (part #CJ688TGEI).
   3. Two Pandit Mini-Com modular jacks to be designated as stations Network (part #CJ688TGBU).
   4. Furnish, install and terminate one Voice, and two Network cable for each outlet.

B. Furnish and install faceplate and modular jacks at each Voice outlet as described below:
   1. One Panduit single gang Sloped Modular Flush-Mount Faceplate (part #CFPSL2EIY).
   2. One Panduit Mini-Com modular jack to be designated as stations Voice (part #CJ688TGEI).
   3. Furnish, install and terminate one Voice cable for each outlet.

C. Furnish and install faceplate and modular jacks at each Data outlet as described below:
   1. One Panduit single gang Sloped Modular Flush-Mount Faceplate (part #CFPSL2EIY)).
   2. Two Panduit Mini-Com modular jacks to be designated as stations Network (part #CJ688TGEI).
   3. Furnish, install and terminate two Network cables for each outlet.

D. Furnish and install faceplate and modular jacks at each Non-Standard Voice/Data outlet as describe below:
   1. One Panduit Sloped Modular Flush-Mount Faceplate in size as required to accommodate number of terminations.
   2. Panduit Mini-Com modular jacks to be designated as stations Network (part #CJ688TGEI) in quantity as indicated on the drawings.
   3. Furnish, install and terminate Network cables for each outlet.
   4. One Panduit Mini-Com modular jack to be designated as stations Voice (part #CJ688TGEI) in quantity as indicated on the drawings.
   5. Furnish, install and terminate Voice cables for each outlet.

E. Furnish and install Commscope terminal blocks on designated wall in Telecommunications Room for termination of voice cables. Terminate voice cabling with sufficient slack to allow for future relocation to a patch panel in the network rack. Furnish and install 19" racks, patch panels and horizontal management for termination of network cables and fiber.

F. Labeling and Standards
   1. Cables at wall outlets and terminations at communication closet shall be identified and labeled as follows, depending on typical vs non typical.
      Typical
      V1 - first telephone (or voice) cable at a given outlet.
      N1 - first network cable at a given outlet
   2. The first location shall start with the number (1) and continue, labels at wall outlet shall be TIA/EIA-606 Compliant
   3. All of work described above shall be ANSI/TIA/EIA-568B.1, B.2, B.3-1 & 569B compliant and follow NEC codes local or otherwise.
   4. All voice and network terminations at communication closet shall be terminated on patch panels and 19" racks permanently mounted on floor of Telecommunication Room. Cables shall be terminated in distinct and separate panels for each type; voice, building network, and research network.

G. Voice cable shall be Panduit (#PUP6004WH-U White) Plenum. Network cable shall be Panduit (#PUP6004BU-U Blue) Plenum. No equivalents accepted. All of the above mentioned equipment and scope of work shall be properly grounded and bonded per TIA/EIA-607.

H. Provide 10- Commscope (#UNC6-XX-10F-B) and 20- Commscope (#UNC6-XX-5F-B) Modular Interface patch Cords for use in Telecommunications Room and at work outlet for Network.

PART 3 - EXECUTION

3.1 ROUGH-INS

A. Furnish and install rough-ins where shown on drawings. Rough-in shall consist of a two-gang outlet box, single gang trim ring, and a minimum 1” conduit stubbed above an accessible ceiling. Install blank covers on all unused rough-ins.

B. Maximum fill of conduit is not to exceed forty percent.

C. Furnish and install minimum 2” sleeve through fire rated partitions.

D. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls.

3.2 Testing and Labeling

A. Field test data cables after installation for acceptance as defined in ANSI/TIA-1152 (and/or IEC 61935-1). Acceptance tests to include continuity, length, attenuation, crosstalk, and noise. The results of all tests for each cable will be documented in a printout from the test instrument and provided to the owner. Any cables which fail will be corrected and re-tested with the new test results provided to owner.

B. Label jacks at outlet faceplates and patch panels and label cables at the outlets and other termination location in accordance with the building standards.

C. Provide colored cables and jacks in accordance with the building standards.

END OF SECTION 27 15 13

SECTION 28 05 28 – PATHWAYS FOR ELECTRONIC AND SAFETY SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Pathways
   2. Hangers and supports
   3. Conduit and backboxes

B. Work Included:
   1. Furnish material, labor and services necessary for, and incidental to, installing the following systems where shown on the Plans and as hereinafter specified. Include all necessary work in the related sections of the Specifications to provide for complete systems.

1.2 ACTION SUBMITTALS

A. Not required

1.3 INFORMATIONAL SUBMITTALS

A. Not required

1.4 CLOSEOUT SUBMITTALS

A. Not required

1.5 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:
   1. Division 26 – Electrical
   2. Division 28 – Electronic Safety and Security

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

PART 3 - EXECUTION

3.1 PATHWAYS

A. All cabling shall be as shown on plans, and per specifications.

B. Cabling may be run as open-type plenum rated cable concealed above lay-in ceiling spaces. Non plenum rated cabling shall be installed in conduit. Cabling shall be installed in conduit in all exterior locations and in all exposed or inaccessible locations including all open to structure, cloud ceilings, inside wall partitions or above drywall, wood, and other inaccessible ceilings.

C. Cabling may be run as open-type plenum rated cable concealed above lay-in ceiling space and exposed open to structure above or cloud type ceilings unless noted below. Cabling shall be installed above bar joist flanges to conceal cabling from view when routed through exposed ceiling. Non plenum rated cabling shall be installed in conduit. Cabling shall be installed in conduit in all exterior locations, all areas exposed below 8' A.F.F., and all inaccessible locations including inside wall partitions or above drywall, wood, and other inaccessible ceilings. Cabling shall be installed in conduit in the following spaces:
   1. Electrical, Mechanical Equipment Rooms
   2. Storage and Janitor Closets
   3. Stairwells
   4. Restrooms

D. Cables shall be continuous from outlet to termination equipment.

E. Cables shall be terminated using tools recommended by the termination manufacturer.

F. Provide 2" minimum sleeves in all walls which cable runs pass through.

G. Furnish and install a minimum of (1) one cable pathway device through fire rated partitions and floors, and where indicated on the drawings. Device shall be Specified Technologies, Inc. EZDP33FWS, 3M QuickPass, or equivalent.

H. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls.

I. Provide access panels as necessary for cable routing.

3.2 HANGERS AND SUPPORTS

A. Cables shall be supported with "J-Hooks" a minimum of every six feet. Bridal rings can be used when supporting (other than Cat 6) a maximum of six wires. Support devices are to be attached to existing permanent structure.

B. Cables shall be installed in cable tray where available.

C. Cables and supports shall be installed at a readily accessible location above ceilings.

3.3 CONDUITS AND BACKBOXES FOR COMMUNICATIONS SYSTEMS

A. Furnish and install conduit rough-ins at all outlets locations where shown on drawings. Rough-in shall consist of a two-gang outlet box, single gang trim ring, and a minimum 1" conduit stubbed

above an accessible ceiling. Plastic bushings shall be installed on both ends of conduit. Install blank covers on all unused rough-ins.

B. All conduits serving telephone/data communication outlets shall be 1” minimum. Conduits for all other system cable runs shall be sized for 40% maximum fill, or as shown on the drawings. Redundant paths shall be installed where fill exceeds 40%.

C. Provide pull strings in all conduits.

D. Conduit bends shall accommodate radius requirements of fiber cable as necessary.

END OF SECTION 28 05 28

SECTION 28 13 00 – ACCESS CONTROL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Adding access control including access control door hardware, card readers, duress (panic) buttons and associated electronic equipment. System shall integrate with the existing Access Control System and shall communicate to new equipment via existing and new IP network.

B. Section includes, but is not necessarily limited to, the following for the integrated access control security and site management system:
   1. Reader controller interfaces and modules.
   2. Remote card readers and display terminals.
   3. Power sourcing equipment, network switches and wireless access points.
   4. Access control cards and credentials.
   5. Access control system application software.

C. Related Sections:
   1. Section 08 70 00 - Door Hardware.
   2. Division 26 Sections for connections to electrical power system and for low-voltage wiring work.
   3. Division 28 Section "Video Surveillance" for motion detection and video camera devices and equipment installed at door openings and provided as part of a security and site management system.
   4. Division 28 Section "Fire Detection and Alarm" for connections to building fire alarm system.

D. Codes and References: Comply with the current version year adopted by the Authority Having Jurisdiction.
   1. ANSI A117.1 - Accessible and Usable Buildings and Facilities.
   2. ICC/IBC - International Building Code.
   3. NFPA 70 - National Electrical Code.
   4. NFPA 80 - Fire Doors and Windows.
   5. NFPA 101 - Life Safety Code.
   6. NFPA 105 - Installation of Smoke Door Assemblies.

E. Products installed, but not provided under this Section include the following. Coordination to remain a requirement of this Section.
   1. Security or High Security keyed cylinders, including provisions for temporary construction keying, provided for mechanical override at access control locking hardware to be furnished under Division 08 Section "Door Hardware". Permanent cores and keys to be installed by Owner, Contractor, or Supplier as directed.

1.3 SUBMITTALS

A. Product Data: Manufacturer's product data sheets including installation details, material descriptions, dimensions of individual components and profiles, operational descriptions and finishes.

B. System Operational Descriptions: Complete system operational narratives for the integrated access controlled openings defining the owner's prescribed requirements for the opening functionality. Narratives include, but are not limited to, the following situations: normal secured/unsecured state of door; authorized access; authorized egress; unauthorized access; unauthorized egress; fire alarm and loss of power conditions, and interfaces with other building control systems.

C. Shop Drawings: Details of electrified integrated locking hardware and access control firmware, indicating the following:
   1. Wiring Diagrams: Upon receipt of approved schedules, submit detailed system wiring diagrams for power, signaling, monitoring, communication and control of the access control system electrified hardware and firmware. Differentiate between manufacturer-installed and field-installed wiring. Include the following:
      a. Elevation diagram of each unique access controlled opening showing location and interconnection of major system components with respect to their placement in the respective door openings.
      b. Complete (risers, point-to-point) access control system block wiring diagrams.
   2. Electrical Coordination: Coordinate with related Division 26 Electrical Sections the voltages and wiring details required at electrically controlled and operated hardware openings.

D. Proof of Certification: Provide copy of manufacturer(s) official certification or accreditation document indicating proof of status as a qualified and authorized provider of the primary access control components.

E. Keying Schedule: Reference Division 08 Section "Door Hardware".

F. Product Test Reports: Indicating compliance with cycle testing requirements, based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified independent testing agency.

G. Operating and Maintenance Manuals: Provide manufacturers operating and maintenance manuals for each item comprising the complete access control and site management installation in quantity as required in Division 01, Closeout Submittals. The manual to include the name, address, and telephone number of the supplier/integrator providing the installation and the nearest service representatives for each item of equipment included in the system. The final copies delivered after completion of the installation test to include "as built" modifications made during installation, checkout, and acceptance.
   1. As-Built Drawings: During system installation, the Contractor to maintain a separate hard copy set of drawings, elevation diagrams, and wiring diagrams of the access control system to be used for record drawings. This set to be kept up to date by the Contractor with all changes and additions to the access control system accurately recorded.

H. Warranties and Maintenance: Special warranties and maintenance agreements specified in this Section.

1.4 QUALITY ASSURANCE

A. Manufacturers Qualifications: Engage qualified manufacturers with a minimum [5] years of documented experience in providing access control and security systems equipment and software similar to that indicated for this Project and that have a proven record of successful in-service performance.
   1. Software and access control systems components to have been previously and thoroughly tested together with proven installations similar in size and functionality to the design requirements indicated for this Project.

B. Integrator Qualifications: Systems Integrators, verifiably factory trained and certified by the primary product manufacturers, with a minimum 3 years documented experience installing complete integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance. Qualifications include, but are not necessarily limited, to the following:
   1. References: Provide a list of references for similar projects including contact name, phone number, name and type of project.
   2. Professional Staffing: Firms to have a dedicated access control systems integration department with full time, experienced professionals on staff experienced in providing on site consulting services for both electrified door hardware and integrated access control systems installations.
   3. Factory Training: Installation and service technicians are to be competent factory trained and certified personnel capable of maintaining the system.
   4. Service Center: Firms to have a service center capable of providing training, in-stock parts, and emergency maintenance and repairs at the Project site with 24 hour/7-days a week maximum response time.

C. Supplier/Dealer Qualifications: Supplier/Dealers, verifiably authorized and in good standing with the primary product manufacturers, with a minimum [3] years experience supplying integrated access control systems similar in material, design, and scope to that indicated for this Project and whose work has resulted in construction with a proven record of successful in-service performance.

D. Integrated Wiegand Output, Wireless, and IP-Enabled access control products are required to be supplied and installed only through designated ASSA ABLOY "Authorized Channel Partner" (ACP) and “Certified Integrator” (CI) accounts.

E. Source Limitations: Obtain the access control door hardware, system firmware and application software specified in this Section from a single source, qualified supplier/integrator unless otherwise indicated.
   1. Electrified modifications or enhancements made to a source manufacturer's product line by a secondary or third party source will not be accepted.
   2. Provide integrated access control door hardware from the same manufacturer as mechanical door hardware, unless otherwise indicated.

F. Regulatory Requirements: Comply with NFPA 70, NFPA 80, NFPA 101 and ANSI A117.1 requirements and guidelines as directed in the model building code including, but not limited to, the following:
   1. Comply with NFPA 70 "National Electrical Code", including electrical components, devices, and accessories listed and labeled as defined in Article 100 by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
   2. Where indicated to comply with accessibility requirements, comply with Americans with Disabilities Act (ADA), "Accessibility Guidelines for Buildings and Facilities (ADAAG)," ANSI A117.1 as follows:
      a. Handles, Pulls, Latches, Locks, and other Operating Devices: Shape that is easy to grasp with one hand and does not require tight grasping, tight pinching, or twisting of the wrist.

b. Door Closers: Comply with the following maximum opening-force requirements indicated:
   1) Interior Hinged Doors: 5 lbf applied perpendicular to door.
   2) Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Comply with NFPA 101 "Life Safety Code" for doors in a means of egress.
   a. Latches, Locks, and Exit Devices: Not more than 15 lbf to release the latch. Locks shall not require the use of a key, tool, or special knowledge for operation.
4. Comply with NFPA 80 "Fire Doors and Windows" for fire labeled opening assemblies.
5. The installed access control system shall conform to all local jurisdiction requirements.

G. Keying Conference: Reference Division 08 Section "Door Hardware".

H. Pre-Submittal Conference: Conduct coordination conference in compliance with requirements in Division 01 Section "Project Meetings" with attendance by representatives of Supplier(s), Installer(s), Systems Integrator(s), and Contractor(s) to review proper methods and procedures for receiving, handling, and installing door and access control hardware to manufacturer's recommendations and according to specifications.
1. Prior to installation of door hardware, arrange for manufacturers' representatives to hold a project specific training meeting on the proper installation and adjustment of their respective products. Product training to be attended by the installers of access control hardware for the aluminum, hollow metal and wood door sections. Training will include the use of installation manuals, hardware schedules, templates and physical product samples as required.
2. Inspect and discuss electrical roughing-in, power supply connections, and other preparatory work performed by other trades.
3. Review sequence of operation narratives for each unique access controlled opening.
4. Review and finalize construction schedule and verify availability of materials.
5. Review the required inspecting, testing, commissioning, and demonstration procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Inventory door hardware on receipt and provide secure lock-up and shelving for door hardware delivered to Project site. Do not store electronic access control hardware, software or accessories at Project site without prior authorization.
1. Access control firmware and software: Where approved and directed, inventory upon receipt and store electronic access control equipment in a secure, temperature and humidity controlled environment in original manufacturer's sealed containers.

B. Tag each item or package separately with identification related to the final Access Control Door Schedule, and include basic installation instructions with each item or package.

C. Deliver permanent keys, cores, access control credentials, software and related accessories directly to Owner via registered mail or overnight package service. Instructions for delivery to the Owner established at the “Pre-Submittal Conference".

1.6 COORDINATION

A. Coordinate quantity and arrangement of assemblies with ceiling space configuration and with components occupying ceiling space, including structural members, pipes, air-distribution components, raceways, cable trays, recessed lighting fixtures, and other items.

B. Integrated Access Control Door Hardware and Electrical Coordination: Coordinate the layout and installation of scheduled integrated access control door hardware, and related access control equipment, with required connections to source power junction boxes, power supplies, detection and monitoring hardware and fire alarm system.
   1. Door Hardware Interface: The access control system to interface and be connected to electrified and integrated access control door hardware as described under Division 08 Sections "Door Hardware" or "Access Control Door Hardware". Coordinate the installation and configuration of electrified door hardware being monitored or controlled with the controls, software and access control hardware specified in this Section.

C. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing electrified door hardware and access control system components. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing access control system hardware to comply with indicated requirements.

D. Door and Frame Preparation: Related Division 08 Sections (Steel, Aluminum and Wood) doors and corresponding frames are to be prepared, reinforced and pre-wired (if applicable) to receive the installation of the specified electrified, monitoring, signaling and access control system hardware without additional in-field modifications.

1.7 WARRANTY

A. General Warranty: Reference Division 01, General Requirements. Special warranties specified in this Article will not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and are in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.

B. Warranty Period: Written warranty, executed by manufacturer(s), agreeing to repair or replace components of the installed access control system hardware and software that fails in materials or workmanship, including all related parts and labor, within specified warranty period after final testing and acceptance by the Owner. Failures include, but are not limited to, the following:
   1. Structural failures including excessive deflection, cracking, or breakage.
   2. Faulty operation of the hardware.
   3. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
   4. Electrical component defects and failures within the systems operation.

C. Standard Warranty Period: One year from date of Substantial Completion, unless otherwise indicated.

D. Special Warranty Periods:
   1. Two years for Integrated Access Control Door Hardware.

1.8 MAINTENANCE SERVICE

A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of standard and access control door hardware.

B. Maintenance Service: Beginning at Substantial Completion, and running concurrent with the specified warranty period, provide continuous (6) months full maintenance including repair and replacement of worn or defective components, lubrication, cleaning, and adjusting as required for

proper door opening operation. Provide parts and supplies as used in the manufacture and installation of original products.

1.9 SCOPE OF WORK

A. Access Control Site Management System: Furnish and install at the indicated locations the specified integrated access control door hardware and access control system firmware and software for a completely operational access control and security site management system. System includes, but is not necessarily limited, to the following:

1. Electrified integrated access control locks and exit hardware, network control processors, reader controller panels, I/O monitor/control interfaces, door position switches, remote card readers, keypads, and display terminals, access cards and credentials, system application software, special tools, operating manuals, and required cabling and accessories as detailed below and listed in the Access Control Hardware Sets at the end of Part 3.
    a. Provide the appropriate number of reader controller panels and I/O monitoring/control expansion interfaces as needed to handle the number of card readers, locking devices, door status devices, and identified alarm inputs specified in this section, and as shown on the security drawings.
    b. Provide manufacturer approved integrated access control locks, exit hardware, and remote mounted card readers, keypads, and display terminals that are functionally compatible with the specified access control equipment interfaces.
2. Access control system equipment to be installed in an enclosure box compatible with the specified components. This enclosure to include, but is not necessarily limited to, the network control processor, I/O monitor/control interface panels, power supplies, terminal strips, wire ducts, keyed lock cylinder, integrated outlet for A/C power, and standoffs.
    a. Enclosure box to be located in the designated IT/Telecom room(s) with connection to the owner designated local area network for communication back to the central server host.
3. Power Supplies, including battery or uninterrupted backup powers supply (UPS) and separately fused surge protection, required for the electrified door hardware, access control equipment, and PoE switches or wireless routers driving the integrated card reader locking devices.
4. Installation, final configuration and commissioning of electrified door and access control system hardware, communication firmware, power supplies and related accessories.
5. System application software including installation, programming, and end user training of the access control system demonstrating operating, repair, and maintenance procedures. Include on-site central server training for designated personnel (facilities maintenance, security, IT, administration) by a factory certified representative.
    a. Include Client Software Application (client workstation) training at each of the remote installed facilities for local administrative staff.
6. Provide manufacturer required power controllers, interface boards, and programming that may be required for approved electric latch retraction exit devices supplied under Division 08 Section "Door Hardware."
7. Electrical contractor, Division 26, to provide the following:
    a. Source power wiring (120VAC) as required for the integrated locking and access control hardware, equipment, accessories and power supplies. This includes quad outlets as required on a dedicated circuit in the designated IT/Telecom room(s) and the related conduit, stub-in, junction boxes and connectors required for the source power delivery and connections.
    b. Provide required conduit, stub-in, junction and back boxes for both the electrified locking hardware and access control equipment at each of the access controlled or monitored openings per plan drawings and specs. Supply and install conduit between each of the aforementioned devices and between the electrical junction boxes, power supplies and access control equipment located on or above the door opening.

1) At wall mounted remote readers, provide conduit on the secured side of the door, 36" from the finish floor and 6" from the edge of the frame, to the related power supplies and access control equipment.
2) At electrical hardware power transfers provide conduit on the secured side of the opening from the power transfer, thru-wire hinge, or serviceable panel location on the frame jamb to the related power supplies and access control equipment.

c. Electrical Contractor to provide all 120VAC cabling connections and terminations from the electrical junction boxes to these electrical devices.

8. Access Control System Integrator to provide the following:
   a. Low voltage wiring (12/24VDC) and communication cabling (RS-232/RS-485) from network control processors to reader controllers, I/O monitor/control interface panels, electrified and integrated locking hardware, remote card readers, keypads, or display terminals, monitoring and signaling switches, and power supplies. Work includes related connectors, final terminations, and hook-ups required for a complete and functional access controlled opening in accordance with applicable codes and specified system operational narratives.
9. Full and seamless integration of the analog, digital or IP-enabled CCTV video surveillance system (Division 28) if applicable, with the installed site access control system software.
10. Full and seamless integration of the site intrusion alarm service and motion detector systems, (Division 28) if applicable, with the installed site access control system software.
11. Final connections to fire alarm system, if required, by electrical and fire alarm system contractors.
12. Provide permits, submittals and approvals required by the authority having jurisdiction, prior to commencing with work.

PART 2 - PRODUCTS

2.1 SYSTEM ARCHITECTURE - ACCESS CONTROL SITE MANAGEMENT SYSTEM (ACSMS)

A. The existing access control system was manufactured by Genetec. All new devices (card readers, power supplies, etc.) shall be compatible with and successfully integrate into the existing system. Specific system information is shown below:
   1. Manufacturer: Genetec
   2. Product Type: Synergis Cloud Link G2
   3. Firmware Version: 2.0.546.0
   4. Synergis Software Version: 11.3.1526.0

B. The existing card readers are Wiegand-type readers. Primarily composed of HID V100 door/reader interfaces and associated readers.

C. For additional information, the existing access control service provider is Utilitra. Contact information: David Murrey 618-883-5241. Utilitra is not a sole sourced provider for this scope of work.

D. General: The intent is to add new card readers and access control devices to an existing operational access control system. The project shall include all necessary components to add new devices to the existing system for a complete and operational extension of the system.

E. Network Support: Communication network connecting the central server host software modules, client workstation software applications, and hardware controllers to be designed to support all of the following:
   1. LAN/Ethernet enterprise ring topology and localized star topology based on TCP/IP.

2. Direct-connected RS-232 and RS-485 communication cabling.
3. Dial-up modem connection using a standard dial-up telephone line.

2.2 MANUFACTURERS

A. General: Provide integrated access control door hardware and access control system equipment and accessories for each designated opening to comply with requirements in this Section and with the Access Control Hardware Sets listed at the end of Part 3.
   1. Access Control Hardware Sets: Requirements for quantity, item, model, design, grade, finish, size, and other distinctive qualities of each type of integrated door and access control hardware are indicated in the Access Control Hardware Sets at the end of Part 3.
   2. Named Manufacturer's Products: Product designation and manufacturer are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in the Door Hardware Schedule.

B. System Design: The equipment and materials supplied are to be standardized components regularly manufactured and utilized within the source manufacturer’s access control systems.
   1. System components to be non-proprietary in design and implementations, providing for an open protocol platform with multiple manufacturers having functional software capable of integrating with the hardware specified. The installed integrated product is to be part of a single, cohesive management and access control system.

C. Substitutions: Requests for substitution and product approval for inclusive integrated access control door and access control systems hardware in compliance with the specifications must be submitted in writing and in accordance with the procedures and time frames outlined in Division 01, Substitution Procedures. Approval of requests is at the discretion of the architect, owner, and their designated consultants.
   1. The access control system described in this specification represents a complete engineered system. If alternate products are submitted, it is the responsibility of the Supplier/Dealer/Integrator to provide an acceptable complete and working system layout, including re-engineering of elevation and wiring diagrams, as applicable. Complete systems to include at a minimum required power supplies, power transfers, and integrated access control locking hardware and accessories.

2.3 ACCESS CONTROL AND SITE MANAGEMENT SYSTEM HARDWARE

A. General: Provide all necessary access control field hardware devices required to receive alarms and administer all access granted/denied decisions. Field hardware devices must be designed and installed in accordance with applicable electrical codes.

B. Central Computer Host Server (Owner Provided): The central host server is interconnected to all system components, including client workstations and field installed controllers, providing operator interface, interaction, display, control, and real-time monitoring.

2.4 ELECTRONIC ACCESSORIES

A. Power Supplies: Provide Nationally Recognized Testing Laboratory Listed 12VDC or 24VDC (field selectable) filtered and regulated power supplies. Include battery backup option with integral battery charging capability in addition to operating the DC load in event of line voltage failure. Provide the least number of units, at the appropriate amperage level, sufficient to exceed the required total draw for the specified electrified hardware and access control equipment.
   1. Acceptable Manufacturers:

a. Securitron (SU)

2.5 CABLES AND WIRING

A. Data Line Supervision: System to include alarm initiation capability in response to opening, closing, shorting, or grounding of data transmission lines.

B. Install appropriate number of conductor pairs, in the wire gage (AWG) recommended by manufacturer, corresponding to the electronic locking functions specified, amperage drawn and distances covered between the power supplies, power transfer devices, electrified hardware and access control equipment.

2.6 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates generally prepared for machine, wood, and sheet metal screws. Provide screws according to manufacturers recognized installation standards for application intended.

2.7 ACCESS CONTROL HARDWARE FINISHES

A. Standard: Designations used in the Hardware Sets and elsewhere indicate hardware finishes complying with ANSI/BHMA A156.18, including coordination with traditional U.S. finishes indicated by certain manufacturers for their products.

B. Protect mechanical finishes on exposed surfaces from damage by applying temporary protective coverings before shipping.

C. Where specified, finishes on integrated card key locksets or exit hardware to incorporate an FDA recognized antimicrobial coating (i.e., MicroShield™) listed for use on equipment as a suppressant to the growth and spread of a broad range of bacteria, algae, fungus, mold and mildew.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine scheduled openings, with Installer present, for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance of the installed access control system.

B. Examine roughing-in for electrical source power to verify actual locations of wiring connections before electrified and integrated access control door hardware installation.

C. Examine roughing-in for LAN and control cable conduit systems to PCs, controllers, card readers, and other cable-connected devices to verify actual locations of conduit and back boxes before device installation.

D. Notify architect of any discrepancies or conflicts between the specifications, drawings and scheduled access controlled hardware. Proceed only after such discrepancies or conflicts have been resolved in writing.

3.2 PREPARATION

A. Doors and frames at scheduled access controlled openings to be properly prepared to receive specified electrified and access control hardware and connections without additional in-field modifications.

3.3 INSTALLATION

A. Install each item of integrated access control door hardware and access control equipment to comply with manufacturer's written instructions and according to specifications.

B. Mounting Heights: Mount integrated access control door hardware units at heights indicated in following applicable publications, unless specifically indicated or required to comply with governing regulations:
   1. Standard Steel Doors and Frames: DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
   2. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
   3. Where indicated to comply with accessibility requirements, comply with ANSI A117.1 "Accessibility Guidelines for Buildings and Facilities."

C. Boxed Power Supplies: Verify locations.
   1. Configuration: Provide the least number of power supplies required to adequately serve doors with access control hardware and equipment.

D. Final connect the system control switches (integrated access control door hardware, remote readers, keypads, display terminals, biometrics), and monitoring, and signaling equipment to the related Controller devices at each opening to properly operate the electrified door and access control hardware according to system operational narratives.

E. Retrofitting: Install each door hardware and access control item to comply with manufacturer's published templates and written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work specified in Division 9 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

F. Networked System Application Software: Install, and test application(s) software and databases for the complete and proper operation of systems involved. Assign software license(s) to Owner.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Perform a final inspection of the installed integrated access control door hardware and access control system and state in report whether installed work complies with or deviates from requirements, including whether each component representing the opening assembly is properly installed, adjusted, operating and performing to system operational narratives.

B. Commissioning and Testing Schedule: Prior to final acceptance of the access control system installation, the following testing and documentation to be performed and provided to the Owner.
   1. Inspection: Verify that units and controls are properly installed, connected, and labeled and that interconnecting wires and terminals are identified.

2. Pre-testing: Program and adjust the system and pretest all components, wiring, and functions to verify they conform to specified requirements. Provide testing reports indicating devices tested, pass/fail status, and actions taken to resolve problem(s) on failed tests.
3. Acceptance Test Schedule: Correct deficiencies identified by tests and observations and retest until specified requirements are met.
4. Provide “as designed” drawings showing each device and wiring connection and electronic enclosure legends indicating cabling in and out.
5. Provide a complete set of operating instructions for access control hardware devices and a complete software user manual. The documentation includes module reference guides for each electronic enclosure.

3.5 ADJUSTING

A. Adjust and check each operating item of integrated access control door hardware, and each door opening to ensure proper secured operation and function of every unit. Replace units that cannot be adjusted to operate as intended.

3.6 CLEANING AND PROTECTION

A. Protect all hardware stored on construction site in a covered and dry place. Protect exposed hardware installed on doors during the construction phase. Install any and all integrated access control door hardware at the latest possible time frame.

B. Clean adjacent surfaces soiled by access control system installation.

C. Clean operating items as necessary to restore proper finish and provide final protection and maintain conditions that ensure access control door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMONSTRATION

A. Instruct Owner's maintenance personnel to adjust, operate, and maintain electronic integrated door hardware and the access control system.

3.8 ACCESS CONTROL FIELD DEVICES

A. Refer to system drawings for additional information such as locations and number of devices required.

END OF SECTION 28 13 00

SECTION 28 23 00 – VIDEO SURVEILLANCE SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Cameras
   2. Camera housings
   3. Lenses
   4. Heaters and power supplies

B. Work Included:
   1. Section includes adding cameras to the existing video surveillance system consisting of cameras, housings, and data transmission wiring. Cameras to terminate on owner provided Ethernet switches, located near CAT6 patch panels. Video Surveillance system shall communicate to existing equipment via existing IP network.

1.2 DEFINITIONS

A. AGC: Automatic gain control.

B. IP: Internet protocol.

C. LAN: Local area network.

D. NTSC: National Television System Committee.

E. PC: Personal computer.

F. TCP: Transmission control protocol – connects hosts on the internet.

G. WAN: Wide area network.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include dimensions and data on features, performance, electrical characteristics, ratings and finishes.

B. Shop Drawings: For video surveillance, include plans, elevations, sections, details and attachments to other work.

C. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.

D. Functional Block Diagram: Show single-line interconnections between components for signal transmission and control. Show cable types and sizes.

E. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

A. Manufacturers installation instructions

B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For cameras, power supplies, infrared illuminators, monitors, videotape recorders, digital video recorders, video switches, and control-station components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section “Operation and Maintenance Data,” include the following:
   1. Lists of spare parts and replacement components recommended to be stored at the site for ready access.

1.6 QUALITY ASSURANCE

A. Electrical Components, Devices and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

B. Comply with NECA 1.

C. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

A. Environmental Conditions: Capable of withstanding the following environmental conditions without mechanical or electrical damage or degradation of operating capability:
   1. Interior, Controlled Environment: System components, except central-station control unit, installed in air-conditioned interior environments shall be rated for continuous operation in ambient temperatures of 40 to 100 deg. F dry bulb and 20 to 90 percent relative humidity, noncondensing. Use NEMA 250, Type 1 enclosures.
   2. Exterior Environment: System components installed in locations exposed to weather shall be rated for continuous operation in ambient temperatures of minus 10 to plus 120 deg. F dry bulb and 20 to 90 percent relative humidity, condensing. Rate for continuous operation when exposed to rain as specified in NEMA 250, winds up to 85 mph. Use NEMA 250, Type 4 or IP66 enclosures.

1.8 WARRANTY

A. Special Warranty: Manufacturer’s standard form in which manufacturer agrees to repair or replace components of cameras, equipment related to camera operation, and control-station equipment that fall in materials or workmanship within specified period.
   1. Warranty Period: One year from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 CAMERAS

A. The existing camera system was manufactured by Genetec. All new devices (cameras, power supplies, etc.) shall be compatible with and successfully integrate into the existing system. Specific system information is shown below:
   1. Manufacturer: Genetec
   2. Product Type: Security Center 5.11.2.0

B. Manufacturers: Axis Communications, Arecont, Bosch or approved eqivalent.

C. For additional information, the existing service provider is Utilitra. Contact information: David Murrey 618-883-5241. Utilitra is not a sole sourced provider for this scope of work.

D. Color Camera, Exterior.
   1. 8 megapixel CMOS image sensor.
   2. Video Signal: 100 Base-T Ethernet Network Protocol at up to 55 MBps.
   3. Power over Ethernet PoE 802.3 af.
   4. Vandal resistant cover.
   5. License for each new camera.

E. Color Camera, Interior.
   1. 8 megapixel CMOS image sensor.
   2. Video Signal: 100 Base-T Ethernet Network Protocol at up to 55 MBps.
   3. Power over Ethernet PoE 802.3 af.
   4. Vandal resistant cover.
   5. License for each new camera.

2.3 REINFORCED DOMES

A. Manufacturers: Subject to compliance with requirements, and compatible with camera supplied.

B. Exterior Domes:
   1. Aluminum Housing with vandal resistant polycarbonate cover.
   2. Allow for full 360 deg. horizontal and 0-90 deg. vertical camera rotation.
   3. Wall Mount: Capable of surface mounting in the horizontal position.
   4. White in color with dark lens.
   5. Provide with heater to allow for low temperature and high humidity conditions of environmental conditions described above.

2.4 LENSES

A. Manufacturers: Same as camera

2.5 HEATER POWER SUPPLIES

A. Low voltage power supplies matched for voltage and power requirements of housing heater as recommended by manufacturer of camera and housing.

B. Enclosure: NEMA 250, Type 1, wall mount.

2.6 SIGNAL TRANSMISSION COMPONENTS

A. Description: 100-ohm, 4-pair UTP, formed into 4-pair, binder groups covered with a blue thermoplastic jacket.
   1. Comply with ICEA S-90-661 for mechanical properties.
   2. Comply with TIA/EIA-568-B.1 for performance specifications.
   3. Comply with TIA/EIA-568-B.2, Category 6.
   4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
      a. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

B. Jacks and Jack Assemblies: 100-ohm, balanced, twisted-pair connector, four-pair, eight-position modular RJ-45 plug units with integral IDC-type terminals rated for CAT 6 terminations. Comply with TIA/EIA-568-B.2.Cable.

2.7 SEISMIC PERFORMANCE REQUIREMENTS

A. Seismic Performance: Video surveillance system shall withstand the effects of earthquake motions determined according to ASCE/SEI7.

B. The term “withstand” means “the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified.”

PART 3 - EXECUTION

3.1 EXAMINATION

A. Coordinate final camera location and desired viewing angles with Owner.

B. Coordinate location of LAN POE rated switch to be used with Owner.

C. Examine pathway elements intended for cables. Check supporting hooks, raceways and other elements for compliance with space allocations, installation tolerance, and other conditions affecting installation. Provide new surface raceway where needed.

D. Coordinate interior wall location for power supply serving exterior camera housings. Locate existing 120Vac, 15 or 20 amp, non-switched power source that can be tapped to feed power supply.

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

3.2 WIRING

A. Comply with requirements in Division 26 Section “Raceway and Boxes for Electrical Systems.”

B. Wiring Method: Install cables in raceways unless otherwise indicated.
   1. Raceways are not required in accessible indoor ceiling spaces and attics.
   2. Utilize surface raceway in office and classroom spaces. Existing raceways may be reused where possible. New must be provided where not.
   3. For cables not installed in raceways:
      a. Cables shall be supported with “J-Hooks” a minimum of every six feet. Bridal rings can be used when supporting a maximum of six wires. Support devices are to be attached to existing permanent structure.
      b. Cables shall be installed in cable tray where available.
      c. Cables shall be continuous from outlet to termination equipment.
      d. Cables shall be terminated using tools recommended by the termination manufacturer.
      e. Cables and supports shall be installed at a readily accessible location above ceilings.

C. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points with no excess and without exceeding manufacturer’s limitations on bending radii. Provide and use lacing bars and distribution spools.

D. Splices, Taps, and Terminations: For power and control wiring, use numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures. Tighten electrical connectors and terminals according to manufacturer’s published torque-tightening values. If manufacturer’s torque values are not indicated, use those specified in UL 486A-486B.

E. For LAN connection and copper communication wiring, comply with Division 27 Sections “Communications Backbone Cabling” and “Communications Horizontal Cabling.”

F. Grounding: Provide independent-signal circuit grounding recommended in writing by manufacturer.

3.3 VIDEO SURVEILLANCE SYSTEM INSTALLATION

A. Install camera housings level and plumb.

B. Install cameras with 96” minimum clear space below cameras and their mountings. Change type of mounting to achieve required clearance.

C. Install power supplies and other auxiliary components.

D. Identify system components, wiring, cabling, and terminals according to Division 26 Section “Identification for Electrical Systems.”

3.4 FIELD QUALITY CONTROL

A. Manufacturer’s Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Assist Owner with modifying their network camera monitoring system to view new camera installations as desired.

B. Tests and Inspections:
   1. Inspection: Verify that units and controls are properly installed, connected, and labeled, and that interconnecting wires and terminals are identified.
   2. Pretesting: Align and adjust system and pretest components, wiring, and functions to verify that they comply with specified requirements. Conduct tests at varying lighting levels, including day and night scenes as applicable. Prepare video-surveillance equipment for acceptance and operational testing as follows:
      a. Prepare equipment list described in “Informational Submittals” Article.
      b. Verify operation of auto-iris lenses.
      c. Set back-focus of fixed local length lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Adjust until image is in focus with and without the filter.
      d. Set back-focus of zoom lenses. At focus set to infinity, simulate nighttime lighting conditions by using a dark glass filter of a density that produces a clear image. Additionally, set zoom to full wide angle and aim camera at an object distance appropriate for intended use of camera location. Adjust until image is in focus from full wide angle to full telephoto, with the filter in place.
      e. Set and name all preset positions; consult Owner’s personnel.
      f. Set sensitivity of motion detection.

C. Test Schedule: Schedule tests after pretesting has been successfully completed and system has been in normal functional operation for at least 14 days. Provide a minimum of 10 days’ notice of test schedule.

D. Video surveillance system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.5 ADJUSTING

A. Occupancy Adjustment: When requested within 6 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Tasks shall include, but are not limited to, the following:
   1. Check cable connections.
   2. Check proper operation of cameras and lenses. Verify operation of auto-iris lenses and adjust back-focus as needed.
   3. Adjust all preset positions; consult Owner’s personnel.
   4. Recommend changes to cameras, lenses, and associated equipment to improve Owner’s use of video surveillance system.
   5. Provide a written report of adjustments and recommendations.

3.6 CLEANING

A. Clean installed items using methods and materials recommended in writing by manufacturer.

B. Clean video-surveillance-system components, including camera-housing windows, lenses and monitor screens.

3.7 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain video-surveillance equipment.

END OF SECTION 28 23 00

SECTION 28 30 00 – FIRE DETECTION AND ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Fire alarm system

B. Work Included:
   1. Install a complete and operational addressable fire alarm system with live and recorded emergency voice communications as indicated by drawings, schedules, and riser diagrams. The system shall be connected to a UL Listed monitoring station which will notify the fire department and owners designated representative upon system activation. In jurisdictions required by ordinance to be UL Certificated per UL Category UUFX the documentation and UL Certificate shall be provided and posted at the job site.
   2. The equipment supplier must be the local factory authorized representative and must also be factory authorized, trained and certified to perform warranty service for the equipment being supplied providing local factory authorized service and spare parts inventory. The supplier or installer must be NICET Certified level II, III or IV and NICET certificate must be submitted with shop drawings.
   3. Equipment manufacturer shall be regularly engaged in manufacturer of fire alarm systems of types, sizes, and electrical characteristics required, and whose products have been in satisfactory use in similar service for not less than 5 years.
   4. Installer shall have at least 5 years of successful experience on projects with fire alarm systems work similar to that required for this project and be a licensed contractor.
   5. For a period of one year from date of Owner's first beneficial use, the system shall be under a no charge warranty/service contract, as authorized by the manufacturer. During that period, replacement components and labor shall be readily available during standard business hours. After the one-year guarantee period, the supplier warrants that he is capable of providing service on a 24 hour, 7-day a week basis for at least five (5) additional years.

1.2 SUBMITTALS

A. Provide shop drawings in accordance with the appropriate paragraphs the applicable version of NFPA 72 for the following items:
   1. Written narrative providing intent and system description.
   2. Floorplan layout showing location of all devices, including isolation components to comply with the applicable NFPA 72 chapter on the Performance of Signaling Line Circuits (SLCs) referencing fault tolerances and manufacturer’s specific product requirements, strobe candela ratings, speaker taps, control equipment, supervising station equipment. Include point of compass (north arrow), scale used, room use identification and building features that will affect installed devices such as shelving or floor mounted equipment such as kitchen equipment.
   3. Sequence of operation in a matrix form.
   4. Equipment data sheets.
   5. Battery and voltage drop calculations.
   6. Mounting elevations of wall mounted equipment.
   7. Wiring pathway diagrams.

8. Provide NICET level II, III or IV (minimum) certificate of individual responsible for the design and calculations of the fire alarm system.
9. Manufacturers published instructions including operation and maintenance manuals. (Hard copy of information shall be left with owner)
10. Record of Completion, per applicable NFPA 72. (Hard copy of information shall be left with owner)
11. Site specific software in the form of a thumb drive.
12. Record (as built) drawings. (Hard copy of information shall be left with owner)
13. Completed record of inspection and testing per NFPA 72 (Hard copy of information shall be left with owner)

B. Submittals shall be submitted in two packages; the first package shall include items 1-7 and 13. Package two shall include items 8-12 submitted after project is completed. Partial submittal packages may be returned as rejected without being reviewed.

C. Engineered sealed fire alarm drawings prepared by fire alarm supplier required for permit application are the responsibility of the Contractor and fire alarm system supplier. Coordinate any system design drawing submission requirements with the Engineer.

1.3 REFERENCES, RELATED SECTIONS of the SPECIFICATIONS

A. Requirements of the following Sections of the Specifications apply to Work for this Section:
1. Division 26 – Electrical
2. Division 28 – Electronic Safety and Security

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by an NRTL, and marked for intended location and use.

2.2 MANUFACTURERS

A. Notifier – Gamewell FCI

2.3 PRODUCTS

A. Field Devices
1. Manual Fire Alarm Stations: Addressable non coded, red semi flush, dual action manual station manufactured of Lexan with clearly visible operating instructions on the cover. Where noted on drawings, provide a Safety Technology International Stopper II cover without horn.
2. Photoelectric Detectors: Addressable photoelectric smoke detectors shall use the photoelectric (light-scattering) principal to measure smoke density. Provide detectors as shown on plans and as a minimum provide a smoke detector at control panel and each remote power supply location.
3. Thermal Detector: Addressable fixed temperature low profile device with twist lock base. Temperature rating to be 135 degrees or 190 degrees (High temp version). In elevator

equipment rooms and shafts, heat detectors shall be located within two feet of each sprinkler head.

4. Relay Modules: Addressable relay modules with LED indicator light.
5. Control Modules: Addressable control modules with LED indicator light.
6. Monitor Modules: Addressable monitor modules with LED indicator light.
7. Door Holders: Flush wall mount electromagnetic door holder controlled by fire alarm system. Provide extension rods or box extensions as necessary. Door Holders shall be 24V or 120V powered. Provide power supplies as necessary. Label power supplies “Door Holder Power Supply”. Door Holders provided by Door Hardware Supplier or Door Holders provided by fire alarm supplier. At the contractors option provide either 24 volt or 120 volt door holders for this project.
8. All initiating devices shall be identified with a black-on-clear (1/4” text minimum) printed adhesive label affixed to the device. This label shall include the device address.

B. Signaling Appliances

1. Speakers. Speakers shall be combined with strobes or stand alone as indicated on plans. Speakers shall be wall or ceiling mounted and white in color.
   a. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.25 to 2.0 Watts.
   b. Speakers in corridors and public spaces shall produce a minimum nominal sound output of 83 dBA at 10 feet (3m).
   c. Frequency response shall be a minimum of 400 HZ to 4000 HZ.
   d. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
2. Strobes. Strobes shall be wall or ceiling mounted and white in color. Strobes shall be combined with speakers or stand alone as indicated on plans. Strobe lights shall be multi-candela units and meet the requirements of the ADA, UL Standard 1971, be fully synchronized, and shall meet the following criteria:
   a. The maximum pulse duration shall be 2/10 of one second.
   b. Strobe intensity and flash rate shall meet the requirements of UL 1971.
   c. Strobes shall be synchronized.
   d. The signals shall operate on 24 VDC polarized and the device shall be able to test circuit supervision without disconnecting wires.
   e. There shall be FIRE lettering clearly visible from both sides. Red or white device color to be coordinated with Architect.
   f. Visual and audible devices shall be synchronized within the project area and synchronized with all adjacent areas. This Contractor and equipment supplier shall provide cabling and equipment to achieve synchronization between the project area and adjacent spaces- including but not limited the installation of synchronization modules, Sync Protocols, replacement of power supplies, replacing strobes without synchronization capability, and associated cabling. Locating existing power supplies outside the project area shall be the responsibility of the Contractor/equipment suppliers.
3. Provide remote strobe signal expander power supplies as necessary. Provide dedicated 20A, 120V circuit to each remote power supply or group of power supplies not exceeding 80% of AC circuit capacity.

PART 3 - EXECUTION

3.1 SYSTEM WIRING

A. All wiring will be as required by the Equipment Supplier. Wire color-coding and the color shall remain the same throughout the system. In general, all initiating devices such as manual stations, smoke detectors and all modules will be installed across a common #18AWG twisted unshielded

pair or as required by system supplier. The strobe circuits shall require #14AWG unshielded or as required by system supplier. The speaker circuits shall require #16AWG shielded cable or as required by system supplier.

B. No conduit or raceway system will include Class I or non-power limited fire protection signaling circuits with Class II or power limited fire protection signaling circuits in accordance with N.E.C. Article 725 or 760.

C. All conduit and wiring to flow switches, tamper switches, etc., shall be furnished and installed as part of this work.

D. Test results shall be submitted to Engineer per this specification section.

E. Wiring may be run as concealed open type plenum rated cable. Exposed or inaccessible wiring shall be installed in conduit. Where possible wiring/conduit shall be concealed. Provide sleeves in all walls which cable runs pass through. Refer to 26 05 29 for fire sealing of penetrations through fire rated walls. Provide access panels as necessary for cable routing. Support devices are to be attached to existing permanent structure.

3.2 SEQUENCE OF OPERATIONS

A. Fire alarm system shall evacuate entire building in the event of an alarm. The evacuation signal shall begin with a pre-announce tone in a code 3 temporal pattern repeated 3 times followed by the evacuation message. The message shall repeat until silenced or overridden by operators at the FACP or remote annunciator/microphone station with live voice instructions. Evacuation message shall be approved by the AHJ.

B. The following will occur upon activation of any alarm initiating device (smoke detector, heat detector, manual pull station and water flow monitor module):
   1. Sound audible signals and flash visual signals.
   2. Display alarm status information on the fire alarm control panel, each remote annunciator and send an alarm signal to the remote supervising station.
   3. Activate addressable control modules to shut down air handling units, close fire/smoke dampers and release all smoke doors.
   4. Upon activation of elevator hoist way or elevator equipment room heat detectors the elevator power shunt trip fusible switch shall be caused to trip open.

C. The following to occur upon activation of a trouble signal (open circuit, ground fault, low battery, loss of AC power, etc.):
   1. Display trouble status at the fire alarm control panel, each remote annunciator and send a trouble signal to the remote supervising station.

D. Tamper switch state change shall display supervisory status at the fire alarm control panel, each remote annunciator and send a supervisory signal to the remote supervising station

3.3 EXISTING FIRE ALARM SYSTEM AND FIRE PROTECTION SYSTEM DISTURBANCE

A. When adding or deleting fire alarm devices care must be taken to assure the existing system will continue to work if an alarm, trouble or supervisory event occurs. When deleting existing addressable devices the address must be deleted or temporarily disabled in the program before the completion of work on any given day. When adding new devices the address must be programmed or temporarily disabled before the completion of work on any given day. Signaling appliances added to any system must maintain parallel supervised wiring with the end of line

device in-tact before the completion of work on any given day. Only if all parties agree (owner, and AHJ) that the fire alarm system shall be out of service overnight shall a system be allowed to be placed in an out of service condition.

B. Where fire protection is reworked/removed from the construction site, The Division 28 contractor shall furnish and install heat detectors in all areas of construction. Heat detector coverage shall be reworked as required in the event construction barrier changes occur or construction phase changes. The Contractor and an approved equipment supplier of the system manufacturer shall include all necessary programming changes to install and remove heat detectors.

END OF SECTION 28 30 00

SECTION 321123 - AGGREGATE BASE COURSES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This section includes the following:

1. Aggregate material and installation requirements for pavement base courses, and utility trench backfill.

1.3 DEFINITIONS

A. Base Course: Layer placed between the prepared subgrade and paving materials.

B. Geotechnical Testing Agency: Individual or company who will be providing geotechnical testing responsibilities for this project.

C. MODOT: Missouri Department of Transportation.

D. Prepared Subgrade: Surface which has been proof-rolled and/or compacted to the satisfaction of the Geotechnical Testing Agency and approved by the Architect.

1.4 SUBMITTALS

A. Material Certifications: Aggregate gradation and written documentation from the manufacturing source certifying that each specified aggregate meets the requirements indicated.

B. Geotechnical Testing Agency:

1. Submit company name and contact information for Contractor’s independent Geotechnical Testing Agency.

1.5 QUALITY ASSURANCE

A. Installation by a contractor specializing in the work, and with a minimum of ten (10) years of documented experience for successful, high-quality installations of aggregate base specified herein.

B. Geotechnical Testing Agency Qualifications: The Contractor shall engage an independent testing agency qualified according to ASTM E 329 to conduct aggregate materials testing and aggregate compaction testing as documented according to ASTM D 3740 and ASTM E 548.

C. Contractor shall only use virgin materials. If recycled aggregate material from a reputable source, and meeting the gradation requirements below, is planned to be used, Contractor must submit this as a substitution for review by the Owner's Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Base Courses:

1. MODOT Type 5 Aggregate: Type 5 aggregate for base shall consist of crushed stone, sand and gravel. The aggregate shall not contain more than 15 percent deleterious rock and shale. The fraction passing the No. 40 sieve shall have a plasticity not to exceed six. Any sand, silt and clay, and any deleterious rock and shale shall be uniformly distributed throughout the material. The aggregate shall be in accordance with the following gradation requirements:

Sieve	Percent by Weight
Passing 1 inch	100
Passing ½ inch	60-90
Passing No. 4	35-60
Passing No. 30	10-35
Passing No. 200	0-15

PART 3 - EXECUTION

3.1 PREPARATION

A. Protect and maintain benchmarks and survey control points from disturbance during construction.

B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.

C. Verify that all erosion control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust has been installed properly. Refer to plan drawings and erosion control details in the construction drawings for specifics on location and placement of erosion control measures.

3.2 DEWATERING

A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.

B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.

1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required

3.3 EXCAVATION

A. Excavation for pavement and sidewalks: Excavate areas under planned pavement and sidewalk areas to indicated subgrade elevations as shown on the plan drawings.

3.4 STORAGE OF SOIL MATERIALS

A. Aggregates shall be produced, handled and stockpiled to minimize segregation, degradation and contamination. Regardless of the method of storage and handling, all aggregate that is segregated, degraded or contaminated to the extent that the aggregate does not meet specifications, will be considered unacceptable.

B. Stockpile aggregate materials away from edges of construction. Do not store within drip line of remaining trees.

3.5 INSTALLATION

A. Only place aggregate bases on compacted and approved prepared subgrades.

B. Place aggregate base materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.

C. Compact each layer of aggregate base material to not less than the following percentages of maximum dry density as determined by ASTM D 1557 (modified proctor test).

1. Compact each layer of aggregate material by compacting to 95 percent of the maximum dry unit weight according to ASTM D 1557.

3.6 FIELD QUALITY CONTROL

A. Testing: All test reports will be submitted to the Architect and Owner's Representative no more than 24 hours after the test results are known.

1. Nuclear density test according to ASTM D 2922 of aggregate base at the rate of one (1) per 5,000 square feet, but in no case fewer than 3 tests.

2. Written verification that the compacted aggregate base meets or exceeds the standards of this specification.

3. When the Geotechnical Testing Agency reports that aggregate bases have not achieved degree of compaction specified, remove and replace aggregates to depth required. Recompact and retest until specified compaction is obtained. The Owner is not responsible for any costs associated with retesting previously failed areas.

B. The Contractor is responsible for limiting the amount of heavy vehicle construction traffic on aggregate bases. Contractor shall be responsible for rebuilding damaged aggregate bases as a result of excessive construction traffic at no additional cost to the Owner.

3.7 PROTECTION

A. Protect newly placed aggregate bases from freezing and erosion. Keep free of trash and debris.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Disposal:

1. Dispose of all excess construction materials and waste material/debris legally off Owner's property.

END OF SECTION 321123

SECTION 321816.13 – PLAYGROUND PROTECTIVE SURFACING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:

1. Poured-in-place (PIP) resilient protective surfacing.
2. Synthetic turf system
3. Drainage mat.
4. Sub-grade preparation.
5. Furnish, deliver, install and warrant a complete, flush and functional system including all labor, material, components, accessories and equipment.

B. Related Requirements:

1. Division 32 section "Concrete Paving".

1.3 REFERENCES

A. Missouri Building Code.

B. ADAAG- Americans with Disabilities Act, 1990, Titles II.

C. ASTM Applicable Standards - Turf:

1. F1292: Standard specification for Impact Attenuation of Surfacing Materials within the Use Zone of PlaygroundEquipment.
2. D1577: Standard Test Method for Linear Density of Textile Fiber
3. D5848: Standard Test Method for Mass Per Unit Area of Pile Yam Floor Covering
4. D418: Standard Test Method for Testing Pile Yarn Floor Covering Construction
5. D1338: Standard Test Method for Tuft Bind of Pile Yarn Floor Coverings
6. D1682: Standard Method of Test for Breaking Load and Elongation of Textile Fabrics
7. D5034: Standard Test Method of Breaking Strength and Elongation of Textile Fabrics (Grab Test)
8. F1551: Standard Test Methods for Water Permeability
9. D2859: Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials
10. F355: Standard Test Method for Shock-Absorbing Properties of Playing Surfaces
11. D1557: Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort.

D. ASTM Applicable Standards - PIP:

1. ASTM D2047: Standard test method for determining the static coefficient of friction of ceramic tile and other like surfaces by the horizontal dynamometer pull meter method. This standard replaces ASTM C1028.
2. ASTM D412: Standard test methods for vulcanized rubber and thermoplastic rubbers and thermoplastic elastomers-tension.
3. ASTM D624: Standard test method for tear strength of conventional vulcanized rubber and thermoplastic elastomers.
4. ASTM D2859: Standard test method for flammability of finished textile floor covering materials.
5. ASTM E303: Standard test method for measuring surfacing frictional properties using the British Pendulum tester.
6. ASTM F1292: Standard specification for impact attenuation of surface systems under and around playground equipment.
7. ASTM F1951: Standard specification for determination of accessibility of surface systems under and around playground equipment.

E. CPSC – Consumer Products Safety Commission, Handbook for Public Playground Safety #325, Current Edition.

F. STC Suggested Guidelines for the Essential Elements of Synthetic Turf Systems.

1.4 COORDINATION

A. Finish elevation for all playground protective system surfaces shall be flush and accessible. Coordinate all sub-base and infill requirements to ensure aligned finish elevations.

B. Coordinate sub-base and perimeter requirements with all Division 32 scope of work provided by others.

1.5 ACTION SUBMITTALS

A. Product Data: Manufacturer's Product Literature and Specification Data.

B. Shop Drawings: Plan of equipment layout indicating location, footings and color patterns. Inclusive of drainage structures.

1. Indicate location and size of all wear mat inserts.

C. Samples: Submit two samples, 12-inch x 12-inch minimum size, illustrating details of finished product, including full cross section of sub-base, turf, and infill material.

1. Submit a 1-lb sample of the selected bid infill material(s).

D. Colors: Selected from manufacturer's color chart. Choice by Owner to be determined prior to installation.

1.6 INFORMATIONAL SUBMITTALS

A. Impact Attenuation Test Certification (ASTM F1292): Submit certification for the poured-in-place system to be installed in compliance with the Critical Fall height as determined by the Playground Equipment to be installed in conjunction with the poured-in-place surfacing system.

B. System Certification: A letter and specification sheet certifying that the products of this section meet or exceed specified requirements.

C. Installer Certifications: Certificates from manufacturer and IPEMA.

D. Evaluation Reports: Certified copies of independent (third-party) laboratory reports on ASTM tests as follows:

1. Pile Height, Face Width & Total Fabric Weight: ASTM D418 or D5848.
2. Primary & Secondary Backing Weights: ASTM D418 or D5848.
3. Tuft Bind: ASTM D1335.
4. Grab Tear Strength: ASTM D1682 or D5034.

E. Manufacturer's Installation Instructions and Procedures: Indicate substrate requirements and installation methods.

F. Warranty: Sample warranty.

1.7 MAINTENANCE MATERIAL SUBMITTALS (EXTRA MATERIALS)

A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Repair Kits: Full size units for each color provided.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: Utilize an installer approved, trained and certified by the manufacturer of the playground surfacing system, having experience with other projects of the scope and scale of the work described in this section.

B. Source Limitations: Obtain all systems from single source with single manufacturer and shall be installed by single Installer.

C. Certifications: Certification by manufacturer that installer is an approved applicator of the playground surfacing system.

D. International Play Equipment Manufacturers Association (IPEMA): IPEMA Certification

1.9 REGULATORY REQUIREMENTS

A. Materials and play areas shall comply with the requirements of ASTM F1951.

1.10 DELIVERY, STORAGE & HANDLING

A. Delivery: Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.

B. Storage and Protection: Store materials protected from exposure to harmful environmental conditions and at a minimum temperature of 40 deg F and a maximum temperature of 90 deg F.

1.11 PROJECT CONDITIONS

A. Coordinate all work with the work of other sections to avoid delay and interference with other work.

B. Install synthetic surfacing only when ambient air temperature is 50° F and rising or above and the relative humidity is below 35% or as specified by the product manufacturer. Installation will not proceed if rain is imminent.

C. Install product only when prepared base is suitably free of dirt, dust, and petroleum products, is moisture free and sufficiently secured to prevent unwanted pedestrian and vehicular access.

D. Maintain all benchmarks, monuments, and other reference points. If disturbed or destroyed, replace as directed.

E. Protect excavations by shoring, bracing sheeting, underpinning, or other methods as required to prevent cave-ins or loose dirt from entering excavations. Barricade open excavations and post warning lights at work adjacent to public streets and walks.

1.12 WARRANTY

A. System Warranty: Provide comprehensive warranty against defects in materials and contractor workmanship. Defects shall include, but not be limited to ultraviolet ray fading, degradation, delamination, loss of impact attenuation, or excessive wear.

1. System shall maintain required impact attenuation characteristics.
2. Warranty shall be for full replacement of any damaged product within the warranty period.
3. Warranty shall be comprehensive and sufficient to replace all system if necessary.
4. Warranty shall contain no usage limits for warranted system.

B. Warranty Period: Minimum five (5) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Subject to compliance with requirements, provide specified products by **Robertson Recreational Surfaces** or an APPROVED comparable product.

1. Contact Information:
   a. Robertson Recreational Surfaces
   b. www.robertsonsurfaces.com
   c. info@totturf.com
   d. 1-800-858-0519

2.2 PLAYGROUND PROTECTIVE SURFACING SYSTEM

A. **RPS** - Basis of Design: Tot Turf Poured-In-Place EPDM, TPV Safety Surfacing System.

1. Colors: Premium, Purple RAL4005 & Light Grey RAL 7035 to be confirmed by Architect in submittals.

    a. Reference MATERIAL LEGEND on Drawing sheet A-600 and A-103, A-104 & A-106 for additional information.

2. Accessibility: Comply with requirements of ASTM F1951.
3. Flammability (ASTM D2859): Pass.
4. Shock Attenuation (ASTM F1292):

    a. Gmax: Less than 200.
    b. Head Injury Criteria: Less than 1000.

5. System components and additional requirements follow.

B. Attenuation Cushion Layer

1. Impact attenuation cushion layer consists of these materials; recycled styrene butadiene rubber (SBR) and/or cryogenic crumb rubber and/or pre consumer postindustrial reclaimed scrap rubber adhered with a 100% solids polyurethane binder to form a resilient porous material.

2. Strands of SBR may vary from 0.5 mm – 2.0 mm in thickness by 3.0 mm – 20 mm in length.

3. Chunk Premium Black Rubber Granules are 5/8” granules: This rubber is pre-consumer, post-industrial, reclaimed rubber, granulated through a 5/8” screen and contains less than 2% dust.

4. SBR Crumb Rubber (5-9 Mesh) using sieve analysis ASTM D5644 with a fiber content of .1% or less mixed in.

5. SBR homogeneous rubber pellets derived from rubber powder reclaimed from end of use tires. Genan Pellets 3.8/35.

C. Wear Course

1. Wear course shall consist of Ethylene Propylene Diene Monomer (EPDM) or (TPV) Rosehill TPV proprietary formula, consisting of a vulcanized (fully cross-linked) premium colored rubber granule with polyurethane binder formulated to produce an even, uniform, seamless surface. Installation of surfacing shall be seamless (unless otherwise agreed upon by owner).

2. EPDM shall be sulfur cured with a poly content of >20 % content to maintain dynamic testing characteristics, weatherization and UV stability. Size of EPDM granules shall be 1-4mm across. Binder shall be not less than 20% of total weight of rubber used in the wear surface and shall provide 100% coating of the particles.

3. ASTM D2240 (Shore A) hardness ±5% of 60.

4. Rosehill TPV shall be angular granules with a (Shore A) hardness of 65°A ±5 and particle size between 1-4mm. Binder shall not be less than 20 percent of total weight of rubber used in the wear surface and shall provide 100 percent coating of particles.

5. The wear course shall be porous.

6. Thickness: 1/2-inch minimum.

D. Binder

1. No Toluene Diphenyl Isocyanate (TDI) shall be used.

2. No filler materials shall be used in urethane such as plasticizers and the catalyzing agent shall contain no heavy metals.

3. Weight of polyurethane shall be no less than 8.5 lbs. /gal (1.02 Kg/1) and no more than 9.5 lbs. /gal (1.14 Kg/1).

4. Manufacturer is permitted to modify the type of urethane required to match extreme weather conditions. Substitutions must be equal to or exceed original quality.

E. Wear Mat Inserts

1. Basis of Design: Rosehill TPV

   a. Vulcanized (fully cross-linked) premium colored rubber granule with a (Shore A) hardness of 65° A ± 5 and particle size between 0.5-1.5 mm shall be used.
   b. Wear Mat Inserts shall be porous.

2. Thickness: 1/2-inch minimum.

3. Binder: Aliphatic Urethane Premium.

4. Location: Inserts shall be provided under swings, swing bays, and slide exits.

5. Size:

   a. Swing bay use locations shall have Inserts inclusive of all outside bay structure poles.
   b. Singular swings and slide exits shall be minimum 4-feet x 4-feet x 6-inch in thickness.

F. Materials:

1. Wear Course: EPDM Granules and/or Rosehill TPV® Granules.
2. Attenuation cushion layer: Shredded and/or Chunk, and or Pellet rubber.
3. Binder: Aliphatic Urethane Premium, Non-Ambering.
4. Chunk Premium Black Rubber Granules.

2.3 TURF SYSTEM

A. **TS** - Basis of Design: Tot Turf Resilient ProPlay Elite Synthetic Turf System.

1. Colors: Blade Color Field Green / Olive & Thatch Color Field Green / Beige.

   a. Reference MATERIAL LEGEND on Drawing sheet A-600 and A-103 & A-104 for additional information.

2. Accessibility: Comply with requirements of ASTM F1951.
3. Flammability (ASTM D2859): Pass.
4. Shock Attenuation (ASTM F1292):

   a. Gmax: Less than 200.
   b. Head Injury Criteria: Less than 1000.

5. System components and additional requirements follow.

B. General: The entire turf system shall be resistant to weather, including ultra-violet light, heat degradation, insects, rot, mildew and fungus growth and be non-allergenic and non-toxic.

1. Turf roll seams: Shall be sewn or glued on site so that no openings larger than the porous backing mat openings are created. All turf fabric edges to be securely bound as per the perimeter detail design. Adhesives for joining seams of turf together shall be Mapei PU1K Glue. No substitutions.

2. Fabric surface: Shall be constructed and installed in minimum widths of 15 feet with no longitudinal or transverse seams.

C. Turf Fiber:

1. The turf fiber shall be tufted to the backing with a minimum tuft bind of 8 pounds.
2. The tufted fiber weight shall be a minimum of 65 ounces per square yard.
3. The turf fiber shall be non-abrasive and a minimum of 100 microns thick for slit tape fibers and 350 microns thick for the monofilament fiber.
4. The turf fiber shall contain less than 100 ppm of lead chromate in all colors.
5. The turf fiber systems shall be from the same dye lots.
6. The turf fiber shall retain a minimum of 75% of its original fibril width after 10,000 cycles on the Lisport Studded Roll Test Machine.

D. Pile Fiber Property Requirements:

1. Linear Density (Denier) (ASTM D1577): Monofilament: 12,000.
2. Yarn Thickness (ASTM D3218): 270 microns.
3. Tensile Strength (ASTM D2256): 71 N (PE Mono);16 N (PE).
4. Pile Weight (ASTM D5848): 65 oz./yd2 (±5%).

E. Pile Fabric Physical Requirements:

1. Finished Pile Height (ASTM D5823): 1-inch.
2. Product Weight (total) (ASTM D3218): 93 oz/yd2.
3. Primary Backing Weight (ASTM D2256): 8.0 oz/yd2.
4. Secondary coating Weight (ASTM D5848): 20 oz/yd2.
5. Fabric Width (ASTM D5793): 15-feet.
6. Tuft Gauge (ASTM D5793): 3/8-inch.
7. Grab Tear Strength (ASTM D5034): 350-lb-F.
8. Tuft Bind (ASTM D1335): >8-lb-F.
9. Infill (Sand): 3 lbs. antimicrobial-coated Silica Sand.

F. Backing Materials:

1. Primary Backing:
    a. Primary backing must be a dual layered woven polypropylene material with polyester fibers used in the weft direction of at least one layer
    b. Primary backing system weight must be a minimum of 8.0 ounces/square yard.
    c. Primary backing layers must be stitched together to form a composite.
2. Secondary Backing:
    a. Secondary backing system weight must be a minimum of 20 ounces/ square yard.
    b. Secondary backing shall saturate the primary backing and effectively lock the fiber tufts in place to the primary backing.
    c. Secondary backing must be a heat activated polyurethane coating
    d. Secondary backing system shall have minimum tuft bind strength of 8 pounds.

G. Attenuation Layer

1. General Requirements for Underlayment System: An impact energy absorbing sub-base drainage system designed specifically for use with synthetic turf is required. The specified material must have physical, drainage and performance properties that meet the following requirements:
    a. Cushion layer to be Brock Pad or SBR/Chunk base.

2. Brock Pad Underlayment System:

    a. Minimum material nominal thickness: 50.8 mm (2-inch) material thickness must be within ± 2 mm (± 0.08”).
    b. Tensile Strength (ASTM D3575): >50 psi.
    c. Tensile Elongation (ASTM D3575): >10%.
    d. Compression Strength (ASTM D3575): >20 psi @ 25% strain.
    e. Water Permeability (EN 12616:2013): >1500 in/hr.
    f. Water Absorption (ASTM C272): 1% after 24 hrs.
    g. Linear Thermal Expansion (ASTM D696): <0.10 mm /m /°C.
    h. Flammability Flame Spread (FMVSS 302): <100 mm /min.
    i. Resistance to Chemicals 2 (ASTM F925)
    j. Resistance to Acid and Alkaline Liquids (EN 14030:2010 / ISO 12960:1998): 0% tensile strength loss after 100-year model.
    k. Resistance to Accelerated Aging (Oxidation) (ISO 13438:2004): <10% tensile strength loss after 100-year model of 56 days at 110oC.
    l. Resistance to Bacteria (ASTM G22): No growth.

H. Synthetic Glue Material

1. Adhesive products shall be Mapei PU1K glue.

2. Any adhesive products required for the installation of a proposed turf system shall be purpose-suited to the system. The material and application methods shall be as recommended by the adhesive manufacturer.

3. Disposal of adhesive containers and unused adhesives as well as any fees resulting from such disposal shall be the responsibility of the Contractor.

I. Infill Material

1. The synthetic infill material shall consist of a blend of Antimicrobial Coated Silica Sand, ceramic coated silica sand.

    a. Antimicrobial Coated Sand: infill for synthetic/artificial turf this product consists of silicon dioxide coated with an acrylic polymer. HAZARDS DISCLOSURE: This product does not contain known hazardous materials in reportable levels as defined by the OSHA Hazard Communication Standard 29 CFR 1910.1200. This product should be classified as NOT being toxic, corrosive, skin/eye irritants, or a strong sensitizer as defined in 16 CFR 1500.3(b)(5), and 1500.3(b)(7)- (9) of the Federal Hazardous Substances Act.

        1) Color: Green
        2) Odor: Odorless
        3) Melting point/Melting range: 1713 °C (3115 °F)
        4) Boiling point/Boiling range: 2230 °C (4046 °F)
        5) Flash point: None
        6) Flammability (solid, gaseous): Product is not flammable.
        7) Ignition temperature - Decomposition temperature: Not determined.
        8) Auto Igniting: Product is not self-igniting.
        9) Danger of explosion - Product does not present an explosion hazard.
        10) Explosion limits - Lower - Not determined; Upper - Not determined.
        11) Vapor pressure@ 1732 °C (3150 °F) - 13.5 hPa (10 mm Hg); Density@20 °C (68 °F) - 2.9-3.1 g/cm3 (24.201-25.87 lbs/gal); Bulk density- 110 (lbs per cu ft); Relative density - Not determined; Vapor density - Not applicable.
        12) Evaporation rate - Not applicable
        13) Solubility in/ Miscibility with: Water – Insoluble
        14) Partition coefficient (n-octanol/water) - Not determined
        15) Viscosity: Dynamic - Not applicable; Kinematic - Not applicable

16) Solvent content: Organic solvents - 0.0 %; Solids content - 100.0 %

2.4 AUXILIARY MATERIALS

A. Geotextile Fabric: Geotextile membrane applied over compacted and graded substrate for aggregate substrate installation.

B. Aggregate sub-base, permeable: Crushed Aggregate Base: 3/4-inch maximum grading, crushed rock and rock dust conforming to requirements of Section 200-2.2, SSPWC, or Permeable Material: CSS Caltrans Standard Specifications, Latest Edition, Section 68, Class 2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Scarify and compact soil sub-base to 90%.

B. Verify that substrate is graded, smooth and ready to receive work of this Section.

C. Verify drainage system has been installed.

D. Verify gradients and elevations of substrate are correct.

E. Verify perimeter concrete curbing has been installed per Section 321313.

F. Install minimum 4-inch-thick aggregate substrate, compacted to 90%, 1/4-inch in 10-feet maximum tolerance, installed in two 2-inch lifts grade to slope minimum 2%, install geotextile fabric over aggregate substrate.

G. Coordinate with installation of playground equipment.

3.2 SITE PREPARATION

1. Finished Grade/Slope: Verify that finished elevations or adjacent areas are as indicated on the architectural or site plans, that the appropriate sub-grade elevation has been established for the safety surface to be installed, and that the subsurface has been installed per architectural, site or equipment plans while meeting accessibility and use zones requirements.
2. Aggregate Sub Base: Tolerance of aggregate sub-base shall be within .5” in depth. Verify that aggregate sub-base has been fully compacted. Per ADA Guidelines: compacted Aggregate sub-base – 4” of .75” minus irregular stone with fines compacted to 95% in 2” watered lifts.
3. Concrete Sub-Base: Tolerance of concrete or bituminous sub-base shall be with .125” (3.0 mm) in 10’ (3050 mm). Per ADA Guidelines: Concrete a minimum of 3’ – 4’ at a minimum 2500 PSI. Concrete must cure for 7 days prior to application of attenuation cushion layer. Concrete must cure 21-28 days if wear course is to be applied directly to concrete surface. If poured-in-place surfacing is installed, verify that the concrete sub-base has cured (all areas appear white in color usually at 7 days) and that all concrete

curing compounds and other deleterious substances that might adversely affect adhesion have been removed. Surface shall be clean and dry.

4. Asphalt Sub-Base: Asphalt cure time requires 21-28 days. Once the new asphalt has cured, it must be pressure washed prior to the surfacing being installed. The contractor shall be responsible for flooding the pad to ensure proper slope and tolerance. Any areas holding enough water to cover a flat nickel shall be patched prior to the arrival of our installation crews.

5. Drainage: Verify that sub-surfacing drainage, if required, has been installed to provide positive drainage.

3.3 INSTALLATION, GENERAL

A. Installation of systems shall comply with manufacturer's written recommendations, requirements and approved shop drawings.

B. The designated Installer supervisor shall be present during any and all construction activity associated with the field installation, including testing, cleanup and training.

C. All products and equipment are to be from sources approved by the manufacturer and conform to the specifications.

D. Surface Preparation: Using a brush or short nap roller, apply primer to the substrate perimeter and any adjacent vertical barriers such as playground equipment support legs, curbs or slabs that will contact the surfacing system at the rate of 300 ft2/gal (7.5 m2/L).

E. Install Shredded SBR cushion course and EPDM wearing surface system per manufacturer’s instructions.

1. Over aggregate: Install play surfacing system over geotextile fabric over compacted aggregate substrate, slope to drain as specified in drawings.

2. Over Concrete: Install play surfacing system over geotextile fabric over concrete substrate, slope to drain as specified in drawings.

3. Basemat Installation:

   a. Using screeds and hand trowels, install the basemat at a consistent density of 29-pounds, 1 ounce per cubic foot to the specified thickness.

   b. Allow basemat to cure for sufficient time so that indentations are not left in the basemat from applicator foot traffic or equipment.

   c. Do not allow foot traffic or use of the basemat surface until it is sufficiently cured.

4. Top Surface Installation: Using a hand trowel, install top surface at a consistent density of 58-pounds, 9 ounces per cubic foot to a nominal thickness of 1/2-inch.

   a. Allow top surface to cure for a minimum of 48-hours.

   b. At the end of the minimum curing period, verify that the top surface is sufficiently dry and firm to allow foot traffic and use without damage to the surface.

   c. Do not allow foot traffic or use of the surface until it is sufficiently cured.

F. Perimeter: As indicated on Drawings and installed in accordance with Section 321313

G. Make necessary adjustments to system to accommodate playground equipment uprights installed into grade.

H. Install play surfacing level abutting path(s) of travel and each playground equipment.

3.4 POURED-IN-PLACE SYSTEM INSTALLATION

A. Poured-in-Place Surfacing: Components of the poured-in-place surfacing shall be mixed on site in a rotating tumbler to ensure components are thoroughly mixed and are in accordance with manufactures recommendations. Installation of surfacing shall be seamless up to 2,000 square feet per day. Material shall cover all foundations and fill around all elements penetrating the surface.

B. Attenuation Cushion Layer: Whenever practical, attenuation cushion layer of surfacing material shall be installed in one continuous pour on the same day of up to 2,000 square feet. When a second pour is required, step the seam (see detail) and fully coat the step of the previous work with polyurethane binder to ensure 100% bond with new work. Apply adhesive in small quantities so that new attenuation cushion layer can be placed before the adhesive dries.

C. Wear Course: Wear course must be quality peroxide cured EPDM or Rosehill TPV® granules. wear surface shall be bonded to attenuation cushion layer. If necessary, additional primer will be used between the attenuation cushion layer and wear course. Apply adhesive to attenuation cushion layer in small quantities allowing the wear course to be applied before adhesive dries. Surface shall be hand troweled to a smooth, even finish. Expect continuous and seamless up to 2,000 square feet per day (contact sales representative for seamless in excess of 2,000 square feet). Where seams are required due to color change, size or adverse weather, a step configuration will be constructed to maintain wear course integrity. The edge of initial pour shall be coated with adhesive and wearing surface mixture shall be immediately applied. Pads with multiple seams are encouraged to include a topcoat of urethane before being placed into use. Butt joint seams are not acceptable except for repairs. Under special conditions and with Owners written approval seams may be permitted in same color pad. Consult with Manufacturer for specific applications.

D. Perimeter: For installations over existing concrete, the perimeter shall be saw cut to provide a keyway 1” deep x 1” wide, or formed during the pour, with surfacing rolled down into the void. Primer adhesive must be applied to all sides of the void. When connecting to a concrete curb or border, the inside vertical edge shall be primed with adhesive and the final 2” of the attenuation cushion layer shall be tapered to allow the wear surface material to be 1.5”– 2” thick where it joins the concrete.

E. Asphalt: When installing over new asphalt, a curb or other type of border is recommended around the entire pad to separate the new surface from other ground materials. Primer adhesive must be applied to the inside vertical edge of the border before poured-in-place surface installation.

F. Asphalt: When installing over existing asphalt, a keyway cut of 1” deep by 1” side for the poured-in-place to taper into and terminate with required ADA slope.

G. Thickness: Construction methods such as the use of measured screeds or guides shall be employed to ensure that the full depth of specified surfacing material is installed. Surfacing system thickness throughout the playground equipment use zone shall be as required to meet the impact attenuation requirements specified herein.

H. Clean Up: Manufacturer installers shall work to minimize excessive adhesive on adjacent surfaces or play equipment. Spills of excess adhesive shall be promptly cleaned.

I. Protection: The safety surface shall be allowed to fully cure in accordance with Manufacturer's instructions. The surface shall be protected by the owner from all traffic during the curing period of at a minimum of 48 hours or as instructed by the Manufacturer.

J. Manufacturer Services: For poured-in-place safety surfacing, a Manufacturer's representative who is experienced in the installation of playground safety surfacing shall be provided. The representative shall supervise the installation to ensure that the system meets the impact attenuation requirements as specified herein.

3.5 TURF SYSTEM INSTALLATION

A. Install synthetic turf system in accordance with the Manufacturer's written installation instructions.

B. Turf shall be attached to the perimeter edge as shown in the construction plans and as per the manufacturer.

C. All seams shall be brushed thoroughly before infill materials are installed.

D. Infill Installation:

1. The synthetic turf system shall be thoroughly brushed prior to installation of infill materials to remove wrinkles.

2. Turf system shall always remain free draining before, during and after the infill materials are installed.

E. All terminations shall be as detailed and approved in the shop drawings.

3.6 CLEANING AND PROTECTION

A. Site shall be kept clean and free of tools, trash, and debris and installation materials daily.

B. Products may be stored on site during installation with appropriate protective measures and approval by Architect and Owner's representative.

END OF SECTION 321816.13

SECTION 329300 – EXTERIOR PLANTS AND SOILS - ALLOWANCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes – Allowance:

1. Plants and Trees.
2. Landscape edgings.
3. Provision, preparation and installation of all related materials and products including but not limited to:
    a. Planting pits and beds including excavation, back filling, and disposal of surplus and unsuitable excavated material.
    b. Topsoil uniformly spread over all planted areas.
    c. Fine grading of tree planting areas.
    d. Planting soil mixes at grade.
    e. Soil amendments and fertilizers.
    f. Mulch.
    g. Erosion control.
    h. Tree Stabilization & Protection
    i. Supplemental slow-release irrigation bags.
4. Maintenance of trees in planting areas.

B. Related Requirements:

1. Division 00 section "Allowances" for allowance values related to Exterior Plants and Soils.
2. Division 32 section "Playground Protective Surfaces" for coordination of adjacent work.

1.3 COORDINATION

A. Coordination with Crushed Stone Surfacing. Plant trees after finish grades are established and before crushed stone installation.

B. Coordination with existing irrigation system regarding planting schedule and water requirements.

C. When planting trees after planting turf areas, protect turf areas, and promptly repair damage caused by planting operations.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Plant Materials: Include quantities, sizes, quality, and sources for plant materials.

2. Plant Photographs:

   a. Include color photographs in digital format of each required species and size of plant material as it will be furnished to Project.

   b. Take photographs from an angle depicting true size and condition of the typical plant to be furnished. Include a scale rod or other measuring device in each photograph.

   c. Also include one image per plant type of the typical root condition of plants (plant must be removed from pot).

   d. For species where more than 20 plants are required, include a minimum of three photographs showing the average plant, the best quality plant, and the worst quality plant to be furnished.

   e. Identify each photograph with the full scientific name of the plant, plant size, and name of the growing nursery.

B. Samples: Mulch.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For landscape Installer. Include list of similar projects completed by Installer demonstrating Installer's capabilities and experience. Include project names, addresses, and year completed, and include names and addresses of Owner's contact persons.

B. Maintenance Instructions: Recommended procedures to be established by Owner for maintenance of plants during a calendar year.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: Landscape work shall be performed by an experienced, single firm specializing in landscape work.

B. Trees, Shrubs and Plants: Provide specimen trees, shrubs and plants of quantity, size, genus, species and variety shown and scheduled for landscape work and complying with recommendations and requirements of ANSI Z60.1 "American Standard for Nursery Stock".

1. Provide healthy, vigorous stock, grown in recognized nursery in accordance with good horticultural practice and free of disease, pests, insects, eggs, larvae, and defects such as knots, sun scald, injuries, abrasions, and disfigurement.

C. Preinstallation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Packaged Materials: Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws if applicable.

B. Bulk Materials:

1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.

2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; di charge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.

3. Accompany each delivery of bulk materials with appropriate certificates.

C. Do not prune trees and shrubs before delivery. Protect bark, branches, and root systems from sun scald, drying, wind burn, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy their natural shape. Provide protective covering of plants during shipping and delivery. Do not drop plants during delivery and handling.

D. Handle planting stock by root ball.

E. Apply antidesiccant to trees and shrubs using power spray to provide an adequate film over trunks (before wrapping), branches, stems, twigs, and foliage to protect during digging, handling, and transportation.

1. If deciduous trees or shrubs are moved in full leaf, spray with antidesiccant at nursery before moving and again two weeks after planting.

F. Wrap trees and shrubs with burlap fabric over trunks, branches, stems, twigs, and foliage to protect from wind and other damage during digging, handling, and transportation.

G. Deliver plants after preparations for planting have been completed and install immediately. If planting is delayed more than six hours after delivery, set plants and trees in their appropriate aspect (sun, filtered sun, or shade), protect from weather and mechanical damage, and keep roots moist.

1. Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.

2. Do not remove container-grown stock from containers before time of planting.

3. Water root systems of plants stored on-site deeply and thoroughly with a fine-mist spray. Water as often as necessary to maintain root systems in a moist, but not overly wet condition.

1.8 FIELD CONDITIONS

A. Field Measurements: Verify actual grade elevations, service and utility locations, irrigation system components, and dimensions of plantings and construction contiguous with new plantings by field measurements before proceeding with planting work.

B. Planting Restrictions: Plant during one of the following periods. Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

1. Spring Planting: April 1st through May 30th.
2. Fall Planting: September 1st through October 15th.

C. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions and warranty requirements.

D. Utilities: Determine location of underground utilities and perform work in a manner which will avoid

possible damage. Hand excavate, as required. Maintain grade stakes set by others until removal is mutually agreed upon by parties concerned.

E. Excavation: When conditions detrimental to plant growth are encountered, such as rubble fill, adverse drainage conditions, or obstructions, notify Project Team before planting.

F. Planting Schedule: Schedule each type of landscape work required during normal seasons for such work in area of site. Establish dates for each type of work and completion date.

1.9 WARRANTY

A. Special Warranty: Installer agrees to repair or replace plantings and accessories that fail in materials, workmanship, or growth within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Death and unsatisfactory growth, except for defects resulting from abuse, lack of adequate maintenance, or neglect by Owner.
b. Structural failures including plantings falling or blowing over.
c. Faulty performance of tree stabilization.
d. Deterioration of metals, metal finishes, and other materials beyond normal weathering.

2. Warranty Periods: From date of substantial completion.

a. All Plants: Twelve (12) months.

3. Include the following remedial actions as a minimum:

a. Immediately remove dead plants and replace unless required to plant in the succeeding planting season.
b. Replace plants that are more than 25 percent dead or in unhealthy condition at end of warranty period.
c. A limit of one replacement of each plant is required except for losses or replacements due to failure to comply with requirements.
d. Provide extended warranty for period equal to original warranty period, for replaced plant material.

1.10 MAINTENANCE SERVICE

A. Initial Maintenance Service: Provide maintenance by skilled employees of landscape Installer. Maintain as required in Part 3. Begin maintenance immediately after plants are installed and continue until plantings are acceptably healthy and well established but for not less than maintenance period below.

1. Maintenance Period for all Plants: Six (6) months from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PLANT MATERIAL

A. General: Furnish nursery-grown plants true to genus, species, variety, cultivar, stem form, shearing, and other features indicated in Plant List, Plant Schedule, or Plant Legend indicated on Drawings and complying with ANSI Z60.1; and with healthy root systems developed by transplanting or root pruning.

1. Trees with damaged, crooked, or multiple leaders; tight vertical branches where bark is squeezed between two branches or between branch and trunk ("included bark"); crossing trunks; cut-off limbs more than 3/4 inch in diameter; or with stem girdling roots are unacceptable.

2. Collected Stock: Do not use plants harvested from the wild, from native stands, from an established landscape planting, or not grown in a nursery unless otherwise indicated.

B. Provide plants of sizes, grades, and ball or container sizes complying with ANSI Z60.1 for types and form of plants required. Plants of a larger size may be used if acceptable to Architect, with a proportionate increase in size of roots or balls.

C. Root-Ball Depth: Furnish trees and shrubs with root balls measured from top of root ball, which begins at root flare according to ANSI Z60.1. Root flare shall be visible before planting.

D. If formal arrangements or consecutive order of plants is indicated on Drawings, select stock for uniform height and spread, and number the labels to assure symmetry in planting.

2.2 PLANTING SOILS

A. Planting Soil: Imported topsoil or manufactured topsoil from off-site sources; do not obtain from agricultural land, bogs or marshes. Verify suitability of soil to produce viable planting soil. Clean soil of roots, plants, sod, stones, clods, clay lumps, pockets of coarse sand, concrete slurry, concrete layers or chunks, cement, plaster, building debris, and other extraneous materials harmful to plant growth. Mix soil with the soil amendments and fertilizers as required.

1. “Garden Bed Mix Soil” by St. Louis Composting or APPROVED comparable product: 50% river-bottom topsoil, 50% black gold compost, evenly mixed.

2. Soils shall be provided, installed and roughly graded by the Contractor. Landscape Subcontractor will perform fine, finish grading related to planter bed preparation and finish.

2.3 SOIL AMENDMENTS

A. Organic Soil Conditioner: A product of composted plant materials only, with total carbon: nitrogen ratio no greater than 10:1 per AOAC method. Shall be in a uniform “beaded” homogenous matrix, all material must pass through a No. 4 sieve per ASTM method. All material must be coated with a water-soluble biodegradable binder. Shall contain in available form: a minimum of 0% organic nitrogen, 3% organic phosphate and 1% organic potash, 500/g aerobic/anaerobic bacteria, yeast and mold, 1% iron, .05% manganese and .05% zinc. Packaged weight to be no more than 50 lbs. with Manufacturer’s name, product name, percentage of nutrients, and net weight of materials shown on label.

2.4 FERTILIZERS

A. Planting Tablets: Tightly compressed chip-type, long-lasting, slow-release, commercial-grade planting fertilizer in tablet form appropriate for planting material. Tablets shall break down with soil bacteria, converting nutrients into a form that can be absorbed by plant roots.

2.5 MULCHES

A. Organic Mulch: Free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:

1. Shredded Bark Mulch:

    a. Mulch shall be completely composted, native, reground, and free from noxious weed seed and all foreign material harmful to plant life.

B. Decorative Rock Mulch: Not required.

2.6 WEED-CONTROL BARRIERS

A. Composite Fabric: Woven, needle-punched polypropylene substrate bonded to a nonwoven polypropylene fabric, 4.8 oz./sq. yd.

2.7 PESTICIDES

A. General: Pesticide registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.

2.8 EROSION CONTROL MATERIALS

A. On slopes and areas subject to erosion, install the following per manufacturer's recommendation:

1. BioD Mat 40, Rolanka International, or APPROVED comparable product.

2.9 TREE-STABILIZATION & GUARDING MATERIALS

A. Trunk-Stabilization Materials:

1. Upright and Guy Stakes: Rough-sawn, sound, new hardwood, free of knots, holes, cross grain, and other defects, 2-by-2-inch nominal by length indicated, pointed at one end.
2. Proprietary Root-Ball Stabilization Devices: Proprietary at- or below-grade stabilization systems to secure each new planting by root ball and that do not encircle the trunk; sized according to manufacturer's written recommendations unless otherwise indicated.

    a. Arbor Tie by DeepRoot or APPROVED comparable product.

3. Webbing: 3/4" wide fabric webbing such as Tree Tie Webbing by A.M. Leonard, Inc., green color, or approved equal.

B. Tree Guard Materials:

1. Rigid Open Plastic Mesh Tree Bark Protector. 12" tall Minimum. Appropriately sized per tree caliper.
2. Propriety Tree Guard materials

    a. A.M. Leonard Rigid Plastic Mesh Tree Bark Protector or APPROVED comparable product.

3. Wrapping Materials: Wrapping material for tree trunks of trees susceptible to sunscald shall be standard nursery tree wrapping paper, tan in color. Twine for tying shall be lightly tarred sisal (lath) yarn. Tacks, staples or tape are not accepted.

2.10 LANDSCAPE EDGINGS

A. Aluminum Edging: 3/16” x 8” Aluminum edging with Black factory-coated finish or approved comparable product fabricated in sections of standard lengths.

1. Basis of Design: Permaloc XL (www. permaloc.com).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas to receive plants, with Installer present, for compliance with requirements and conditions affecting installation and performance of the Work.

1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
2. Verify that plants and vehicles loaded with plants can travel to planting locations with adequate overhead clearance.
3. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
4. Uniformly moisten excessively dry soil that is not workable or which is dusty.

B. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

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

3.2 PLANTING AREA ESTABLISHMENT

A. Loosen subgrade of planting areas to a minimum depth of 12 inches. Remove stones larger than 1-1/2 inches in any dimension and sticks, roots, rubbish, and other extraneous matter and legally dispose of them off Owner's property.

1. Apply fertilizer directly to subgrade before loosening.
2. Thoroughly blend planting soil off-site before spreading or spread topsoil, apply soil amendments and fertilizer on surface, and thoroughly blend planting soil.
3. Spread planting soil to a depth of 12 inches but not less than required to meet finish grades after natural settlement. Do not spread if planting soil or subgrade is frozen, muddy, or excessively wet.

B. Finish Grading: Grade planting areas to a smooth, uniform surface plane with loose, uniformly fine texture. Roll and rake, remove ridges, and fill depressions to meet finish grades.

3.3 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities and turf areas and existing plants from damage caused by planting operations.

B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

C. Lay out individual tree and shrub locations and areas for multiple plantings. Stake locations, outline areas, adjust locations when requested, and obtain Architect's acceptance of layout before excavating or planting. Make minor adjustments as required.

D. Lay out plants at locations directed by Architect. Stake locations of individual trees and shrubs and outline areas for multiple plantings.

3.4 EXCAVATION FOR TREES, SHRUBS, AND PERENNIALS

A. Planting Pits and Trenches: Excavate circular planting pits.

1. Excavate planting pits with sides sloping inward at a 45-degree angle. Excavations with vertical sides are unacceptable. Trim perimeter of bottom leaving center area of bottom raised slightly to support root ball and assist in drainage away from center. Do not further disturb base. Ensure that root ball will sit on undisturbed base soil to prevent settling. Scarify sides of planting pit smeared or smoothed during excavation.
2. Excavate approximately two times as wide as ball diameter for plant stock.
3. Do not excavate deeper than depth of the root ball, measured from the root flare to the bottom of the root ball.
4. If area under the plant was initially dug too deep, add soil to raise it to the correct level and thoroughly tamp the added soil to prevent settling.
5. Maintain angles of repose of adjacent materials to ensure stability. Do not excavate subgrades of adjacent paving, structures, hardscapes, or other new or existing improvements.

3.5 TREE, SHRUB, AND PERENNIAL PLANTING

A. Inspection: At time of planting, verify that root flare is visible at top of root ball according to ANSI Z60.1. If root flare is not visible, remove soil in a level manner from the root ball to where the top-most root emerges from the trunk. After soil removal to expose the root flare, verify that root ball still meets size requirements.

B. Roots: Remove stem girdling roots and kinked roots. Remove injured roots by cutting cleanly; do not break.

C. Balled and Burlapped Stock: Set each plant plumb and in center of planting pit or trench with root flare 2 inches above adjacent finish grades.

1. After placing some backfill around root ball to stabilize plant, carefully cut and remove burlap, rope, and wire baskets from tops of root balls and from sides, but do not remove from under root balls. Remove pallets, if any, before setting. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
3. Place planting tablets equally distributed around each tree planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.

4. Continue backfilling process. Water again after placing and tamping final layer of soil.

D. Container-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Carefully remove root ball from container without damaging root ball or plant.
2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
3. Place planting tablets equally distributed around each tree planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
4. Continue backfilling process. Water again after placing and tamping final layer of soil.

E. Fabric Bag-Grown Stock: Set each plant plumb and in center of planting pit or trench with root flare 1 inch above adjacent finish grades.

1. Carefully remove root ball from fabric bag without damaging root ball or plant. Do not use planting stock if root ball is cracked or broken before or during planting operation.
2. Backfill around root ball in layers, tamping to settle soil and eliminate voids and air pockets. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
3. Place planting tablets equally distributed around each tree planting pit when pit is approximately one-half filled. Place tablets beside the root ball about 1 inch from root tips; do not place tablets in bottom of the hole.
4. Continue backfilling process. Water again after placing and tamping final layer of soil.

F. Bare-Root Stock: Set and support each plant in center of planting pit or trench with root flare 1 inch above adjacent finish grade.

1. Spread roots without tangling or turning toward surface. Plumb before backfilling, and maintain plumb while working.
2. Carefully work backfill in layers around roots by hand. Bring roots into close contact with the soil.
3. When planting pit is approximately one-half filled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed.
4. Place planting tablets equally distributed around each tree planting pit when pit is approximately one-half filled. Place tablets beside soil-covered roots about 1 inch from root tips; do not place tablets in bottom of the hole or touching the roots.
5. Continue backfilling process. Water again after placing and tamping final layer of soil.

G. Slopes: When planting on slopes, set the plant so the root flare on the uphill side is flush with the surrounding soil on the slope; the edge of the root ball on the downhill side will be above the surrounding soil. Apply enough soil to cover the downhill side of the root ball.

3.6 TREE, SHRUB, AND PERENNIAL PRUNING

A. Remove only dead, dying, or broken branches. Do not prune for shape.

B. Prune, thin, and shape trees, shrubs, and perennials as directed by Architect.

C. Prune, thin, and shape trees, shrubs, and perennials according to standard professional horticultural and arboricultural practices. Unless otherwise indicated by Architect, do not cut tree leaders; remove only injured, dying, or dead branches from trees and shrubs; and prune to retain natural character.

D. Do not apply pruning paint to wounds.

3.7 PLANT AREA MULCHING

A. Install weed-control barriers before placing crushed basalt rock according to manufacturer's written instructions. Completely cover area to be covered with rock, overlapping edges a minimum of 6 inches and secure seams with galvanized pins.

B. Place crushed basalt rock on surfaces of planting areas and other areas indicated.

1. Trees in Turf Areas: Place crushed basalt rock in a ring of 2-inch average thickness, to the radius indicated on the plans. Do not place rock against the trunks of the trees.
2. Planting Areas: Apply 2-inch average thickness of crushed basalt rock over whole surface of planting area, and finish level with adjacent finish grades. Do not place rock against the trunks of the trees.

3.8 EDGING INSTALLATION

A. Aluminum Edging: Install edging where indicated according to manufacturer's written instructions.

3.9 PLANT MAINTENANCE

A. Maintain plantings by pruning, cultivating, watering, weeding, fertilizing, mulching, restoring planting saucers, adjusting and repairing tree-stabilization devices, resetting to proper grades or vertical position, and performing other operations as required to establish healthy, viable plantings.

B. Fill in, as necessary, soil subsidence that may occur because of settling or other processes. Replace mulch materials damaged or lost in areas of subsidence.

C. Apply treatments as required to keep plant materials, planted areas, and soils free of pests and pathogens or disease. Use integrated pest management practices when possible to minimize use of pesticides and reduce hazards. Treatments include physical controls such as hosing off foliage, mechanical controls such as traps, and biological control agents.

D. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

3.10 PESTICIDE APPLICATION

A. Apply pesticides and other chemical products and biological control agents according to authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.

3.11 REPAIR AND REPLACEMENT

A. General: Repair or replace existing or new trees and other plants that are damaged by construction operations, in a manner approved by Architect.

1. Submit details of proposed pruning and repairs.
2. Perform repairs of damaged trunks, branches, and roots within 24 hours, if approved.
3. Replace trees and other plants that cannot be repaired and restored to full-growth status, as determined by Architect.

B. Remove and replace trees that are more than 25 percent dead or in an unhealthy condition or are damaged during construction operations that Architect determines are incapable of restoring to normal growth pattern.

3.12 CLEANING AND PROTECTION

A. During planting, keep adjacent paving and construction clean and work area in an orderly condition. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.

B. Remove surplus soil and waste material including excess subsoil, unsuitable soil, trash, and debris and legally dispose of them off Owner's property.

C. Protect plants from damage due to landscape operations and operations of other contractors and trades. Maintain protection during installation and maintenance periods. Treat, repair, or replace damaged plantings.

D. After installation and before, remove nursery tags, nursery stakes, tie tape, labels, wire, burlap, and other debris from plant material, planting areas, and Project site.

E. At time of Substantial Completion, verify that tree-watering devices are in good working order and leave them in place. Replace improperly functioning devices.

END OF SECTION 329300

APPENDIX 1

022200a CORE DRILL REPORT [SITEX]

Your Sole Provider of Environmental Health & Safety Services

December 9, 2025

Ms. Beth Clarkin
Project Designer
Patterhn Ives, LLC
130 South Bemiston Avenue | Suite 800
Saint Louis, Missouri 63105

RE: Core Drilling – Playground
Missouri School for the Blind
3815 Magnolia Avenue
Saint Louis, Missouri 63110

Dear Beth:

SITEX, Inc. (SITEX) was contracted to perform coring at the Missouri School for the Blind located at 3815 Magnolia Avenue in St. Louis, Missouri. The core drilling was performed o0n November 11, 2025, at the west end playground area. A HILTI electric core drill (Model No. DD-250) 2was used to core through the concrete slab. Two (2) core slabs were advanced through the slab, one on the eastern portion (CB-1), and one on the western portion (CB-2).

Concrete core (CB-1) was advanced through the concrete slab to a depth of four inches thick. The concrete core (CB-2) advanced through the concrete slab to a depth of five inches thick. Both coring's showed a solid monolith solid pour with no reinforced rebar.

Photographs of the concrete cores and their locations in the playground are included in this report as Attachment No. 1.

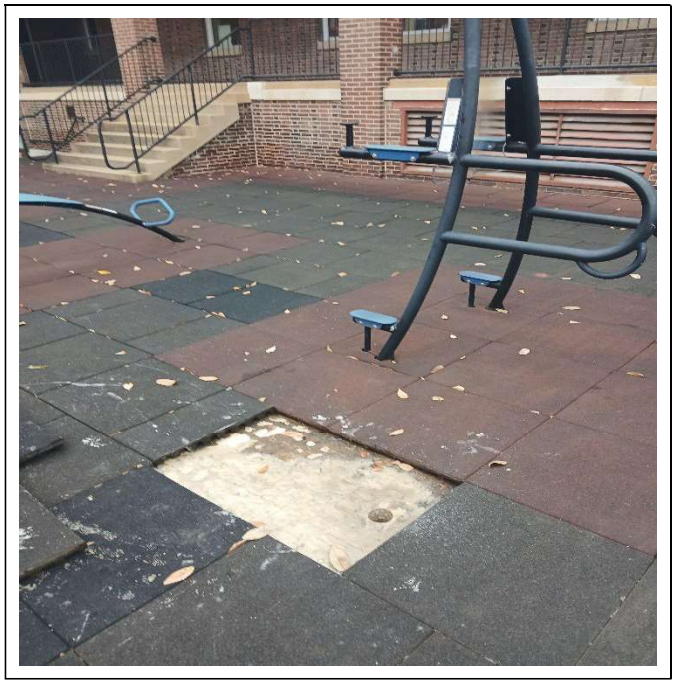
If you have any questions, please contact me on my cell phone (618) 795-0502. SITEX greatly appreciates your business.

Sincerely
SITEX

Robert H. Hill II, CHMM



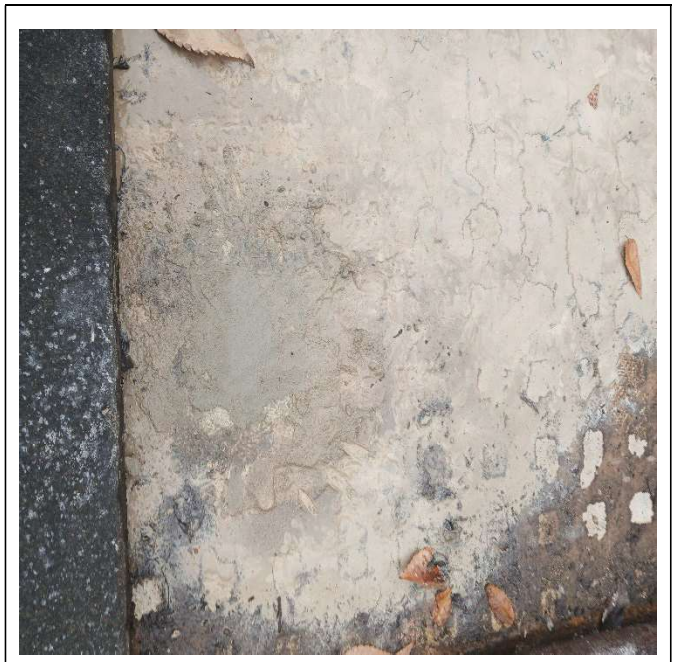
Photograph No. 1: East end core drilling completion (CB-1).



Photograph No. 2: East end core drilling completion (CB-1).



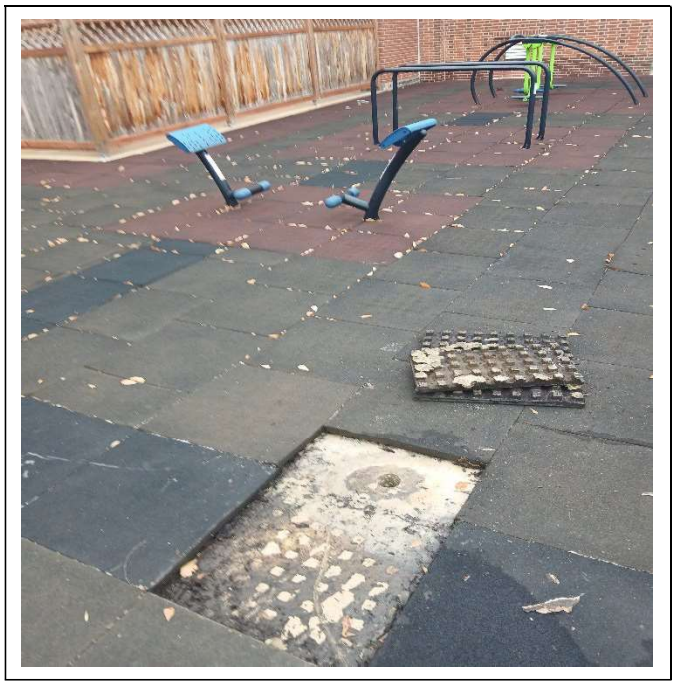
Photograph No. 3: View of core (CB-1) void to gravel base.



Photograph No. 4: Core void (CB-1) filled with concrete.



Photograph No. 5: Core void (CB-1) filled with concrete.



Photograph No. 6: West end core drilling completion (CB-2).



Photograph No. 7: West end core drilling completion (CB-2).



Photograph No. 8: West end core drilling completion (CB-2).



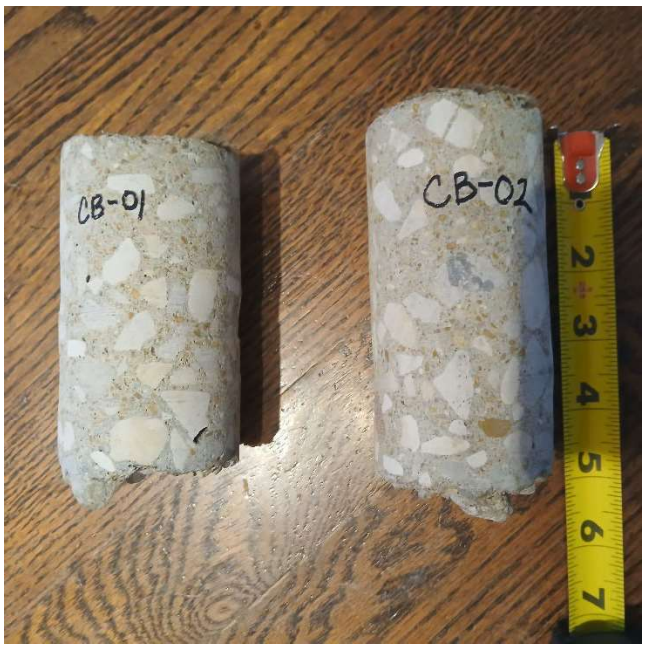
Photograph No. 9: View of core (CB-2) void to gravel base.



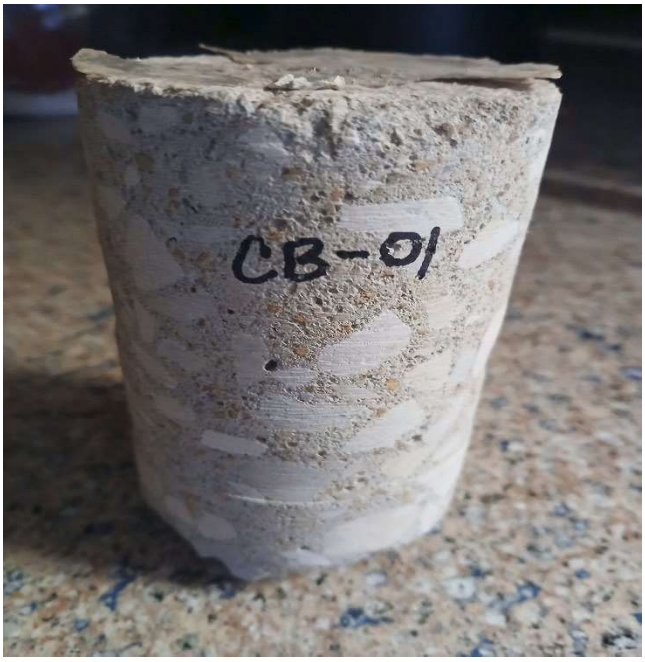
Photograph No. 10: Core void (CB-2) filled with concrete



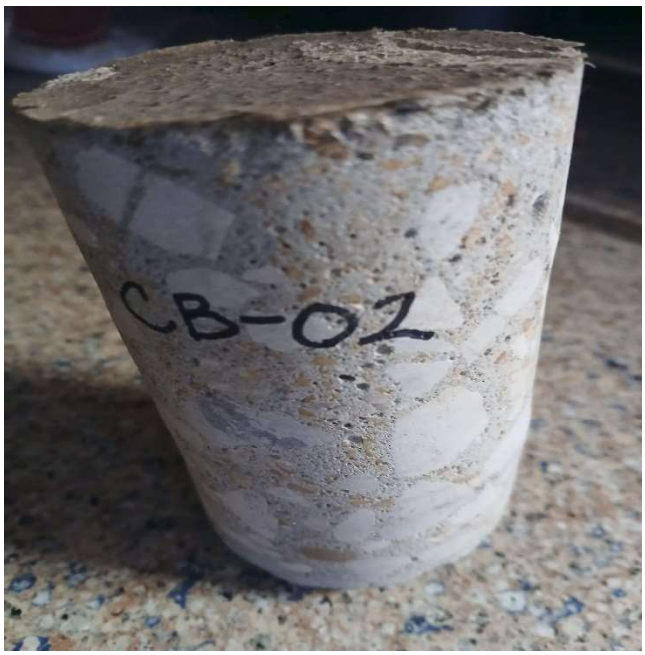
Photograph No. 11: Core void (CB-2) filled with concrete



Photograph No. 12: Both concrete cores



Photograph No. 13: Concrete Bore No. 1.



Photograph No. 14: Concrete Bore No. 2

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Photograph No. 15:

Intentionally Left Blank

Photograph No. 16:

APPENDIX 2

022600a HAZARDOUS MATERIALS SURVEY [SITEX]

SITEX Project No: 23436

HAZARDOUS MATERIALS SURVEY

Of

Missouri School for the Blind
3815 Magnolia Avenue
St. Louis, Missouri 63110

Prepared for:

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St. Louis, Missouri 63105

Prepared by:

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December 15, 2025

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EXECUTIVE SUMMARY

SITEX Environmental, Inc. (SITEX) was awarded the contract by Patterhn Ives, to perform a hazardous materials survey of the Missouri School for the Blind located at 3815 Magnolia Avenue in St. Louis, Missouri. This assessment was performed to determine the presence or absence of asbestos-containing materials (ACM) and Lead-Based Paint (LBP) for the purposes of building renovation and demolition. Bulk samples of suspect building materials were analyzed for asbestos content by Polarized Light Microscopy (PLM). Paint on surfaces was tested for lead content using an X-Ray Fluorescence (XRF) spectrum analyzer.

SURVEY INTRODUCTION/SCOPE OF WORK

Robert H. Hill II and Mackenzie Wagner of SITEX conducted the hazardous materials survey from December 5, 2025, and December 12, 20205. The structure is described as a two-story brick veneer building. The structure is currently being used as a state school for the blind (Missouri School for the Blind). The exterior roof is flat. The interior ceilings and walls consist of painted plaster or drywall. Interior walls consist of painted drywall or plaster. Interior floors consist of painted concrete, wall-to-wall carpeting, floor tiles, or terrazzo. Exterior windows are anodized aluminum double paned window. The French door located in the dormitory is wood.

ASBESTOS SURVEY SUMMARY TABLE DEFINITIONS

Sample Number

A number is assigned to each sample to track results. A homogenous area is defined as an area of material that is uniform in color, texture, and age. Each homogenous area was given a distinct letter designation. An example of the numbering sequence is as follows:

23436-FT-01C

23436 = SITEX project number
FT = Floor tile
1 = First sample taken of material description
C = Homogeneous area designation (3rd identified homogeneous area)

Sample Description

Describes the bulk sample material collected.

Approximate Quantity

Approximate quantity of ACM per sample location.

Abbreviations

BM = Brick Mortar
CB = Cove Base
CBM = Cove Base Mastic
CM = Carpet Mastic
CT = Ceiling Tile
DC = Door Caulk
DI = Duct Insulation
FT = Floor Tile
PL = Plaster
RFT = Roof Flashing Tar
VJC = Vibration Joint Cloth
WC = Window Caulk
WG = Window Glazing

Condition

Condition of the suspect material at the time of this inspection. This is based on the discretion of the inspector. The condition categories are as follows:

Good = no visible damage
Fair = minor damage
Poor = major damage, needs action as soon as possible

Accessibility

Indicates how accessible the suspect material is and to what group of people. The categories are as follows:

Low = material was inaccessible, or access was limited.
Moderate = material was only accessible to maintenance personnel.
High = material was accessible to the public.

Friability (Non-Friable versus Friable)

A designation to indicate friability (extent to which material, when dry, may be crushed, crumbled, or reduced to powder with hand pressure):

Friability (Non-Friable versus Friable) Continued

No = non-friable
Yes = friable

Bulk Sample Results

Positive - > 1% Asbestos
Negative - < or = 1% Asbestos

The United States Environmental Protection Agency (U.S. EPA) guidelines for classifying asbestos containing material is any material that contains equal to or greater than one percent (1%) asbestos by visual estimated weight percent (% weight).

ASBESTOS SURVEY SUMMARY

SITEX collected up to three bulk samples of each homogeneous suspect asbestos continuing building materials (ACBM) which were observed throughout the interior or exterior of the structure.

Bulk samples were collected in discrete locations or in aeras which already had sustained water and/or physical damage.

Assumptions

SITEX did not have any assumptions as the suspect building materials samples were limited and in plain view

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-CT-01A	3T Dormitory	White ceiling tile (coating)	N/A	Good	Low	Friable	None Detected
23436-CT-01A	3T Dormitory	White ceiling tile	N/A	Good	Low	Friable	None Detected
23436-CT-01B	3T Dormitory	White ceiling tile (coating)	N/A	Good	Low	Friable	None Detected
23436-CT-01B	3T Dormitory	White ceiling tile	N/A	Good	Low	Friable	None Detected
23436-CT-01C	3T Dormitory	White ceiling tile (coating)	N/A	Good	Low	Friable	None Detected
23436-CT-01C	3T Dormitory	White ceiling tile	N/A	Good	Low	Friable	None Detected
23436-CM-02A	3T Dormitory	Yellow Carpet Mastic	N/A	Good	Low	Non-Friable	None Detected
23436-CM-02B	3T Dormitory	Yellow Carpet Mastic	N/A	Good	Low	Non-Friable	None Detected
23436-CM-02C	3T Dormitory	Yellow Carpet Mastic	N/A	Good	Low	Non-Friable	None Detected
23436-PL-03A	3T Dormitory	White Plaster	N/A	Poor	High	Friable	None Detected
23436-PL-03B	3T Dormitory	White Plaster	N/A	Poor	High	Friable	None Detected
23436-PL-03C	3T Dormitory	White Plaster	N/A	Poor	High	Friable	None Detected
23436-WG-04A	3T Dormitory	White Window Glazing	N/A	Poor	High	Non-Friable	None Detected
23436-WG-04B	3T Dormitory	White Window Glazing	N/A	Poor	High	Non-Friable	None Detected
23436-WG-04C	3T Dormitory	White Window Glazing	N/A	Poor	High	Non-Friable	None Detected

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-WC-05A	3T Dormitory	White Window Caulk	N/A	Fair	High	Non-Friable	None Detected
23436-WC-05B	3T Dormitory	White Window Caulk	N/A	Fair	High	Non-Friable	None Detected
23436-WC-05C	3T Dormitory	White Window Caulk	N/A	Fair	High	Non-Friable	None Detected
23436-CB-06A	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06A	4F Storage Room	Red Cove Base	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06A	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06B	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06B	4F Storage Room	Red Cove Base	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06B	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06C	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06C	4F Storage Room	Red Cove Base	N/A	Good	Low	Non-Friable	None Detected
23436-CB-06C	4F Storage Room	Red Cove Base (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-CBM-07A	2E Storage Room	Cove Base Mastic	N/A	Moderate	Low	Non-Friable	None Detected
23436-CBM-07A	2E Storage Room	Cove Base Plaster	N/A	Moderate	Low	Non-Friable	None Detected
23436-CBM-07B	2E Storage Room	Cove Base Mastic	N/A	Moderate	Low	Non-Friable	None Detected

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-CBM-07B	2E Storage Room	Cove Base Plaster	N/A	Fair	Low	Non-Friable	None Detected
23436-CBM-07C	2E Storage Room	Cove Base Mastic	N/A	Fair	Low	Non-Friable	None Detected
23436-CBM-07C	2E Storage Room	Cove Base Plaster	N/A	Fair	Low	Non-Friable	None Detected
23436-DI-08A	2E Storage Room	Duct Work Insulation (Coating)	N/A	Fair	Low	Friable	None Detected
23436-DI-08A	2E Storage Room	Duct Work Insulation (Cloth)	N/A	Fair	Low	Friable	None Detected
23436-DI-08A	2E Storage Room	Duct Work Insulation (Insulation)	N/A	Fair	Low	Friable	None Detected
23436-DI-08B	2E Storage Room	Duct Work Insulation (Coating)	N/A	Fair	Low	Friable	None Detected
23436-DI-08B	2E Storage Room	Duct Work Insulation (Cloth)	N/A	Fair	Low	Friable	None Detected
23436-DI-08B	2E Storage Room	Duct Work Insulation (Insulation)	120 SF	Fair	Low	Friable	**1-5% Amosite**
23436-DI-08C	2E Storage Room	Duct Work Insulation (Coating)	N/A	Fair	Low	Friable	None Detected
23436-DI-08C	2E Storage Room	Duct Work Insulation (Cloth)	N/A	Fair	Low	Friable	None Detected
23436-DI-08C	2E Storage Room	Duct Work Insulation (Insulation)	120 SF	Fair	Low	Friable	**Not Analyzed, Positive Stop**

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-WC-09A	2E Storage Room	Window Caulk	N/A	Good	High	Non-Friable	None Detected
23436-WC-09B	2E Storage Room	Window Caulk	N/A	Good	High	Non-Friable	None Detected
23436-WC-09C	2E Storage Room	Window Caulk	N/A	Good	High	Non-Friable	None Detected
23436-FT-10A	2W Hallway	Gray Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-10A	2W Hallway	Gray Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-10B	2W Hallway	Gray Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-10B	2W Hallway	Gray Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-10C	2W Hallway	Gray Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-10C	2W Hallway	Gray Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-11A	2W Hallway	White Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-11A	2W Hallway	White Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-11B	2W Hallway	White Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-11B	2W Hallway	White Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-11C	2W Hallway	White Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-11C	2W Hallway	White Floor Tile	N/A	Good	High	Non-Friable	None Detected

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-FT-12A	2W Hallway	Red Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-12A	2W Hallway	Red Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-12B	2W Hallway	Red Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-12B	2W Hallway	Red Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-FT-12C	2W Hallway	Red Floor Tile (Adhesive)	N/A	Good	Low	Non-Friable	None Detected
23436-FT-12C	2W Hallway	Red Floor Tile	N/A	Good	High	Non-Friable	None Detected
23436-WC-13A	3T Dormitory	Window Caulk	N/A	Good	Low	Non-Friable	None Detected
23436-WC-13B	3T Dormitory	Window Caulk	N/A	Good	Low	Non-Friable	None Detected
23436-WC-13C	3T Dormitory	Window Caulk	N/A	Good	Low	Non-Friable	None Detected
23436-RFT-14A	3T Dormitory	Roof Flashing Tar	N/A	Good	Low	Non-Friable	None Detected
23436-RFT-14B	3T Dormitory	Roof Flashing Tar	N/A	Good	Low	Non-Friable	None Detected
23436-RFT-14C	3T Dormitory	Roof Flashing Tar	N/A	Good	Low	Non-Friable	None Detected
23436-VJC-15A	3T Dormitory	Vibration Joint Cloth	N/A	Good	Low	Non-Friable	None Detected
23436-VJC-15B	3T Dormitory	Vibration Joint Cloth	N/A	Good	Low	Non-Friable	None Detected
23436-VJC-15C	3T Dormitory	Vibration Joint Cloth	N/A	Good	Low	Non-Friable	None Detected

SAMPLE NUMBER	SAMPLE LOCATION	SAMPLE DESCRIPTION	APPROXIMATE QUANTITY	CONDITION	ACCESSIBILITY	FRIABILITY	SAMPLE RESULTS
23436-DI-16A	3T Dormitory	Duct Insulation	N/A	Poor	Low	Friable	None Detected
23436-DI-16B	3T Dormitory	Duct Insulation	N/A	Poor	Low	Friable	None Detected
23436-DI-16C	3T Dormitory	Duct Insulation	N/A	Poor	Low	Friable	None Detected
23436-BM-17A	3T Dormitory	Brick Mortar	N/A	Fair	Low	Friable	None Detected
23436-BM-17B	3T Dormitory	Brick Mortar	N/A	Fair	Low	Friable	None Detected
23436-BM-17C	3T Dormitory	Brick Mortar	N/A	Fair	Low	Friable	None Detected
23436-DC-18A	3T Dormitory	Door Caulk	N/A	Poor	Low	Friable	1-5% Chrysotile
23436-DC-18B	3T Dormitory	Door Caulk	N/A	Poor	Low	Friable	Not Analyzed Positive Stop
23436-DC-18C	3T Dormitory	Door Caulk	N/A	Poor	Low	Friable	Not Analyzed Positive Stop

Notes:
Listed items in **Bold** denote asbestos containing building materials (ACBMs).
The United States Environmental Protection Agency (U.S. EPA) has defined an asbestos material to contain equal to or greater than one percent asbestos.
Occupational Safety and Health Administration (OSHA) has determined asbestos detected at any level is a potential health exposure hazard.
Bulk samples were analyzed using Polarized Light Microscopy (PLM) by a trained McCrone Research Institute microscopist.
PLM Methodology using United States Environmental Protection Agency (U.S. EPA) EPA/600/R-93/116 based on a total visual estimated weight percentage*** = Asbestos floor tile second layer in contact with adjoining and floor tile above and adhered to this floor tile.
Bulk samples ending with 1/2/3 denote each sample collected per homogeneous sample set.
Negative = A non-regulated material containing less than one percent asbestos (<1%).
Positive = A regulated material containing asbestos equal to or greater than one percent (>1%).
SF = Square feet.

Notes:
LF = Linear feet.
N/A = Not applicable.

ASBESTOS SAMPLING AND ANALYTICAL PROCEDURES

Random bulk samples, representative of the suspect asbestos-containing building materials of each homogeneous area, were collected. Representative sampling is based on the following criteria:

1. The distribution of the suspect material throughout the homogeneous area.
2. The suspect material's physical characteristics and application.
3. Random sampling patterns determined for each homogeneous area.

Suspicions, sampled and analyzed, should be considered to be representative of materials in each homogeneous area if:

1. They exhibit similar physical characteristics. (i.e., color, texture).
2. The application of the sampled material can be correlated to the application of unsampled material by physical appearance and time of application.

All bulk samples collected were analyzed using the Environmental Protection Agency's Method for the Detection of Asbestos in Bulk Samples (EPA 600/M4-82020, December 1982) and the McCrone Research Institute's The Asbestos Particle Atlas as method references.

The bulk samples were collected on December 5, 2025, and December 12, 2025. Robert H. Hill II and Mackenzie Wagner of SITEX collected fifty-four bulk samples for asbestos analysis. SITEX was responsible for determining if asbestos was present on the exterior and interior of the structure and if present, provide estimated quantities of asbestos materials found. The samples, along with the proper Chain-of-Custody forms, were sent to SITEX, Inc. (SITEX) for bulk sample analysis. The analysis of the bulk samples was performed on December 8, 2025, December 9, 2025, and December15, 2025. SITEX's McCrone Institute microscopists credentials are included in this report as Appendix D – Laboratory and Accreditations and Individual Certifications.

XRF LEAD-BASED PAINT SURVEY SUMMARY

The XRF lead paint survey shots are included in this report and summarized in Appendix C – XRF Lead Paint Summary. An X-ray Fluorescence analyzer spectrum (XRF) was used for the lead survey. The InnoV-X Systems Delta Standard (Model DS-2000, Serial #501736). The XRF was pre-calibrated and post calibrated using a coin, and plastic cards coated with pre-determined lead dust or no lead dust in accordance with the manufacturer requirements.

Assumptions

SITEX assumed that premanufactured, anodized or baked-on surfaces were not LBP due to the paint composition and processes. Therefore, no shots were taken of these building components. Typically, these materials contain negligible amounts of lead which are below the regulated threshold limits for LBP. These materials are usually classified as lead-containing materials (LCM).

SITEX assumed that the lower level exterior concrete balcony (mezzanine) painted wood ceiling, beams, and fascia are Lead-Based Paint (LBP) based on similar paining history, color and condition.

XRF Lead Shot Sample Identification and Documentation

Each lead shot taken was immediately recorded onto the Lead Paint Survey field log sheet. The following paragraphs provide an explanation of the terms used on the lead paint survey log sheet.

Lead Survey Paint Field Log Sheet

The lead paint survey field log sheet includes the shot number, shot location, a description of the building component shot, its condition, paint substrate, paint color, XRF shot results, positive/negative, and estimated quantity. The following paragraphs provide an explanation of the above-mentioned terms used on the lead paint survey data sheet.

Shot Number

The shot number is a three-digit sequential number beginning with 001. The shot number includes pre- and post-calibration shots, and quality control shots (duplicates or re-takes). An example of the numbering sequence is as follows:

001 = First shot taken for the lead survey

Shot Location

Describes the shot's physical location of the painted building component within the facility exterior or interior.

Component

Describes the painted building component material being tested.

Condition

Describes the physical condition of the building component material. Two physical conditions exist which include intact, or deterioration as described in these categories.

Intact: Exterior surfaces with large surface areas with no deteriorated paint.

Intact: Interior surfaces with large surface areas with no deteriorated paint.

Intact: Interior and Exterior components with small surface area with no deteriorated paint.

Deteriorated: Exterior components with large surface area more than 10 square feet of deteriorated paint or, Interior components with large surface more than 2 square feet of deteriorated paint or interior and exterior components with small surface area more than 10 percent (10%) of the total surface area of the component.

Substrate

Defines the composition of the material (concrete, metal, wood, plastic) to which the paint is adhered to.

Color

Provides the physical description of the color of the painted building component. Color helps the lead-risk assessor determine homogenous areas (similar painting history) and can assist with certain types of older paint known to contain lead (battleship gray, red).

Results

Shows the units of measure for the painted building component. For purposes of this survey, the XRF direct-reading instrument displays the lead content in milligrams per square centimeter (mg/cm^2). This unit of measure can be directly compared to the federal HUD guideline definition of LBP.

Positive/Negative

The determination of whether a painted component is positive or negative is given by the XRF direct-reading measurement displayed in mg/cm^2. Painted building components which are equal to (=) or greater than (>) 1.0 mg/cm^2 are lead-based paint (LBP). LBP is regulated under the United States Environmental Protection Agency (USEPA), HUD federal regulatory lead standards, and State of Illinois lead regulations.

Painted building components which do not exceed (<) 1.0 mg/cm^2 are not considered to be LBP and are not regulated. However, the Occupational Safety and Health Administration

(OSHA) regulates exposure to workers. OSHA considers any amount of lead in a painted building component to be a lead-containing material (LCM). According to OSHA, LCMs have the potential to create exposure hazards to workers.

For purposes of this survey the following terms will be used to represent the following:

Positive: Painted component which contains > or = 1.0 mg/cm^2 lead content.
Negative: Painted component which contains < 1.0 mg/cm^2 lead content.

Painted components which are listed as positive are LBP; these materials are regulated.

Painted components which are negative are LCM; these materials are non-regulated.

Quantity

The approximate estimated quantities of the lead building component are expressed as square feet (SF), linear feet (LF), or each (Each).

Pre- and post-calibration shots do not have a quantity associated with these shots.

Regulatory Guidance

State and federal regulatory agencies define Lead-Based Paint (LBP) 1.0 milligrams per square centimeter (mg/cm^2) for the XRF instrumentation, or 0.5 lead percent by weight (% weight) for physical lead paint chip samples.

Lead testing combinations were followed in accordance with the federal United States Department of Urban and Housing Development (HUD) guidelines. The XRF instrument was pre- and post-calibrated using a manufactured coin, a negative plastic-coated lead template (SRM 2570), and a positive plastic-coated lead template (SRM 2573).

According to the Resource Conservation Recovery Act (RCRA) for Lead-Based Paint (LBP) renovation/demolition activities, general construction debris which contain lead must be analyzed by the Toxicity Characteristic Leaching Procedure (TCLP) to determine toxicity. Construction debris that exceeds 5 parts per million (ppm) will be disposed of as hazardous waste. Construction debris that is below 5 ppm is non-hazardous and disposed of into a sanitary landfill.

The Occupational Safety and Health Administration (OSHA) has determined that any level of lead in a substance is defined as a Lead Containing Material (LCM). When disturbing LCMs the contractor is held to specific work practices and employee protection in accordance with the Lead in Construction Standard 20CFR 1926.62.

LBP PAINT SAMPLING AND ANALYTICAL PROCEDURES

The direct-reading shots were taken on December 5, 2025. State of Missouri Lead Risk-Assessor Robert Hill II took a total of 49 shots. SITEX did not collect paint chip samples because the direct-reading instrument had no inconclusive readings. SITEX identified three painted building components that were LBP on the interior and exterior of the structure.

CONCLUSIONS AND RECOMMENDATIONS

SITEX performed a limited asbestos and lead survey on targeted building materials identified as part of an exterior renovation of the Missouri School for the Blind located at 3815 Magnolia Avenue within the city limits of Saint Louis, Missouri. SITEX's conclusions and recommendations regarding identified asbestos and lead based paint is summarized below.

Identified Asbestos Containing Materials (ACM)

Based on the bulk samples collected and review of laboratory analytical results the following ACM was identified on the interior of the building.

Bulk Sample Number	***Floor(s)***	***Identification***	***Estimated Quantities***
23436-DI-08A/B/C	2E Storage Room	Ductwork Insulation	~120 SF
23436-DC-18A/B/C	3T Dormitory	Door Caulk	~40 LF

Identified Lead-Based Paint Building Components (December 12, 2025)

Shot Number	**Shot Location**	**Component**	**Estimated Quantity**
004	3T Dormitory	French Door Frame	~0 LF
005	3T Dormitory	French Door	~40 SF
014	2E Hallway	Green Ceramic Tile	~100 SF
Assumed	Concrete Balcony (Mezzanine)	Ceiling, Beams, and Fascia	~685 SF

Recommendations

ACM

Asbestos Containing Building Materials (ACBM) were found on the interior of the Subject Property. Asbestos duct insulation was identified in the 2E Storage Room (23436-DI-08A/B/C Prior to future planned renovation/demolition activities, suspect or confirmed ACBM should be removed by a Missouri licensed asbestos abatement contractor.

LBP

Lead-based paints were found to be present on the interior and exterior of the Subject Property. SITEX recommends that these materials be stabilized and/or removed by a State of Missouri lead abatement contractor prior to the demolition/renovation activities.

Additionally, the results indicate that some of the paint does contain lead below 1.0 mg/cm^2. The Occupational Safety & Health Administration (OSHA) regulations require proper handling and safety precautions when working with any amount of lead-containing paint. SITEX recommends that the use of cutting equipment that will raise the temperature of the lead-containing surface above 250^o F be prohibited.

SURVEY TEAM

The representative for SITEX Environmental, Inc. conducting the survey included SITEX personnel Robert H. Hill II and Mackenzie Wagner. Mr. Hill is accredited in Missouri as an asbestos inspector and Lead Risk Assessor. Mr. Hill's certifications are included in Appendix D – Laboratory Accreditations and Individual Certifications
of this report.

Limitations

At the time of the survey SITEX experienced no limitations.

Disclaimer

These results do not imply nor deny conditions that may have existed prior to our sampling or previous inspections. This survey and sampling were performed in a thorough and professional manner consistent with industry standards.

The ACM and LBP survey are representative of bulk samples collected and XRF shots taken at the time of the survey. SITEX performed limited destructive sampling. The analytical results are valid only for the bulk samples collected and the XRF shots taken.

If during renovation and/or demolition activities, additional suspect asbestos and/or lead is uncovered, SITEX recommends that a State of Missouri licensed asbestos or lead inspector collect a bulk sample for analysis to determine the presence of asbestos or taken additional shots to determine the presence of lead.

The Asbestos and Lead-Based Paint (LBP) Survey Team consisted of the following State of Missouri licensed individuals.

Surveyed by:

Mackenzie Wagner+
Missouri Asbestos Inspector
Missouri Certificate #7118110624MOI12401

Robert H. Hill II, CHMM
Missouri Asbestos Inspector
Missouri Certificate #7118072525MOIR2164

Missouri Lead Risk Assessor
Missouri Certificate #010517-200133036

APPENDICES

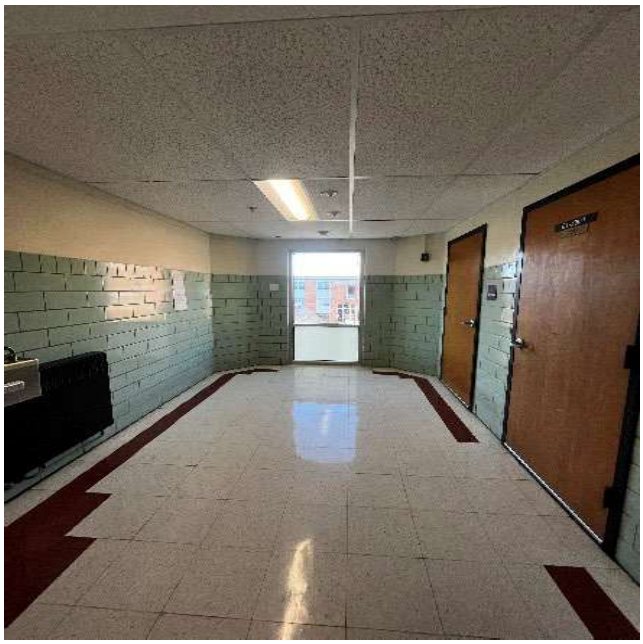
Appendix A – Photograph Log SITEX Laboratory PLM Analysis Reports
Appendix B – SITEX Laboratory PLM Analysis Reports
Appendix C – XRF Lead Paint Summary Log Sheets
Appendix D – Laboratory Accreditation and Individual Certifications

APPENDIX A

PHOTOGRAPH LOG



Photograph No. 1: 3T Dormitory French Door Frame and French Door Lead-Based Paint (LBP).



Photograph No. 2: 2 West Hallway green ceramic tile Lead-Based Paint (LBP).



Photograph No. 3: 2E Storage Room asbestos ductwork.



Photograph No. 4: Mezzanine ceiling, beam, and columns Lead-Based Paint (LBP).

APPENDIX B

SITEX LABORATORY PLM ANALYSIS REPORTS

SITEX PLM REPORT

(December 8, 2025)

SITEX Est. 1987

1525 South Broadway
St. Louis, Missouri 63104
Phone: (314) 421-0600
Fax: (314) 421-0234

Your Sole Provider of Environmental Health & Safety Services

POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT

(Method : EPA/600/R-93/116)

Project No. : 23436 | Received Date: 12/8/2025 | Customer: Missouri School for the Blind
Report No. : 25-12-0140 | Analyzed Date: 12/8/2025-12/9/2025 | Project Name: Missouri School for the Blind
Contact : Robert Hill | Customer PO: N/A | Project Address: 3815 Magnolia Ave St. Louis, MO

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-CT-01A	1184	White Ceiling Tile (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	1-5% Cellulose	None Detected
23436-CT-01A	1184	White Ceiling Tile (Ceiling Tile)	Miscellaneous	Heterogeneous, Mixed	Fibrous	Beige	20-30% Other	70-80% Cellulose	None Detected
23436-CT-01B	1185	White Ceiling Tile (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	1-5% Cellulose	None Detected
23436-CT-01B	1185	White Ceiling Tile (Ceiling Tile)	Miscellaneous	Heterogeneous, Mixed	Fibrous	Beige	20-30% Other	70-80% Cellulose	None Detected
23436-CT-01C	1186	White Ceiling Tile (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	1-5% Cellulose	None Detected
23436-CT-01C	1186	White Ceiling Tile (Ceiling Tile)	Miscellaneous	Heterogeneous, Mixed	Fibrous	Beige	20-30% Other	70-80% Cellulose	None Detected
23436-CM-02A	1187	Yellow Carpet Mastic	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Yellow	5-10% Other	90-95% Cellulose	None Detected
23436-CM-02B	1188	Yellow Carpet Mastic	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Yellow	5-10% Other	90-95% Cellulose	None Detected
23436-CM-02C	1189	Yellow Carpet Mastic	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Yellow	5-10% Other	90-95% Cellulose	None Detected
23436-PL-03A	1190	White Plaster	Miscellaneous	Homogeneous, Non-Fibrous	Rough	White	>95% Other	<1% Cellulose	None Detected
23436-PL-03B	1191	White Plaster	Miscellaneous	Homogeneous, Non-Fibrous	Rough	White	>95% Other	<1% Cellulose	None Detected
23436-PL-03C	1192	White Plaster	Miscellaneous	Homogeneous, Non-Fibrous	Rough	White	>95% Other	<1% Cellulose	None Detected
23436-WG-04A	1193	White Window Glazing	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-WG-04B	1194	White Window Glazing	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	1-5% Cellulose	None Detected

ANALYST: E Nelson

REVIEWED BY: Robert H Hill III

Samples 65 SAMPLES ANALYZED

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(Method : EPA/600/R-93/116)

Project No. : 23436 | Received Date: 12/8/2025 | Customer: Missouri School for the Blind
Report No. : 25-12-0140 | Analyzed Date: 12/8/2025-12/9/2025 | Project Name: Missouri School for the Blind
Contact : Robert Hill | Customer PO: N/A | Project Address: 3815 Magnolia Ave St. Louis, MO

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-WG-04C	1195	White Window Glazing	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-WC-05A	1196	White Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-WC-05B	1197	White Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	<1% Cellulose	None Detected
23436-WC-05C	1198	White Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Off-White	>95% Other	<1% Cellulose	None Detected
23436-CB-06A	1199	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Red	>95% Other	<1% Cellulose	None Detected
23436-CB-06A	1199	Red Cove Base (Cove Base)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Gray	>95% Other	<1% Cellulose	None Detected
23436-CB-06A	1199	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Beige	>95% Other	1-5% Cellulose	None Detected
23436-CB-06B	1200	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Red	>95% Other	<1% Cellulose	None Detected
23436-CB-06B	1200	Red Cove Base (Cove Base)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Gray	>95% Other	1-5% Cellulose	None Detected
23436-CB-06B	1200	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Beige	>95% Other	<1% Cellulose	None Detected
23436-CB-06C	1201	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Red	>95% Other	<1% Cellulose	None Detected
23436-CB-06C	1201	Red Cove Base (Cove Base)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Gray	>95% Other	<1% Cellulose	None Detected
23436-CB-06C	1201	Red Cove Base (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Beige	>95% Other	<1% Cellulose	None Detected
23436-CBM-07A	1202	Cove Base Mastic (Mastic)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Brown	>95% Other	1-5% Cellulose	None Detected

ANALYST: E Nelson

REVIEWED BY: Robert H Hill II

Samples 65 SAMPLES ANALYZED

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(Method : EPA/600/R-93/116)

Project No. : 23436 | Received Date: 12/8/2025 | Customer: Missouri School for the Blind
Report No. : 25-12-0140 | Analyzed Date: 12/8/2025-12/9/2025 | Project Name: Missouri School for the Blind
Contact : Robert Hill | Customer PO: N/A | Project Address: 3815 Magnolia Ave St. Louis, MO

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-CBM-07A	1202	Cove Base Mastic (Plaster)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	White	90-95% Other	5-10% Cellulose	None Detected
23436-CBM-07B	1203	Cove Base Mastic (Mastic)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Brown	>95% Other	1-5% Cellulose	None Detected
23436-CBM-07B	1203	Cove Base Mastic (Plaster)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	White	>95% Other	1-5% Cellulose	None Detected
23436-CBM-07C	1204	Cove Base Mastic (Mastic)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Brown	>95% Other	1-5% Cellulose	None Detected
23436-CBM-07C	1204	Cove Base Mastic (Plaster)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	White	>95% Other	1-5% Cellulose	None Detected
23436-DI-08A	1205	Duct Work Insulation (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	<1% Cellulose	None Detected
23436-DI-08A	1205	Duct Work Insulation (Cloth)	Miscellaneous	Heterogeneous, Mixed	Woven	Beige	1-5% Other	>95% Cellulose	None Detected
23436-DI-08A	1205	Duct Work Insulation (Insulation)	Miscellaneous	Heterogeneous, Mixed	Rough, Fibrous	Beige	20-30% Other	<1% Cellulose, 70-80% Mineral Wool	None Detected
23436-DI-08B	1206	Duct Work Insulation (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	1-5% Cellulose	None Detected
23436-DI-08B	1206	Duct Work Insulation (Cloth)	Miscellaneous	Heterogeneous, Mixed	Woven	Beige	1-5% Other	>95% Cellulose	None Detected
23436-DI-08B	1206	Duct Work Insulation (Insulation)	Miscellaneous	Heterogeneous, Mixed	Rough, Fibrous	Beige	20-30% Other	<1% Cellulose, 70-80% Mineral Wool	1-5% Amosite
23436-DI-08C	1207	Duct Work Insulation (Coating)	Miscellaneous	Heterogeneous, Mixed	Rough	White	>95% Other	1-5% Cellulose	None Detected
23436-DI-08C	1207	Duct Work Insulation (Cloth)	Miscellaneous	Heterogeneous, Mixed	Woven	Beige	1-5% Other	>95% Cellulose	None Detected
23436-DI-08C	1207	Duct Work Insulation (Insulation)							Not Analyzed, Positive Stop

ANALYST: E Nelson

REVIEWED BY: Robert H Hill II

Samples 65 SAMPLES ANALYZED

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(Method : EPA/600/R-93/116)

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Report No. : 25-12-0140 | Analyzed Date: 12/8/2025-12/9/2025 | Project Name: Missouri School for the Blind
Contact : Robert Hill | Customer PO: N/A | Project Address: 3815 Magnolia Ave St. Louis, MO

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-WC-09A	1208	Window Caulking	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	<1% Cellulose	None Detected
23436-WC-09B	1209	Window Caulking	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	<1% Cellulose	None Detected
23436-WC-09C	1210	Window Caulking	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	<1% Cellulose	None Detected
23436-FT-10A	1211	Gray Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-FT-10A	1211	Gray Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-FT-10B	1212	Gray Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-FT-10B	1212	Gray Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-FT-10C	1213	Gray Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-FT-10C	1213	Gray Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-FT-11A	1214	White Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	1-5% Cellulose	None Detected
23436-FT-11A	1214	White Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Orange	>95% Other	1-5% Cellulose	None Detected
23436-FT-11B	1215	White Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	<1% Cellulose	None Detected
23436-FT-11B	1215	White Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Orange	>95% Other	1-5% Cellulose	None Detected
23436-FT-11C	1216	White Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Off-White	>95% Other	1-5% Cellulose	None Detected

ANALYST: E Nelson

REVIEWED BY: Robert H Hill II

Samples 65 SAMPLES ANALYZED

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St. Louis, Missouri 63104
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(Method : EPA/600/R-93/116)

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Report No. : 25-12-0140 | Analyzed Date: 12/8/2025-12/9/2025 | Project Name: Missouri School for the Blind
Contact : Robert Hill | Customer PO: N/A | Project Address: 3815 Magnolia Ave St. Louis, MO

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-FT-11C	1216	White Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Orange	>95% Other	1-5% Cellulose	None Detected
23436-FT-12A	1217	Red Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Red	>95% Other	1-5% Cellulose	None Detected
23436-FT-12A	1217	Red Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-FT-12B	1218	Red Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Red	>95% Other	<1% Cellulose	None Detected
23436-FT-12B	1218	Red Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-FT-12C	1219	Red Floor Tile (Tile)	Miscellaneous	Heterogeneous, Non-Fibrous	Smooth	Red	>95% Other	1-5% Cellulose	None Detected
23436-FT-12C	1219	Red Floor Tile (Adhesive)	Miscellaneous	Heterogeneous, Non-Fibrous	Rough	Yellow	>95% Other	1-5% Cellulose	None Detected
23436-WC-13A	1220	Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	1-5% Cellulose	None Detected
23436-WC-13B	1221	Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	1-5% Cellulose	None Detected
23436-WC-13C	1222	Window Caulk	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Gray	>95% Other	1-5% Cellulose	None Detected

ANALYST: E Nelson

REVIEWED BY: Robert H Hill III

Samples 65 SAMPLES ANALYZED

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CHAIN OF CUSTODY / LABORATORY WORK REQUEST

SITEX Environmental Inc.
1525 S. Broadway
St. Louis, MO 63104-4014

Phone: (314) 421-0600
FAX: (314) 421-0234

Project Name: School for the Blind
Project Address: 3815 Magnolia Ave St. Louis, MO

Project # : 23436
Client Contact
E-Mail:

Invoice to:

Date : 12/5/25
P.O. # :

Sample ID	Description	Date/Time Sampled	# of Cont	Type	Matrix: Bulk	Air	Water	Soil	Sludge	Preservative: Unpres.	HNO_3	NaOH	H_2SO_4	HCl	Cold	Analysis Required: PLM / DS
23436-CT-01A	White ceiling tile	12/5/25	1	Bulk	X					X						X
CT-01B	"															
CT-01C	"															
CM-02A	Yellow carpet mastic															
CM-02B	"															
CM-02C	"															
PL-03A	White plaster															
PL-03B	"															
PL-03C	"															
WC-04A	White window sealants															
WC-04B	"															
WC-04C	"															
WC-05A	White window caulk															
WC-05B	"															
WC-05C	"															

Comments:

Turn Around Time

- ___ 1 hour
- ___ 2-3 hour
- ___ 6-8 Hours
- ___ 24 Hour
- ___ Same Day
- ___ 48 Hours
- X 3-5 Day

Samples Taken By
MW + RHH

Relinquished By	Date/Time	Received By	Date/Time
Mackenzie Wagner	1:13 P.M., 12/5/25	E Nelson	08DEC2025 10:32 AM

25-12-0140
EJW
08DEC2025

CHAIN OF CUSTODY / LABORATORY WORK REQUEST

SITEX Environmental Inc.
1525 S. Broadway
St. Louis, MO 63104-4014

Phone: (314) 421-0600
FAX: (314) 421-0234

Project Name: School for the blind
Project Address: 3815 Magnolia Ave
St. Louis, MO

Project # : 23436
Client Contact
E-Mail:

Invoice to:

Date : 12/5/25
P.O. # :

Sample ID	Description	Date/Time Sampled	# of Cont	Type	Matrix: Bulk	Air	Water	Soil	Sludge	Preservative: Unpres.	HNO_3	NaOH	H_2SO_4	HCl	Cold	Analysis Required: PLM / DS
23436 CB 06A	Radiant cove base	12/5/25	1	Bagged	X					X						X
CB 06B	↓															
CB 06C	↓															
CBM 07A	cove base mastic															
CBM 07B	↓															
CBM 07C	↓															
DI 08A	Duct work insulation															
DI 08B	↓															
DI 08C	↓															
WC 09A	window caulking															
WC 09B	↓															
WC 09C	↓															
FI 10A	Grout, fiber mesh															
FI 10B	↓															
FI 10C	↓															

Comments:

Relinquished By	Date/Time	Received By	Date/Time
[illegible]	12/5/25 ; 1:18 P.M	[illegible]	08DEC2025 10:32 am

Turn Around Time

___ 1 hour
___ 2-3 hour
___ 6-8 Hours
___ 24 Hour
___ Same Day
___ 48 Hours
X 3-5 Day

Samples Taken By [illegible]

25-12-0140
EJN
08DEC2025

CHAIN OF CUSTODY / LABORATORY WORK REQUEST

SITEX Environmental Inc.
1525 S. Broadway
St. Louis, MO 63104-4014

Phone: (314) 421-0600
FAX: (314) 421-0234

Project Name: School for the blind
Project Address: 3815 Magnolia Ave
St. Louis, MO

Project # : 23436
Client Contact
E-Mail:

Invoice to:

Date : 12/5/25
P.O. # :

Sample ID	Description	Date/Time Sampled	# of Cont	Type	Matrix: Bulk	Air	Water	Soil	Sludge	Preservative: Unpres.	HNO_3	NaOH	H_2SO_4	HCl	Cold	Analysis Required: PLM / DS
23436 – FT-011A	White flooring	12/5/25	1	Bagsite	X					X						X
FT-011B																
FT-011C																
FT-012A	Red flooring															
FT-012B																
FT-012C																
WC-013A	window caulk															
WC-013B																
WC-013C																

Comments:

Relinquished By	Date/Time	Received By	Date/Time
Nathan Rogers	12/5/25, 1:21 P.M.	E Nelson	08DEC2025 10:32 AM

Turn Around Time

- ___ 1 hour
- ___ 2-3 hour
- ___ 6-8 Hours
- ___ 24 Hour
- ___ Same Day
- ___ 48 Hours
- X 3-5 Day

Samples Taken By
MW & RH

25-12-0140
EJW
08DEC2025

McCRONE RESEARCH INSTITUTE

certifies that

Elizabeth Nelson

has successfully completed an intensive course of instruction in

Microscopical Identification of Asbestos

given by the McCrone Research Institute

Presented this 11th day of October, 2024

Course Date: October 7-11, 2024

McCRONE RESEARCH INSTITUTE

certifies that

Robert H. Hill, II

has successfully completed an intensive course of instruction in

"Microscopical Identification of Asbestos"

given by the McCrone Research Institute

Presented this 13th *day of* Jan. 1989

3.5 CEU's
4.5 ABIH CM

Robert D. McCrone

John G. Delly

SITEX PLM REPORT

(December 15, 2025)

SITEX Est. 1987

1525 South Broadway
St. Louis, Missouri 63104
Phone: (314) 421-0600
Fax: (314) 421-0234

Your Sole Provider of Environmental Health & Safety Services

POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT

(Method : EPA/600/R-93/116)

Project No. : 23436 Received Date: 12/15/2025 Customer: Missouri School for the Blind
Report No. : 25-12-0146 Analyzed Date: 12/15/2025 Project Name: Missouri School for the Blind
Contact : Bob Hill Customer PO: N/A Project Address: 3815 Magnolia Ave
St. Louis, MO 63108

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-RFT-014A	1256	Roof Flashing Tar-3T	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Black	70-80% Other	20-30% Cellulose	None Detected
23436-RFT-014B	1257	Roof Flashing Tar-3T	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Black	70-80% Other	20-30% Cellulose	None Detected
23436-RFT-014C	1258	Roof Flashing Tar-3T	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Black	70-80% Other	20-30% Cellulose	None Detected
23436-VJC-015A	1259	Vibration Joint Cloth-3T Roof	Miscellaneous	Heterogeneous, Mixed	Smooth, Fibrous	Brown	50-60% Other	40-50% Synthetic	None Detected
23436-VJC-015B	1260	Vibration Joint Cloth-3T Roof	Miscellaneous	Heterogeneous, Mixed	Smooth, Fibrous	Brown	50-60% Other	40-50% Synthetic	None Detected
23436-VJC-015C	1261	Vibration Joint Cloth-3T Roof	Miscellaneous	Heterogeneous, Mixed	Smooth, Fibrous	Brown	50-60% Other	40-50% Synthetic	None Detected
23436-DI-016A	1262	Duct Insulation Roof	Miscellaneous	Homogeneous, Fibrous	Fibrous	Brown	10-20% Other	80-90% Mineral Wool	None Detected
23436-DI-016B	1263	Duct Insulation Roof	Miscellaneous	Homogeneous, Fibrous	Fibrous	Brown	5-10% Other	90-95% Mineral Wool	None Detected
23436-DI-016C	1264	Duct Insulation Roof	Miscellaneous	Homogeneous, Fibrous	Fibrous	Brown	5-10% Other	90-95% Mineral Wool	None Detected
23436-BM-017A	1265	Brick Mortar 3T	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	Beige	>95% Other	1-5% Cellulose	None Detected
23436-BM-017B	1266	Brick Mortar 3T	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	Beige	>95% Other	<1% Cellulose	None Detected
23436-BM-017C	1267	Brick Mortar 3T	Miscellaneous	Heterogeneous, Non-Fibrous	Rough, Grainy	Beige	>95% Other	<1% Cellulose	None Detected
23436-DC-018A	1268	Door Caulk 3T	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Beige	>95% Other	1-5% Cellulose	None Detected
23436-DC-018B	1269	Door Caulk 3T	Miscellaneous	Homogeneous, Non-Fibrous	Rough	Beige	90-95% Other	1-5% Cellulose	1-5% Chrysotile

ANALYST: E Nelson

REVIEWED BY: Robert H Hill II

Samples

Laboratory Disclaimer:
The test data only pertains to the items tested. No assumptions or conclusions should be made to materials or samples not analyzed in this report.
SITEX maintains liability limited to cost of analysis.
Interpretation and uses of test results are the responsibility of the client.
This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by SITEX.
SITEX participates in the American Industrial Hygiene Association (AIHA) Bulk Asbestos Proficiency Analytical Testing (BAPAT) Program , Participant Number 286604.

1525 South Broadway
St. Louis, Missouri 63104
Phone: (314) 421-0600
Fax: (314) 421-0234

Your Sole Provider of Environmental Health & Safety Services

POLARIZED LIGHT MICROSCOPY ANALYSIS REPORT

(Method : EPA/600/R-93/116)

Project No. :	23436	Received Date:	12/15/2025	Customer:	Missouri School for the Blind
Report No. :	25-12-0146	Analyzed Date:	12/15/2025	Project Name:	Missouri School for the Blind
Contact :	Bob Hill	Customer PO:	N/A	Project Address:	3815 Magnolia Ave
					St. Louis, MO 63108

Sample Info		Client Provided Information		Analytical Info			Non-Asbestos		Asbestos
Sample ID	Lab ID	Sample Description	Material Type	Appearance	Texture	Color	% Non-Fibrous	% Fibrous	% Type
23436-DC-018C	1270	Door Caulk 3T							Not Analyzed, Positive Stop

ANALYST: E Nelson

REVIEWED BY: Robert H Hill III

Samples 14 SAMPLES ANALYZED

Laboratory Disclaimer:
The test data only pertains to the items tested. No assumptions or conclusions should be made to materials or samples not analyzed in this report.
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CHAIN OF CUSTODY / LABORATORY WORK REQUEST

~~Page 2 of 2~~ Page 1 of 1

EJW 15DEC2025

SITEX Environmental Inc.
1525 S. Broadway
St. Louis, MO 63104-4014

Phone: (314) 421-0600
FAX: (314) 421-0234

Project Name: Missouri School for the Blind
Project Address: 3815 Magnolia Ave. Saint Louis, MO. 63108
Project #: 23436
Client Contact
E-Mail:

Invoice to: SITEX, Inc. 2715 Cherokee Saint Louis MO 63104
Date: Dec 12 2025
P.O. #: N/A

Sample ID	Description	Date/Time Sampled	# of Cont	Type	Matrix: Bulk	Air	Water	Soil	Sludge	Preservative: Unpres.	HNO_3	NaOH	H_2SO_4	HCl	Cold	Analysis Required: PLM / DS
23436-RFT-014A	Roof Flashing Tar - 3T	12/12/25 1140	1	Baggie	X					X						X
23436-RFT-014B	Roof Flashing Tar - 3T	11:41	1		X					X						X
23436-RFT-014C	Roof Flashing Tar - 3T	1143	1		X					X						X
23436-VJC-015A	Vibration Joint Cloth-3T Roof	1145	1		X					X						X
23436-VJC-015B	Vibration Joint Cloth-3T Roof	1147	1		X					X						X
23436-VJC-015C	Vibration Joint Cloth-3T Roof	1150	1		X					X						X
23436-DI-016A	Duct Insulation Roof	1152	1		X					X						X
23436-DI-016B	Duct Insulation Roof	1153	1		X					X						X
23436-DI-016C	Duct Insulation Roof	1155	1		X					X						X
23436-BM-017A	Brick Mortar 3T	1201	1		X					X						X
23436-BM-017B	Brick Mortar 3T	1202	1		X					X						X
23436-BM-017C	Brick Mortar 3T	1204	1		X					X						X
23436-DC-018A	Door Caulk 3T	1206	1		X					X						X
23436-DC-018B	Door Caulk 3T	1207	1		X					X						X
23436-DC-018C	Door Caulk 3T	1210	1		X					X						X

Comments:

STOP AT FIRST POSITIVE PER SAMPLE SET.

Note: Door Caulk is same as window caulk

Relinquished By	Date/Time	Received By	Date/Time
Robert Rifell	12/12/25 14:00 pm	E Hudson	15DEC2025 8:31 AM

Turn Around Time

- ___ 1 hour
- ___ 2-3 hour
- ___ 6-8 Hours
- X 24 Hour Same Day
- ___ 48 Hours
- ___ 3-5 Day

Samples Taken By: ~~RJF~~

25-12-0146
EJW
15DEC2025

McCRONE RESEARCH INSTITUTE

certifies that

Elizabeth Nelson

has successfully completed an intensive course of instruction in

Microscopical Identification of Asbestos

given by the McCrone Research Institute

Presented this 11th day of October, 2024

Course Date: October 7-11, 2024

McCRONE RESEARCH INSTITUTE

certifies that

Robert H. Hill, II

has successfully completed an intensive course of instruction in

"Microscopical Identification of Asbestos"

given by the McCrone Research Institute

Presented this 13th *day of* Jan. 1989

3.5 CEU's
4.5 ABIH CM

Robert D. McCrone

John G. Delly

APPENDIX C

XRF LEAD PAINT SUMMARY LOG SHEETS

LEAD PAINT SURVEY

Project Name: School for the Blind | **Date Collected:** December 5, 2025

On-Site Technician: Robert Hill II | **Project Number:** 23436

Project Location: 3815 Magnolia Avenue | **Instrument Used:** Innov-X Olympus

SAMPLE	LOCATION	COMPONENT	CONDITION	SUBSTRATE	COLOR	RESULTS	POS/NEG	QUANTITY
001	Calibration	Coin	Intact	Metal	Silver	Pass	N/A	N/A
002	Calibration	SRM2570	Intact	Plastic	White	0.00±0.00	NEG	N/A
003	Calibration	SRM2573	Intact	Plastic	Red	1.15±0.03	POS	N/A
004	3T Dormitory (West)	French Door	Intact	Wood	White	0.11±0.01	NEG	N/A
005	3T Dormitory (West)	Door Trim	Intact	Wood	White	0.06±0.01	NEG	N/A
006	3T Dormitory	South Wall	Intact	Plaster	White	0.23±0.09	NEG	N/A
007	3T Dormitory	North Wall	Intact	Plaster	Black	0.22±0.22	NEG	N/A
008	3E Storage Room	North Wall	Intact	Plaster	Green	0.00±0.00	NEG	N/A
009	3E Storage Room	East Wall	Intact	Plaster	Green	0.00±0.00	NEG	N/A
010	3E Storage Room	South Wall	Detriorated	Plaster	Green	0.01±0.00	NEG	N/A
011	3E Storage Room	West Wall	Intact	Plaster	Green	0.02±0.00	NEG	N/A
012	3E Storage Room	Floor	Intact	Concrete	Red	0.00±0.00	NEG	N/A
013	3E Storage Room	Window Sill	Intact	Stone	Green	0.00±0.00	NEG	N/A
014	3E Storage Room	Radiator	Intact	Metal	Gray	0.00±0.00	NEG	N/A
015	3E Storage Room	Ceiling	Intact	Concrete	White	0.03±0.01	NEG	N/A
016	3E Storage Room	Cove Base	Intact	Plastic	Red	0.00±0.00	NEG	N/A
017	3E Storage Room	Door Frame	Intact	Metal	Black	0.00±0.00	NEG	N/A
018	4F Storage Room	North Wall	Intact	Plaster	Off white	0.00±0.00	NEG	N/A
019	4F Storage Room	East Wall	Intact	Plaster	Off white	0.00±0.00	NEG	N/A
020	4F Storage Room	South Wall	Intact	Plaster	Off white	0.00±0.00	NEG	N/A
021	4F Storage Room	West Wall	Intact	Plaster	Off white	0.00±0.00	NEG	N/A
022	4F Storage Room	Ceiling	Intact	Plaster	Off white	0.01±0.00	NEG	N/A
023	4F Storage Room	Window Sill	Intact	Stone	Green	0.00±0.00	NEG	N/A
024	4F Storage Room	Ductwork	Intact	Metal	Gray	0.00±0.00	NEG	N/A
025	4F Storage Room	Roof Vent	Intact	Iron	White	0.08±0.01	NEG	N/A
026	4F Storage Room	Ductwork	Intact	Metal	White	0.10±0.02	NEG	N/A
027	Calibration	Coin	Intact	Metal		Pass	N/A	N/A
028	Calibration	SRM 2570	Intact	Plastic	White	0.00±0.00	NEG	N/A
029	Calibration	SRM 2573	Intact	Plastic	Red	1.16±0.01	POS	N/A
030								
031								
032								
033								
034								

LEAD PAINT SURVEY

Project Name: School for the Blind

Date Collected: December 12, 2025

On-Site Technician: Robert Hill II

Project Number: 23436

Project Location: 3815 Magnolia Avenue

Instrument Used: Innov-X Olympus

SAMPLE	LOCATION	COMPONENT	CONDITION	SUBSTRATE	COLOR	RESULTS	POS/NEG	QUANTITY
001	Calibration	Coin	Intact	Metal	Silver	Pass	N/A	N/A
002	Calibration	SRM2570	Intact	Plastic	White	0.00±0.00	NEG	N/A
003	Calibration	SRM2573	Intact	Plastic	Red	1.16±0.04	POS	N/A
004	3T Dormitory	French Door Frame	Deteriorated	Wood	White	2.47±0.09	POS	1 Each
005	3T Dormitory	French Door	Deteriorated	Wood	White	1.26±0.06	POS	1 Each
006	3T Dormitory	Exterior Ductwork	Intact	Metal	Red	0.23±0.09	NEG	N/A
007	3T Dormitory	Ductwork Bracing	Intact	Metal	Red	0.22±0.22	NEG	N/A
008	3T Dormitory	HVAC Unit	Intact	Metal	Pale Blue	0.00±0.00	NEG	N/A
009	3T Dormitory	HVAC Control Box	Intact	Metal	Pale Blue	0.00±0.00	NEG	N/A
010	4F Storage Room	Interior Ductwork	Intact	Metal	White	0.01±0.00	NEG	N/A
011	4F Storage Room	Ceiling	Intact	Plaster	White	0.02±0.00	NEG	N/A
012	4F Storage Room	Power Panel	Intact	Metal	Gray	0.00±0.00	NEG	N/A
013	4F Storage Room	Door Frame	Intact	Metal	Black	0.00±0.00	NEG	N/A
014	2E Hallway	Hallway	Intact	Ceramic Tile	Green	4.69±0.59	POS	100 SF
015	2E Hallway	Hallway	Intact	Plaster	White	0.03±0.01	NEG	N/A
016	2E Hallway	Hallway	Intact	Ceramic Tile	White	0.00±0.00	NEG	N/A
017	2E Hallway	Door Frame	Intact	Metal	Black	0.00±0.00	NEG	N/A
018	Calibration	Coin	Intact	Metal	Silver	0.00±0.00	NEG	N/A
019	Calibration	SRM 2570	Intact	Plastic	White	0.00±0.00	NEG	N/A
020	Calibration	SRM 2573	Intact	Plastic	Red	1.11±0.01	POS	N/A
021								
022								
023								
024								
025								
026								
027								
028								
029								
030								
031								
032								
033								
034								

APPENDIX D

LABORATORY ACCREDITATION AND INDIVIDUAL CERTIFICATIONS

MISSOURI
DEPARTMENT OF
NATURAL RESOURCES

Mike Kehoe
Governor

Kurt U. Schaefer
Director

CERTIFICATION NUMBER:
7118072525MOIR2164

THIS CERTIFIES
Robert H Hill II
HAS COMPLETED THE CERTIFICATION
REQUIREMENTS FOR
Inspector



APPROVED: **07/25/2025**
EXPIRES: **07/25/2026**
TRAINING DATE: **07/25/2025**

Director of Air Pollution Control Program

July 25, 2025

Robert H Hill II
608 N 43rd St
Belleville, IL 62226

RE: **Missouri Asbestos Occupation Certification Card**

Enclosed is your certification card for Asbestos Inspector, as issued by the Asbestos Unit of the Missouri Department of Natural Resources' Air Pollution Control Program.

Missouri Certification Number: 7118072525MOIR2164
Course Training Date: July 25, 2025
Missouri Certification Approval Date: July 25, 2025
Missouri Certification Expiration Date: July 25, 2026

Note:

- All Missouri-certified asbestos personnel must comply with the following statutes and regulations:
  - Sections 643.225 to 643.250, RSMo;
  - 10 CSR 10-6.241 *Asbestos Projects-Registration, Abatement, Notification, Inspection, Demolition, and Performance Requirements; and*
  - 10 CSR 10-6.250 *Asbestos Projects-Certification, Accreditation and Business Exemption Requirements.*
- To keep your occupation certification up-to-date, you must complete an annual refresher course and submit a renewal application each year.
- In order to be eligible to renew your certification, you must successfully complete a refresher course with a Missouri-accredited training provider within 12 months of the expiration date of your current training certificate. If you exceed this grace period, you will be required to retake a Missouri-accredited initial course in order to be eligible for Missouri certification.

To obtain a copy of the certification renewal application, or review regulations and requirements, please visit our website at http://dnr.mo.gov/env/apcp/asbestos/index.htm.

If you have any questions please call the Air Pollution Control Program at 573-751-4817.

AIR POLLUTION CONTROL PROGRAM

Director of Air Pollution Control Program

STATE OF MISSOURI
DEPARTMENT OF HEALTH AND SENIOR SERVICES

LEAD ABATEMENT OCCUPATION LICENSE

Issued to:

Robert Hill

The person, firm or corporation whose name appears on this certificate has fulfilled the requirements for licensure as set forth in the Missouri Revised Statutes 701.300-701.338, as long as not suspended or revoked, and is hereby authorized to engage in the activity listed below.

Lead Risk Assessor
Category of License

Issuance Date:	**05/16/2025**
Expiration Date:	**05/16/2027**
License Number:	**010517-200133036**

Sarah Willson

Sarah Willson
Acting Director
Department of Health and Senior Services

Lead Licensing Program, PO Box 570, Jefferson City, MO 65102

APPENDIX 3

023200a GEOTECHNICAL REPORT - MSB NATURE PARK [SCI]

SCI ENGINEERING, INC.
130 Point West Boulevard
St. Charles, Missouri 63301
636-949-8200
www.sciengineering.com

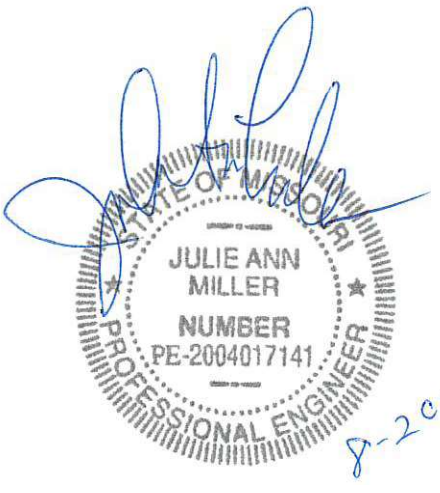
Geotechnical Report

MSB NATURE PARK (E1703-01)
ST. LOUIS, MISSOURI

August 2019

MISSOURI SCHOOL FOR THE BLIND
Owner

OATES ASSOCIATES, INC.
Civil Engineer/Surveyor



8-20-19

SCI No. 2015-0067.10, Task 100

SCI ENGINEERING, INC.
EARTH • SCIENCE • SOLUTIONS
GEOTECHNICAL
ENVIRONMENTAL
NATURAL RESOURCES
CULTURAL RESOURCES
CONSTRUCTION SERVICES

August 20, 2019

Mr. Travis Helmkamp
Oates Associates, Inc.
Eastport Plaza Drive
100 Lanter Court, Suite 1
Collinsville, Illinois 62234-6124

RE: Geotechnical Report
MSB Nature Park (E1703-01)
St. Louis, Missouri
SCI No. 2015-0067.10, Task 100

Dear Mr. Helmkamp:

Attached is our *Geotechnical Report*, dated August 2019. It should be read in its entirety, and our recommendations applied to the design and construction of the project. Selected excerpts from the report are highlighted below:

- Existing fill was encountered at each test location to depths ranging from 2 to 5 feet. Based on the results of the field and laboratory testing, the majority of the fill material encountered appears to have been placed and compacted in a controlled manner. Based on the age of the fill and the results of field and laboratory testing, the risk of supporting the proposed improvements on the fill is judged to be low with proper proofrolling and treatment.

- Fat clays were not observed in the depths explored. However, Atterberg limits testing within the existing fill and native soils suggest that lean clays with moderate swell potential ($45 < LL < 50$) are present on site. As such, these soils should not be allowed to dry out as the risk for volume change increases as the soils dry out. Dry soils should be removed and replaced with compacted structural fill. Fat clay soils could be encountered between the widely-spaced borings. If the bearing soils consist of fat clay, we recommend that they be removed to minimum depths of 2 feet beneath the bearing level of the footings and 3 feet beneath the bottom of the floor slab.

- Groundwater will influence any excavations extending below a depth of 8.5 feet. Groundwater below this depth will likely contribute to an unstable subgrade at the base of the overexcavation. A mud mat or crushed rock could be considered at the base of the overexcavation to create a stable working platform. A series of pumps can be used to remove the groundwater from the excavation prior to backfilling with select materials.

- Shallow spread footing foundations may be designed for a maximum net allowable soil bearing pressure of 2,000 pounds per square foot for strip footings and isolated column footings, as discussed in the report.

- Infiltration tests were conducted in Hand Augers I-1 and I-2 at a depth of 3 feet and resulted in average infiltration rates of 20.5 and 1.5 inches per hour, respectively. The value obtained from I-2 appears more representative of the soils encountered at the site as variable fill conditions, some containing rubble, were observed closer to I-1.

- Site Class C should be used for the project, with seismic design parameters as follows: $F_a = 1.30$, $F_v = 1.50$, $S_{DS} = 0.39$, and $S_{D1} = 0.16$. The Seismic Design Category for the site is C for Occupancy Categories I, II, and III.

We appreciate the opportunity to be of service and look forward to working with you during the construction phase of the project. SCI should participate in a meeting prior to construction. Such meetings are valuable in reviewing and clarifying project requirements and responsibilities.

If you have any questions or comments, please call.

Respectfully,

SCI ENGINEERING, INC.

Curtis J. Connor, E.I.
Staff Engineer

Julie A. Miller, P.E.
Senior Engineer

CJC/JAM/hmm

Enclosure
Geotechnical Report

C: Mr. Tom Cissell, Oates Associates, Inc.
Mr. Joseph Hagerty, Oates Associates, Inc.

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APPENDICES

Appendix A - CPTu Log Legend and Nomenclature, CPTu Logs
Appendix B - Boring Log Legend and Nomenclature, Hand Auger Logs

Geotechnical Report

MSB NATURE PARK (E1703-01)
ST. LOUIS, MISSOURI

1.0 INTRODUCTION

At the request of Mr. Tom Cissell of Oates Associates, Inc., SCI Engineering, Inc. (SCI) conducted a geotechnical exploration for the proposed site improvements. The purpose of our exploration was to characterize and evaluate the subsurface conditions, provide recommendations for foundations, and address other geotechnical aspects. Our services were provided in general accordance with our proposal, dated March 28, 2019, and authorized by Mr. Joseph Hagerty of Oates Associates, Inc. on April 29, 2019 in the Subconsultant Agreement, dated May 6, 2019.

2.0 SITE AND PROJECT DESCRIPTION

Site improvements are currently being planned for Missouri School for the Blind located at 3815 Magnolia Avenue in the City of St. Louis, Missouri. The location of the site is shown on the *Vicinity and Topographic Map*, Figure 1. Improvements are planned within the existing east and west courtyards on campus. Currently, the east courtyard houses sidewalks, grass-covered areas, occasional trees, and a playground on the northern-half of the courtyard. The west courtyard houses sidewalks, some trees, mostly grass-covered areas, and some gardening areas. The buildings on the edges of the courtyards appear to be performing satisfactorily with no significant cracking that was visible from the exterior. The existing conditions are shown on the *Aerial Photograph*, Figure 2.

Based on the preliminary civil, structural, and architectural plans provided to SCI on July 11 through July 15, 2019, the improvements in the east courtyard will consist of an entrance canopy, an elevated catwalk, and new playground equipment featuring synthetic turf and a zipline. In the west courtyard, the planned improvements consist of a greenhouse and associated planters. Shallow bio-swales will be located in the lawn areas on the south side of the courtyards. In the east courtyard, the top and the bottom of the storage bed will be 30 inches below the finished grade at an elevation of 517.00. The bottom of the storage bed elevation in the west courtyard is 515.40. The proposed construction is shown on the *Site Plan*, Figure 3.

Grading plans indicate cuts and fills of 1-foot are planned for the improvements with the bio-retention basin extending up to 2.5 feet below the existing grade. Structural loads were not provided at the time of this report; however, we anticipate that the structures will be lightly-loaded with column loads of less than 100 kips.

SCI previously provided asbestos air monitoring and clearance at the school during the removal of asbestos-containing materials from March 4 through March 11, 2015 and February 28 through April 3, 2017. We have not reviewed, nor are we aware of, any previous studies on this specific site, by SCI or others, that would affect the preparation of this report.

3.0 SUBSURFACE CONDITIONS

Two piezocone penetration test (CPTu) soundings and adjacent hand augers (B-1 and B-2) and five additional hand augers (B-3, I-1, and I-2) were performed at the approximate locations shown on the *Site Plan*. The test locations were staked in the field by SCI personnel utilizing a global positioning system and measuring from existing site features. The ground surface elevations at the test locations were interpolated from available light detection and ranging (LiDAR) data and should be considered approximate. Detailed information regarding the nature and thickness of the soils encountered, and the results of the field sampling and laboratory testing are shown on the *CPTu and Hand Auger Logs* contained in Appendix A and Appendix B, respectively.

3.1 Existing Fill

Existing fill was encountered in each sounding/hand auger to the depths shown in Table 3.1, below. The fill consisted of lean clay with trace amounts of sand, gravel, and crushed brick. Interpretations of CPTu data indicate the fill was generally medium stiff to stiff in consistency. Shear strengths recorded in the fill in B-3 via a field vane ranged from 2.6 to 10.4 kips per square foot. Moisture contents in the fill ranged from 21 to 26 percent. An Atterberg limits test on samples of the fill from B-3 yielded a liquid limit (LL) of 49, classifying the soils as a lean clay. We anticipate the fill was likely placed during construction of the existing school; however, we are not aware of documentation regarding the placement or compaction of the fill.

Table 3.1 – Existing Fill Summary

Sounding/Hand Auger	Approximate Surface Elevation (feet)	Existing Fill Depth (feet)	Approximate Bottom of Existing Fill Elevation (feet)
B-1	520	2	518
B-2	520	2.5	517.5
B-3	518	5	513
I-1	521	≥3	≤518
I-2	518	≥3	≤515

3.2 Native Soil Profile

The native soils predominately consisted of lean clay (CL in accordance with the Unified Soil Classification System and ASTM D 2488-09a), which extended to the sounding termination depth of 15 feet. Interpretations of CPTu data indicate the native soils were generally soft to medium stiff in consistency. Moisture contents in the native soils ranged from 20 to 32 percent. An Atterberg limits test on samples of the fill from B-3 yielded a LL of 49, classifying the soils as a lean clay.

3.3 Bedrock Geology

Documented geology, including *the Bedrock Geologic Map of the St. Louis Quadrangle, Missouri and Illinois,* indicates that bedrock at the site consists of the Cherokee Group, which typically consists of cycles of sandstone, siltstone, shale, clay, and coal. It is mapped only in Missouri and can be as much as 100 feet thick. Based on our experience with projects in the area and data available from the Missouri Department of Natural Resources (MDNR) Geological Survey Geosciences Technical Resource Assessment Tool site https://dnr.mo.gov/geostrat/, limestone bedrock is typically present at depths between 20 and 25 feet below the ground surface.

3.4 Groundwater

Interpretations of CPTu data and observations made during hand augering indicate groundwater was encountered in B-1 through B-3 at the depths shown in Table 3.2, below. Groundwater was not observed in Hand Auger Borings I-1 and I-2.

Table 3.2 – Groundwater Summary

Sounding/Hand Auger	Approximate Surface Elevation (feet)	Groundwater Depth (feet)	Approximate Groundwater Elevation (feet)
B-1	520	11	509
B-2	520	10	510
B-3	518	8.5	509.5

The groundwater level depends on seasonal and climatic variations, and may be present at different depths in the future. In addition, without extended periods of observation, accurate groundwater level measurements may not be possible, particularly in low permeability soils. Groundwater will influence any excavations extending below a depth of 8.5 feet.

4.0 DESIGN RECOMMENDATIONS

4.1 Existing Fill

Existing fill was encountered at each test location to depths ranging from 2 to 5 feet. Presently, there are no records to document that the existing fill was placed and compacted in a controlled manner. Therefore, the engineering properties and performance of the existing fill cannot be predicted with certainty and there is some risk of settlement or other performance problems if the foundations or floor slab are supported on the fill material. To eliminate the risk associated with the fill, all the existing fill would have to be excavated and either recompacted or replaced.

However, based on the results of the field and laboratory testing, the majority of the fill material encountered appears to have been placed and compacted in a controlled manner. Based on the age of the fill and the results of field and laboratory testing, the risk of supporting the proposed improvements on the fill is judged to be low with proper proofrolling and treatment as discussed in Sections 4.2, 5.1, and 5.2.

SCI personnel should check the fill at the footing bearing elevations and floor slab subgrade. We anticipate that isolated, soft, unsuitable layers of existing fill may be encountered between our widely-spaced test locations and will require remediation. Any soft or otherwise unsuitable fill should be selectively undercut and replaced with engineered fill in accordance with Sections 5.1 and 5.2. Where the fill consists of expansive soils within a zone of 2 feet below the bearing elevation of the footings or 3 feet below the bearing elevation of the floor slab, it should be remediated as discussed in Section 4.2.

4.2 Expansive Clay Remediation

Fat clays were not observed in the depths explored. However, Atterberg limits testing within the existing fill and native soils suggest that lean clays with moderate swell potential ($45 < LL < 50$) are present on site. As such, these soils should not be allowed to dry out as the risk for volume change increases as the soils dry out. Dry soils should be removed and replaced with compacted structural fill.

Fat clay soils could be encountered between the widely-spaced borings. If the bearing soils consist of fat clay, we recommend that they be removed to minimum depths of 2 feet beneath the bearing level of the footings and 3 feet beneath the bottom of the floor slab. The overexcavation should extend at least 2 feet beyond the outside edge of the footings and building footprint to facilitate uniform compaction of the replacement materials and may require additional widening at the building corners to allow equipment access for proper compaction. The overexcavation, however, should not undermine the existing footings. The overexcavation should be backfilled with properly compacted low plastic soil or one-inch minus crushed limestone. As an alternate, the footing overexcavation may be backfilled with lean concrete. With this option, widening of the footing excavation is not required. If clean rock is used as backfill material, it must be drained to daylight or to a sump with a pump. The footings and floor slab would then be constructed on the newly placed fill.

The method of treatment described above are based on generally accepted standards in the local engineering community; however, swell pressures and volume change potential are greater than can be mitigated by these methods may exist. Consequently, the owner should recognize that there is an inherent, but reduced risk that foundation and floor slab damage may occur, even after remedial treatment of the subgrade soil.

4.3 Groundwater

Groundwater will influence any excavations extending below a depth of 8.5 feet. Groundwater below this depth will likely contribute to an unstable subgrade at the base of the overexcavation. A mud mat or crushed rock could be considered at the base of the overexcavation to create a stable working platform. A series of pumps can be used to remove the groundwater from the excavation prior to backfilling with select materials.

4.4 Shallow Foundations

Shallow spread footing foundations bearing in suitable existing fill, native lean clay, remediated fat clay, or newly placed low plastic structural fill are appropriate for support of the proposed structures. Based on the soils encountered during our exploration, shallow foundations can be sized for a maximum net allowable

bearing pressure of 2,000 pounds per square foot (psf) for continuous wall footings and isolated column footings. We anticipate that some localized areas of inadequate bearing materials may be encountered during construction; therefore, we recommend that an allowance be made in the construction budget for selected footing overexcavations.

Exterior footings and foundations in unheated areas of the greenhouse should be provided with at least 30 inches of soil cover for frost protection. Interior footings in heated areas can be located at nominal depths below the finished floor. For footings designed and constructed in accordance with our recommendations, total settlement should be less than 1-inch, and differential settlement between adjacent footings should be less than ¾-inch.

Special attention must be given to designing the foundations immediately adjacent to the existing improvements. It is advisable to place the foundations for the proposed addition at the same level as those of the existing building. If the footings of the new structures bear at a different elevation, either the new or existing footing walls, whichever are deeper, should be structurally checked to evaluate whether they could accommodate the external stresses imposed by the shallower adjacent existing structure or new footings. In spite of these precautions, some minor settlement of the existing building adjacent to the proposed structures should be expected. Accordingly, we recommend that construction joints be provided and other measures be taken, as needed, between the existing building and the proposed structures. Even so, small differential movements may occur and future leveling of the floor slab between the existing and new construction may be necessary.

4.5 Seismic Considerations

Ground shaking at the foundation of structures and liquefaction of the soil under the foundation are the principle seismic hazards to be considered in design of earthquake-resistant structures. Liquefaction occurs when a rapid buildup in water pressure, caused by the ground motion, pushes sand particles apart, resulting in a loss of strength and later densification as the water pressure dissipates. This loss of strength can cause bearing capacity failure, while the densification can cause excessive settlement. Potential earthquake damage can be mitigated by structural and/or geotechnical measures or procedures common to earthquake resistant design.

4.5.1 Design Earthquake

According to International Building Code (2018 edition) (IBC 2018), structures such as those proposed for this project are required to be designed to a design earthquake with a 2 percent Probability of Exceedance over a 50-year exposure period (i.e. a 2,475-year design earthquake). The design earthquake has a Moment Magnitude (Mw) of 7.7 and a Peak Ground Acceleration of 0.16g, as determined from data provided by the IBC 2018 and the United States Geological Survey National Seismic Hazard Mapping Project.

4.5.2 International Building Code Site Classification

Based on procedures outlined in the IBC 2018 and our geotechnical explorations for the subject site, including the borings through predominantly medium stiff near surface cohesive soil and the anticipated depth to bedrock, the site can be classified as Site Class C. Using the procedures outlined in Section 1613 of the IBC 2018, the calculated weighted average undrained shear strength (s_u) is in excess of the 2,000 psf required to be classified as Site Class C. Seismic design parameters for the site are as follows: $F_a = 1.30$, $F_v = 1.50$, $S_{DS} = 0.39$, and $S_{D1} = 0.16$. The Seismic Design Category for the site is C for Occupancy Categories I, II, or III.

4.5.3 Liquefaction Potential Analysis

The liquefaction potential analysis for the site was conducted using data from the field exploration and laboratory test results and the techniques outlined in the National Center for Earthquake Engineering (NCEER) Technical Report NCEER-97-0022.

Based on our analyses, the majority of the soils have sufficient strength and/or a plasticity index that make the threat of liquefaction minimal during the design earthquake.

While the amount of the seismically-induced settlement is dependent on the magnitude and distance from the seismic event, we estimate that the settlements from the design earthquake will be negligible so liquefaction mitigation techniques are not required.

4.6 Floor Slab

We recommend that the floor slab be designed using a modulus of subgrade reaction (k) of 150 pounds per square inch per inch of deflection if bearing on suitable existing fill, native lean clay, remediated fat clay, or newly placed low plastic structural fill. The floor slab should be supported on a minimum 4-inch-thick

layer of crushed stone. This will help to distribute concentrated loads and equalize moisture conditions beneath the slab.

It is generally preferable to maintain structural separation between the floor slab and the foundation walls and column pads using isolation joints. We also suggest that joints be placed in the floor slab on no more than 15-foot intervals in any direction. Such joints permit slight movements of the independent elements and help reduce random cracking that might otherwise be caused by restraint of shrinkage, slight rotations, heave, or settlement.

Where occupied space or moisture sensitive floor coverings are planned, we recommend a 6-mil-thick polyethylene sheeting be placed immediately beneath the floor slabs and above the crushed rock or gravel, to reduce the transfer of capillary moisture to the slabs. However, without careful attention to curing of the floor slabs, the polyethylene sheeting can cause excessive shrinkage cracking and "curling."

The precautions listed below should be followed for construction of slab-on-grade pads. These details will not reduce the amount of movement, but are intended to reduce potential damage should some settlement of the supporting subgrade take place. Some increase in moisture content is inevitable as a result of development and associated landscaping. However, extreme moisture content increases can be largely controlled by proper and responsible site drainage, building maintenance and irrigation practices.

- Cracking of slab-on-grade concrete is normal and should be expected. Cracking can occur not only as a result of heaving on compression of the supporting soil and/or bedrock material, but also as a result of concrete curing stresses. The occurrence of concrete shrinkage cracking, and problems associated with concrete curing may be reduced and/or controlled by limiting the slump of the concrete, proper concrete placement, finishing, and curing, and by the placement of crack control joints at frequent intervals, particularly where re-entrant slab corners occur. The American Concrete Institute recommends a maximum panel size (in feet) equal to approximately three times the thickness of the slab (in inches) in both directions. For example, joints are recommended at a maximum spacing of 12 feet based on having a 4-inch slab. SCI also recommends that the slab be independent of the foundation walls.

- Areas supporting slabs should be properly moisture conditioned and compacted. Backfill in all interior and exterior water and sewer line trenches should be carefully compacted to reduce the shear stress in the concrete extending over these areas.

Exterior slabs should be isolated from the building. These slabs should be reinforced to function as independent units. Movement of these slabs should not be transmitted to the building foundation or superstructure.

4.7 Below-Grade Walls

Below-grade walls required at this site may include retaining walls designed to accommodate surface grade changes around the structures and paved areas. The maximum toe pressure for below-grade walls should not exceed the bearing pressure previously given for continuous strip footings. Retaining walls may be designed with an ultimate coefficient of friction between the base of the concrete footing and the soil subgrade of 0.3.

Below-grade walls should also be designed to withstand lateral earth pressures caused by the weight of the backfill, including slopes behind the walls; and any surcharge, such as adjacent floor loads. We recommend the equivalent fluid unit weights tabulated below for lateral earth pressures, in pounds per cubic foot (pcf), be used in the design of below-grade walls. The indicated values assume that positive drainage is provided to prevent buildup of hydrostatic pressure. Expansive soils should not be used to backfill the wall excavations. Values for granular material should only be used if the granular backfill extends upwards and outwards the full height of the wall at a slope of 45 degrees or flatter from its base. In this case, exterior granular backfill should be capped with approximately 2 feet of cohesive soil to reduce the potential for surface water infiltration into the granular backfill. With clean granular backfill, filter fabric, such as Mirafi 140N, should be placed along the interface between the soil and granular backfill to reduce the potential for infiltration of the soil into the granular material.

Table 4.1 - Recommended Lateral Earth Pressures

Backfill Type	Equivalent Fluid Unit Weights	
	At-Rest Earth Pressures (pcf)	Active Earth Pressures (pcf)
Cohesive Soil	70	50
Granular Material (1-inch minus)	60	40
Free-Draining Granular Material (1-inch clean)	50	30

At-rest earth pressures should be used for restrained or fixed-head walls that are restricted from rotation, such as basement walls connected to floor joists or beams, or a wing wall attached to a basement wall. Active earth pressures should be used for free-head walls where the base remains fixed and deflection at the top of the wall of approximately 1-inch for each 10 feet of wall height is allowed, such as a retaining wall.

The above values are applicable when the surface of the backfill behind the wall is horizontal. Upward sloped or loaded backfill will result in increased values. In addition to lateral earth pressures, below-grade walls should be designed to resist any surcharge loads, including shallow building foundations and traffic. These surface loads can be modeled as uniform lateral loads, equivalent to one-half of the surface load, acting at the halfway point on the wall.

A passive soil resistance modeled by an equivalent fluid unit weight of 250 pcf may be used for native soil against the face of the exterior base or a key below the base of the wall. The upper 2 feet of soil backfilled against the exterior face of the walls and uncontrolled backfill soils should be ignored when calculating the lateral resistance. Lower passive pressure should be used if the ground surface slopes downward away from the face of the wall.

We recommend that all below-grade walls be provided with a drainage system. A minimum 4-inch diameter, perforated drainpipe should be used, and placed at foundation level. Granular drainage material, consisting of 1-inch clean crushed rock, classified as GP by ASTM D 2487-11, with less than 5 percent of the rock passing the No. 200 sieve, should be placed a minimum of 6 inches in all directions around the drainage pipe. Synthetic filter fabric, such as Mirafi 140N or equivalent, should encapsulate the drainpipe and granular drainage material. The pipe should be sloped to drain by gravity or through weepholes located on approximately 10-foot centers for above-grade retaining walls, or to a sump with a pump for below-grade walls where positive drainage by gravity cannot be achieved. Alternately, drainage can be provided directly through the weepholes without a drain pipe, provided that filter fabric is used or other measures are taken to prevent the granular backfill from migrating out through the weepholes. Any interior sumps must be isolated "watertight" from the interior subgrade to prevent the movement of moisture from the sump into the underlying soils.

When information is available regarding specific wall locations, configurations and heights, SCI should be retained to evaluate global stability for walls taller than 5 feet, based on developed strength parameters for the subsurface soils and backfill. At your request, we can provide the global stability study, or we can work with your wall designer to provide coordinated internal and global stability studies. These services are beyond our current scope.

4.8 Site Grading and Drainage

Positive site drainage should be provided to reduce surface water infiltration around the perimeter of the improvements and beneath the greenhouse's floor slab. All grades should be sloped away from the improvements. Roof and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill of the proposed structures.

Large trees and shrubs should be planted away from exterior footings as they may cause drying and shrinkage of the foundation soils and, with the passage of time, potentially detrimental settlement of the floor slab and foundations. A minimum distance of 20 feet or the mature tree's dripline, whichever is greater, is suggested.

We recommend that all final slopes have a maximum inclination of 3 horizontal to 1 vertical (3H:1V), and that a crest of at least 10 feet in width or a distance equivalent to the total height of the slope, whichever is less, be provided around the building before the surface slopes down and away. Cut slopes of less than 15 feet in total height and properly compacted fill slopes up to about 25 feet in total height should perform satisfactorily at this inclination, or flatter. We do not anticipate that steeper or taller slopes will be required. However, if they are proposed, the slopes should be brought to our attention and individually addressed and evaluated by SCI on a case-by-case basis.

4.9 Underground Utilities

Underground utilities can provide a pathway for water to migrate below the floor slab. Drain and utility pipes beneath floors should have tight joints to prevent leakage. If utility excavations are backfilled with free-draining granular materials, then cutoffs should be provided at the exterior walls to reduce the potential for water to migrate beneath the proposed structures. Impermeable cutoffs may consist of a 3-foot-long "plug" of cohesive soil or bentonite soil mix, or a 1-foot-long plug of lean concrete. Soil may be used for the balance of the backfill.

Except for individual service lines to the improvements that intersect foundations perpendicularly, below-grade utilities should not be located within the stress influence zone of the building foundations. Accordingly, below-grade utilities should be located outside a zone extending 45 degrees downward and outward from the edge of the footings.

4.10 Bio-Swales and Porous Pavements

Shallow bio-swales, approximately 2 to 3 feet in depth, and porous pavements will be constructed within the vicinity of I-1 and I-2. These hand auger borings encountered existing fill, consisting of lean clay with trace amounts of sand, gravel, and crushed brick, to the termination depth of 3 feet. Infiltration tests were conducted in I-1 and I-2 in general accordance with *Appendix D.1 of Maryland Stormwater Design Manual*, dated October 2000, as adopted by the State of Missouri for general stormwater management practices. Infiltration testing data is shown below in Table 4.2, below.

Table 4.2 – Infiltration Test Summary

Hand Auger	Approximate Ground Surface Elevation (feet)	Depth of Infiltration Test (feet)	Approximate Infiltration Test Elevation (feet)	Average Infiltration Rate (inches/hour)
I-1	521	3	518	20.5
I-2	518	3	515	1.5

A minimum required infiltration rate of 0.52 in/hr, as specified by the *Maryland Stormwater Design Manual*, was met at the test locations. It should be noted, that the infiltration rate measured at I-1 may be artificially raised because of the present variable rubble fill in the area. Where soils with less sand and gravel content are present, we anticipate significantly lower infiltration rates. Therefore, the value obtained from I-2, appears more representative of the soils encountered at the site.

We have assumed that the bio-swales are not designed with a permanent normal pool elevation. Based on the near surface soils encountered across the site, we anticipate that the basin bottom and embankments will consist of lean clay existing fill.

The upstream and downstream embankment slopes of the bio-swales should be no steeper than 3H:1V. We recommend that the crest be at least 8 feet wide to provide access for maintenance. The embankments of the bio-swales should consist of cohesive soils with a plasticity index (PI) of at least 20. The lean clay fill appears suitable for construction of the bio-swales. However, the fill material will vary between the borings. As such, SCI should observe the excavation for areas of unsuitable materials. Rocky, sandy, organic soils, or high silt-content soils are not suitable for the construction of bio-swale embankments because of their potential for erosion and piping.

Rock bedding should not be used for the outlet piping of the bio-swales. Instead, the outlet pipe should be placed on a cohesive soil subgrade, shaped to fit the pipe barrel, and the trench backfilled with properly compacted cohesive soil. Alternately, the trench can be backfilled to the springline of the pipe with lean concrete or flowable fill. Concrete anti-seepage collars should also be used to reduce seepage around the pipe.

5.0 SITE DEVELOPMENT AND CONSTRUCTION CONSIDERATIONS

5.1 Site Preparation

Within the construction area, existing structures and related below-grade components to be abandoned must be properly demolished and the debris removed from the site. Existing foundation walls and footings, floor slabs, pavements, cisterns, and utilities, as well as their associated backfill, should be removed from below and at least 10 feet beyond the proposed footprint for the proposed improvements. As an exception, deep utilities may be grouted in-place rather than being removed. However, the existing backfill associated with deep utilities should be removed and replaced or recompacted. Outside this area, existing foundation walls and footings deeper than 3 feet below the proposed subgrade may be left in place. Excavations resulting from the removal of existing site improvements should be backfilled with properly compacted fill.

Areas to be cut, or to receive fill, should be stripped of any surface vegetation or organic topsoil. The stripping's should be removed and stockpiled for later placement in landscaped or common ground areas, as appropriate. Topsoil can be reused as fill, if thoroughly mixed with other, acceptable, non-organic fill materials, as approved by SCI.

After stripping and removal of the existing improvements, the site should be proofrolled by systematically passing over the subgrade to achieve complete coverage with proper compaction or loaded construction equipment, and observing the subgrade for pockets of excessively soft, wet or disturbed soil, or otherwise unacceptable materials. **In particular, soft areas within the existing fill to remain in place should be identified during this process.** Soft areas or otherwise unacceptable materials, if encountered, should be removed and replaced with structural fill or stabilized prior to placing additional fill.

5.2 Fill Materials and Compaction

Prior to fill placement and compaction, the upper 8 inches of the exposed subgrade should be scarified, moisture conditioned and recompacted. Structural fill should be placed in maximum 8-inch-thick loose lifts and mechanically compacted in accordance with Table 5.1, below. We recommend that any fill placed in building areas have a LL less than 45 and a PI less than 25. If higher plasticity soils are placed within 3 feet of the floor slab subgrade, or 2 feet of the bottom of the footings, then remediation will be required. Acceptable non-organic fill soils include materials designated CL, ML, CL-ML, SP, SW, GP, and GW by ASTM D 2487-11. Pavement broken to less than 4 inches in maximum dimension may be used as fill, if properly blended with acceptable soil and placed as approved by SCI.

Table 5.1 - Typical Compaction Requirements for Fill

Material Tested	Proctor Type	Minimum Percentage Dry Density
Structural Fill (Cohesive)	Modified (ASTM D 1557)	90
	Standard (ASTM D 698)	95
Structural Fill (Granular)	Modified	95
	Standard	98
Landscaped Areas (non-load bearing)	Modified	88
	Standard	92
Utility Trench Backfill	Modified	90
	Standard	95

Prior to compaction, the soil may require moisture adjustment. During warm weather, moisture reduction can generally be accomplished by disking or otherwise aerating the soil. When air drying is not feasible, a moisture reducing chemical additive, such as hydrated lime, could be incorporated into the soil. During dry weather, some addition of moisture may be required to facilitate compaction. This should also be done in a controlled manner using a tank truck with a spray bar. The moistened soil should be thoroughly blended with a disk or pulverizer to produce a uniform moisture content. If construction is performed during the winter season, fill materials should be carefully observed to see that no frozen soil is placed as fill or remains in the base materials upon which fill is placed.

Backfill for foundation walls may consist of lean clay, one-inch minus crushed limestone, or controlled low strength material. We advise performing field density tests on at least every other lift to monitor compaction. As an alternate, we suggest using one-inch clean crushed limestone to provide improved drainage and to reduce lateral pressures on the walls. Due to a slight risk of migration of soil fines into the clean rock, a synthetic filter fabric, such as Mirafi 140N or equivalent, should be placed between the soil face of the excavation and the crushed limestone. If clean rock is used, it may be placed in 2-foot-thick lifts and tamped or tracked to achieve adequate densification. Exterior clean rock backfill should be capped with cohesive soil to reduce the potential for surface water infiltration.

Backfill placed next to walls should be compacted with hand operated equipment and not large self-propelled or machine operated equipment, which could result in potential overcompaction and higher lateral pressures. Compaction should be reduced within approximately one-foot of the walls, and the walls should be observed periodically for signs of movement. If movement is detected, it may be necessary to provide bracing and/or change backfill procedures.

In addition to the minimum density requirements listed above, the soil must be stable, i.e., not "pumping" or rutting excessively under construction traffic, prior to placing additional fill or constructing foundations, floor slabs, or pavements. Field density tests should be performed on each lift of fill to document that proper compaction is achieved.

5.3 Shallow Foundation Excavations

SCI should observe all footing and floor slab excavations for problem areas, such as soft zones or areas of desiccated lean clay, fat clay or unsuitable existing fill, prior to placing concrete. Excessive disturbance of siltier soils in footing excavations should be avoided and could complicate construction. The potential for such disturbance will increase during wetter times of the year. Footing excavations that have been excessively disturbed should be overdeepened to approved undisturbed soils. Overexcavation and replacement with structural fill should be performed where inadequate bearing materials are present in footing excavations.

During construction, existing footings must not be undercut, i.e. no excavation should encroach within an area extending 45 degrees downward and outward from the outside edge of the existing foundations. If this is required, then SCI should be retained to provide specific recommendations to maintain support of the existing foundations and lateral support of the excavations.

The base of all excavations should be clean, free of loose soil or uncompacted fill, relatively dry, and maintained near their optimum moisture content. Excavations should be protected from extreme temperatures, precipitation, and construction disturbances. To reduce the possibility of desiccation or saturation of the foundation soils, we recommend that the concrete be placed as soon as possible after excavations are made.

Groundwater is not anticipated to be encountered in the footing excavations but could be encountered if excavations extend below a depth of 8.5 feet. However, in most situations, small amounts of groundwater seepage into the excavations can be handled by means of gravity ditching and a sump pump. If greater flows are experienced, SCI should be retained to provide additional consultation.

5.4 Subgrade Considerations

The floor slab subgrade may be subjected to construction traffic and exposure to weather for an extended period and significant problems may be incurred. It may be necessary to proofroll the subgrade, in both cut and fill areas, and recompact the subgrade immediately prior to placing base rock for the floor slab. In addition, subgrades covered with base rock may be very slow to dry if precipitation occurs after placing the base rock. Therefore, we recommend that proofrolling and placement of the base rock be done as close to the time of pouring the floor slab as is practical. Proofroll passes should be limited, particularly on silty subgrades, to reduce the potential for pumping of moisture from deeper within the soil profile.

Special measures may be required to facilitate construction during wet or cold weather, or where excessive areas of soft soils are identified. These measures may include, but are not limited to, the addition of lime to the subgrade soils for drying purposes, or the removal of soft spongy soils and their replacement with crushed limestone. Soft areas should be selectively undercut and backfilled with properly compacted cohesive soil. A geotextile, such as Mirafi 600X, or geogrid, such as Tensar TriAx-140, or equivalents, may be used to help stabilize particularly soft areas. Where possible, the subgrade should be sloped to provide drainage.

5.5 Excavation Bracing Requirements

In the *Federal Register*, Volume 54, No. 209 (October 1989), the United States Department of Labor, Occupational Safety and Health Administration (OSHA) amended its "Construction Standards for Excavations, 29 CFR, Part 1926, Subpart P." This document was issued to provide for the safety of workers entering excavations, including utility trenches, basements, footings, and others. All operations should be performed under the supervision of qualified site personnel in accordance with OSHA regulations.

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. The contractor’s “responsible person”, as defined in 29 CFR Part 1926,

should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, sloped inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations.

SCI is providing this information solely as a service to our client. SCI does not assume responsibility for construction site safety or the contractor's or other party's compliance with local, state, and federal safety or other regulations.

5.6 Erosion Control and Land Disturbance Monitoring Program

Appropriate erosion and sediment control measures, such as proper contouring during site grading activities, the installation of siltation fences, and/or inlet protection, should be used during construction to keep eroded materials from being carried onto adjacent properties or waterbodies. Depending on the length of time the subgrade is exposed and the amount of siltation that occurs, it may be necessary to periodically remove materials collected by the sediment control systems. Timely sodding and/or seeding of sloped surfaces will help reduce this potential problem.

SCI recommends following the procedures detailed in the Stormwater Pollution Prevention Plan (SWPPP). Any site disturbing more than one acre of ground must obtain a Land Disturbance Permit from the MDNR. As part of the permit compliance procedures, weekly and rain-event site observations must be performed to document the changing site conditions and maintenance of control measures.

6.0 CONSTRUCTION MONITORING PROGRAM

The following list summarizes SCI's recommendations for a construction monitoring program. These services are recommended to provide quality assurance in assessing design assumptions and to document earth-related construction procedures for compliance with plans, specifications, and good engineering practice. SCI should be retained to:

- **Review the final development and grading plans to assess the need for additional or revised recommendations or additional exploration;**
- Participate in a formal preconstruction meeting with the Owner's Representative, Civil Engineer, and Contractor, prior to construction at the site;
- Observe site preparation activities prior to construction, including removal of the existing improvements, stripping and proofrolling;

- Conduct and document weekly and rain-event observations at the site, maintain and update on-site paperwork, and provide submittals required by the SWPPP and Land Disturbance Permit;
- Assess the suitability of potential fill materials, including both on-site and off-site sources;
- Monitor placement and compaction of structural fill and backfill;
- Observe foundation excavations and the floor slab subgrade to assess the impact of desiccated lean clay, potential fat clay, and existing fill, and to recommend the extent of remedial measures;
- Observe footing excavations for adequacy of bearing materials;
- Observe the floor slab subgrade prior to placing base rock;
- Observe backfilling of below-grade utility excavations;
- Observe pavement subgrade preparation and provide observation and testing services for the base course and pavement section;
- Check the thickness of pavement sections and, for asphaltic concrete, its density; and
- Provide quality assurance testing of structural concrete and pavement materials.

7.0 LIMITATIONS

The recommendations provided herein are for the exclusive use of Oates Associates, Inc. and Missouri School for the Blind, and their respective successors and assigns. It is imperative that SCI be contacted by any third-party interests to evaluate the applicability of this report relative to use by anyone other than Oates Associates, Inc. and Missouri School for the Blind, and their respective successors and assigns. Our recommendations are specific only to the project described and are not meant to supersede more stringent requirements of local ordinances. They are based on subsurface information obtained at two specific CPTu sounding locations and five hand auger borings within the project area; our understanding of the project as presented in Section 2.0, “Site and Project Description”; and geotechnical engineering practice consistent with the standard of care. No other warranty is expressed or implied. SCI should be contacted if conditions encountered are not consistent with those described.

We should also be provided with a set of final development plans, once they are available, to review whether our recommendations have been understood and applied correctly, and to assess the need for additional exploration or analysis. Failure to provide these documents to SCI may nullify some or all of the recommendations provided herein. In addition, any changes in the planned project or changed site conditions may require revised or additional recommendations on our part.

The final part of our geotechnical service should consist of direct observation during construction, to observe that conditions actually encountered are consistent with those described in this report, and to assess the appropriateness of the analyses and recommendations contained herein. SCI cannot assume responsibility or liability for the adequacy of its recommendations without being retained to observe construction.



PROJECT NAME: MSB NATURE PARK (E1703-01) ST. LOUIS, MISSOURI				GENERAL NOTES/LEGEND USGS TOPOGRAPHIC MAP WEBSTER GROVES, MISSOURI QUADRANGLE GRANITE CITY, ILLINOIS - MISSOURI QUADRANGLE CAHOKIA, ILLINOIS - MISSOURI QUADRANGLE DATED 1998 10' CONTOURS STREET MAP HTTP://GOTO.ARCGISONLINE.COM/MAPS/WORLD_STREET_MAP
VICINITY AND TOPOGRAPHIC MAP				
DRAWN BY: RCV	DATE: 08/2019	JOB NUMBER: 2015-0067.10		FIGURE: 1
CHECKED BY: JAM				



GENERAL NOTES/LEGEND

AERIAL PHOTOGRAPH OBTAINED FROM ARCGIS ONLINE, WORLD IMAGERY.

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME

MSB NATURE PARK (E1703-01)
ST. LOUIS, MISSOURI

AERIAL PHOTOGRAPH

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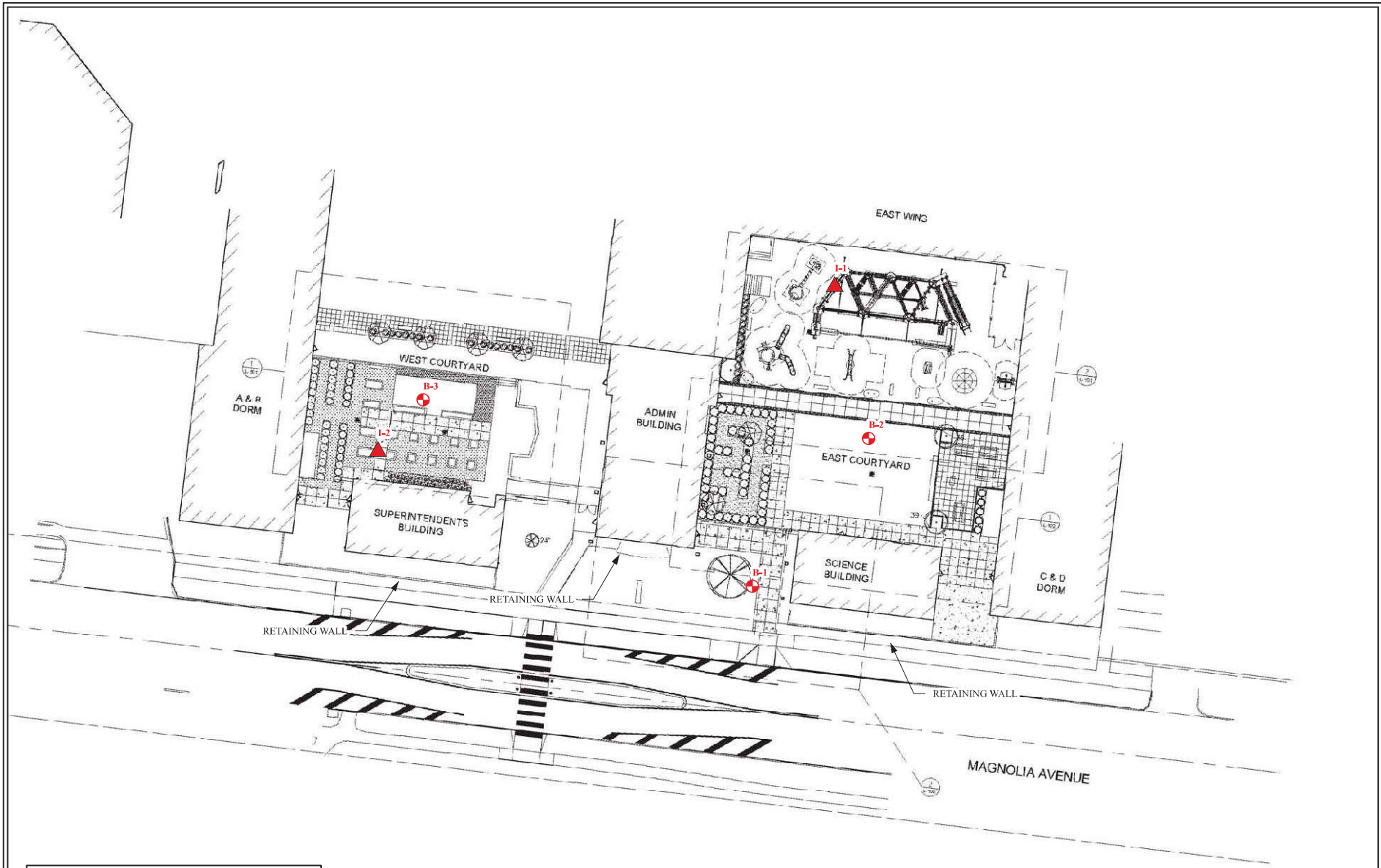
JOB NUMBER 2015-0067.10

DATE 08/2019

DRAWN BY RCV

CHECKED BY JAM

FIGURE 2



GENERAL NOTES/LEGEND

UNDATED PLAN PROVIDED 3/25/2019 BY OATES ASSOCIATES

DIMENSIONS AND LOCATIONS ARE APPROXIMATE; ACTUAL MAY VARY. DRAWING SHALL NOT BE USED OUTSIDE THE CONTEXT OF THE REPORT FOR WHICH IT WAS GENERATED.

PROJECT NAME
MSB NATURE PARK (E1703-01)
ST. LOUIS, MISSOURI

SITE PLAN

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JOB NUMBER 2015-0067.10
DATE 08/2019
DRAWN BY RCV
CHECKED BY JAM
FIGURE 3

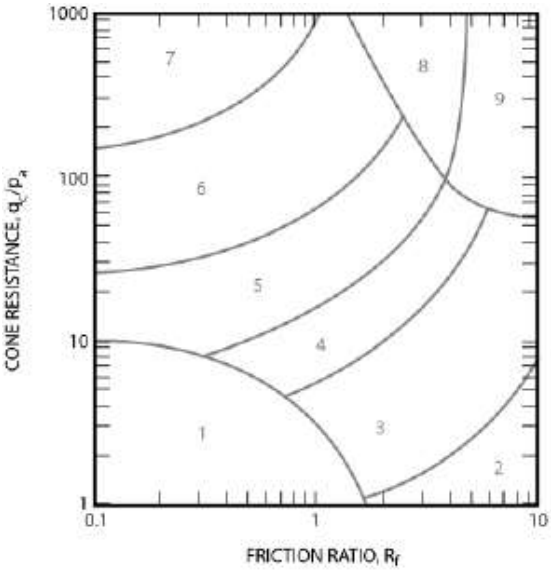
Appendix A

USE and UNDERSTANDING of CPTu Logs

The CPTu logs show the corrected Tip Resistance (q_t), Friction (f_s), Porewater Pressure (U_2), SPT N_{60} correlation (N_{60}), and the Soil Behavior interpretation results. The corrected cone tip resistance (q_t) is measured as the maximum force over the projected area of the cone tip. It is a point stress related to the bearing capacity of the soil. The measured uncorrected tip value (q_c) must be corrected for porewater pressure effects (Lunne et al, 1997), especially in clays and silts where porewater pressures typically vary greatly from hydrostatic. The sleeve friction (fs) is used as a measure of soil type and can be expressed by friction ratio (R_F) which is used in the soil behavior classification. The u_2 position element is required for the measurement of penetration porewater pressures and the correction of tip resistance. Calculations of q_t, R_F, and the SPT N_{60} calculation are discussed below.

The estimated stratigraphic profiles included in the CPTu logs are based on relationships between q_t, f_s, and U2 as shown graphically in the figure below.

Non-normalized CPT Soil Behavior Type (SBT) chart



Z	*Soil Behavior Type*
1	*Sensitive, fine grained*
2	*Organic soils - clay*
3	*Clay – silty clay to clay*
4	*Silt mixtures – clayey silt to silty clay*
5	*Sand mixtures – silty sand to sandy silt*
6	*Sands – clean sand to silty sand*
7	*Gravelly sand to dense sand*
8	*Very stiff sand to clayey sand**
9	*Very stiff fine grained**

** Heavily overconsolidated or cemented*

P_a = atmospheric pressure = 100 kPa = 1 tsf

Derived Values from CPT

Corrected cone resistance: $q_t = q_c + u_2(1\text{-}a)$

Friction ratio: $R_f = (f_s/q_t) \times 100\%$

$$\frac{(q_t/p_a)}{N_{60}} = 8.5 \times \left(1 - \frac{I_c}{4.6}\right)$$

Where $I_c = ((3.47 - \log Q_{t1})2 + (\log R_F + 1.22)2)0.5$
And $Qt_n = ((q_t - sv_o)/p_a) \times (p_a/(s'v_o)n$, and
recalculate I_c, then iterate for n:

$$n = 0.381 \times I_c + 0.05 \times \left(\frac{s'_{vo}}{p_a}\right) - 0.15$$

Iterate until the change in n, $\Delta_n < 0.01$

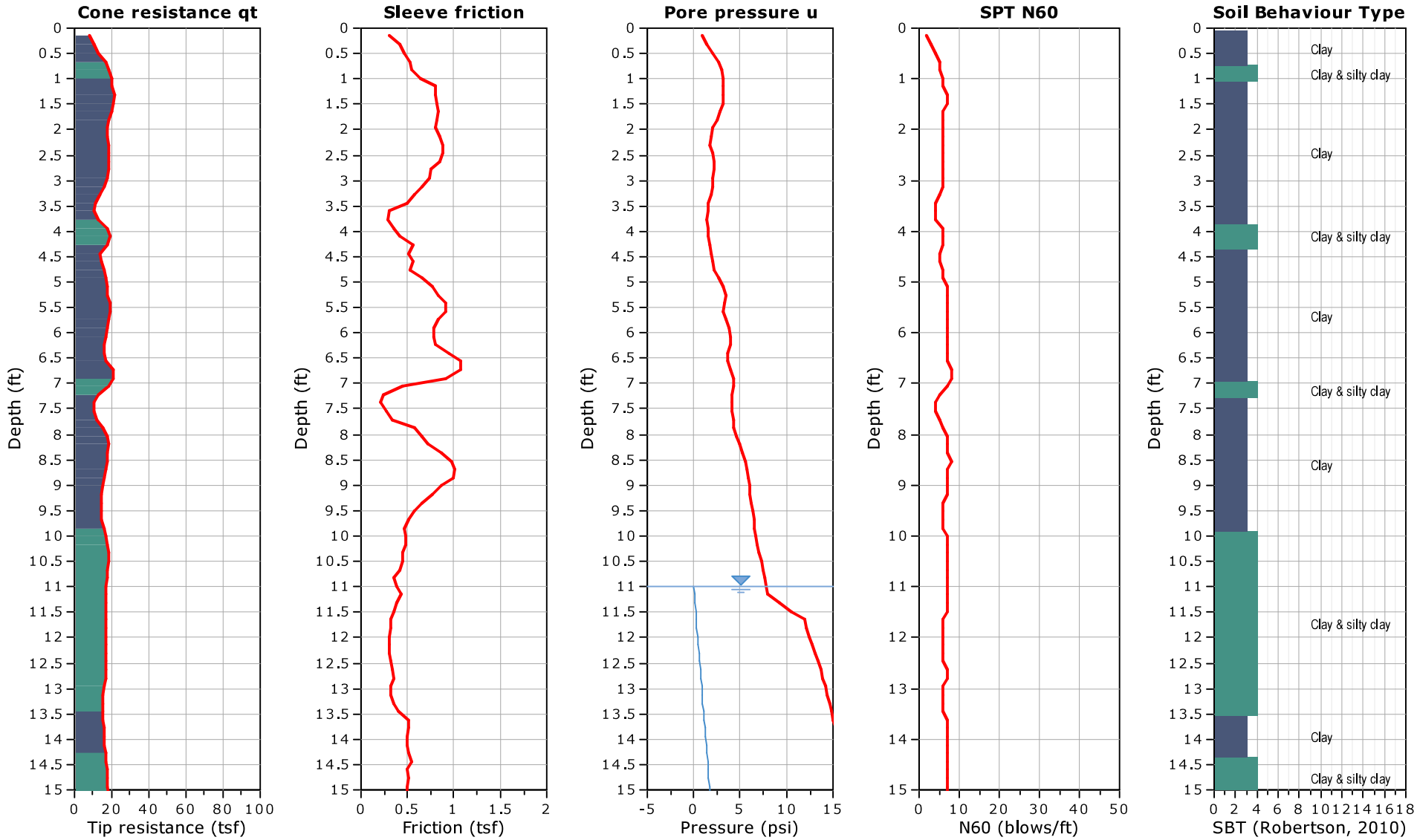
Equivalent SPT N60, (blows/ft) Lunne et al. (1997)

SCI Engineering, Inc.
650 Pierce Boulevard, O'Fallon, Illinois 62269
Geotechnical Engineers
www.sciengineering.com

CPT: B-1

Project: **MSB Nature Park (E1703-01): 2015-0067.10**
Location: **St. Louis, Missouri**

Total depth: 15.09 ft, Date: 5/14/2019
Surface Elevation: 520.00 ft

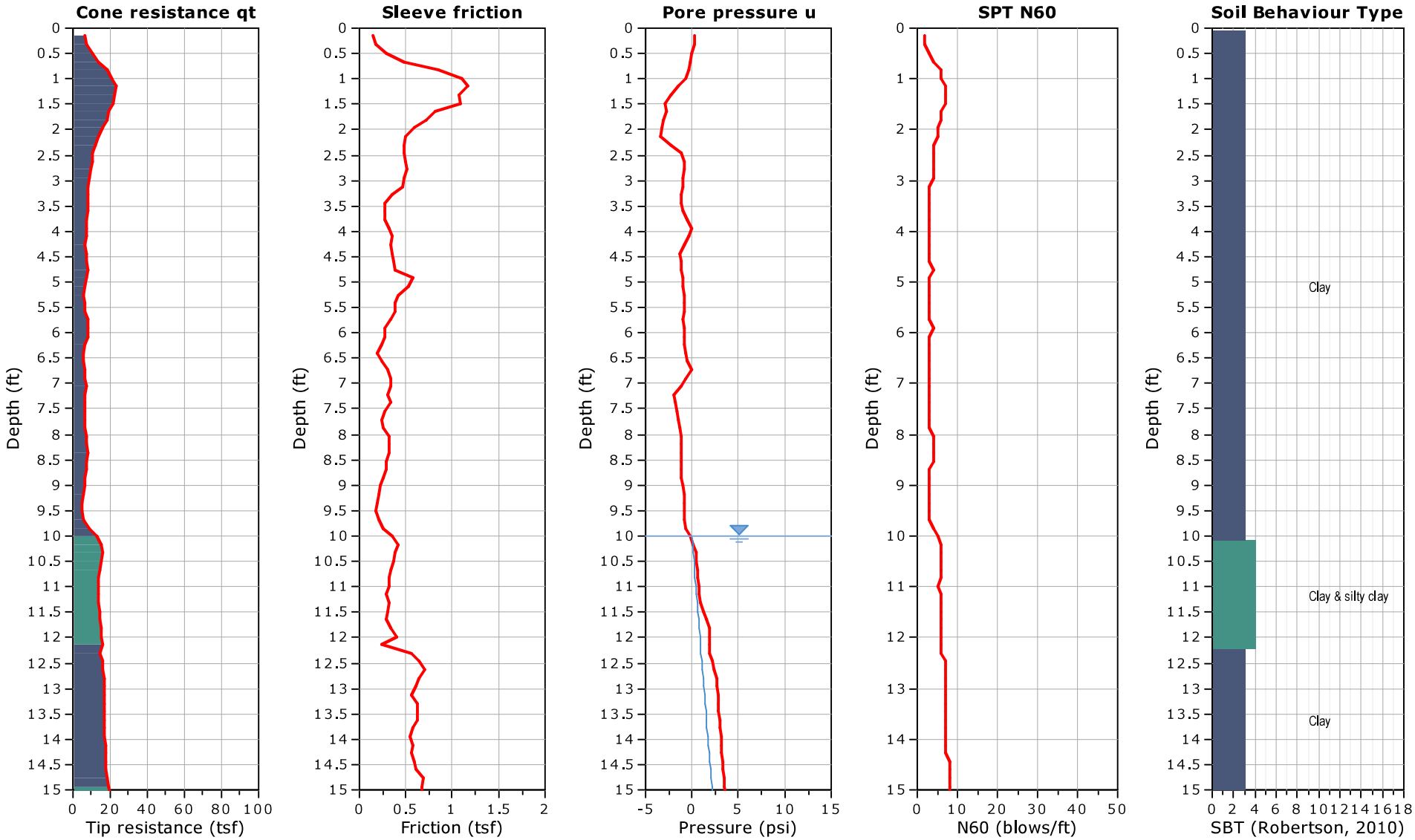


SCI Engineering, Inc.
650 Pierce Boulevard, O'Fallon, Illinois 62269
Geotechnical Engineers
www.sciengineering.com

CPT: B-2

Project: **MSB Nature Park (E1703-01): 2015-0067.10**
Location: **St. Louis, Missouri**

Total depth: 15.09 ft, Date: 5/14/2019
Surface Elevation: 520.00 ft



Appendix B

SCI ENGINEERING, INC.
130 Point West Boulevard
St. Charles, Missouri 63301
636-949-8200
www.sciengineering.com

BORING LOG LEGEND AND NOMENCLATURE

Depth is in feet below ground surface. **Elevation** is in feet mean sea level, site datum, or as otherwise noted.

Sample Type

- **SS** Split-spoon sample, disturbed, obtained by driving a 2-inch-O.D. split-spoon sampler (ASTM D 1586).
- **NX** Diamond core bit, nominal 2-inch-diameter rock sample (ASTM D 2113).
- **ST** Thin-walled (Shelby) tube sample, relatively undisturbed, obtained by pushing a 3-inch-diameter, tube (ASTM D 1587).
- **CS** Continuous sample tube system, relatively undisturbed, obtained by split-barrel sampler in conjunction with auger advancement.
- **SV** Shear vane, field test to determine strength of cohesive soil by pushing or driving a 2-inch-diameter vane, and then shearing by torquing soil in existing and remolded states (ASTM D 2573).
- **BS** Bag sample, disturbed, obtained from cuttings.

Recovery is expressed as a ratio of the length recovered to the total length pushed, driven, cored.

Blows Numbers indicate blows per 6 inches of split-spoon sampler penetration when driven with a 140-pound hammer falling freely 30 inches. The number of total blows obtained for the second and third 6-inch increments is the N value (Standard Penetration Test or SPT) in blows per foot (ASTM D 1586). Practical refusal is considered to be 50 or more blows without achieving 6 inches of penetration, and is expressed as a ratio of 50 to actual penetration, e.g., 50/2 (50 blows for 2 inches).

For analysis, the N value is used when obtained by a cathead and rope system. When obtained by an automatic hammer, the N value may be increased by a factor of 1.3.

Vane Shear Strength is expressed as the peak strength (existing state) / the residual strength (remolded state).

Description indicates soil constituents and other classification characteristics (ASTM D 2488) and the Unified Soil Classification (ASTM D 2487). Secondary soil constituents (expressed as a percentage) are described as follows:

Trace	<5
Few	5-15
With	>15-30

Stratigraphic Breaks may be observed or interpreted, and are indicated by a dashed line. Transition between described materials may be gradual.

Laboratory Test Results

- Natural moisture content (ASTM D 2216) in percent.
- Dry density in pounds per cubic foot (pcf).
- Hand penetrometer value of apparently intact cohesive sample in kips per square foot (ksf).
- Unconfined compressive strength (ASTM D 2166) in kips per square foot (ksf).
- Liquid and Plastic Limits (ASTM D 4318) in percent.

RQD (Rock Quality Designation) is the ratio between the total length of core segments 4 inches or more in length and the total length of core drilled. RQD (expressed as a percentage) indicates insitu rock quality as follows:

Excellent	90 to 100
Good	75 to 90
Fair	50 to 75
Poor	25 to 50
Very Poor	0 to 25

HAND AUGER LOG

PROJECT MSB Nature Park (E1703-01) **BORING NUMBER** B-1
LOCATION St. Louis, Missouri **SHEET** 1 **of** 1
DRILLER SCI Engineering, Inc. **PROJECT NO.** 2015-0067.10
EQUIPMENT Hand Auger **ELEVATION** 520± **DATE DRILLED** 05/16/19

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	FIELD VANE COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	ELEVATION (ft)
	1	BS	FILL: Brown, lean clay, trace fine sand, trace roots			26							519
	2	BS				21							
	3	BS	LEAN CLAY (CL): Brown, trace fine sand			24							
3	4	BS				25							516
	5	BS				20							
			Hand auger terminated at 5 feet.										
6													513
9													510
12													507
15													504
18													501

WATER LEVEL:

X	NONE OBSERVED WHILE DRILLING
	ft WHILE DRILLING
	ft ___ HRS AFTER DRILLING
	ft ___ DAYS AFTER DRILLING

REMARKS:

HAND AUGER LOG

PROJECT MSB Nature Park (E1703-01) **BORING NUMBER** B-2
LOCATION St. Louis, Missouri **SHEET** 1 **of** 1
DRILLER SCI Engineering, Inc. **PROJECT NO.** 2015-0067.10
EQUIPMENT Hand Auger **ELEVATION** 520± **DATE DRILLED** 05/16/19

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	FIELD VANE COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	ELEVATION (ft)
	1	SS	FILL: Brown, lean clay, trace fine sand, trace fine gravel, trace roots			22							519
	2	SS				22							
	3	SS				29							
3	4	SS	LEAN CLAY (CL): Brown, trace fine sand			27							516
	5	SS				27							
			Hand auger terminated at 5 feet.										
6													513
9													510
12													507
15													504
18													501

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
_____ ft WHILE DRILLING
_____ ft ___ HRS AFTER DRILLING
_____ ft ___ DAYS AFTER DRILLING

REMARKS:

HAND AUGER LOG

PROJECT MSB Nature Park (E1703-01) **BORING NUMBER** B-3
LOCATION St. Louis, Missouri **SHEET** 1 **of** 1
DRILLER SCI Engineering, Inc. **PROJECT NO.** 2015-0067.10
EQUIPMENT Hand Auger **ELEVATION** 518± **DATE DRILLED** 05/14/19

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	FIELD VANE COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	ELEVATION (ft)
	1	BS	2" TOPSOIL FILL: Brown, lean clay, trace fine sand, trace roots			23					49		
	2	BS	No roots			23				4.9			516
	3	BS				25				5.8			
3	4	BS				24				10.4			
	5	BS	Trace crushed brick			25				2.6			513
	6	BS	LEAN CLAY (CL): Brown, trace fine sand			27				4.2	46		
6	7	BS				27				4.8			
	8	BS				27				8.4			510
	9	BS	Becomes gray, with organics			32				6.6			
9	10	BS	No organics			30				5.1			
			Hand auger terminated at 10 feet.										507
12													
													504
15													
													501
18													

WATER LEVEL:

_____ NONE OBSERVED WHILE DRILLING
8.5 ft WHILE DRILLING
_____ ft ___ HRS AFTER DRILLING
_____ ft ___ DAYS AFTER DRILLING

REMARKS:

HAND AUGER LOG

PROJECT MSB Nature Park (E1703-01) **BORING NUMBER** I-1
LOCATION St. Louis, Missouri **SHEET** 1 **of** 1
DRILLER SCI Engineering, Inc. **PROJECT NO.** 2015-0067.10
EQUIPMENT Hand Auger **ELEVATION** 521± **DATE DRILLED** 05/14/19

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	FIELD VANE COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	ELEVATION (ft)
	1	BS	FILL: Brown, lean clay, trace fine sand, trace fine roots			24							
	2	BS				21							519
	3	BS				25							
3			Hand auger terminated at 3 feet.										
													516
6													
													513
9													
													510
12													
													507
15													
													504
18													

WATER LEVEL:

- X NONE OBSERVED WHILE DRILLING
- ____ ft WHILE DRILLING
- ____ ft ____ HRS AFTER DRILLING
- ____ ft ____ DAYS AFTER DRILLING

REMARKS:

HAND AUGER LOG

PROJECT MSB Nature Park (E1703-01) **BORING NUMBER** I-2
LOCATION St. Louis, Missouri **SHEET** 1 **of** 1
DRILLER SCI Engineering, Inc. **PROJECT NO.** 2015-0067.10
EQUIPMENT Hand Auger **ELEVATION** 518± **DATE DRILLED** 05/14/19

DEPTH (ft)	SAMPLE NUMBER	SAMPLE TYPE	DESCRIPTION (UNIFIED SOIL CLASSIFICATION)	GRAPHIC	SEE REMARK NO.	LABORATORY TEST RESULTS: MOISTURE CONTENT (%)	DRY DENSITY (pcf)	HAND PENETROMETER (ksf)	UNCONFINED COMPRESSIVE STRENGTH (ksf)	FIELD VANE COMPRESSIVE STRENGTH (ksf)	LIQUID LIMIT	PLASTICITY INDEX	ELEVATION (ft)
	1	BS	FILL: Brown, lean clay, trace fine sand, trace fine roots			26							
	2	BS				25							516
	3	BS	Trace crushed brick, trace fine to coarse gravel			22							
3			Hand auger terminated at 3 feet.										513
6													510
9													507
12													504
15													501
18													

WATER LEVEL:

X	NONE OBSERVED WHILE DRILLING
	ft WHILE DRILLING
	ft ___ HRS AFTER DRILLING
	ft ___ DAYS AFTER DRILLING

REMARKS:

Important Information about Your

Geotechnical Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

Geotechnical Services Are Performed for Specific Purposes, Persons, and Projects

Geotechnical engineers structure their services to meet the specific needs of their clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared *solely* for the client. No one except you should rely on your geotechnical engineering report without first conferring with the geotechnical engineer who prepared it. *And no one — not even you* — should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report Is Based on A Unique Set of Project-Specific Factors

Geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the client's goals, objectives, and risk management preferences; the general nature of the structure involved, its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless the geotechnical engineer who conducted the study specifically indicates otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed structure,
- composition of the design team, or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project changes—even minor ones—and request an assessment of their impact. *Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.*

Subsurface Conditions Can Change

A geotechnical engineering report is based on conditions that existed at the time the study was performed. *Do not rely on a geotechnical engineering report* whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. *Always* contact the geotechnical engineer before applying the report to determine if it is still reliable. A minor amount of additional testing or analysis could prevent major problems.

Most Geotechnical Findings Are Professional Opinions

Site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. Geotechnical engineers review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ—sometimes significantly—from those indicated in your report. Retaining the geotechnical engineer who developed your report to provide construction observation is the most effective method of managing the risks associated with unanticipated conditions.

A Report's Recommendations Are *Not* Final

Do not overrely on the construction recommendations included in your report. *Those recommendations are not final,* because geotechnical engineers develop them principally from judgment and opinion. Geotechnical engineers can finalize their recommendations only by observing actual

subsurface conditions revealed during construction. *The geotechnical engineer who developed your report cannot assume responsibility or liability for the report's recommendations if that engineer does not perform construction observation.*

A Geotechnical Engineering Report Is Subject to Misinterpretation

Other design team members' misinterpretation of geotechnical engineering reports has resulted in costly problems. Lower that risk by having your geotechnical engineer confer with appropriate members of the design team after submitting the report. Also retain your geotechnical engineer to review pertinent elements of the design team's plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having your geotechnical engineer participate in prebid and preconstruction conferences, and by providing construction observation.

Do Not Redraw the Engineer's Logs

Geotechnical engineers prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in a geotechnical engineering report should *never* be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable, *but recognize that separating logs from the report can elevate risk.*

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, *but* preface it with a clearly written letter of transmittal. In that letter, advise contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with the geotechnical engineer who prepared the report (a modest fee may be required) and/or to conduct additional study to obtain the specific types of information they need or prefer. A prebid conference can also be valuable. *Be sure contractors have sufficient time* to perform additional study. Only then might you be in a position to give contractors the best information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering is far less exact than other engineering disciplines. This lack of understanding has created unrealistic expectations that have led to disappointments, claims, and disputes. To help reduce the risk of such outcomes, geotechnical engineers commonly include a variety of explanatory provisions in their reports. Sometimes labeled "limitations" many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The equipment, techniques, and personnel used to perform a *geoenvironmental* study differ significantly from those used to perform a *geotechnical* study. For that reason, a geotechnical engineering report does not usually relate any geoenvironmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated environmental problems have led to numerous project failures.* If you have not yet obtained your own geoenvironmental information, ask your geotechnical consultant for risk management guidance. *Do not rely on an environmental report prepared for someone else.*

Obtain Professional Assistance To Deal with Mold

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts of mold from growing on indoor surfaces. To be effective, all such strategies should be devised for the *express purpose* of mold prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional mold prevention consultant. Because just a small amount of water or moisture can lead to the development of severe mold infestations, a number of mold prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of the geotechnical engineering study whose findings are conveyed in this report, the geotechnical engineer in charge of this project is not a mold prevention consultant; ***none of the services performed in connection with the geotechnical engineer's study were designed or conducted for the purpose of mold prevention. Proper implementation of the recommendations conveyed in this report will not of itself be sufficient to prevent mold from growing in or on the structure involved.***

Rely, on Your ASFE-Member Geotechncial Engineer for Additional Assistance

Membership in ASFE/The Best People on Earth exposes geotechnical engineers to a wide array of risk management techniques that can be of genuine benefit for everyone involved with a construction project. Confer with your ASFE-member geotechnical engineer for more information.

ASFE
THE BEST PEOPLE ON EARTH

8811 Colesville Road/Suite G106, Silver Spring, MD 20910
Telephone: 301/565-2733 Facsimile: 301/589-2017
e-mail: info@asfe.org www.asfe.org

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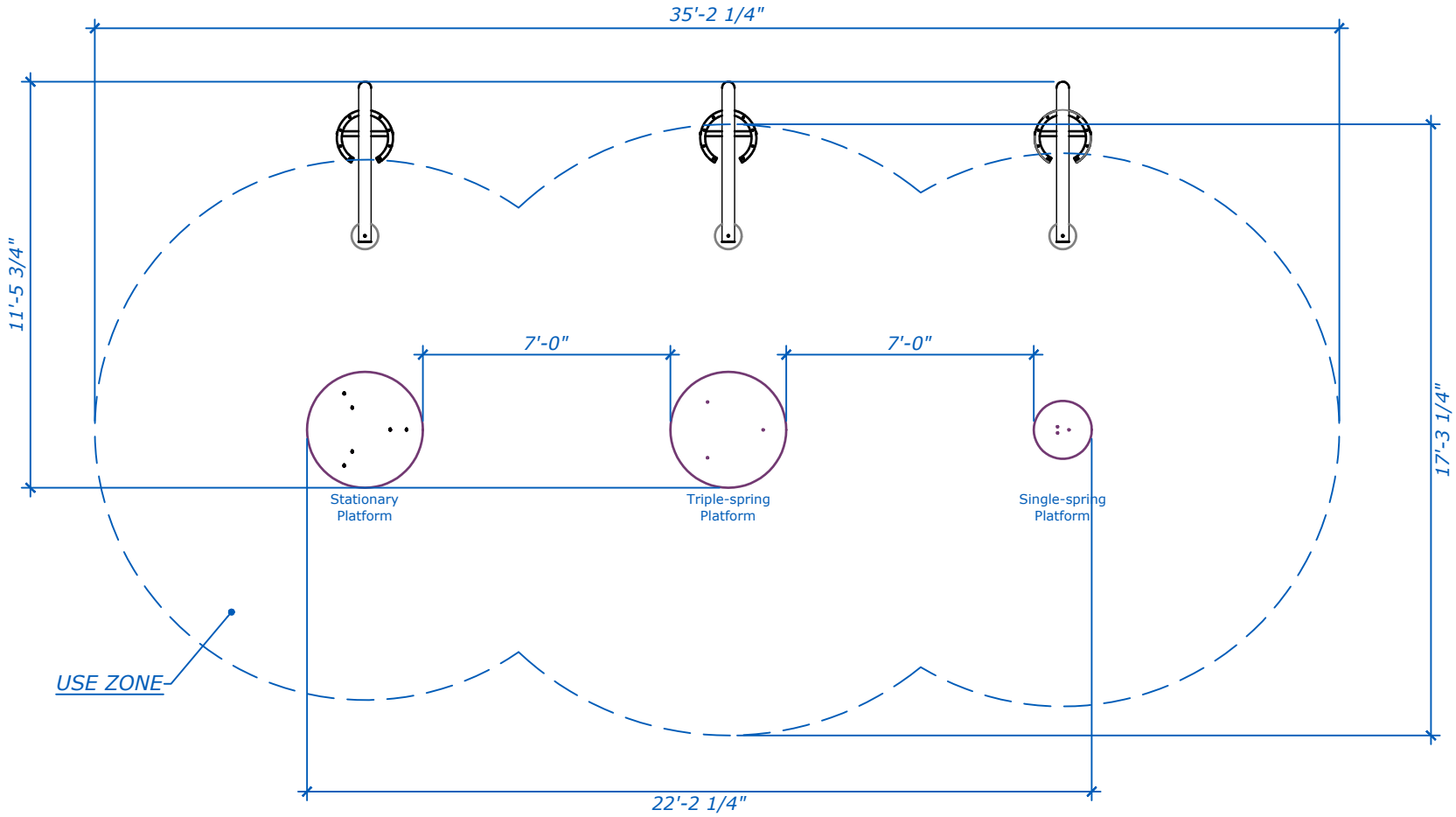
APPENDIX 4

PLAYGROUND EQUIPMENT PRODUCT INFORMATION
[APPROVED SOLE SOURCE ITEMS]

Goal Challenge

BY GORIC

PLAN



The Goal Challenge is not playground equipment and therefore does not conform to the ASTM-F1487 use zone requirements for standing/rocking equipment. Nor does it fit within the ASTM-F3101 for outdoor fitness equipment. However, based on these standards, it is our professional opinion that at least 7' between the platforms is sufficient. This conclusion is based on the following assumptions:
-The equipment is not being installed within a playground.
-The equipment is being installed at a school for the blind and there will be supervision as well as help, as needed, to access the platforms.
-Children will not be playing or jumping on and off the platforms.
-Children should master the lower difficulty before moving on to the more difficult platforms.

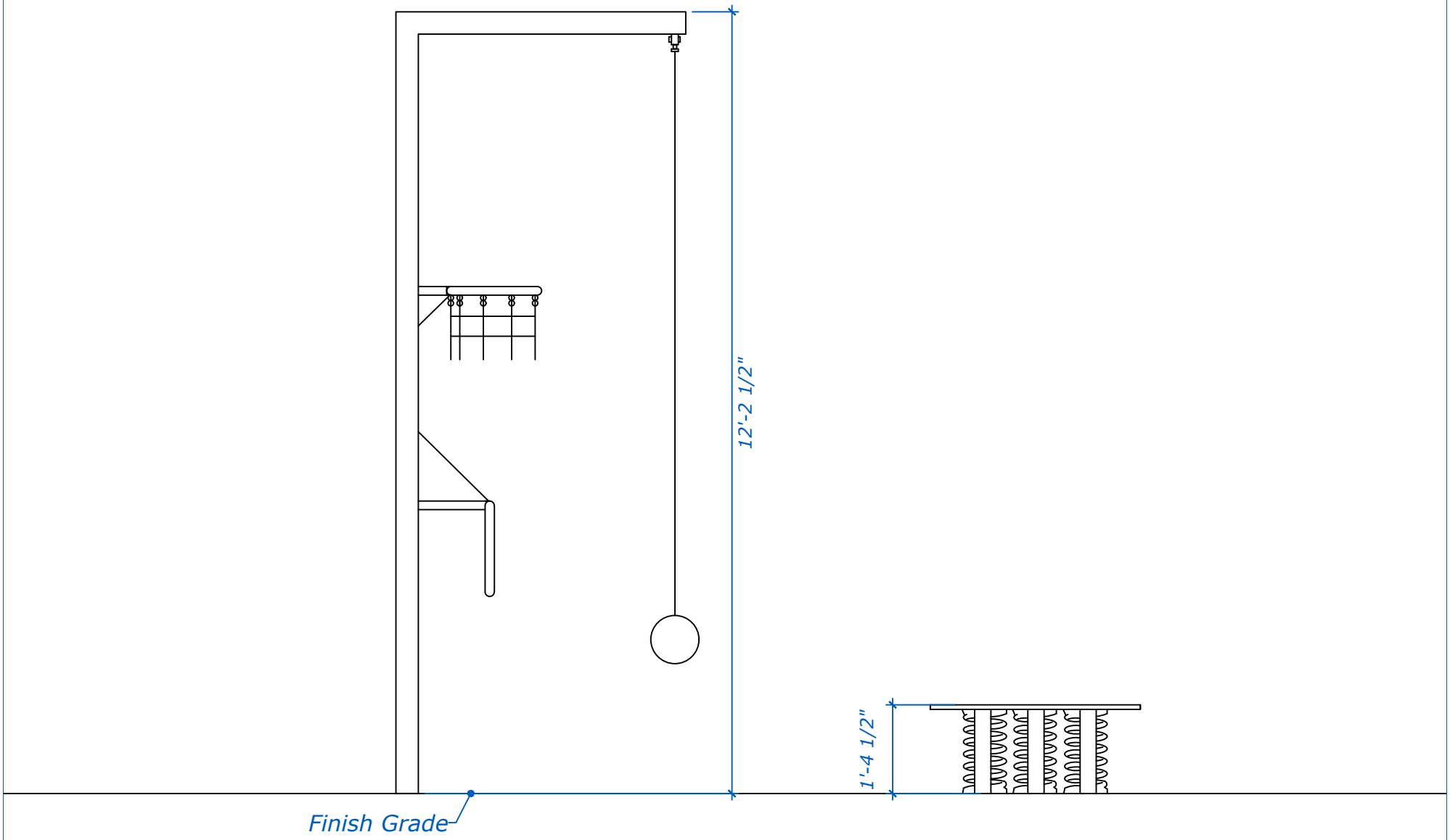
It is our recommendation that resilient surfacing for a 2' fall height is installed within the use zone area."

Goal Challenge

goric
The finest playgrounds known to children
phone 617-744-0772 fax 617-744-1037
www.goric.com Email Info@goric.com

DATE: 02/2026	BY: APT
SCALE: NTS	
ITEM #: MOCK-UP	
MANUFACTURER: PLAY-PARC	PAGE #: 1 OF 5

ELEVATION

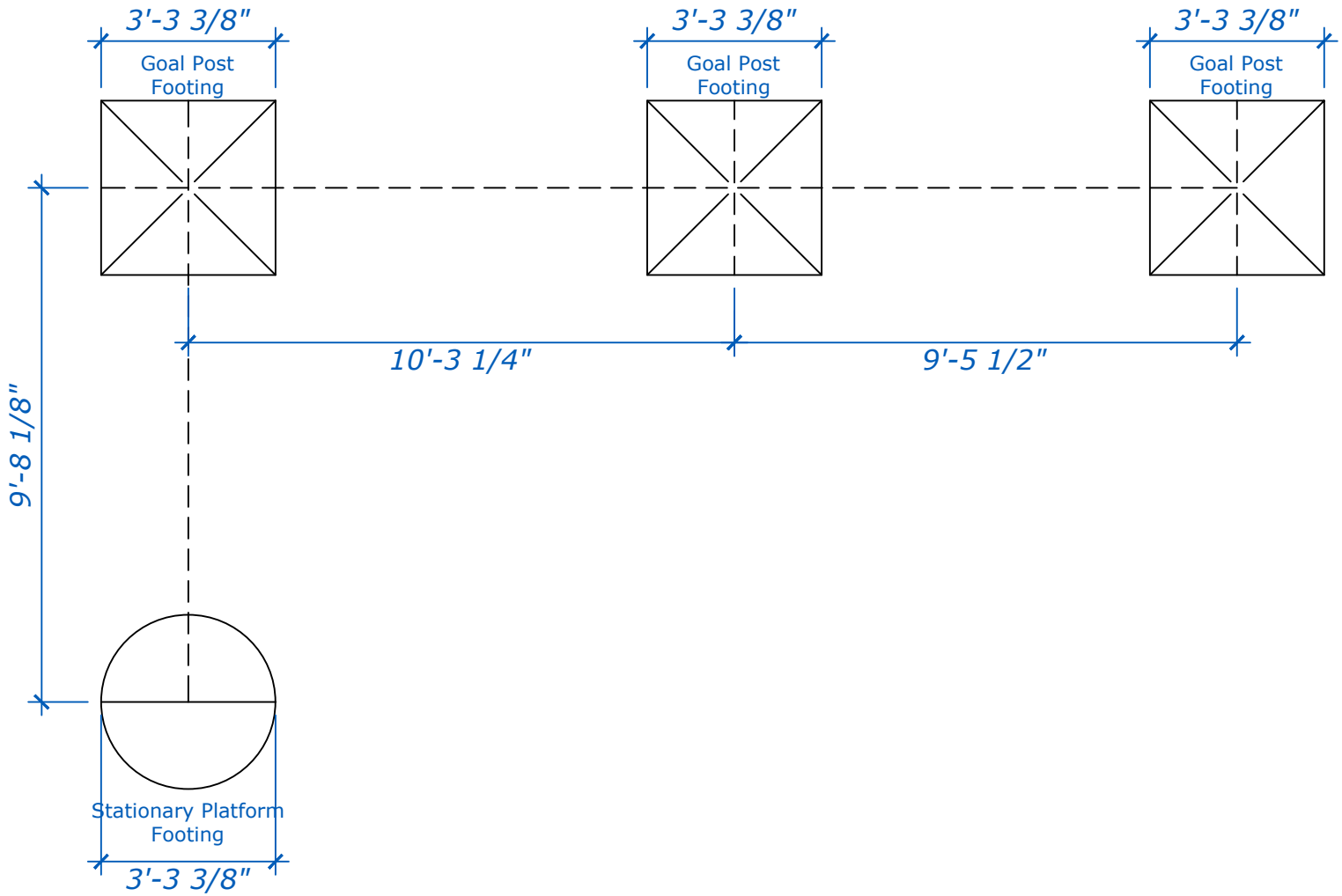


Goal Challenge

goric
The finest playgrounds known to children
phone 617-744-0772 fax 617-744-1037
www.goric.com Email Info@goric.com

DATE: 02/2026	BY: APT
SCALE: NTS	
ITEM #: MOCK-UP	
MANUFACTURER: PLAY-PARC	PAGE #: 2 OF 5

FOUNDATION PLAN



Foundation = 3500 psi Concrete

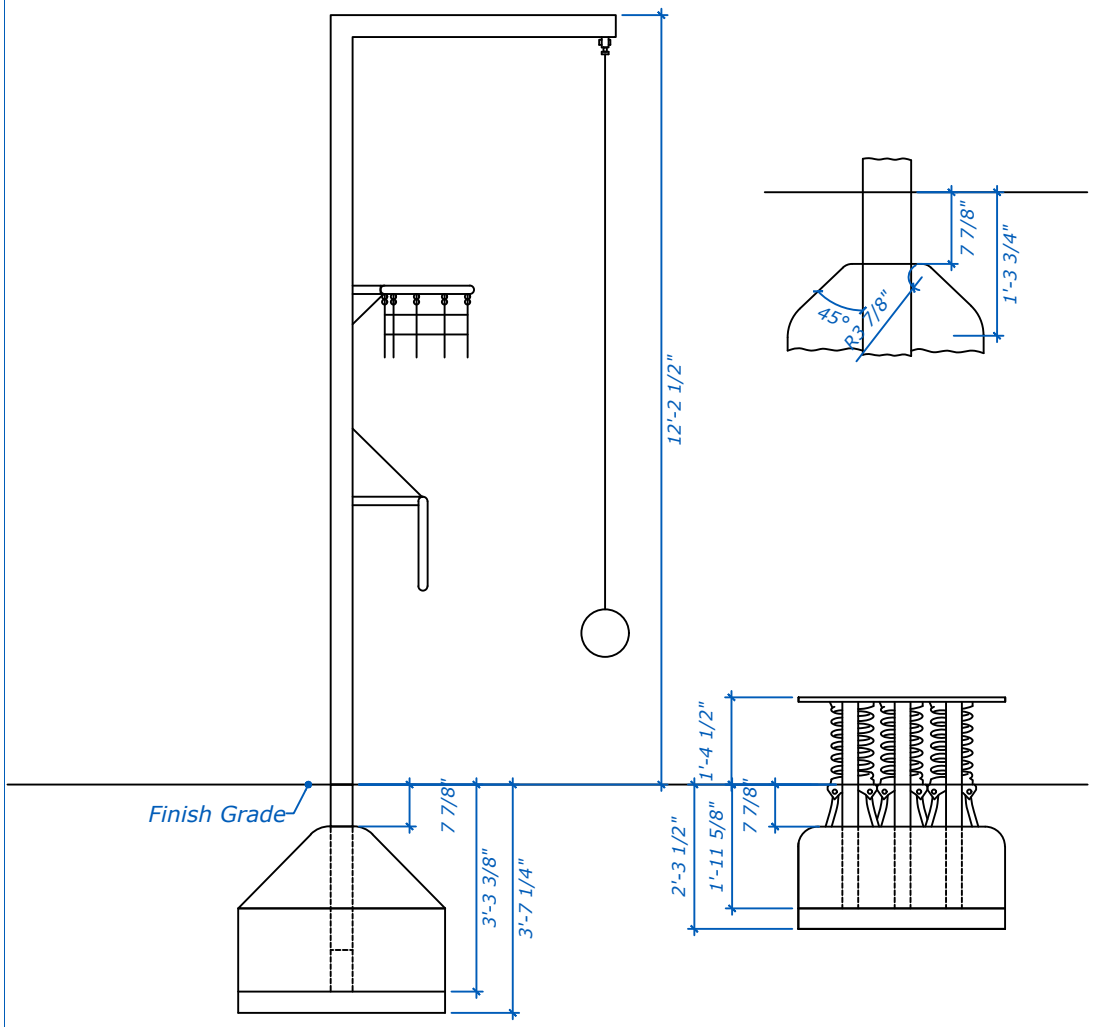
* CHECK FOR LOCAL FROST LINE REQUIREMENTS

Goal Challenge

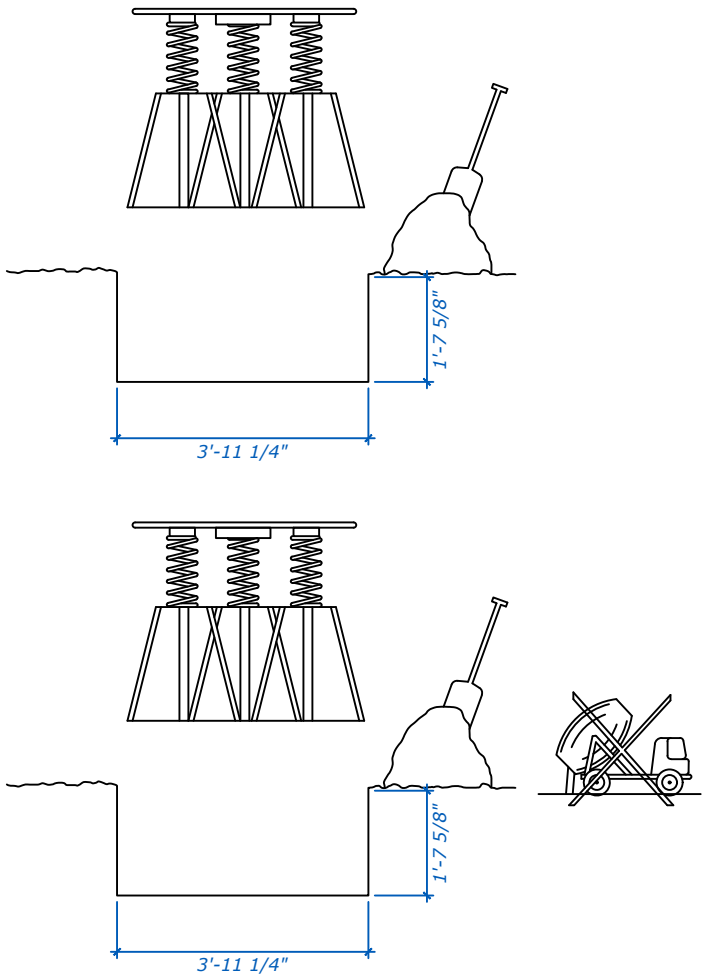
goric
The finest playgrounds known to children
phone 617-744-0772 fax 617-744-1037
www.goric.com Email Info@goric.com

DATE: 02/2026	BY: APT
SCALE: NTS	
ITEM #: MOCK-UP	
MANUFACTURER: PLAY-PARC	PAGE #: 3 OF 5

FOUNDATION PLAN (Section)



Middle Platform Installation (Triple-spring)



Foundation = 3500 psi Concrete

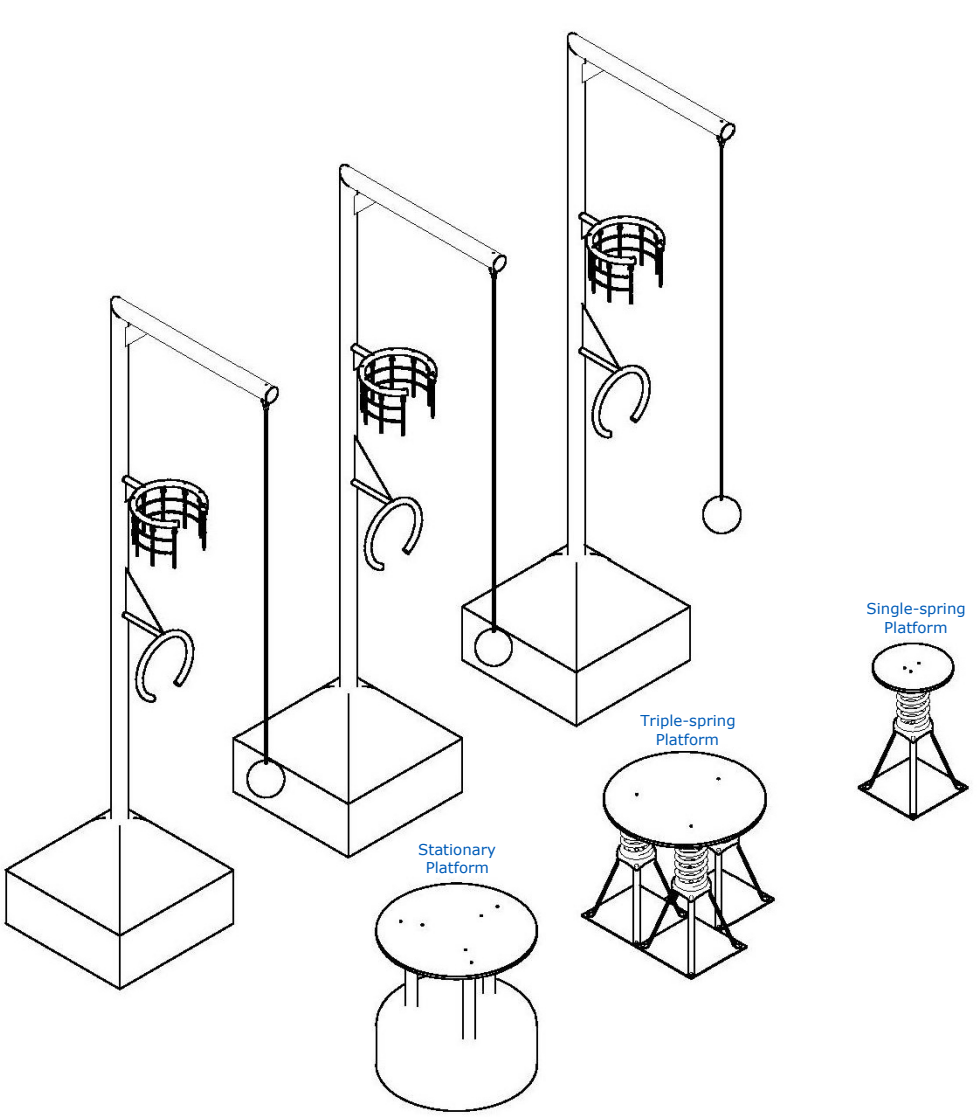
* CHECK FOR LOCAL FROST LINE REQUIREMENTS

Goal Challenge

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DATE: 02/2026	BY: APT
SCALE: NTS	
ITEM #: MOCK-UP	
MANUFACTURER: PLAY-PARC	PAGE #: 4 OF 5

3D VIEW



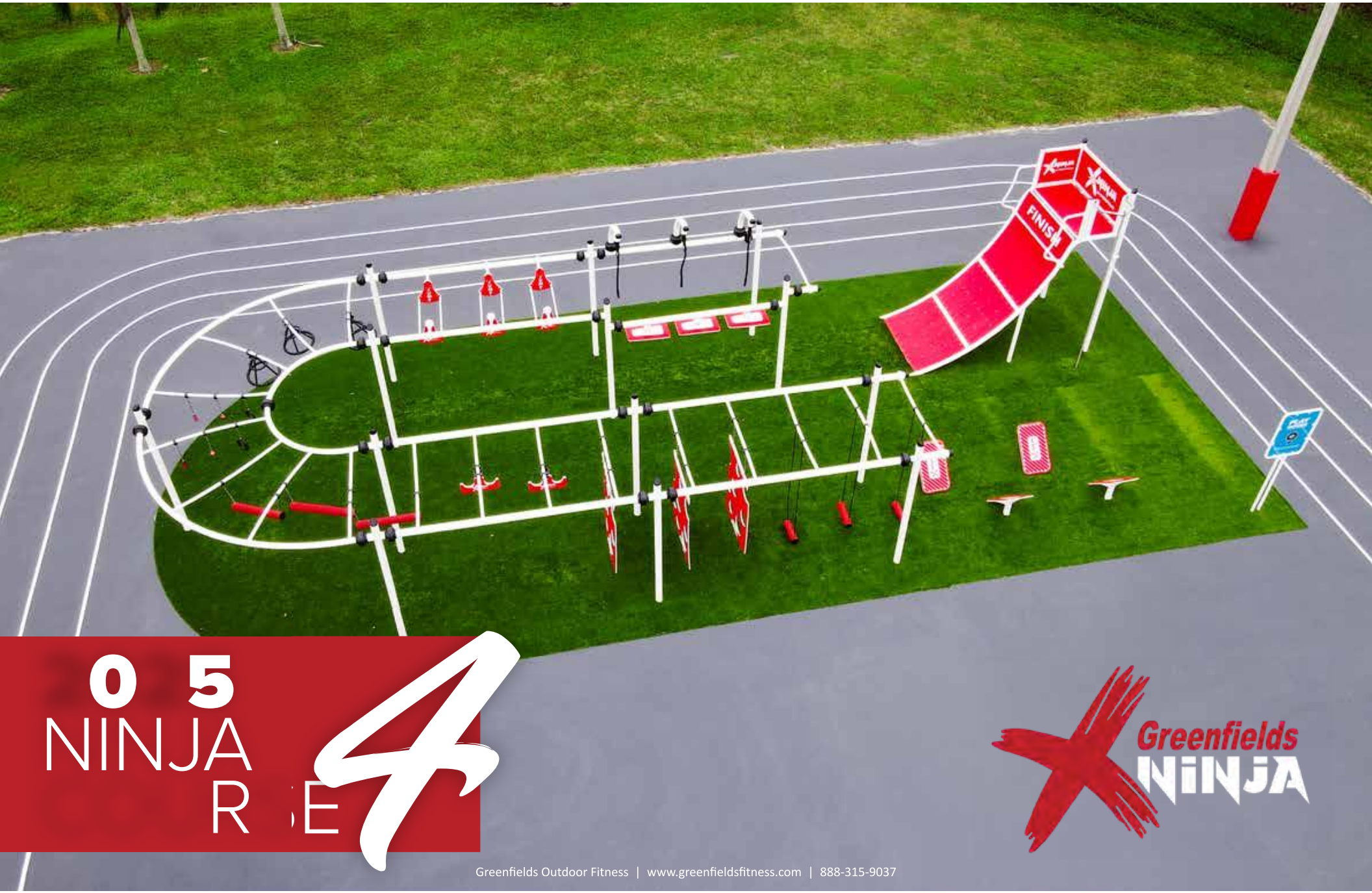
Goal Challenge

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DATE: 02/2026	BY: APT
SCALE: NTS	
ITEM #: MOCK-UP	
MANUFACTURER: PLAY-PARC	PAGE #: 5 OF 5

Ninja Course 4

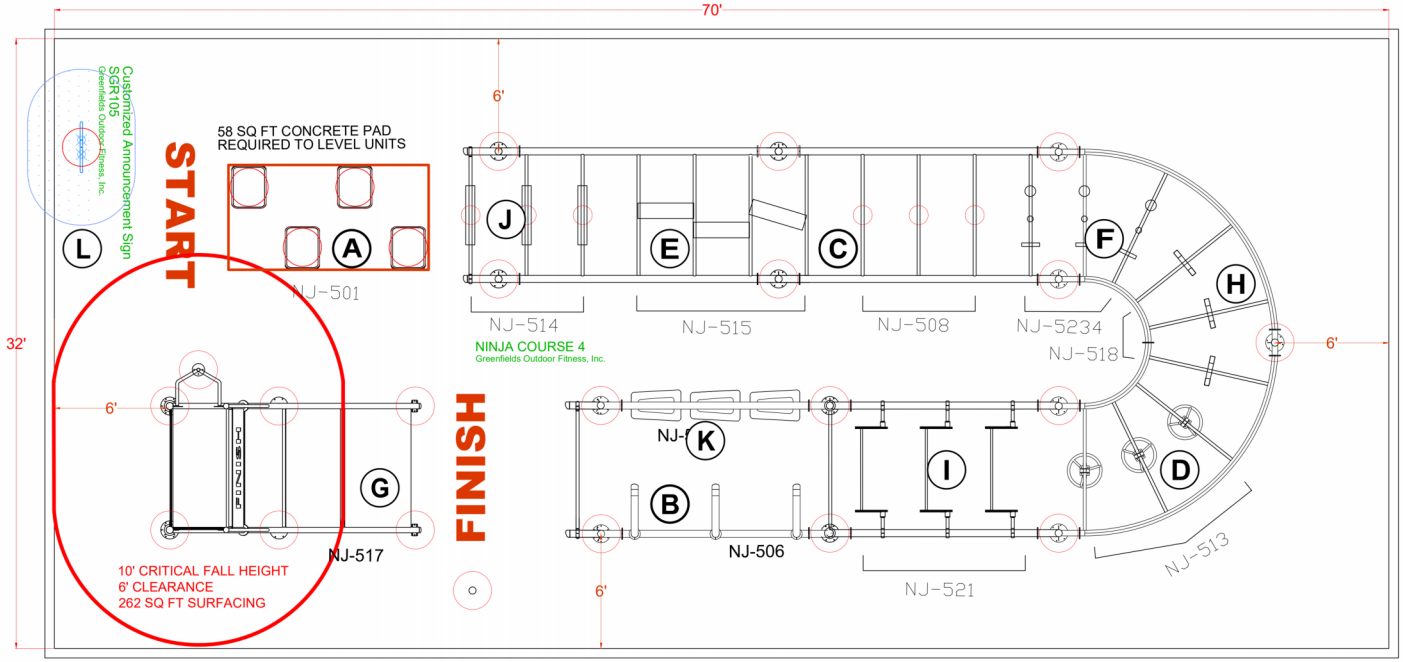
BY GREENFIELDS OUTDOOT FITNESS



05 NINJA RACE 4

Greenfields NINJA

2025 NINJA COURSE 4



COURSE FEATURES:

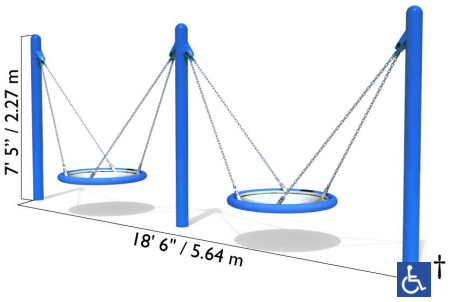
A	Slanted Jump Boards	NJ-501
B	Swinging Ropes	NJ-506
C	Cheese Walls	NJ-508
D	Rotating Cone Wheels	NJ-513
E	Burmese Floating Bridge	NJ-514
F	Spider Walk	NJ-515
G	Finish Wall	NJ-517
H	Swings	NJ-518
I	Toggle Pull-Up Triangles	NJ-521
J	Rings, Grip Balls, & Cones	NJ-5234
K	Hanging Platforms	NJ-528
L	Announcement Sign	SGR105

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Biggo Spia Duo

BY DYNAMO PLAYGROUNDS

PRODUCT SPECIFICATION



Product Name	Biggo Spia Duo
Product Number	DX-3275
Size -- Width	5.64 m / 18' 6"
Size -- Height	2.27 m / 7' 5"
Shipping Weight	545 kg / 1201.5 lb
Shipping Volume	4.08 m^3 / 144.1 ft^3
Foundations	3
Concrete Volume	0.88 m^3 / 31.1 ft^3

	ASTM F-1487	CSA Z614	EN 1176
Ages	2 years - 12 years	18 months - 12 years	2 years - 12 years
Capacity	8	8	8
Use Zone -- Length	8.14 m / 26' 8"	6.75 m / 22' 2"	7.43 m / 24' 5"
Use Zone -- Width	9.46 m / 31' 0"	9.46 m / 31' 0"	8.80 m / 28' 10"
Use Zone -- Area	57.96 m^2 / 623.9 ft^2	68.13 m^2 / 733.3 ft^2	42.54 m^2 / 457.9 ft^2
Fall Height	2.04 m / 6' 8"	2.04 m / 6' 8"	1.19 m / 3' 11"
No-Encroachment Zone	Not Applicable	1.80 m / 5' 11"	Not Applicable

*Note: Concrete must be minimum 3500 PSI / 25MPa

To verify product certification, visit www.ipema.org

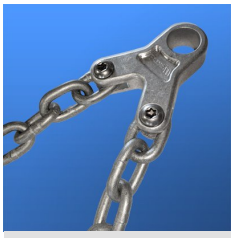
To verify product certification, visit www.ipema.org

Product Features:

SUPPORT POSTS:	This will be 5 9/16" (141.3mm) OD Schedule 40 steel pipe.
SWIVEL CONNECTOR:	This will be an aluminum swivel connector with a low friction and high abrasion resistant UHMWPE bushing and tamper-resistant attachments. The aluminum swivel will have a smooth machine finish.
SUSPENSION CHAIN:	This will be either 5/16" (8 mm) galvanized steel chain. Each chain will have independent connections at seat and pivot.
SEAT CONNECTION:	The seat will be connected to the chain at four points, each by a one-piece machined stainless steel sleeve. (Patent Pending)
SEAT BUMPER:	This will be 3 1/2" (90mm) OD textile reinforced high-pressure rubber hose, containing no external dye markings and covered with a wear and soil resistant surface.
BIGGO™ SEAT:	This will be a one-piece aluminum bowl, weighing with its bumper and pieces no more than 42 lbs (19 kg) empty.
BASIC FASTENERS:	All fasteners for component attachments are stainless steel.
PAINT PROCESS:	All exposed steel will be finished with polyester powder coating unless otherwise specified. Prior to the powder coating application, the surface will undergo sand blasting and will be treated with a zinc rich epoxy primer having a minimum thickness of 1.5 mils.

PRODUCT SPECIFICATION

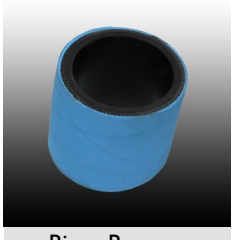
INSTALLATION:	This should be installed only by a licensed playground installer, trained and certified on the relevant playground standards in place in the region of installation, e.g., NPSI, CPSI or similar certified.
NO-ENCROACHMENT ZONE:	Where required, this will be an obstacle-free zone that does not necessarily meet the requirements of the protective surfacing zone. See applicable standard for more information.
COMPLIANT WITH:	**CAN/CSA-Z614** **ASTM F-1487** **EN-1176** **CPSC Handbook for Public Playground Safety**
TÜV CERTIFIED:	Certified to EN 1176:2008 TÜV SÜD Certificate N° Z1 13 08 84504 002
IPEMA CERTIFIED:	The DX-3275 identified in this specification sheet is IPEMA certified. The use and layout of the DX-3275 conforms to the requirements of ASTM F1487 and CSA Z614. To verify product certification visit www.ipema.org.
	† Where proper surfacing is used, this product meets the ADAAG guidelines for accessibility, allowing the same play possibilities for people of all abilities.
OPTIONS:	Optional Equipment: · Polished Stainless Steel Post (Max. Qty: 3) #SS-POST


Swivel Connector


UHMWPE Bushing

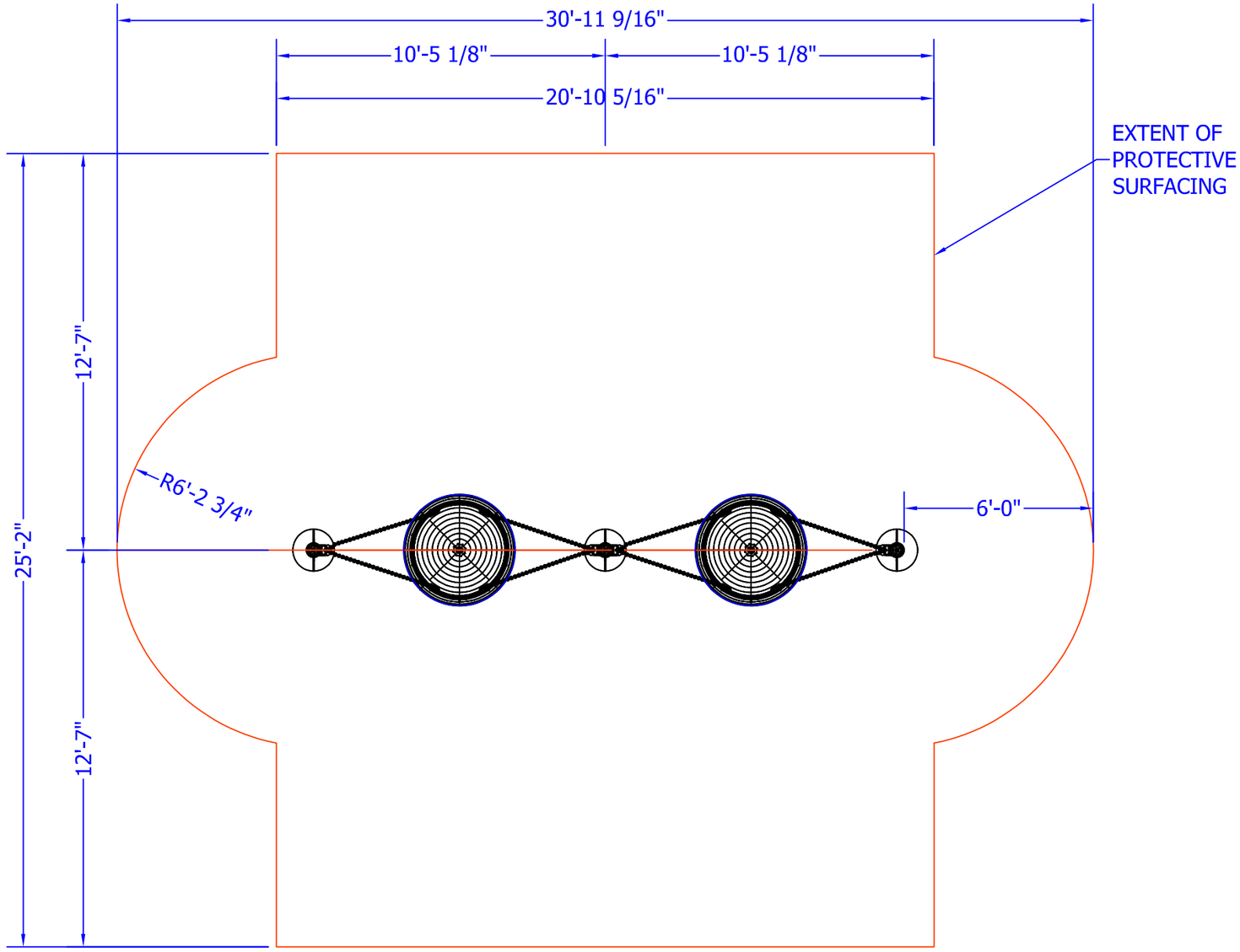

Galvanized Steel Chain


Biggo Seat Connector


Biggo Bumper

Dynamo Playgrounds
661 County Rd 9
Plantagenet, ON K0B 1L0 Canada

P: 1-800-790-0034 / 613-446-0030
F: 613-446-0034
W: www.dynamoplaygrounds.com



PLAN VIEW

SIDE VIEW
REFERRING DX-3175

DOCUMENT No:	200-000-457

REVISION HISTORY

REV	DESCRIPTION	REF. No.	DATE	DRWN BY:	RWD BY:
0	Initial Release	-	-	-	

ENGINEERING SEAL:

CLIENT: GENERAL

PROJECT NAME: BIGGO SPIA DUO

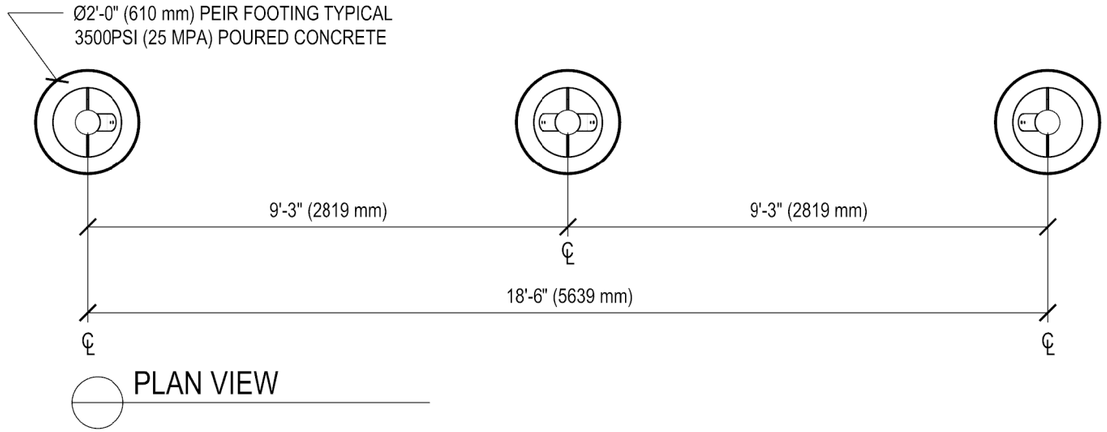
PRODUCT NO: DX-3275

DRAWING TITLE:
DX-3275 USE ZONE
ASTM

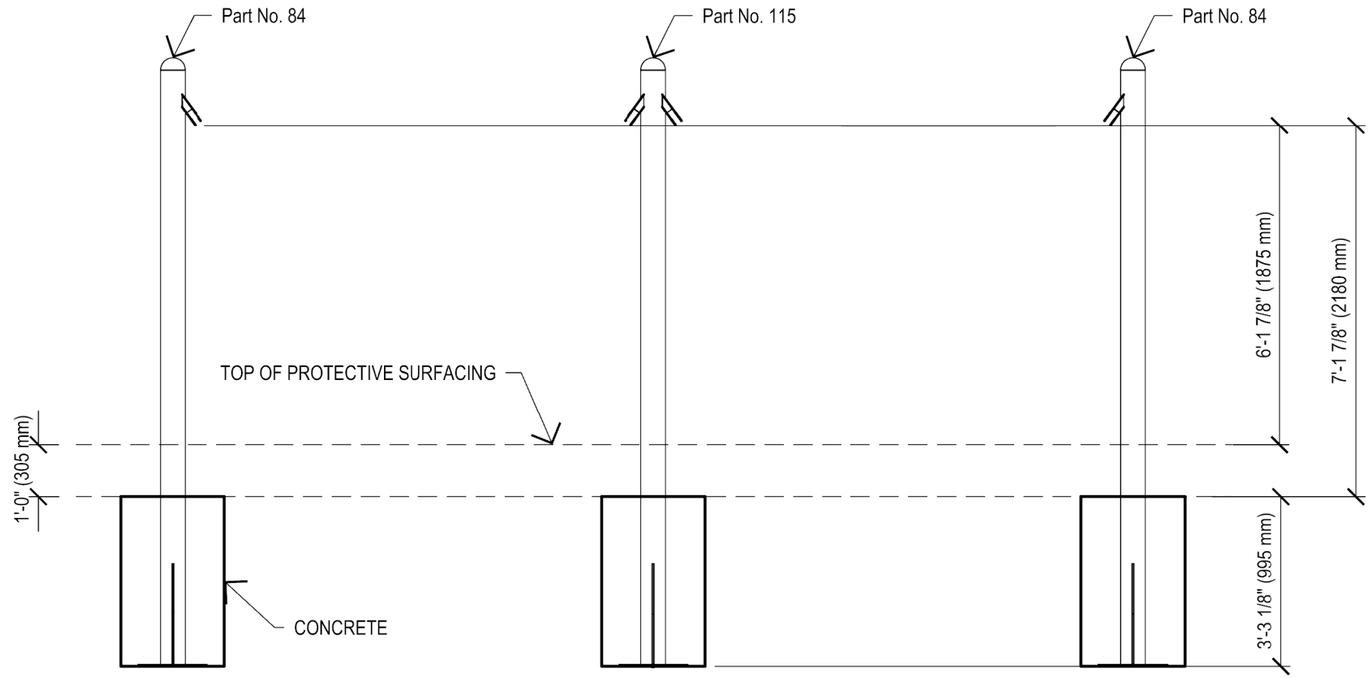
REV:	SHEET:	SHEET SIZE:	SCALE:
0	1 OF 1	PA3	NTS

DESIGNED BY:	DATE:
DRAWN BY: JZ	DATE: 2018-10-29
CHECKED BY:	DATE:
REVIEWED BY:	DATE:
APPROVED BY:	DATE:

DYNAMO PLAYGROUNDS
Local: 613-446-0030
Toll free: 800-790-0034
Email: info@dynamoplaygrounds.com
Fax: 613-446-0034
URL: www.dynamoplaygrounds.com



PLAN VIEW



ELEVATION VIEW

DOCUMENT NO:	200-000-167	
REV. NO.	DESCRIPTION/REFERENCE	DATE
0	Revised for ECO# 1711-09 -DOC No. Added. -P/N Reference added -Height Reference Added	2018-03-08

General Notes:

1. THE FOUNDATION IN THE DRAWING TO BE USED AS A MININUM GUIDELINE.

2. THE CONCRETE SHALL BE GRADE C25 (CHARACTERISTIC STRENGTH OF 3500 PSI AT 28 DAYS) MINIMUM.

3. THE FOUNDATION SHALL BE PLACED ON FIRM, UNDISTURBED SOIL SURFACE. WHEREVER EXCAVATION OCCURS BELOW THE DESIGNED FOUNDATION LEVEL, WELL COMPACTED BACK FILL OR LEAN CONCRETE SHALL BE USED FOR LEVELING.

4. BACKFILLING FOR FOUNDATION SHALL BE PLACED EVENLY IN LAYERS OF 6" (150mm) THICKNESS AND SHALL BE WELL COMPACTED.

5. THE FOUNDATION DESIGN IS SUITABLE FOR SOIL WITH A BEARING CAPACITY OF 1600 PSF (80 KPA) AND ABOVE.

6. THE FOUNDATION DESIGN IS SUITABLE FOR SOIL WITH FROST LINE OF 4' (1200 MM) OR LESS.

CLIENT:	STOCK	
PROJECT NAME:	STOCK	
PROJECT ADDRESS:	CHECK LOCAL REGULATIONS	
DRAWING TITLE:	BIGGO SPIA DUO FOUNDATIONLAYOUT DRAWING	
PRODUCT NO:	DX -3275	

	NAME	DATE
DESIGNER:		
DRAWN BY:	William McNair	2018-03-08
CHECKED BY:		
REVIEWED BY:		
APPROVED BY:		

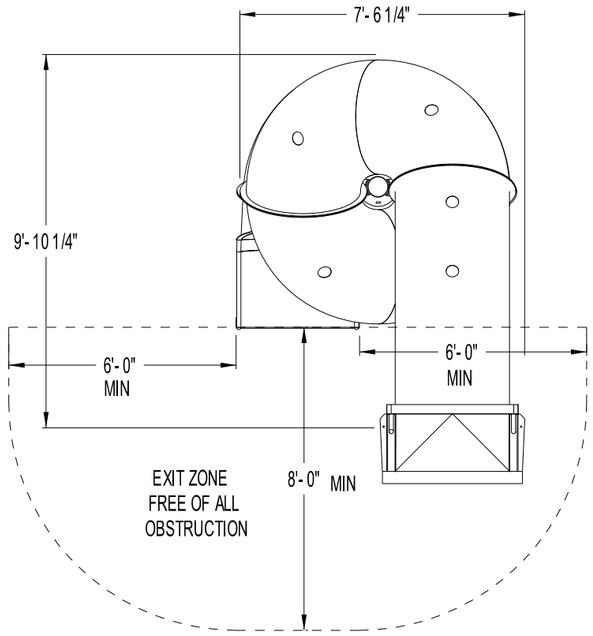
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PA3	1 of 1	NTS

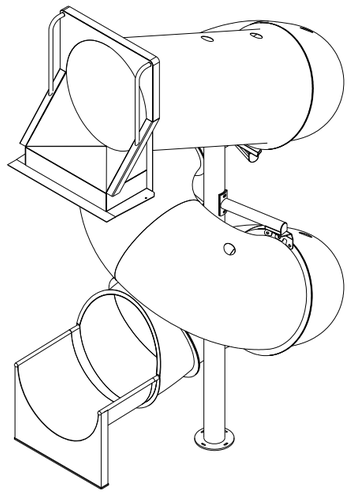
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Slides

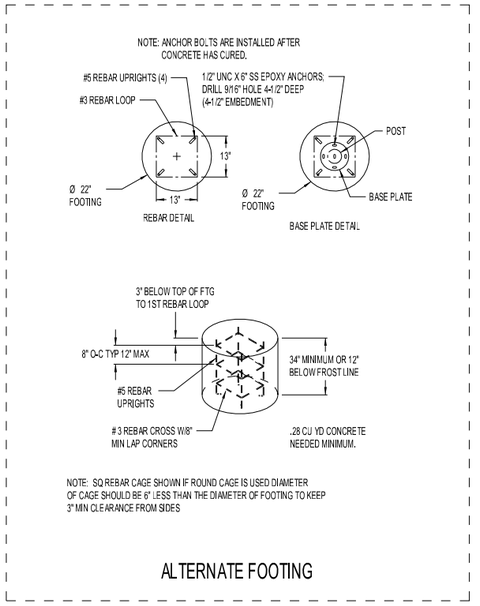
BY NATURAL STRUCTURES

PRELIMINARY: NOT FOR CONSTRUCTION



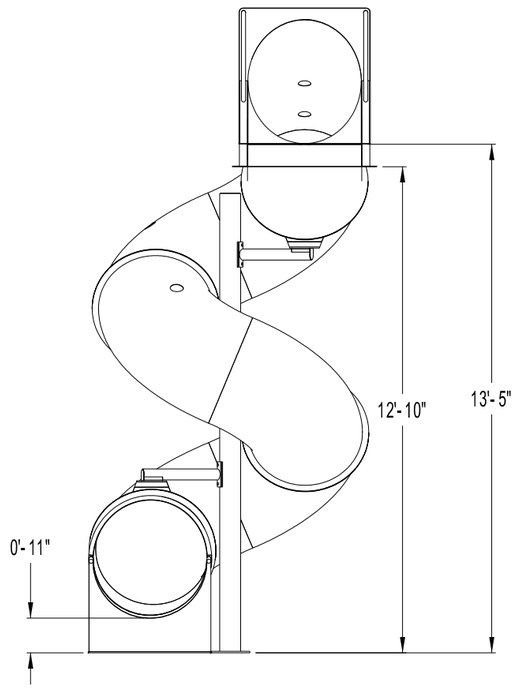


ISO VIEW

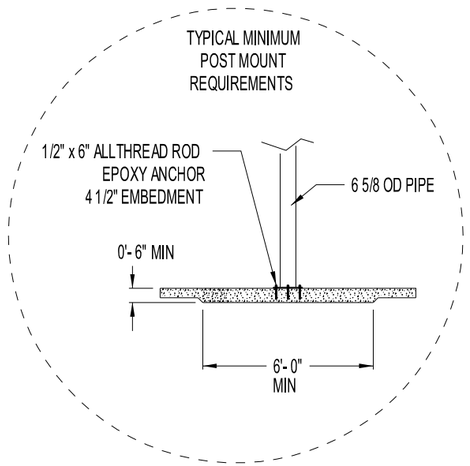


ALTERNATE FOOTING

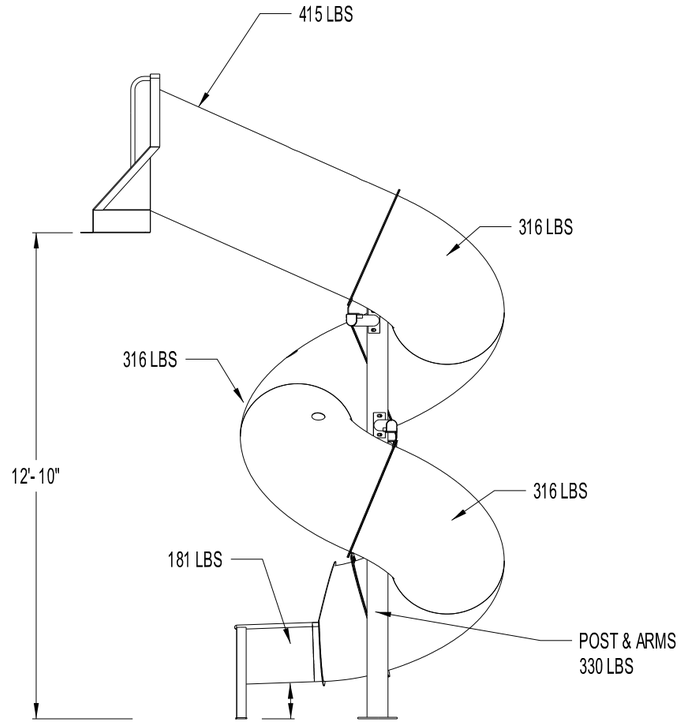
SLIDE PLATFORM HEIGHT:	12' - 10"
SLIDE ENTRY HEIGHT:	13' - 5"
SLIDE EXIT HEIGHT:	0' - 11"
SIZE OF FLUME:	36" ID STAINLESS
CENTERLINE RUN:	30' - 1"
AVERAGE PITCH:	24.55°
NUMBER OF 4" PORT HOLES:	8



FRONT VIEW



EXISTING SLABS LESS THAN 6 INCHES THICK:
CUT CONCRETE AND POUR FOOTING 6" THICK AND 6' DIAMETER.
REBAR (4) STRAIGHT #4 12" OC BW.
FASTENERS: 1/2" THREADED ROD & BACKING PLATE



SIDE VIEW

TOTAL WEIGHT:	1874 LBS
SLIDE ONLY:	1544 LBS
POST & ARMS:	330 LBS

Natural Structures
PO Box 270
Baker City, OR 97814
Phone: (541) 523-0224
Fax (541) 523-0231

PATTERHN IVES S2 TO S1
36" STAINLESS STEEL SLIDE

DRAWN BY: PS
REVIEWED BY:
DATE: 10/16/2025
ANSI SHEET SIZE: B

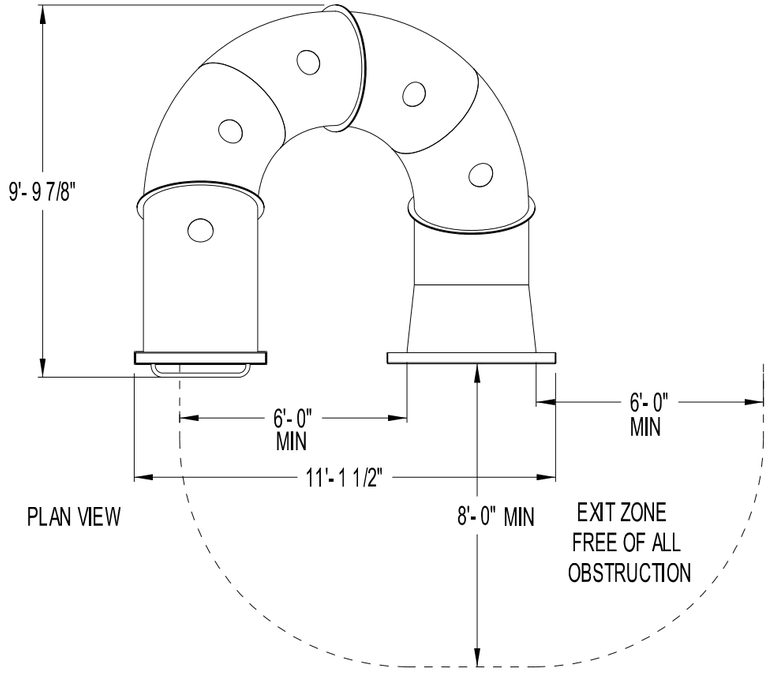
REVISION / DATE

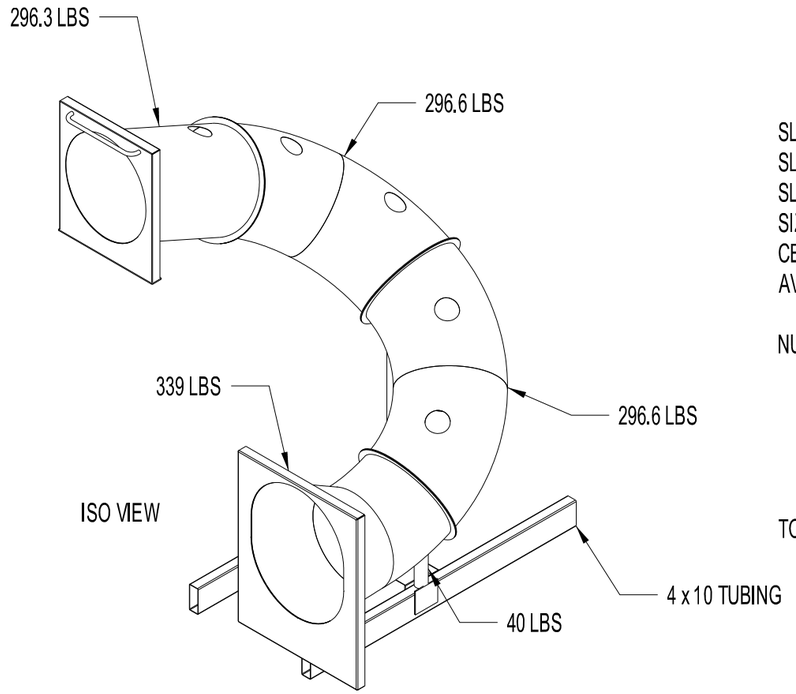
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PAGE: 1

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PRELIMINARY: NOT FOR CONSTRUCTION

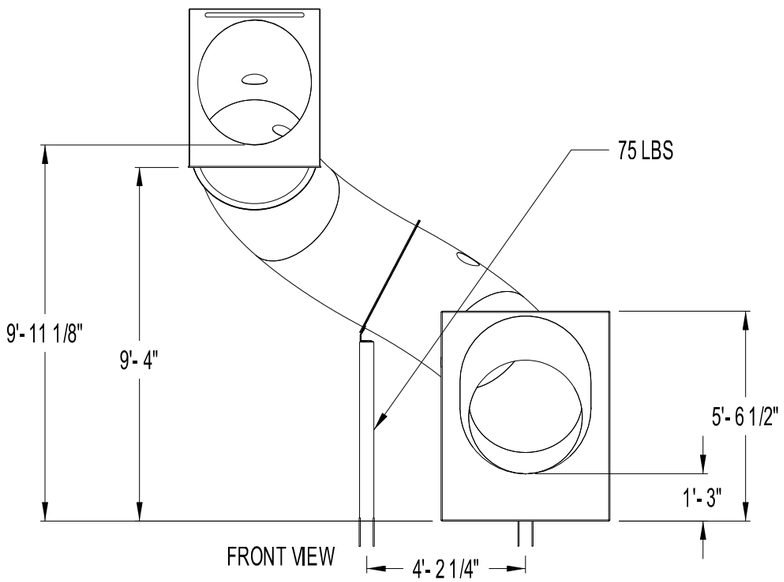


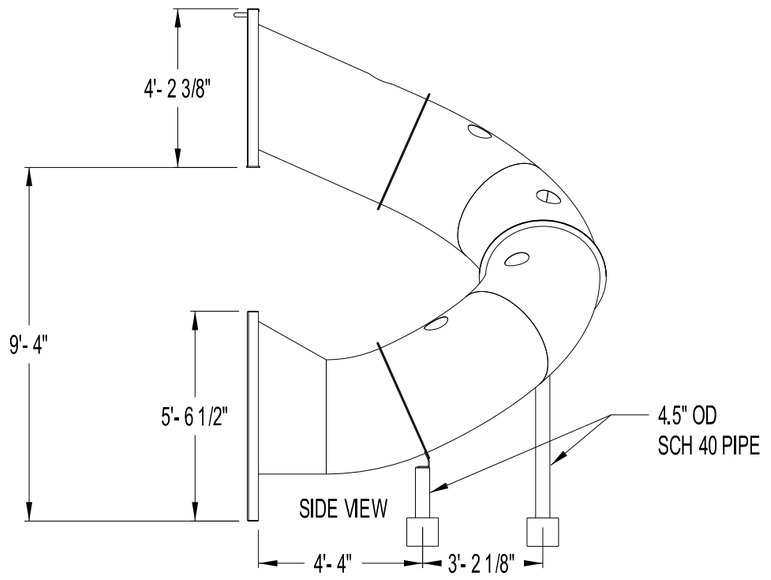


SLIDE ENTRY HEIGHT: 9' - 11 1/8"
SLIDE PLATFORM HEIGHT: 9' - 4"
SLIDE EXIT HEIGHT: 1' - 3"
SIZE OF FLUME: 36" ID STAINLESS STEEL
CENTERLINE RUN: 21' - 3 5/8"
AVERAGE PITCH: 24.05°

NUMBER OF 8" PORT HOLES: 5

TOTAL APPROXIMATE WEIGHT: 1344 LBS





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Fax (541) 523-0231

PATTERHN IVES S3 S4
36" ID STAINLESS STEEL SLIDE

DRAWN BY: PS
REVIEWED BY:
DATE: 11/21/2024
ANSI SHEET SIZE: B

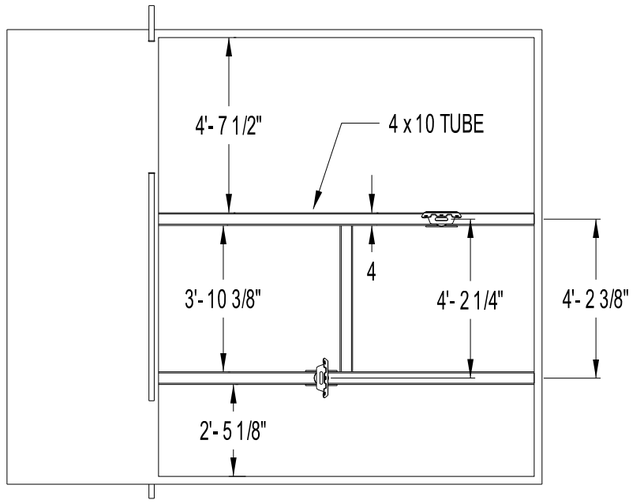
REVISION / DATE

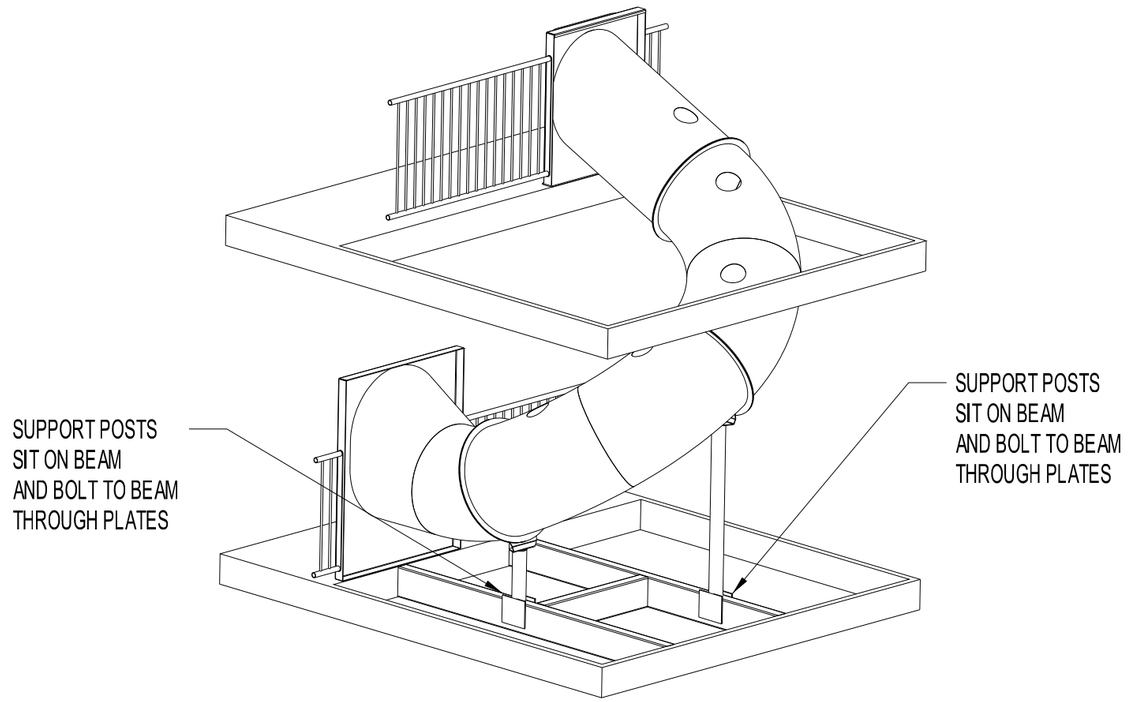
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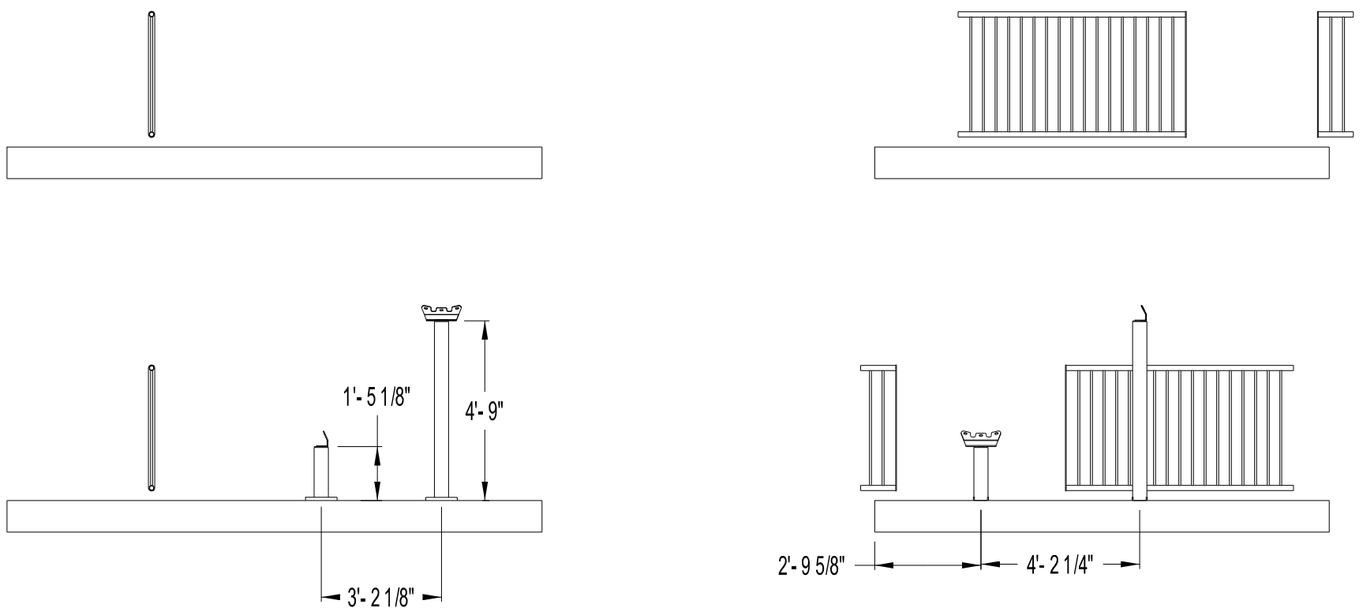
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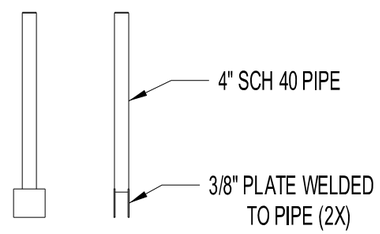
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Baker City, OR 97814
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Fax (541) 523-0231

PATTERHN IVES S3 S4
36" ID STAINLESS STEEL SLIDE
SUPPORT DETAIL

DRAWN BY: PS
REVIEWED BY:
DATE: 11/21/2024
ANSI SHEET SIZE: B

REVISION / DATE

PAGE SCALE: 1/4" = 1'

PAGE:

1

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