PROJECT MANUAL FOR:
University of Missouri
Middlebush Farm - Nextgen Center of Excellence for Influenza Research, Phase II

PROJECT NUMBER:
CP230831

AT:
UNIVERSITY OF MISSOURI – COLUMBIA
COLUMBIA, MISSOURI

FOR:
THE CURATORS OF THE UNIVERSITY OF MISSOURI

PREPARED BY:
Clark & Enersen
Architect of Record
2020 Baltimore Ave, Suite 300
Kansas City, MO 64108
816.474.8237

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Kansas City, MO 64108
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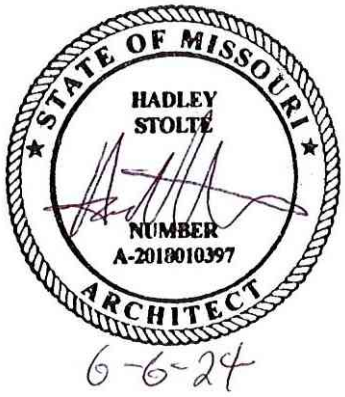
SK Design Group, Inc.
Civil Engineer of Record
4600 College Boulevard, Suite 100
Overland Park, KS 66211913.451.1818

Leigh + O'Kane
Structural Engineer of Record
250 NE Mulberry Street, Suite 201
Lee's Summit, MO 64086
816.444.3144

DATE:
Contract Documents: June 6, 2024

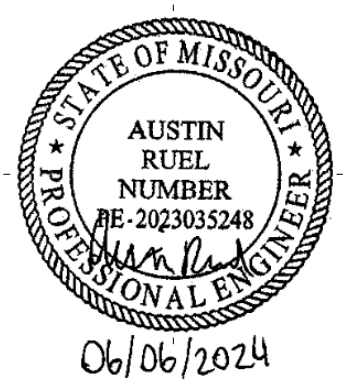
VOLUME 1

I hereby certify that drawing sheets G0.00, G0.01, G0.10, G0.20, G0.21, A0.00, A0.10, A1.10, A1.11, A1.12, A1.15, A1.20, A1.21, A1.22, A1.30, A1.40, A2.10, A3.10, A4.10, A6.10, A6.40, A7.10, A8.10, F1.11 and specification sections 017329, 024119, 055000; and sections in divisions 06, 07, 08, 09,10, 11,12, 13 have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.



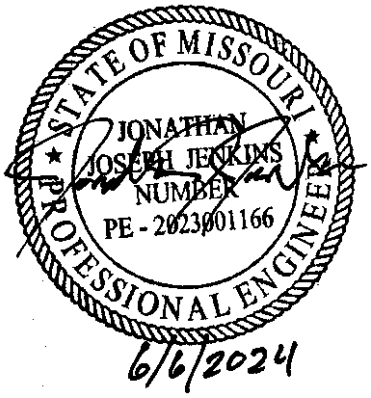
Signature: _____

I hereby certify that drawing sheets FS1.01, FS1.02, FS1.03 M0.00, M0.02, M1.01, M1.02, M1.03, M1.04, M2.01, M3.01, M3.02, M4.01, M5.01, M5.02, M6.01, M6.02, M6.03, M6.04, M6.05, M7.01, M7.02, P0.01, P1.01, P1.02, P1.03, P1.04, P2.01, P2.02, P3.01, P3.02, P4.01, P4.02, P5.01 and specification sections in divisions 21, 22, 23 have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.



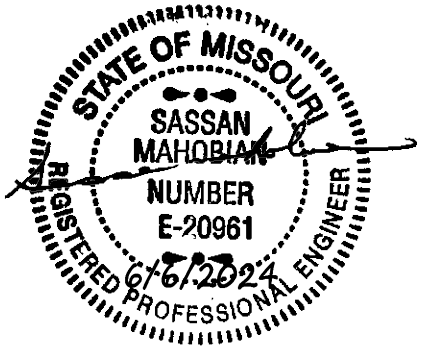
Signature: _____

I hereby certify that drawing sheets E0.00, E0.01. E0.10, E1.11, E2.11, E2.12, E2.13, E3.01, E4.01, E4.02, E5.01, E5.02, E5.03, E5.04 and specification in divisions 26, 27, 28, and section 337119 have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.



Signature: _____

I hereby certify that Drawing sheets C0.51, C0.61, C1.01, C2.01, C3.01, C3.11, C4.01, C4.11, C4.12, C5.01, C5.02, & C6.01 have been prepared under my supervision and Specification sections 015713, 311000, 312000, 312319, 321313, 321373, 323113, 329119, 329219, 333100, and 334100 have all been prepared by me. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.



Signature: _____

I hereby certify that Drawing sheets S0.01, S1.10, S1.11, S2.10, S2.20, S5.10, S5.11, S5.12 and Specification sections in divisions 03, 04 and 054000 have been prepared by me, or under my supervision. I further certify that to the best of my knowledge these Drawings and/or Specifications are as required by and in compliance with Building Codes of the University of Missouri.

Signature: _____

TABLE OF CONTENTS

END OF SECTION

PLANNING DESIGN & CONSTRUCTION

900 E. Stadium, Ste. 130
Columbia, Missouri 65211
Telephone: (573) 882-6800

ADVERTISEMENT FOR BIDS

Sealed bids for:

MIDDLEBUSH FARM –
NEXTGEN CENTER FOR INFLUENZA RESEARCH - PHASE II
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI
PROJECT NUMBER: CP230831 CONSTRUCTION ESTIMATE: $4,987,450 - $5,541,612

will be received by the Curators of the University of Missouri, Owner, at Planning, Design & Construction, Room L100 (Front Reception Desk), General Services Building, University of Missouri, Columbia, Missouri 65211, until 1:30 p.m., C.T., February 1, 2024 and then immediately opened and publicly read aloud.

Drawings, specifications, and other related contract information may be obtained at http://operations-webapps.missouri.edu/pdc/adsite/ad.html. Electronic bid sets are available at no cost and may be printed as desired by the plan holders. No paper copies will be issued. If paper copies are desired, it is the responsibility of the user to print the files or have them printed.

Questions regarding the scope of work should be directed to Hadley Stolte with Clark & Enersen at (816) 474-8237 or hadley.stolte@clarkenersen.com. Questions regarding commercial conditions should be directed to Ashley Karpel at (573) 882-1349 or karpela@missouri.edu.

A prebid meeting will be held at 10:00 a.m., C.T., January 18, 2024 in the General Services Bldg., Room 194A, followed by a site walk-through.

A Diversity Participation goal of 10% MBE, 10% Combined WBE, DBE, Veteran Owned Business and 3% SDVE has been established for this contract.

The Owner reserves the right to waive informalities in bids and to reject any and all bids.

Individuals with special needs as addressed by the Americans with Disabilities Act may contact (573) 882-6800.

Advertisement Date:

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SECTION 1.A

BID FOR LUMP SUM CONTRACT

Date:_____

BID OF _____
(hereinafter called "Bidder") a corporation* organized and existing under laws of the State of _____
_____,
a partnership* consisting of _____,
an individual* trading as _____,
a joint venture* consisting of _____
_____.
*Insert Corporation(s), partnership or individual, as applicable.

TO: Curators of the University of Missouri
Campus Facilities. Planning, Design and Construction
General Services Building
Room L100
University of Missouri
Columbia, Missouri 65211

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by CLARK & ENERSEN, entitled " Middlebush Farm – NextGen Center for Influenza Research, Phase II ", project number CP230831, dated December 21, 2023 having examined Contract Documents and site of proposed work, and being familiar with all conditions pertaining to construction of proposed project, including availability of materials and labor, hereby proposes to furnish all labor, materials and supplies to construct project in accordance with Contract Documents, within time set forth herein at prices stated below. Prices shall cover all expenses, including taxes not covered by the University of Missouri's tax exemption status, incurred in performing work required under Contract documents, of which this Bid is a part.

Bidder acknowledges receipt of following addenda:

Addendum No. _____Dated _____
Addendum No. _____Dated _____
Addendum No. _____Dated _____
Addendum No. _____Dated _____

2. In following Bid(s), amount(s) shall be written in both words and figures. In case of discrepancy between words and figures, words shall govern.

3. BID PRICING
a. Base Bid:

The Bidder agrees to furnish all labor, materials, tools, and equipment required for the new Nextgen Center of Excellence for Inf, all site and utility work, all as indicated on the Drawings and described in these Specifications for sum of:

_____
_____DOLLARS ($_____).

b. Additive Alternate Bids:

Above Base Bid may be changed in accordance with following Alternate Bids as Owner may

elect. Alternates are as described in Section 1.H of Project Manual. Alternates are written in a priority order, but Owner is not required to accept or reject in order listed. This is a one (1) contract project, therefore, Alternates shall be studied by each Bidder to determine effect on Bids of Contractor and each Subcontractor and/or Material supplier.

(1) Additive Alternate No. 1: **Fit-Out of Shower, Procedure, & Holding Rooms: 202, 202A, 202B, 204, 204A, 204b, 206, 206A, 206B**

Base Bid: Provide shell space in rooms 202, 202A, 202B, 204, 204A, 204B, 206, & 206B. Include plumbing and electrical rough-ins.

Add Alternate: Fit-out rooms 202, 202A, 202B, 204, 204A, 204B, 206, & 206B with ceilings, finishes, and fixtures. Refer to drawings on A1.40.

_____
_____DOLLARS ($_____).

(2) Additive Alternate No. 2: **Generator**

Base Bid: Provide generator pad and conduit for future install.

Add Alternate: Procure and install generator. Includes ATS, docking station, and associated cabling.

_____
_____DOLLARS ($_____).

(3) Additive Alternate No. 3: **FRP Doors**

Base Bid: Provide stainless steel doors per door schedule.

Add Alternate: Provide FRP doors in lieu of stainless steel.

_____
_____DOLLARS ($_____).

(4) Additive Alternate No. 4: **Reverse osmosis water service pipe to procedure rooms for held animal feeding.**

Base Bid: Provide domestic water service pipe including source connections and terminations.

Add Alternate: Provide reverse osmosis water service pipe including source connection from purification equipment and terminations.

_____
_____DOLLARS ($_____).

c. Unit Prices:

(1) For changing specified quantities of work from those indicated by Contract Drawings and Specifications, upon written instructions of Owner, the following Unit Prices shall prevail in accordance with General Conditions.

(2) The following Unit Prices include all labor, overhead and profit, materials,

equipment, appliances, bailing, shoring, shoring removal, etc., to cover all work.

(3) The following Unit Prices are required where applicable to particular Base Bid and/or Alternate being submitted.

(4) Only a single Unit Price shall be given and it shall apply for either MORE or LESS work than that indicated on Drawings and called for in Specifications as indicated to be included in Base Bid and/or Alternates. In the event that more or less units than so indicated is actually furnished, Change Orders will be issued for increased or decreased amounts as approved by the Owner.

(5) Bidder understands that the Owner will not be liable for any Unit Price or any amount in excess of Base Bid and any Alternate(s) accepted at time of award of Contract, except as expressed in written Change Orders duly executed and delivered by Owner's Representative.

(6) Unsuitable material below exposed subgrade

a. Description: Unit price for volume of unsuitable soil materials removed below Exposed subgrade as directed by the testing and inspection agency. This unit price shall include the replacement of an equal volume of satisfactory soil material.

b. Exposed Subgrade: Surface or elevation remaining after completion of excavation to required elevations indicated on drawings and specifications is unclassified and shall be included in the base bid.
Base Bid Quantity = 830 CY
1. ADD / DEDUCT $_____/Cubic Yard

(7) Building Footings

a. Description: Add or Deduct volume of building footings as needed for design loads provided by PEMB supplier.

1. Exterior Trench Footings

ADD / DEDUCT $_____/Cubic Yard Base Qty. 40 CY

2. Isolated Column Footings

ADD / DEDUCT $_____/Cubic Yard Base Qty. 94 CY

d. Allowance:

(1) None

4. PROJECT COMPLETION

a. Contract Period - Contract period begins on the day the Contractor receives unsigned Contract, Performance Bond, Payment Bond, and "Instructions for Execution of Contract, Bonds, and Insurance Certificates." Bidder agrees to complete project within five hundred sixty (560) calendar days from receipt of aforementioned documents. Fifteen (15) calendar days have been allocated in construction schedule for receiving aforementioned documents from Bidder.

b. Commencement - Contractor agrees to commence work on this project after the "Notice to Proceed" is issued by the Owner. "Notice to Proceed" will be issued within seven

(7) calendar days after Owner receives properly prepared and executed Contract documents listed in paragraph 4.a. above.

c. Refer to Scheduling Requirements in Special Conditions for specific scheduling of the following activities:

1. Site Work
2. Special Work
3. Utility Shut-downs, Outages and Tie-ins
4. Refuse / Trash Removal and Materials Delivery

5. SUBCONTRACTOR LIST:

Bidder hereby certifies that the following subcontractors will be used in performance of Work:

NOTE: Failure to list subcontractors for each category of work identified on this form or listing more than one subcontractor for any category of work without designating the portion of work performed by each shall be grounds for rejection of bid. List name, city, and state of designated subcontractor, for each category of work listed in Bid For Lump Sum Contract. If work within a category will be performed by more than one subcontractor, Bidder shall provide name, city, and state of each subcontractor and specify exact portion of work to be performed by each. If acceptance/non-acceptance of Alternates will affect designation of a subcontractor, Bidder shall provide information, for each affected category, with this bid form. If Bidder intends to perform any designated subcontract work by using Bidder's own employees, then Bidder shall list their own name, city, and state. The bidder may petition the Owner to change a listed subcontractor only within 48 hours of the bid opening. See Information For Bidders Section 16 List of Subcontractors for requirements.

Work to be performed	Subcontractor Name,	City, State
Mechanical Contractor		
Electrical Contractor		

6. SUPPLIER DIVERSITY PARTICIPATION GOALS

a. The Contractor shall have as a goal, subcontracting with Minority Business Enterprise (MBE) of ten percent (10%), with Service Disabled Veteran Owned Business (SDVE) of three percent (3%); and with Women Business Enterprise (WBE), Disadvantage Business Enterprise (DBE), and/or Veteran Owned Business of ten percent (10%) of awarded contract price for work to be performed.

b. Requests for waiver of this goal shall be submitted on the attached Application For Waiver form. A determination by the Director of Facilities Planning & Development, UM, that a good faith effort has not been made by Contractor to achieve above stated goal may result in rejection of bid.

c. The Undersigned proposes to perform work with following Supplier Diversity participation level:

MBE PERCENTAGE PARTICIPATION: _____ percent (___%)
SDVE PERCENTAGE PARTICIPATION: _____ percent (____%)
WBE, DBE, and/or VETERAN PERCENTAGE PARTICIPATION:_____ percent (____%)

d. A Supplier Diversity Compliance Evaluation form shall be submitted with this bid for each diverse subcontractor to be used on this project.

. 7. BIDDER'S ACKNOWLEDGMENTS

a. Bidder declares that he has had an opportunity to examine the site of the work and he has examined Contract Documents therefore; that he has carefully prepared his bid upon the basis thereof; that he has carefully examined and checked bid, materials, equipment and labor required thereunder, cost thereof, and his figures therefore. Bidder hereby states that amount, or amounts, set forth in bid is, or are, correct and that no mistake or error has occurred in bid or in Bidder's computations upon which this bid is based. Bidder agrees that he will make no claim for reformation, modifications, revisions or correction of bid after scheduled closing time for receipt of bids.

b. Bidder agrees that bid shall not be withdrawn for a period of sixty (60) days after scheduled closing time for receipt of bids.

c. Bidder understands that Owner reserves right to reject any or all bids and to waive any informalities in bidding.

d. Accompanying the bid is a bid bond, or a certified check or a cashier's check payable without condition to "The Curators of the University of Missouri" which is an amount at least equal to five percent (5%) of amount of largest possible total bid herein submitted, including consideration of Alternates.

e. Accompanying the bid is a Bidder's Statement of Qualifications. Failure of Bidder to submit the Bidder's Statement of Qualifications with the bid may cause the bid to be rejected. Owner does not maintain Bidder's Statements of Qualifications on file.

f. It is understood and agreed that bid security of two (2) lowest and responsive Bidders will be retained until Contract has been executed and an acceptable Performance Bond and Payment Bond has been furnished. It is understood and agreed that if the bid is accepted and the undersigned fails to execute the Contract and furnish acceptable Performance/Payment Bond as required by Contract Documents, accompanying bid security will be realized upon or retained by Owner. Otherwise, the bid security will be returned to the undersigned.

8. BIDDER'S CERTIFICATE

Bidder hereby certifies:
a. His bid is genuine and is not made in interest of or on behalf of any undisclosed person, firm or corporation, and is not submitted in conformity with any agreement or rules of any group, association or corporation.

b. He has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid.

c. He has not solicited or induced any person, firm or corporation to refrain from bidding.

d. He has not sought by collusion or otherwise to obtain for himself any advantage over any other Bidder or over Owner.

e. He will not discriminate against any employee or applicant for employment because of race, color, religion, sex or national origin in connection with performance of work.

f. By virtue of policy of the Board of Curators, and by virtue of statutory authority, a preference will be given to materials, products, supplies, provisions and all other articles produced, manufactured, mined or grown within the State of Missouri. By virtue of policy of the Board of Curators, preference will also be given to all Missouri firms, corporations, or individuals, all as more fully set forth in "Information For Bidders."

9. BIDDER'S SIGNATURE

Note: All signatures shall be original; not copies, photocopies, stamped, etc.

Authorized Signature	Date
Printed Name	Title
Company Name i.	
Mailing Address i.	
City, State, Zip i.	
Phone No.	Federal Employer ID No.
Fax No.	E-Mail Address
Circle one: Individual Partnership Corporation Joint Venture	
If a corporation, incorporated under the laws of the State of_____	
Licensed to do business in the State of Missouri? ____yes _____no	

(Each Bidder shall complete bid form by manually signing on the proper signature line above and supplying required information called for in connection with the signature. Information is necessary for proper preparation of the Contract, Performance Bond and Payment Bond. Each Bidder shall supply information called for in accompanying "Bidder's Statement of Qualifications.")

END OF SECTION

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UNIVERSITY OF MISSOURI
BIDDER'S STATEMENT OF QUALIFICATIONS

Submit with Bid for Lump Sum Contract in separate envelope appropriately labeled. Attach additional sheet if necessary.

1. Company Name_____

   Phone# _____ Fax #:_____

   Address _____

2. Number of years in business _____. If not under present firm name, list previous firm names and types of organization.

3. List contracts on hand (complete the following schedule, include telephone number).

Project & Address	Owner/Owner's Representative	Phone Number	Architect	Amount of your Contract	Percent Completed

4. General character of work performed by your company personnel.

5. List important projects completed in the last five (5) years on a type similar to the work now bid for, including approximate cost and telephone number.

Project & Address	Owner/Owner's Representative	Phone Number	Architect	Amount of your Contract	Percent Completed

6. Other experience qualifying you for the work now bid.

7. No default has been made in any contract complete or incomplete except as noted below:
   (a) Number of contracts on which default was made _____
   (b) Description of defaulted contracts and reason therefor

8. (a) Have you or your company participated in any contract subject to an equal opportunity clause similar to that described in the General Conditions?
   Yes _____ No ____

   (b) Have you filed all required compliance reports?
   Yes _____ No ____

(c) Is fifty percent or more of your company owned by a minority?
Yes _____ No ____

(d) Is fifty percent or more of your company owned by a woman?
Yes _____ No ____

(e) Is fifty percent or more of your company owned by a service disabled veteran?
Yes _____ No ____

(f) Is fifty percent or more of your company owned by a veteran?
Yes _____ No ____

(g) Is your company a Disadvantaged Business Enterprise?
Yes _____ No ____

9. Have you or your company been suspended or debarred from working at any University of Missouri campus?
Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

10. Have any administrative or legal proceedings been started against you or your company alleging violation of any wage and hour regulations or laws?
Yes _____ No ____ (If the answer is "yes", give details.)

_____

_____

11. Workers Compensation Experience Modification Rates (last 3 yrs): ____/____/____

Incidence Rates (last 3 years): _____/____/_____

12. List banking references.

_____

_____

13. (a) Do you have a current confidential financial statement on file with Owner?
Yes _____ No ____ (If not, and if desired, Bidder may submit such statement with bid, in a separate sealed and labeled envelope.)

(b) If not, upon request will you file a detailed confidential financial statement within three (3) days?
Yes _____ No ____

Dated at _____ this _____ day of _____ 20____

_____
Name of Organization

_____
Signature

_____
Printed Name

_____
Title of Person Signing

END OF SECTION

SUPPLIER DIVERSITY COMPLIANCE EVALUATION FORM

This form shall be completed by Bidders and submitted with the Bidder's Statement of Qualifications form for each diverse firm who will function as a subcontractor on the contract.

The undersigned submits the following data with respect to this firm's assurance to meet the goal for Supplier Diversity participation.

I. Project:

_____

II. Name of General Contractor:_____

III. Name of Diverse Firm:_____

Address:_____

Phone No.:_____ Fax No.:_____

Status (check one) MBE _____ WBE _____ Veteran_____ Service Disabled Veteran_____ DBE_____

IV. Describe the subcontract work to be performed. (List Base Bid work and any Alternate work separately):

Base Bid:_____

_____

_____

_____

_____

V. Dollar amount of contract to be subcontracted to the Diverse firm:

Base Bid:_____

Alternate(s), (Identify separately):_____

_____

_____

_____

_____

VI. Is the proposed subcontractor listed in the Directory of M/W/DBE Vendors, Directory of Serviced Disabled Veterans and/or the Directory of Veterans maintained by the State of Missouri?

Yes _____ No _____

Is the proposed subcontractor certified as a diverse supplier by any of the following: federal government agencies, state agencies, State of Missouri city or county government agencies, Minority and/or WBE certifying agencies?

Yes _____ No _____ If yes, please provide details and attach a copy of the certification.

_____

_____

_____

_____

Does the proposed subcontractor have a signed document from their attorney certifying the Supplier as a Diverse and meeting the 51% owned and committed requirement?

Yes _____ No _____ If yes, please attach letter.

Signature: _____

Name: _____

Title: _____

Date: _____

APPLICATION FOR WAIVER

This form shall be completed and submitted with the Bidder's Statement of Qualifications. Firms wishing to be considered for award are required to demonstrate that a good faith effort has been made to include diverse suppliers. This form will be used to evaluate the extent to which a good faith effort has been made. The undersigned submits the following data with respect to the firm's efforts to meet the goal for Supplier Diversity Participation.

1. List pre-bid conferences your firm attended where Supplier Diversity requirements were discussed.

2. Identify advertising efforts undertaken by your firm which were intended to recruit potential diverse subcontractors for various aspects of this project. Provide names of newspapers, dates of advertisements and copies of ads that were run.

3. Note specific efforts to contact in writing those diverse suppliers capable of and likely to participate as subcontractors for this project.

4. Describe steps taken by your firm to divide work into areas in which diverse suppliers/contractors would be capable of performing.

5. What efforts were taken to negotiate with prospective diverse suppliers/contractors for specific sub-bids? Include the names, addresses, and telephone numbers of diverse suppliers/contractors contacted, a description of the information given to diverse suppliers/contractors regarding plans and specifications for the assigned work, and a statement as to why additional agreements were not made with diverse suppliers/contractors.

6. List reasons for rejecting a diverse supplier/contractor which has been contacted.

8. Describe the follow-up contacts with diverse suppliers/contractors made by your firm after the initial solicitation.

_____

_____

_____

9. Describe the efforts made by your firm to provide interested diverse suppliers/contractors with sufficiently detailed information about the plans, specifications and requirements of the contract.

_____

_____

_____

10. Describe your firm's efforts to locate diverse suppliers/contractors.

_____

_____

_____

Based on the above stated good faith efforts made to include supplier diversity, the bidder hereby requests that the original supplier diversity percentage goal be waived and that the percentage goal for this project be set at _____ percent.

The undersigned hereby certifies, having read the answers contained in the foregoing Application for Waiver, that they are true and correct to the best of his/her knowledge, information and belief.

Signature_____

Name_____

Title_____

Company_____

Date_____

AFFIDAVIT

"The undersigned swears that the foregoing statements are true and correct and include all material information necessary to identify and explain the operation of _____ _____(name of firm) as well as the ownership thereof. Further, the undersigned agrees to provide through the prime contractor or directly to the Contracting Officer current, complete and accurate information regarding actual work performed on the project, the payment therefore and any proposed changes, if any, of the project, the foregoing arrangements and to permit the audit and examination of books, records and files of the named firm. Any material misrepresentation will be grounds for terminating any contract which may be awarded and for initiating action under federal or state laws concerning false statements."

Note - If, after filing this information and before the work of this firm is completed on the contract covered by this regulation, there is any significant change in the information submitted, you must inform the Director of Facilities Planning and Development of the change either through the prime contractor or directly.

Signature _____

Name _____

Title _____

Date _____

Corporate Seal (where appropriate)

Date _____

State of _____

County of _____

On this _____ day of _____, 19_,

before me appeared (name) _____ to me personally known, who, being duly sworn, did execute the foregoing affidavit, and did state that he or she was properly authorized by (name of firm)

_____

_____to execute the affidavit and did so as his or her own free act and deed.

(Seal)

Notary Public _____

Commission expires _____

AFFIDAVIT FOR AFFIRMATIVE ACTION

State of Missouri)
) ss.
County of)

_____ first being duly sworn on his/her oath states: that he/she is the (sole proprietor, partner, or officer) of _____ _____ a (sole proprietorship, partnership, corporation), and as such (sole proprietor, partner, or officer) is duly authorized to make this affidavit on behalf of said (sole proprietorship, partnership, corporation); that under the contract known as "_____" Project No. _____ less than 50 persons in the aggregate will be employed and therefore, the applicable Affirmative Action requirements as set forth in the "Nondiscrimination in Employment Equal Opportunity," Supplemental Special Conditions, and Article 13 in the General Conditions do not apply.

_____

Subscribed and sworn before me this _____ day of _____, 19_____.

My commission expires _____, 19_____.

CERTIFYING SUPPLIER DIVERSITYAGENCIES

Diverse firms are defined in General Conditions Articles 1.1.7 and those businesses must be certified as disadvantaged by an approved agency. The Bidder is responsible for obtaining information regarding the certification status of a firm. A list of certified firms may be obtained by contacting the agencies listed below. Any firm listed as disadvantaged by any of the following agencies will be classified as a diverse firm by the Owner.

St. Louis Development Corporation
1520 Market St., Ste. 2000
St. Louis, MO 63103
P: 314.982.1400
W: www.stlouis-mo.gov/sldc/

Bi-State Development
211 N. Broadway, Ste. 700
St. Louis, MO 63102
P: 314.982.1400
W: www.metrostlouis.dbesystem.com

St. Louis Minority Business Council
211 N. Broadway, Ste. 1300
St. Louis, MO 63102
P: 314.231.5555
W: www.slmbc.org

U.S. Small Business Administration - St. Louis, MO
8(a) Contractors, Minority Small Business
1222 Spruce Street, Suite 10.103
St. Louis, MO 63101
P: 314.539.6600
W: www.sba.gov

Lambert St. Louis International Airport
Business Diversity Development Office
11495 Navaid
Bridgeton, MO 63044
P: 314-426-8111
W: www.flystl.com/business/business-diversity-development-1/directories

City of Kansas City, Missouri
Human Relations Department, MBE/WBE Division
4th Floor, City Hall
414 E. 12th Street
Kansas City, MO 64106
P: 816.513.1836
W: kcmohrd.mwdbe.com/?TN=kcmohrd

Mid-States Minority Supplier Development Council
505 N. 7th Street, Ste. 1820
St. Louis, MO 63101
P: 314.278.5616
W: midstatesdc.org

U.S. Small Business Administration - Kansas City, MO
8(a) Contractors, Minority Small Business
1000 Walnut, Suite 500
Kansas City, MO 64106
P: 816.426.4900
W: kcmohrd.mwdbe.com/?TN=kcmohrd

Missouri Department of Transportation
Division of Construction
1617 Missouri Blvd.
P.O. Box 270
Jefferson City, MO 65102
P: 573.526.2978
W: www.modot.org/mrcc-directory

Illinois Department of Transportation
MBE/WBE Certification Section
2300 Dirksen Parkway
Springfield, IL 62764
217/782-5490; 217/785-1524 (Fax)
W: webapps.dot.illinois.gov/UCP/ExternalSearch

State of Missouri OA
Office of Equal Opportunity
301 W. High St. HSC Rm 870-B
Jefferson City, MO 65101
P: 877.259.2963
W: oa.mo.gov/sites/default/files/sdvelisting.pdf
W: oeo.mo.gov/

Minority Newspapers

Dos Mundos Bilingual Newspaper
902A Southwest Blvd.
Kansas City, MO 64108
816-221-4747
www.dosmundos.com

Kansas City Hispanic News
2918 Southwest Blvd.
Kansas City, MO 64108
816/472-5246
www.kchispanicnews.com

The Kansas City Globe
615 E. 29th Street
Kansas City, MO 64109
816-531-5253
www.thekcglobe.com/about_us.php

St. Louis American
4144 Lindell
St. Louis, MO 63108
314-533-8000
www.stlamerican.com

St. Louis Chinese American News
1766 Burns Ave, Suite 201
St. Louis, MO 63132
314-432-3858
www.scannews.com

St. Louis Business Journal
815 Olive St., Suite 100
St. Louis, MO 63101
314-421-6200
www.bizjournal.com/stlouis

Kansas City Business Journal
1100 Main Street, Suite 210
Kansas City, MO 64105
816-421-5900
www.bizjournals.com/kansascity

AFFIDAVIT OF SUPPLIER DIVERSITY PARTICIPATION

The apparent low Bidder shall complete and submit this form within 48 hours of bid opening for each Diverse firm that will participate on the contract.

1. Diverse Firm:_____

   Contact Name: _____

   Address:_____

   Phone No.:_____ E-Mail:_____

   Status (check one) MBE ☐ WBE ☐ Veteran ☐ Service Disabled Veteran ☐ DBE ☐
   If MBE, Certified as (circle one): 1) Black American 2) Hispanic American 3) Native American 4) Asian American

2. Is the proposed diverse firm certified by an approved agency [see IFB article 15]? Yes ☐ No ☐

   Agency: _____[attach copy of certification authorization from agency]

   Certification Number:_____

3. Diverse firm scope work and bid/contract dollar amount of participation (List Base Bid and Alternate work separately). The final Dollar amount will be determined at substantial completion:

	Scope of Work	Bid/Contract Amount	Final Dollar Amount
Base Bid			
Alternate #1			
Alternate #2			
Alternate #3			
Alternate #4			
Alternate #5			
Alternate #6			

The undersigned certifies that the information contained herein (i.e. Scope of Work and Bid/Contract Amount) is true and correct to the best of their knowledge, information and belief.

General Contractor:_____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date: _____

The undersigned certifies that the information contained herein (i.e. Scope of Work and Final Dollar Amount) is true and correct to the best of their knowledge, information and belief. If the Final Dollar Amount is different than the Bid/Contract Amount, then attach justification for the difference.

.

Contractor: _____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date:_____

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University of Missouri

INFORMATION FOR BIDDERS

Page No.

1. Contract Documents

1.1 Drawings, specifications, and other contract documents, pursuant to work, which is to be done, may be obtained shown in the Advertisement for Bids and Special Conditions.

2. Bidder Obligations

2.1 Before submitting bids, each bidder shall carefully examine the drawings and specifications and related contract documents, visit site of work, and fully inform themselves as to all existing conditions, facilities, restrictions, and other matters which can affect the work or the cost thereof.

2.2 Each bidder shall include in their bid the cost of all work and materials required to complete the contract in a first-class manner as hereinafter specified.

2.3 Failure or omission of any bidder to receive or examine any form, instrument, addendum, or other document, or to visit the site and acquaint themselves with existing conditions, shall in no way relieve them from any obligation with respect to their bid or contract, and no extra compensation will be allowed by reason of anything or matter concerning which bidder should have fully informed themselves prior to bidding.

2.4 Submission of bids shall be deemed acceptance of the above obligations and each and every obligation required to be performed by all of the contract documents in the event the bid is accepted.

3. Interpretation of Documents

3.1 If any prospective bidder is in doubt as to the true meaning of any part of the drawings and specifications or contract documents, they shall submit a written request to the Architect for an interpretation.

3.2 Requests for such interpretations shall be delivered to the Architect at least one (1) week prior to time for receipt of bids.

3.3 Bids shall be based only on interpretations issued in the form of addenda mailed to each person who is on the Architect's record as having received a set of the contract documents.

4. Bids

4.1 Bids shall be received separately or in combination as shown in and required by the Bid for Lump Sum contract. Bids will be completed so as to include insertion of amounts for alternate bids, unit prices and cost accounting data.

4.2 Bidders shall apportion each base bid between various phases of the work, as stipulated in the Bid for Lump Sum contract. All work shall be done as defined in the specifications and as indicated on the drawings.

4.3 Bids shall be presented in sealed envelopes which shall be plainly marked "Bids for (indicate name of project from cover sheet)" and mailed or delivered to the building and room number specified in the Advertisement for Bids. Bidders shall be responsible for actual delivery of bids during business hours, and it shall not be sufficient to show that a bid was mailed in time to be received before scheduled closing time for receipt of bids, nor shall it be sufficient to show that a bid was somewhere in a university facility.

4.4 The bidder's price shall include all federal sales, excise, and similar taxes, which may be lawfully assessed in connection with their performance of work and purchase of materials to be incorporated in the work. City & State taxes shall not be included as defined within Article 3.16 of the General Conditions for Construction Contract included in the contract documents.

4.5 Bids shall be submitted on a single bid form, furnished by the Owner or Architect. Do not remove the bid form from the specifications.

4.6 No bidder shall stipulate in their bid any conditions not contained in the bid form.

4.7 The Owner reserves the right to waive informalities in bids and to reject any or all bids.

5. Modification and Withdrawal of Bids

5.1 The bidder may withdraw their bid at any time before the scheduled closing time for receipt of bids, but no bidder may withdraw their bid after the scheduled closing time for receipt of bids.

5.2 Only telegrams, letters and other written requests for modifications or correction of previously submitted bids, contained in a sealed envelope which is plainly marked "Modification of Bid on (name of project on cover sheet)," which are addressed in the same manner as bids, and are received by Owner before the scheduled closing time for receipt of bids will be accepted and bids corrected in accordance with such written requests.

6. Signing of Bids

6.1 Bids which are signed for a partnership shall be **manually** signed in the firm name by at least one partner, or in the firm name by Attorney-in-Fact. If signed by Attorney-in-Fact there should be attached to the bid, a Power of Attorney evidencing authority to sign the bid dated the same date as the bid and executed by all partners of the firm.

6.2 Bids that are signed for a corporation shall have the correct corporate name thereon and the signature of an authorized officer of the corporation manually written below corporate name. Title of office held by the person signing for the corporation shall appear below the signature of the officer.

6.3 Bids that are signed by an individual doing business under a firm name, shall be manually signed in the name of the individual doing business under the proper firm name and style.

6.4 Bids that are signed under joint venture shall be manually signed by officers of the firms having authority to sign for their firm.

7. Bid Security

7.1 Each bid shall be accompanied by a bid bond, certified check, or cashier's check, acceptable to and payable without condition to The Curators of the University of Missouri, in an amount at least equal to five percent (5%) of bidder's bid including additive alternates.

7.2 Bid security is required as a guarantee that bidder will enter into a written contract and furnish a performance bond within the time and in form as specified in these specifications; and if successful bidder fails to do so, the bid security will be realized upon or retained by the Owner. The apparent low bidder shall notify the Owner in writing within 48 hours (2 workdays) of the bid opening of any circumstance that may affect the bid security including, but not limited to, a bidding error. This notification will not guarantee release of the bidder's security and/or the bidder from the Bidder's Obligations.

7.3 If a bid bond is given as a bid security, the amount of the bond may be stated as an amount equal to at least five percent (5%) of the bid, including additive alternates, described in the bid. The bid bond shall be executed by the bidder and a responsible surety licensed in the State of Missouri with a Best's rating of no less than A-/XI.

7.4 It is specifically understood that the bid security is a guarantee and shall not be considered as liquidated damages for failure of bidder to execute and deliver their contract and performance bond, nor limit or fix bidder's liability to Owner for any damages sustained because of failure to execute and deliver the required contract and performance bond.

7.5 Bid security of the two (2) lowest and responsive Bidders will be retained by the Owner until a contract has been executed and an acceptable bond has been furnished, as required hereby, when such bid security will be returned. Surety bid bonds of all other bidders will be destroyed and all other alternative forms of bid bonds will be returned to them within ten (10) days after Owner has determined the two (2) lowest and responsive bids.

8. Bidder's Statement of Qualifications

8.1 Each bidder submitting a bid shall present evidence of their experience, qualifications, financial responsibility and ability to carry out the terms of the contract by completing and submitting with their bid the schedule of information set forth in the form furnished in the bid form.

8.2 Such information, a single copy required in a separate sealed envelope, will be treated as confidential information by the Owner, within the meaning of Missouri Statue 610.010.

8.3 Bids not accompanied with current Bidder's Statement of Qualifications may be rejected.

9. Award of Contract

9.1 The Owner reserves the right to let other contracts in connection with the work, including, but not by way of limitation, contracts for furnishing and installation of furniture, equipment, machines, appliances, and other apparatus.

9.2 In awarding the contract, the Owner may take into consideration the bidder's, and their subcontractor's, ability to handle promptly the additional work, skill, facilities, capacity, experience, ability, responsibility, previous work, financial standing of bidder, and the bidder's ability to provide the required bonds and insurance; quality, efficiency and construction of equipment proposed to be furnished; period of time within which equipment is proposed to be furnished and delivered; success in achieving the specified Supplier Diversity goal, or demonstrating a good faith effort as described in Article 15; necessity of prompt and efficient completion of work herein described, and the bidder's status as suspended or debarred. Inability of any bidder to meet the requirements mentioned above may be cause for rejection of their bid.

10. Contract Execution

10.1 The Contractor shall submit within fifteen (15) days from receipt of notice, the documents required in Article 9 of the General Conditions for Construction Contract included in the contract documents.

10.2 No bids will be considered binding upon the Owner until the documents listed above have been furnished. Failure of Contractor to execute and submit these documents within the time period specified will be treated, at the option of the

Owner, as a breach of the bidder's bid security under Article 7 and the Owner shall be under no further obligation to Bidder.

11. Contract Security

11.1 When the Contract sum exceeds $50,000, the Contractor shall procure and furnish a Performance bond and a Payment bond in the form prepared by Owner. Each bond shall be in the amount equal to one hundred percent (100%) of the contract sum, as well as adjustments to the Contract Sum. The Performance Bond shall secure and guarantee Contractor's faithful performance of this Contract, including but not limited to Contractor's obligation to correct defects after final payment has been made as required by the Contract Documents. The Payment Bond shall secure and guarantee payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. These Bonds shall be in effect through the duration of the Contract plus the Guaranty Period as required by the Contract Documents.

11.2 The bonds required hereunder shall be meet all requirements of Article 11 of the General Conditions for Construction Contract included in the contract documents.

11.3 If the surety of any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to conduct business in the State of Missouri is terminated, or it ceases to meet the requirements of this Article 11, Contractor shall within ten (10) days substitute another bond and surety, both of which must be acceptable to Owner. If Contractor fails to make such substitution, Owner may procure such required bonds on behalf of Contractor at Contractor's expense.

12. Time of Completion

12.1 Contractors shall agree to commence work within five (5) days of the date "Notice to Proceed" is received from the Owner, and the entire work shall be completed by the completion date specified or within the number of consecutive calendar days stated in the Special Conditions. The duration of the construction period, when specified in consecutive calendar days, shall begin when the contractor receives notice requesting the documents required in Article 9 of the General Conditions for Construction Contract included in the contract documents.

13. Number of Contract Documents

13.1 The Owner will furnish the Contractor a copy of the executed contract and performance bond.

13.2 The Owner will furnish the Contractor the number of copies of complete sets of drawings and specifications for the work, as well as clarification and change order drawings pertaining to change orders required during construction as set forth in the Special Conditions.

14. Missouri Products and Missouri Firms

14.1 The Curators of the University of Missouri have adopted a policy which is binding upon all employees and departments of the University of Missouri, and which by contract, shall be binding upon independent contractors and subcontractors with the University of Missouri whereby all other things being equal, and when the same can be secured without additional cost over foreign products, or products of other states, a preference shall be granted in all construction, repair and purchase contracts, to all products, commodities, materials, supplies, and articles mined, grown, produced, andmanufactured in marketable quantity and quality in the Stateof Missouri, and to all firms, corporations or individuals doing business as Missouri firms, corporations, or individuals. Each bidder submitting a bid agrees to comply with and be bound by the foregoing policy.

15. SUPPLIER DIVERSITY

15.1 Award of Contract

The Supplier Diversity participation goal for this project is stated on the Bid for Lump Sum Contract Form, and the Owner will take into consideration the bidder's success in achieving the Supplier Diversity participation goal in awarding the contract. Inability of any bidder to meet this requirement may be cause for rejection of their bid.

A 3-point Service-Disabled Veteran Enterprises (SDVE) bonus preference shall apply to this contract. The 3 bonus points can be obtained by a certified, Missouri based SDVE performing a commercially useful function, (as defined in Article 1 of the General Conditions of the Contract for Construction) either by submitting a bid directly to the Owner, or through the utilization of certified SDVE subcontractors and/or suppliers, whose participation provides atleast 3% of the total bid amount. A firm does not perform a commercially useful function if its role is limited to that of an extra participant in a transaction, contract, or project through which funds are passed in order to obtain the appearance of SDVE participation. In determining whether a firm is such an extra participant, the Owner will examine similar transactions, particularly those in which SDVEs do not participate. The 3-point bonus preference shall be calculated and applied by reducing the bid amount of the eligible bidder by three (3) percent of the apparent low responsive bidder's bid. Based on this calculation, if the eligible bidder's resulting total bid valuation is less than the apparent low responsive bidder's bid, the eligible bid becomes the apparent low responsive bid. This reduction is for evaluation purposes only and will have no impact on the actual amount(s) of the eligible bidder's bid or the amount(s) of any contract awarded. The submitted bid form must include a minimum of 3% SDVE participation to obtain the three (3) point bonus. For every SDVE firm utilized, a completed AFFIDAVIT OF SUPPLIER DIVERSITY PARTICIPATION form shall be submitted to the Owner within 24 hours of the receipt of bids. Failure to do so may be grounds for rejection of the SDVE bonus preference.

15.2 List of Supplier Diversity Firms

15.2.1 The bidder shall submit as part of their bid a list of diverse firms performing as contractor, subcontractors, and/or suppliers. The list shall specify the single designated diverse firm name and address. If acceptance or non-acceptance of alternates will affect the designation of a subcontractor, provide information for each affected category.

15.2.2 Failure to include a complete list of diverse firms may be grounds for rejection of the bid.

15.2.3 The list of diverse firms shall be submitted in addition to any other listing of subcontractors required in the Bid for Lump Sum Contract Form.

15.3 Supplier Diversity Percentage Goal

The bidder shall have a minimum goal of subcontracting with diverse contractors, subcontractors, and suppliers, the percent

of contract price stated in the Supplier Diversity goal paragraph of the Bid for Lump Sum Contract Form.

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15.4 Supplier Diversity Percent Goal Computation

15.4.1 The total dollar value of the work granted to the diverse firms by the successful bidder is counted towards the applicable goal of the entire contract, unless otherwise noted below.

15.4.2 The bidder may count toward the Supplier Diversity goal only expenditures to diverse firms that perform a commercially useful function in the work of a contract. A diverse firm is considered to perform a commercially useful function when it is responsible for executing a distinct element of the work and carrying out its responsibilities by actually performing, managing and supervising the work involved. A bidder that is a certified diverse firm may count as 100% of the contract towards the Supplier Diversity goal. For projects with separate MBE, SDVE, and WBE/Veteran/DBE goals, a MBE firm bidding as the prime bidder is expected to obtain the required SDVE, and WBE/Veteran/ DBE participation; a WBE or Veteran or DBE firm bidding as the prime bidder is expected to obtain the required MBE and SDVE participation and a SDVE firm bidding as the prime bidder is expected to obtain the required MBE, and WBE/Veteran/ DBE participation.

15.4.3 When a MBE, WBE, Veteran Business Enterprise, DBE, or SDVE performs work as a participant in a joint venture, only the portion of the total dollar value of the contract equal to the distinct, clearly defined portion of the work of the contract that the MBE, WBE, Veteran Business Enterprise, DBE, or SDVE performs with its own forces shall count toward the MBE, WBE, Veteran Business Enterprise, DBE, or SDVE individual contract percentages.

15.4.4 The bidder may count toward its Supplier Diversity goal expenditures for materials and supplies obtained from diverse suppliers and manufacturers, provided the diverse firm assumes the actual and contractual responsibility for the provision of the materials and supplies.

15.4.4.1 The bidder may count its entire expenditure to a diverse manufacturer. A manufacturer shall be defined as an individual or firm that produces goods from raw materials or substantially alters them before resale.

15.4.4.2 The bidder may count its entire expenditure to diverse suppliers that are not manufacturers provided the diverse supplier performs a commercially useful function as defined above in the supply process.

15.4.4.3 The bidder may count 25% of its entire expenditures to diverse firms that do not meet the definition of a subcontractor, a manufacturer, nor a supplier. Such diverse firms may arrange for, expedite, or procure portions of the work but are not actively engaged in the business of performing, manufacturing, or supplying that work.

15.4.5 The bidder may count toward the Supplier Diversity goal that portion of the total dollar value of the work awarded to a certified joint venture equal to the percentage of the ownership and control of the diverse partner in the joint venture.

15.5 Certification by Bidder of Diverse Firms

15.5.1. The bidder shall submit with its bid the information requested in the "Supplier Diversity Compliance Evaluation Form" for every diverse firm the bidder intends to award work to on the contract.

15.5.2. Diverse firms are defined in Article 1 – (Supplier Diversity Definitions) of the General Conditions of the Contract for Construction included in the contract documents, and as those businesses certified as disadvantaged by an approved agency. The bidder is responsible for obtaining information regarding the certification status of a firm. A listof certified firms may be obtained by contacting the agencies listed in the proposal form document "Supplier Diversity Certifying Agencies." Any firm listed as disadvantaged by any of the identified agencies will be classified as a diverse firm by the Owner.

15.5.3. Bidders are urged to encourage their prospective diverse contractors, subcontractors, joint venture participants, team partners, and suppliers who are not currently certified to obtain certification from one of the approved agencies.

15.6 Supplier Diversity Participation Waiver

15.6.1 The bidder is required to make a good faith effort to locate and contract with diverse firms. If a bidder has made a good faith effort to secure the required diverse firms and has failed, the bidder shall submit with the bid, the information requested in "Application for Supplier Diversity Participation Waiver." The Contracting Officer will review the bidder's actions as set forth in the bidder's "Application for Waiver" and any other factors deemed relevant by the Contracting Officer to determine if a good faith effort has been made to meet the applicable percentage goal. If the bidder is judged not to have made a good faith effort, the bid may be rejected. Bidders who demonstrate that they have made a good faith effort to include Supplier Diversity participation may be awarded the contract regardless of the percent of Supplier Diversity participation, provided the bid is otherwise acceptable and is determined to be the best bid.

15.6.2 To determine good faith effort of the bidder, the Contracting Officer may evaluate factors including, but not limited to, the following:

15.6.2.1 The bidder's attendance at pre-proposal meetings scheduled to inform bidders and diverse firms of contracting and subcontracting opportunities and responsibilities associated with Supplier Diversity participation.

15.6.2.2 The bidder's advertisements in general circulation trade association, and diverse (minority) focused media concerning subcontracting opportunities.

15.6.2.3 The bidder's written notice to specific diverse firms that their services were being solicited in sufficient time to allow for their effective participation.

15.6.2.4 The bidder's follow-up attempts to the initial solicitation(s) to determine with certainty whether diverse firms were interested.

15.6.2.5 The bidder's efforts to divide the work into packages suitable for subcontracting to diverse firms.

15.6.2.6 The bidder's efforts to provide interested diverse firms with sufficiently detailed information about the drawings, specific actions and requirements of the contract, and clear scopes of work for the firms to bid on.

15.6.2.7 The bidder's efforts to solicit for specific sub-bids from diverse firms in good faith. Documentation should include names, addresses, and telephone numbers of firms contacted a description of all information provided the diverse firms, and an explanation as to why agreements were not reached.

15.6.2.8 The bidder's efforts to locate diverse firms not on the directory list and assist diverse firms in becoming certified as such.

15.6.2.9 The bidder's initiatives to encourage and develop participation by diverse firms.

15.6.2.10 The bidder's efforts to help diverse firms overcome legal or other barriers impeding the participation of diverse firms in the construction contract.

15.6.2.11 The availability of diverse firms and the adequacy of the bidder's efforts to increase the participation of such business provided by the persons and organizations consulted by the bidder.

15.7 Submittal of Forms

15.7.1 The bidder will include the Supplier Diversity Compliance Evaluation Form(s), or the Application for Waiver and other form(s) as required above in the envelope containing the "Bidder's Statement of Qualifications", see Article 8.

15.8 Additional Bid/Proposer Information

15.8.1 The Contracting Officer reserves the right to request additional information regarding Supplier Diversity participation and supporting documentation from the apparent low bidder. The bidder shall respond in writing to the Contracting Officer within 24 hours (1 workday) of a request.

15.8.2 The Contracting Officer reserves the right to request additional information after the bidder has responded to prior 24-hour requests. This information may include follow up and/or clarification of the information previously submitted.

15.8.3 The Owner reserves the right to consider additional diverse subcontractor and supplier participation submitted by the bidder after bids are opened under the provisions within these contract documents that describe the Owner's right to accept or reject subcontractors including, but not limited to, Article 16 below. The Owner may elect to waive the good faith effort requirement if such additional participation achieves the Supplier Diversity goal.

15.8.4 The Bidder shall provide the Owner information related to the Supplier Diversity participation included in the bidder's proposal, including, but is not limited to, the complete Application for Waiver, evidence of diverse certification of participating firms, dollar amount of participation of diverse firms, information supporting a good faith effort as described in Article 15.6 above, and a list of all diverse firms that submitted bids to the Bidder with the diverse firm's price and the name and the price of the firm awarded the scope of work bid by the diverse firm.

16. List of Subcontractors

16.1 If a list of subcontractors is required on the Bid for Lump Sum Contract Form, the bidders shall list the name, city and state of the firm(s) which will accomplish that portion of the contract requested in the space provided. This list is separate from both the list of diverse firms required in Article 15.2, and the complete list of subcontractors required in Article 10.1 of this document. Should the bidder choose to perform any of the listed portions of the work with its own forces, the bidder shall enter its own name, city and state in the space provided. If acceptance or non-acceptance of alternates will affect the designation of a subcontractor, the bidder shall provide that information on the bid form.

16.2 Failure of the bidder to supply the list of subcontractors required or the listing of more than one subcontractor for any category without designating the portion of the work to be performed by each, shall be grounds for the rejection of the bid. The bidder can petition the Owner to change a listed subcontractor within 48 hours of the bid opening. The Owner reserves the right to make the final determination on a petition to change a subcontractor. The Owner will consider factors such as clerical and mathematical bidding errors, listed subcontractor's inability to perform the work for the bid used, etc. Any request to change a listed subcontractor shall include at a minimum, contractor's bid sheet showing tabulation of the bid; all subcontractor bids with documentation of the time they were received by the contractor; and a letter from the listed subcontractor on their letterhead stating why they cannot perform the work if applicable. The Owner reserves the right to ask for additional information.

16.3 Upon award of the contract, the requirements of Article 10 of this document and Article 5 of the General Conditions of the Contract for Construction included in the contract documents will apply.

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University of Missouri

General Conditions

of the

Contract

for

Construction

December 2021 Edition

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TABLE OF ARTICLES

ARTICLE 1
GENERAL PROVISIONS

1.1 Basic Definitions
As used in the Contract Documents, the following terms shall have the meanings and refer to the parties designated in these definitions.

1.1.1 Owner
The Curators of the University of Missouri. The Owner may act through its Board of Curators or any duly authorized committee or representative thereof.

1.1.2 Contracting Officer
The Contracting Officer is the duly authorized representative of the Owner with the authority to execute contracts. Communications to the Contracting Officer shall be forwarded via the Owner's Representative.

1.1.3 Owner's Representative
The Owner's Representative is authorized by the Owner as the administrator of the Contract and will represent the Owner during the progress of the Work. Communications from the Architect to the Contractor and from the Contractor to the Architect shall be through the Owner's Representative, unless otherwise indicated in the Contract Documents.

1.1.4 Architect
When the term "Architect" is used herein, it shall refer to the Architect or the Engineer specified and defined in the Contract for Construction or its duly authorized representative. Communications to the Architect shall be forwarded to the address shown in the Contract for Construction.

1.1.5 Owner's Authorized Agent
When the term "Owner's Authorized Agent" is used herein, it shall refer to an employee or agency acting on the behalf of the Owner's Representative to perform duties related to code inspections, testing, operational systems check, certification or accreditation inspections, or other specialized work.

1.1.6 Contractor
The Contractor is the person or entity with whom the Owner has entered into the Contract for Construction. The term "Contractor" means the Contractor or the Contractor's authorized representative.

1.1.7 Subcontractor and Lower-tier Subcontractor
A Subcontractor is a person or organization who has a contract with the Contractor to perform any of the Work. The term "Subcontractor" is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or its authorized representative. The term "Subcontractor" also is applicable to those furnishing materials to be incorporated in the Work whether work performed is at the Owner's site or off site, or both. A lower-tier Subcontractor is a person or organization who has a contract with a Subcontractor or another lower-tier Subcontractor to perform any of the Work at the site. Nothing contained in the Contract Documents shall create contractual relationships between the Owner or the Architect and any Subcontractor or lower-tier Subcontractor of any tier.

1.1.8 Supplier Diversity Definitions
Businesses that fall into the Supplier Diversity classification shall mean an approved certified business concern which is at least fifty-one percent (51%) owned and controlled by one (1) or more diverse suppliers as described below.

.1 Minority Business Enterprises (MBE)

Minority Business Enterprise [MBE] shall mean an approved certified business concern which is at least fifty-one percent (51%) owned and controlled by one (1) or more minorities as defined below or, in the case of any publicly-owned business, in which at least fifty-one percent (51%) of the stock of which is owned by one (1) or more minorities as defined below, and whose management and daily business operations are controlled by one (1) or more minorities as defined herein.

- **.1.1** "African Americans", which includes persons having origins in any of the black racial groups of Africa.
- **.1.2** "Hispanic Americans", which includes persons of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race.
- **.1.3** "Native Americans", which includes persons of American Indian, Eskimo, Aleut, or Native Hawaiian origin.
- **.1.4** "Asian-Pacific Americans", which includes persons whose origins are from Japan, China, Taiwan, Korea, Vietnam, Laos, Cambodia, the Philippines, Samoa, Guam, the U.S. Trust Territories of the Pacific, or the Northern Marinas.
- **.1.5** "Asian-Indian Americans", which includes persons whose origins are from India, Pakistan, or Bangladesh.

.2 Women Business Enterprise (WBE)

Women Business Enterprise [WBE] shall mean an approved certified business concern which is at least fifty-one percent (51%) owned and controlled by one (1) or more women or, in the case of any publicly owned business, in which at least fifty-one percent (51%) of the stock of which is owned by one (1) or more women, and whose management and daily business operations are controlled by one (1) or more women.

.3 Veteran Owned Business

Veteran Owned Business shall mean an approved certified business concern which is at least fifty-one percent (51%) owned and controlled by one (1) or more Veterans or, in the case of any publicly owned business, in which at least fifty-one percent (51%) of the stock of which is owned by one (1) or more Veterans, and whose management and daily business operations are controlled by one (1) or more Veterans. Veterans must be certified by the appropriate federal agency responsible for veterans' affairs.

.4 Service-Disabled Veteran Enterprise (SDVE)
Service-Disabled Veteran Enterprise (SDVE) shall mean a business certified by the State of Missouri Office of Administration as a Service-Disabled Veteran Enterprise, which is at least fifty-one percent (51%) owned and controlled by one (1) or more Serviced-Disabled Veterans or, in the case of any publicly-owned business, in which at least fifty-one percent (51%) of the stock of which is owned by one (1) or more Service-Disabled Veterans, and whose management and daily business operations are controlled by one (1) or more Serviced-Disabled Veterans.

.5 Disadvantaged Business Enterprise (DBE)
A Disadvantaged Business Enterprise (DBE) is a for-profit small business concern where a socially and economically disadvantaged individual owns at least 51% interest and also controls management and daily business operations. These firms can and also be referred to as Small Disadvantaged Businesses (SDB). Eligibility requirements for certification are stated in 49 CFR (Code of Federal Regulations), part 26, Subpart D.

U.S. citizens that are African Americans, Hispanics, Native Americans, Asian-Pacific and Subcontinent Asian Americans, and women are presumed to be socially and economically disadvantaged. Also recognized as DBE's are Historically Black Colleges and Universities (HBCU) and small businesses located in Federal HUB Zones.
To be regarded as economically disadvantaged, an individual must have a personal net worth that does not exceed $1.32 million. To be seen as a small business, a firm must meet Small Business Administration (SBA) size criteria (500 employees or less) and have average annual gross receipts not to exceed $22.41 million. To be considered a DBE/SDB, a small business owned and controlled by socially and/or economically disadvantaged individuals must receive DBE certification from one of the recognized Missouri state agencies to be recognized in this classification.

1.1.9 Work
Work shall mean supervision, labor, equipment, tools, material, supplies, incidentals operations and activities required by the Contract Documents or reasonably inferable by Contractor therefrom as necessary to produce the results intended by the Contract Documents in a safe, expeditious, orderly, and workmanlike manner, and in the best manner known to each respective trade.

1.1.10 Approved
The terms "approved", "equal to", "directed", "required", "ordered", "designated", "acceptable", "compliant", "satisfactory", and similar words or phrases will be understood to have reference to action on the part of the Architect and/or the Owner's Representative.

1.1.11 Contract Documents
The Contract Documents consist of (1) the executed Contract for Construction, (2) these General Conditions of the Contract for Construction, (3) any Supplemental Conditions or Special Conditions identified in the Contract for Construction, (4) the Specifications identified in the Contract for Construction, (5) the Drawings identified in the Contract for Construction, (6) Addenda issued prior to the receipt of bids, (7) Contractor's bid addressed to Owner, including Contractor's completed Qualification Statement, (8) Contractor's Performance Bond and Contractor's Payment Bond, (9) Notice to Proceed, (10) and any other exhibits and/or post bid adjustments identified in the Contract for Construction, (11) Advertisement for Bid, (12) Information for Bidders, and (13) Change Orders issued after execution of the Contract. All other documents and technical reports and information are not Contract Documents, including without limitation, Shop Drawings, and Submittals.

1.1.12 Contract
The Contract Documents form the Contract and are the exclusive statement of agreement between the parties. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior representations or agreements, either written or oral. The Contract Documents shall not be construed to create a contractual relationship of any kind between the Owner and a Subcontractor or any lower-tier Subcontractor.

1.1.13 Change Order
The Contract may be amended or modified without invalidating the Contract, only by a Change Order, subject to the limitations in Article 7 and elsewhere in the Contract Documents. A Change Order is a written instrument signed by the Owner and the Contractor stating their agreement to a change in the Work, the amount of the adjustment to the Contract Sum, if any, and the extent of the adjustment to the Contract Time, if any. Agreement to any Change Order shall constitute a final settlement of all matters relating to the change in the work which is the subject of the Change Order, including, but not limited to, all direct and indirect costs associated with such change and any and all adjustments of the Contract sum, time and schedule.

1.1.14 Substantial Completion
The terms "Substantial Completion" or "substantially complete" as used herein shall be construed to mean the completion of the entire Work, including all submittals required under the Contract Documents, except minor items which in the opinion of the Architect, and/or the Owner's Representative will not interfere with the complete and satisfactory use of the facilities for the purposes intended.

1.1.15 Final Completion
The date when all punch list items are completed, including all closeout submittals and approval by the Architect is given to the Owner in writing.

1.1.16 Supplemental and Special Conditions
The terms "Supplemental Conditions" or "Special Conditions" shall mean the part of the Contract Documents

which amend, supplement, delete from, or add to these General Conditions.

1.1.17 Day
The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

1.1.18 Knowledge.
The terms “knowledge,” “recognize” and “discover” their respective derivatives and similar terms in the Contract Documents, as used in reference to the Contractor, shall be interpreted to mean that which the Contractor knows or should know, recognizes, or should recognize and discovers or should discover in exercising the care, skill, and diligence of a diligent and prudent contractor familiar with the work. Analogously, the expression “reasonably inferable” and similar terms in the Contract Documents shall be interpreted to mean reasonably inferable by a diligent and prudent contractor familiar with the work.

1.1.19 Punch List
“Punch List” means the list of items, prepared in connection with the inspection(s) of the Project by the Owner’s Representative or Architect in connection with Substantial Completion of the Work or a portion of the Work, which the Owner’s Representative or Architect has designated as remaining to be performed, completed, or corrected before the Work will be accepted by the Owner.

1.1.20 Public Works Contracting Minimum Wage
The public works contracting minimum wage shall be equal to one hundred twenty percent of the average hourly wage in a particular locality, as determined by the Missouri economic research and information center within the department of economic development, or any successor agency.

1.1.21 Force Majeure
An event or circumstance that could not have been reasonably anticipated and is out of the control of both the Owner and the Contractor.

1.2 Specifications and Drawings
1.2.1 The Specifications are that portion of the Contract Documents consisting of the written requirements for materials, equipment, construction system, standards and workmanship and performance of related services for the Work identified in the Contract for Construction. Specifications are separated into titled divisions for convenience of reference only. Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade. Such separation will not operate to make the Owner or the Architect an arbiter of labor disputes or work agreements.

1.2.2 The drawings herein referred to, consist of drawings prepared by the Architect and are enumerated in the Contract Documents.

1.2.3 Drawings are intended to show general arrangements, design, and dimensions of work and are partly diagrammatic. Dimensions shall not be determined by scale or rule. If figured dimensions are lacking, they shall be supplied by the Architect on the Contractor's written request to the Owner's Representative.

1.2.4 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complimentary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall by required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the intended results.

1.2.5 In the event of inconsistencies within or between parts of the Contract Documents, or between the Contract Documents and applicable standards, codes and ordinances, the Contractor shall (1) provide the better quality or greater quantity of Work or (2) comply with the more stringent requirement; either or both in accordance with the Owner’s Representative’s interpretation. On the Drawings, given dimensions shall take precedence over scaled measurements and large-scale drawings over small scale drawings. Before ordering any materials or doing any Work, the Contractor and each Subcontractor shall verify measurements at the Work site and shall be responsible for the correctness of such measurements. Any difference which may be found shall be submitted to the Owner’s Representative and Architect for resolution before proceeding with the Work. If a minor change in the Work is found necessary due to actual field conditions, the Contractor shall submit detailed drawings of such departure for the approval by the Owner’s Representative and Architect before making the change.

1.2.6 Data in the Contract Documents concerning lot size, ground elevations, present obstructions on or near the site, locations and depths of sewers, conduits, pipes, wires, etc., position of sidewalks, curbs, pavements, etc., and nature of ground and subsurface conditions have been obtained from sources the Architect believes reliable, but the Architect and Owner do not represent or warrant that this information is accurate or complete. The Contractor shall verify such data to the extent possible through normal construction procedures, including but not limited to contacting utility owners and by prospecting.

1.2.7 Only work included in the Contract Documents is authorized, and the Contractor shall do no work other than that described therein.

1.2.8 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be

performed and correlated personal observations with requirements of the Contract Documents. Contractor represents that it has performed its own investigation and examination of the Work site and its surroundings and satisfied itself before entering into this Contract as to:

.1 conditions bearing upon transportation, disposal, handling, and storage of materials;

.2 the availability of labor, materials, equipment, water, electrical power, utilities and roads;

.3 uncertainties of weather, river stages, flooding and similar characteristics of the site;

.4 conditions bearing upon security and protection of material, equipment, and Work in progress;

.5 the form and nature of the Work site, including the surface and sub-surface conditions;

.6 the extent and nature of Work and materials necessary for the execution of the Work and the remedying of any defects therein; and

.7 the means of access to the site and the accommodations it may require and, in general, shall be deemed to have obtained all information as to risks, contingencies and other circumstances.

.8 the ability to complete work without disruption to normal campus activities, except as specifically allowed in the contract documents.

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.

1.2.9 Drawings, specifications, and copies thereof furnished by the Owner are and shall remain the Owner's property. They are not to be used on another project and, with the exception of one contract set for each party to the Contract, shall be returned to the Owner's Representative on request, at the completion of the Work.

1.3 Required Provisions Deemed Inserted

Each and every provision of law and clause required by law to be inserted in this Contract shall be deemed to be inserted herein, and the Contract shall be read and enforced as though it were included herein; and if through mistake or otherwise any such provision is not inserted, or is not correctly inserted, then upon the written application of either party the Contract shall forthwith be physically amended to make such insertion or correction.

ARTICLE 2
OWNER

2.1 Information and Services Required of Owner

2.1.1 Permits and fees are the responsibility of the Contractor under the Contract Documents, unless specifically stated in the contract documents that the Owner will secure and pay for specific necessary approvals, easements, assessments, and charges required for construction, use or occupancy of permanent structures, or for permanent changes in existing facilities.

2.1.2 When requested in writing by the Contractor, information or services under the Owner's control, which are reasonably necessary to perform the Work, will be furnished by the Owner with reasonable promptness to avoid delay in the orderly progress of the Work.

2.2 Owner's Right to Stop the Work

2.2.1 If the Contractor fails to correct Work which is not in strict accordance with the requirements of the Contract Documents or fails to carry out Work in strict accordance with the Contract Documents, the Owner's Representative may order the Contractor to stop the Work, or any portion thereof, until the cause for such order has been eliminated; however, the right of the Owner to stop the Work will not give rise to a duty on the part of the Owner to exercise this right for the benefit of the Contractor or any other person or entity. Owner's lifting of Stop Work Order shall not prejudice Owner's right to enforce any provision of this Contract.

2.3 Owner's Right to Carry Out the Work

2.3.1 If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a seven (7) day period after receipt of a written notice from the Owner to correct such default or neglect, the Owner may, without prejudice to other remedies the Owner may have, correct such default or neglect. In such case, an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the cost of correcting such deficiencies, including compensation for the Architect's additional services and expenses made necessary by such default or neglect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to Owner. However, such notice shall be waived in the event of an emergency with the potential for property damage or the endangerment of students, faculty, staff, the public or construction personnel, at the sole discretion of the Owner.

2.3.2 In the event the Contractor has not satisfactorily completed all items on the Punch List within thirty (30) days of its receipt, the Owner reserves the right to complete the Punch List without further notice to the Contractor or its surety. In such case, Owner shall be entitled to deduct from payments then or thereafter due the Contractor the cost of completing the Punch List items, including compensation for the Architect's additional services. If payments then or

thereafter due Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to Owner.

2.4 Extent of Owner Rights

2.4.1 The rights stated in this Article 2 and elsewhere in the Contract Documents are cumulative and not in limitation of any rights of the Owner (1) granted in the Contract Documents, (2) at law or (3) in equity.

2.4.2 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.

ARTICLE 3
CONTRACTOR

3.1 Contractor's Warranty

3.1.1 The Contractor warrants all equipment and materials furnished, and work performed, under this Contract, against defective materials and workmanship for a period of twelve months after acceptance as provided in this Contract, unless a longer period is specified, regardless of whether the same were furnished or performed by the Contractor or any Subcontractors of any tier. Upon written notice from the Owner of any breech of warranty during the applicable warranty period due to defective material or workmanship, the affected part or parts thereof shall be repaired or replaced by the Contractor at no cost to the Owner. Should the Contractor fail or refuse to make the necessary repairs, replacements, and tests when requested by the Owner, the Owner may perform, or cause the necessary work and tests to be performed, at the Contractor's expense, or exercise the Owner's rights under Article 14.

3.1.2 Should one or more defects mentioned above appear within the specified period, the Owner shall have the right to continue to use or operate the defective part or apparatus until the Contractor makes repairs or replacements or until such time as it can be taken out of service without loss or inconvenience to the Owner.

3.1.3 The above warranties are not intended as a limitation but are in addition to all other express warranties set forth in this Contract and such other warranties as are implied by law, custom, and usage of trade. The Contractor, and its surety or sureties, if any, shall be liable for the satisfaction and full performance of the warranties set forth herein.

3.1.4 Neither the final payment nor any provision in the Contract Documents nor partial or entire occupancy of the premises by the Owner, nor expiration of warranty stated herein, will constitute an acceptance of Work not done in accordance with the Contract Documents or relieve the Contractor of liability in respect to any responsibility for non-conforming work. The Contractor shall immediately remedy any defects in the Work and pay for any damage to other Work resulting therefrom upon written notice from the Owner. Should the Contractor fail or refuse to remedy the non-conforming work, the Owner may perform, or cause to be performed the work necessary to bring the work into conformance with the Contract Documents at the Contractor's expense.

3.1.5 The Contractor agrees to defend, indemnify, and save harmless The Curators of the University of Missouri, their Officers, Agents, Employees and Volunteers, from and against all loss or expense from any injury or damages to property of others suffered or incurred on account of any breech of the aforesaid obligations and covenants. The Contractor agrees to investigate, handle, respond to and provide defense for and defend against any such liability, claims, and demands at the sole expense of the Contractor, or at the option of the University, agrees to pay to or reimburse the University for the defense costs incurred by the University in connection with any such liability claims, or demands. The parties hereto understand and agree that the University is relying on and does not waive or intend to waive by any provision of this Contract, any monetary limitations or any other rights, immunities, and protections provided by the State of Missouri, as from time to time amended, or otherwise available to the University, or its officers, employees, agents or volunteers.

3.2 Compliance with Laws, Regulations, Permits, Codes, and Inspections

3.2.1 The Contractor shall, without additional expense to the Owner, comply with all applicable laws, ordinances, rules, permit requirements, codes, statutes, and regulations (collectively referred to as “Laws”).

3.2.2 Since the Owner is an instrumentality of the State of Missouri, municipal, or political subdivision, ordinances, zoning ordinances, and other like ordinances are not applicable to construction on the Owner's property, and the Contractor will not be required to submit plans and specifications to any municipal or political subdivision authority to obtain construction permits or any other licenses or permits from or submit to, inspection by any municipality or political subdivision relating to the construction on the Owner's property, unless required by the Owner in these Contract Documents or otherwise in writing.

3.2.3 All fees, permits, inspections, or licenses required by municipality or political subdivision for operation on property not belonging to the Owner, shall be obtained by and paid for by the Contractor. The Contractor, of its own expense, is responsible to ensure that all inspections required by said permits or licenses on property, easements, or utilities not belonging to the Owner are conducted as required therein. All connection charges, assessments or transportation fees as may be imposed by any utility company or others are

included in the Contract Sum and shall be the Contractor's responsibility, as stated in 2.1.1 above.

3.2.4 If the Contractor has knowledge that any Contract Documents are at variance with any Laws, including Americans with Disabilities Act – Standards for Accessible Design, ordinances, rules, regulations, or codes applying to the Work, Contractor shall promptly notify the Architect and the Owner's Representative, in writing, and any necessary changes will be adjusted as provided in the Contract Documents. However, it is not the Contractor's primary responsibility to ascertain that the Contract Documents are in accordance with applicable Laws, unless such Laws bear upon performance of the Work.

3.3 Anti-Kickback

3.3.1 No member or delegate to Congress, or resident commissioner, shall be admitted to any share or part of this Contract or to any benefit that may arise therefrom, but this provision shall not be construed to extend to this Contract if made with a corporation for its general benefit.

3.3.2 No official of the Owner who is authorized in such capacity and on behalf of the Owner to negotiate, make, accept or approve, or to take part in negotiating, making, accepting, or approving any architectural, engineering, inspection, construction, or material supply contract or any Subcontract of any tier in connection with the construction of the Work shall have a financial interest in this Contract or in any part thereof, any material supply contract, Subcontract of any tier, insurance contract, or any other contract pertaining to the Work.

3.4 Supervision and Construction Procedures

3.4.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for and have control over construction means, methods, techniques, sequences, and procedures and for coordinating all portions of the Work under the Contract. The Contractor shall supply sufficient and competent supervision and personnel, and sufficient material, plant, and equipment to prosecute the Work with diligence to ensure completion thereof within the time specified in the Contract Documents, and shall pay when due any laborer, Subcontractor of any tier, or supplier.

3.4.2 The Contractor, if an individual, shall give the Work an adequate amount of personal supervision, and if a partnership or corporation or joint venture the Work shall be given an adequate amount of personal supervision by a partner or executive officer, as determined by the Owner's Representative.

3.4.3 The Contractor and each of its Subcontractors of any tier shall submit to the Owner such schedules of quantities and costs, progress schedules in accordance with 3.17.2 of this document, payrolls, reports, estimates, records, and other data as the Owner may request concerning Work performed or to be performed under the Contract.

3.4.4 The Contractor shall be represented at the site by a competent superintendent from the beginning of the Work until its final acceptance, whenever contract work is being performed, unless otherwise permitted in writing by the Owner's Representative. The superintendent for the Contractor shall exercise general supervision over the Work and such superintendent shall have decision making authority of the Contractor. Communications given to the superintendent shall be binding as if given to the Contractor. The superintendent shall not be changed by the contractor without approval from the Owner's Representative.

3.4.5 The Contractor shall establish and maintain a permanent benchmark to which access may be had during progress of the Work, and Contractor shall establish all lines and levels, and shall be responsible for the correctness of such. Contractor shall be fully responsible for all layout work for the proper location of Work in strict accordance with the Contract Documents.

3.4.6 The Contractor shall establish and be responsible for wall and partition locations. If applicable, separate contractors shall be entitled to rely upon these locations and for setting their sleeves, openings, or chases.

3.4.7 The Contractor's scheduled outage/tie-in plan, time, and date for any utilities is subject to approval by the Owner's Representative. Communication with the appropriate entity and planning for any scheduled outage/tie-in of utilities shall be the responsibility of the Contractor. Failure of Contractor to comply with the provisions of this Paragraph shall cause Contractor to forfeit any right to an adjustment of the Contract Sum or Contract Time for any postponement, rescheduling or other delays ordered by Owner in connection with such Work. The Contractor shall follow the following procedures for all utility outages/tie-ins or disruption of any building system:

.1 All shutting of valves, switches, etc., shall be by the Owner's personnel.

.2 Contractor shall submit its preliminary outage/tie-in schedule with its baseline schedule.

.3 The Contractor shall request an outage/tie-in meeting at least two weeks before the outage/tie-in is required.

.4 The Owner's Representative will schedule an outage/tie-in meeting at least one week prior to the outage/tie-in.

3.4.8 The Contractor shall coordinate all Work so there shall be no prolonged interruption of existing utilities, systems, and equipment of Owner. Any existing plumbing, heating, ventilating, air conditioning, or electrical disconnection necessary, which affect portions of this construction or building or any other building, must be scheduled with the Owner's Representative to avoid any

disruption of operation within the building under construction or other buildings or utilities. In no case shall utilities be left disconnected at the end of a workday or over a weekend. Any interruption of utilities, either intentionally or accidentally, shall not relieve the Contractor from repairing and restoring the utility to normal service. Repairs and restoration shall be made before the workers responsible for the repair and restoration leave the job.

3.4.9 The Contractor shall be responsible for repair of damage to property on or off the project occurring during construction of project, and all such repairs shall be made to meet code requirements or to the satisfaction of the Owner's Representative if code is not applicable.

3.4.10 The Contractor shall be responsible for all shoring required to protect its work or adjacent property and shall pay for any damage caused by failure to shore or by improper shoring or by failure to give proper notice. Shoring shall be removed only after completion of permanent supports.

3.4.11 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 students, faculty, 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.

3.4.12 During the performance of the 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 shall give proper and understandable warning to all persons of danger of entry onto land, structure, or equipment, within the limits of the Contractor's work area.

3.4.13 The Contractor shall pump, bail, or otherwise keep any general excavations free of water. The Contractor shall keep all areas free of water before, during and after concrete placement. The Contractor shall be responsible for protection, including weather protection, and proper maintenance of all equipment and materials installed, or to be installed by him.

3.4.14 The Contractor shall be responsible for care of the Work and must protect same from damage of defacement until acceptance by the Owner. All damaged or defaced Work shall be repaired or replaced to the Owner's satisfaction, without cost to the Owner.

3.4.15 When requested by the Owner's Representative, the Contractor, at no extra charge, shall provide scaffolds or ladders in place as may be required by the Architect or the Owner for examination or inspection of Work in progress or completed.

3.4.16 The Contractor shall be responsible to the Owner for acts and omissions of the Contractor's employees, Subcontractors of any tier and their agents and employees, and any entity or other persons performing portions of the Work.

3.4.17 The Contractor shall not be relieved of its obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Owner's Representative or Architect in their administration of the Contract, or by tests, inspections or approvals required or performed by persons other than the Contractor.

3.4.18 The Contractor shall be responsible for inspection of portions of the Work already performed under this Contract to determine that such portions are compliant and in proper condition to receive subsequent Work.

3.5 Use of Site

3.5.1 The Contractor shall limit operations and storage of material to the area within the Work limit lines shown on Drawings, except as necessary to connect to exiting utilities, shall not encroach on neighboring property, and shall exercise caution to prevent damage to existing structures.

3.5.2 Only materials and equipment, which are to be used directly in the Work, shall be brought to and stored on the Work site by the Contractor. After equipment is no longer required for the Work, it shall be promptly removed from the Work site. Protection of construction materials and equipment stored at the Work site from weather, theft, damage and all other adversity is solely the responsibility of the Contractor.

3.5.3 No project signs shall be erected without the written approval of the Owner's Representative.

3.5.4 The Contractor shall ensure that the Work is at all times performed in a manner that affords reasonable access, both vehicular and pedestrian, to the site of the Work and all adjacent areas. Particular attention shall be paid to access for emergency vehicles, including fire trucks. Wherever there is the possibility of interfering with normal emergency vehicle operations, Contractor shall obtain permission from both campus and municipal emergency response entities prior to limiting any access. The Work shall be performed, to the fullest extent reasonably possible, in such a manner that public areas adjacent to the site of the Work shall be free from all debris, building materials and equipment likely to cause hazardous conditions. Without limitation of any other provision of the Contract Documents, Contractor shall not interfere with the occupancy or beneficial use of (1) any areas and buildings adjacent to the site of the Work or (2) the Work in the event of partial occupancy. Contractor shall assume full responsibility for any damage to the property

comprising the Work or to the owner or occupant of any adjacent land or areas resulting from the performance of the Work.

3.5.5 The Contractor shall not permit any workers to use any existing facilities at the Work site, including, without limitation, lavatories, toilets, entrances, and parking areas other than those designated by Owner. The Contractor, Subcontractors of any tier, suppliers and employees shall comply with instructions or regulations of the Owner's Representative governing access to, operation of, and conduct while in or on the premises and shall perform all Work required under the Contract Documents in such a manner as not to unreasonably interrupt or interfere with the conduct of Owner's operations. Any request for Work, a suspension of Work or any other request or directive received by the Contractor from occupants of existing buildings shall be referred to the Owner's Representative for determination.

3.5.6 The Contractor and the Subcontractor of any tier shall have its' name, acceptable abbreviation or recognizable logo and the name of the city and state of the mailing address of the principal office of the company, on each motor vehicle and motorized self-propelled piece of equipment which is used in connection with the project. The signs are required on such vehicles during the time the Contractor is working on the project.

3.6 Review of Contract Documents and Field Conditions by Contractor

3.6.1 The Contractor shall carefully study and compare the Contract Documents with each other and with information furnished by the Architect and Owner and shall at once report in writing to the Architect and Owner's Representative any errors, inconsistencies or omissions discovered. If the Contractor performs any construction activity which it knows or should have known involves a recognized error, inconsistency, or omission in the Contract Documents without such written notice to the Architect and Owner's Representative, the Contractor shall assume appropriate responsibility for such performance and shall bear an appropriate amount of the attributable costs for correction.

3.6.2 The Contractor shall take field measurements and verify field conditions and shall carefully compare such field measurements and conditions and other information known to the Contractor with the Contract Documents before commencing activities. Errors, inconsistencies, or omissions discovered shall be reported in writing to the Architect and Owner's Representative within twenty-four (24) hours. During the progress of work, Contractor shall verify all field measurements prior to fabrication of building components or equipment and proceed with the fabrication to meet field conditions. Contractor shall consult all Contract Documents to determine the exact location of all work and verify spatial relationships of all work. Any question concerning said location or spatial relationships shall be submitted to the Owner's Representative. Specific locations for equipment, pipelines, ductwork and other such items of work, where not dimensioned on plans, shall be determined in consultation with Owner's Representative and Architect. Contractor shall be responsible for the proper fitting of the Work in place.

3.6.3 The Contractor shall provide, at the proper time, such material as required for support of the Work. If openings or chases are required, whether shown on Drawings or not, the Contractor shall see they are properly constructed. If required openings or chases are omitted, the Contractor shall cut them at the Contractors own expense, but only as directed by the Architect, through the Owner Representative.

3.6.4 Should the Contract Documents fail to particularly describe materials or goods to be used, it shall be the duty of the Contractor to inquire of the Architect and the Owner's Representative what is to be used and to supply it at the Contractor's expense, or else thereafter replace it to the Owner's Representative's satisfaction. At a minimum, the Contractor shall provide the quality of materials as generally specified throughout the Contract Documents.

3.7 Cleaning and Removal

3.7.1 The Contractor shall keep the Work site and surrounding areas free from accumulation of waste materials, rubbish, debris, and dirt resulting from the Work and shall clean the Work site and surrounding areas as requested by the Architect and the Owner's Representative, including mowing of grass greater than 6 inches high. The Contractor shall be responsible for the cost of clean up and removal of debris from premises. The building and premises shall be kept clean, safe, in a workmanlike manner, and in compliance with OSHA standards and code at all times. At completion of the Work, the Contractor shall remove from and about the Work site tools, construction equipment, machinery, fencing, and surplus materials. Further, at the completion of the work, all dirt, stains, and smudges shall be removed from every part of the building, all glass in doors and windows shall be washed, and entire Work shall be left broom clean in a finished state ready for occupancy. The Contractor shall advise his Subcontractors of any tier of this provision, and the Contractor shall be fully responsible for leaving the premises in a finished state ready for use to the satisfaction of the Owner's Representative. If the Contractor fails to comply with the provisions of this paragraph, the Owner may do so, and the cost thereof shall be charged to the Contractor.

3.8 Cutting and Patching

3.8.1 The Contractor shall be responsible for cutting, fitting, or patching required to complete the Work or to make its parts fit together properly.

3.8.2 The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching, or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter

such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

3.8.3 If the Work involves renovation and/or alteration of existing improvements, Contractor acknowledges that cutting and patching of the Work is essential for the Work to be successfully completed. Contractor shall perform any cutting, altering, patching, and/or fitting of the Work necessary for the Work and the existing improvements to be fully integrated and to present the visual appearance of an entire, completed, and unified project. In performing any Work which requires cutting or patching, Contractor shall use its best efforts to protect and preserve the visual appearance and aesthetics of the Work to the reasonable satisfaction of both the Owner's Representative and Architect.

3.9 Indemnification

3.9.1 To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, the Architect, Architect's consultants, and the agents, employees, representatives, insurers and re-insurers of any of the foregoing (hereafter collectively referred to as the "Indemnitees") from and against claims, damages (including loss of use of the Work itself), punitive damages, penalties and civil fines unless expressly prohibited by law, losses and expenses, including, but not limited to, attorneys' fees, arising out of or resulting from performance of the Work to the extent caused in whole or in part by negligent acts or omissions or other fault of Contractor, a Subcontractor of any tier, or anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss, or expense is caused in part by the negligent acts or omissions or other fault of a party indemnified hereunder. The Contractor's obligations hereunder are in addition to and shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that the Owner may possess. If one or more of the Indemnitees demand performance by the Contractor of obligations under this paragraph or other provisions of the Contract Documents and if Contractor refuses to assume or perform, or delays in assuming or performing Contractor's obligations, Contractor shall pay each Indemnitee who has made such demand its respective attorneys' fees, costs, and other expenses incurred in enforcing this provision. The defense and indemnity required herein shall be a binding obligation upon Contractor whether or not an Indemnitee has made such demand. Even if a defense is successful to a claim or demand for which Contractor is obligated to indemnify the Indemnitees from under this Paragraph, Contractor shall remain liable for all costs of defense.

3.9.2 The indemnity obligations of Contractor under this Section 3.9 shall survive termination of this Contract or final payment thereunder. In the event of any claim or demand made against any party which is entitled to be indemnified hereunder, the Owner may in its sole discretion reserve, return or apply any monies due or to become due the Contractor under the Contract for the purpose of resolving such claims; provided, however, that the Owner may release such funds if the Contractor provides the Owner with reasonable assurance of protection of the Owner's interests. The Owner shall in its sole discretion determine if such assurances are reasonable. Owner reserves the right to control the defense and settlement of any claim, action or proceeding which Contractor has an obligation to indemnify the Indemnitees against under Paragraph 3.9.1.

3.9.3 In claims against any person or entity indemnified under this Section 3.9 by an employee of the Contractor, a Subcontractor of any tier, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, the indemnification obligation under this Section 3.9 shall not be limited by a limitation on amount or type of damages, compensation or benefits payable by or for the Contractor or a Subcontractor of any tier under workers' or workmen's compensation acts, disability benefit acts or other employee benefit acts.

3.9.4 The obligations of the Contractor under Paragraph 3.9.1 shall not extend to the liability of the Architect, his agents or employees, arising out of the preparation and approval of maps, drawings, opinions, reports, surveys, Change Orders, designs, or Specifications.

3.10 Patents

3.10.1 The Contractor shall hold and save harmless the Owner and its officers, agents, servants, and employees from liability of any nature or kind, including cost and expense, for, or on account of, any patented or otherwise protected invention, process, article, or appliance manufactured or used in the performance of the Contract, including its use by the Owner, unless otherwise specifically stipulated in the Contract Documents.

3.10.2 If the Contractor uses any design, device, or material covered by letters patent or copyright, he 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 Sum include, and the Contractor shall pay all royalties, license fees or costs arising from the use of such design, device, or material in any way involved in the Work. The Contractor and/or sureties shall indemnify and save harmless the Owner from any and all claims for infringement by reason of the use of such patented or copyrighted design, device, or material 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 obligated to pay by reason of

such infringement at any time during the prosecution of the Work or after completion of the Work.

3.11 Delegated Design

3.11.1 If the Contract Documents specify the Contractor is responsible for the design of any work as part of the project, then the Contractor shall procure all design services and certifications necessary to complete the Work as specified, from a design professional licensed in the State of Missouri. The signature and seal of that design professional shall appear on all drawings, calculations, specifications, certifications, shop drawings, and other submittals related to the Work. The design professional shall maintain insurance as required per Article 11.

3.12 Materials, Labor, and Workmanship

3.12.1 Materials and equipment incorporated into the Work shall strictly conform to the Contract Documents and representations and approved Samples provided by Contractor and shall be of the most suitable grade of their respective kinds for their respective uses and shall be fit and sufficient for the purpose intended, merchantable, of good new material and workmanship, and free from defect. Workmanship shall be in accordance with the highest standard in the industry and free from defect in strict accordance with the Contract Documents.

3.12.2 Materials and fixtures shall be new and of latest design unless otherwise specified and shall provide the most efficient operating and maintenance costs to the Owner. All Work shall be performed by competent workers and shall be of best quality.

3.12.3 The Contractor shall carefully examine the Contract Documents and shall be responsible for the proper fitting of his material, equipment, and apparatus into the building.

3.12.4 The Contractor shall base his bid only on the Contract Documents.

3.12.5 Materials and workmanship shall be subject to inspection, examination, and testing by the Architect and the Owner's Representative at any and all times during manufacture, installation, and construction of any of them, at places where such manufacture, installation, or construction is performed.

3.12.6 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Contract. The Contractor shall not permit employment of unfit persons or persons not skilled in tasks assigned to them.

3.12.7 Unless otherwise specifically noted, the Contractor shall provide and pay for supervision, labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services necessary for the proper execution and completion of the Work.

3.12.8 Substitutions

3.12.8.1 A substitution is a Contractor proposal of an alternate product or method in lieu of what has been specified or shown in the Contract Documents, which is not an "or equal" as set forth in Section 3.12.1.

3.12.8.2 Contractor may make a proposal to the Architect and the Owner's Representative to use substitute products or methods as set forth herein, but the Architect's and the Owner's Representative's decision concerning acceptance of a substitute shall be final. The Contractor must do so in writing and setting forth the following:

.1 Full explanation of the proposed substitution and submittal of all supporting data including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and other like information necessary for a complete evaluation of the substitution.

.2 Reasons the substitution is advantageous and necessary, including the benefits to the Owner and the Work in the event the substitution is acceptable.

.3 The adjustment, if any, in the Contract Sum, in the event the substitution is acceptable.

.4 The adjustment, if any, in the time of completion of the Contract and the construction schedule in the event the substitution is acceptable.

.5 An affidavit stating that (a) the proposed substitution conforms to and meets all of the Contract Document requirements and is code compliant, except as specifically disclosed and set forth in the affidavit and (b) the Contractor accepts the warranty and correction obligations in connection with the proposed substitution as if originally specified by the Architect. Proposals for substitutions shall be submitted to the Architect and Owner's Representative in sufficient time to allow the Architect and Owner's Representative no less than ten (10) working days for review. No substitution will be considered or allowed without the Contractor's submittal of complete substantiating data and information as stated herein.

3.12.8.3 Substitutions may be rejected without explanation at the Owner's sole discretion and will be considered only under one or more of the following conditions:

.1 Required for compliance with interpretation of code requirements or insurance regulations then existing;

.2 Unavailability of specified products, through no fault of the Contractor;

.3 Material delivered fails to comply with the Contract Documents;

.4 Subsequent information discloses inability of specified products to perform properly or to fit in designated space;

.5 Manufacturer/fabricator refuses to certify or guarantee performance of specified product as required; or

.6 When in the judgment of the Owner or the Architect, a substitution would be substantially to the Owner's best interests, in terms of cost, time, or other considerations.

3.12.8.4 Whether or not any proposed substitution is accepted by the Owner or the Architect, the Contractor shall reimburse the Owner for any fees charged by the Architect or other consultants for evaluating each proposed substitution.

3.13 Approved Equal

3.13.1 Whenever in the Contract Documents any article, appliance, device, or material is designated by the name of a manufacturer, vendor, or by any proprietary or trade name, the words "or approved equal," shall automatically follow and shall be implied unless specifically indicated otherwise. The 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's Representative and the Architect they are equal in design, appearance, spare parts availability, strength, durability, usefulness, serviceability, operation cost, maintenance cost, and convenience for the purpose intended. Any general listings of approved manufacturers in any Contract Document shall be for informational purposes only and it shall be the Contractor's sole responsibility to ensure that any proposed "or equal" complies with the requirements of the Contract Documents and is code compliant.

3.13.2 The Contractor shall submit to Architect and Owner's Representative a written and full description of the proposed "or equal" including all supporting data, including technical information, catalog cuts, warranties, test results, installation instructions, operating procedures, and similar information demonstrating that the proposed "or equal" strictly complies with the Contract Documents. The Architect or Owner's Representative shall take appropriate action with respect to the submission of a proposed "or equal" item. If Contractor fails to submit proposed "or equals" as set forth herein, it shall waive any right to supply such items. The Contract Sum and Contract Time shall not be adjusted as a result of any failure by Contractor to submit proposed "or equals" as provided for herein. All documents submitted in connection with preparing an "or equal" shall be clearly and obviously marked as a proposed "or equal" submission.

3.13.3 No approvals or action taken by the Architect or Owner's Representative shall relieve Contractor from its obligation to ensure that an "or equal" article, appliance, devise, or material strictly complies with the requirements of the Contract Documents. Contractor shall not propose "or equal" items in connection with Shop Drawings or other Submittals, and Contractor acknowledges and agrees that no approvals or action taken by the Architect or Owner's Representative with respect to Shop Drawings or other Submittals shall constitute approval of any "or equal" item or relieve Contractor from its sole and exclusive responsibility. Any changes required in the details and dimensions indicated in the Contract Documents for the incorporation or installation of any "or equal" item supplied by the Contractor shall be properly made and approved by the Architect at the expense of the Contractor. No 'or equal' items will be permitted for components of or extensions to existing systems when, in the opinion of the Architect, the named manufacturer must be provided in order to ensure compatibility with the existing systems, including, but not limited to, mechanical systems, electrical systems, fire alarms, smoke detectors, etc. No action will be taken by the Architect with respect to proposed "or equal" items prior to receipt of bids, unless otherwise noted in the Special Conditions.

3.14 Shop Drawings, Product Data, Samples, and Coordination Drawings/BIM Models

3.14.1 Shop Drawings are drawings, diagrams, schedules, and other data specifically prepared for the Work by the Contractor or a Subcontractor, sub-subcontractor, manufacturer, supplier, or distributor to illustrate some portion of the Work.

3.14.2 Product Data are illustrations, standard schedules, performance charts, instructions, brochures, diagrams and other information furnished by the Contractor to illustrate materials or equipment for some portion of the Work.

3.14.3 Samples are physical samples which illustrate materials, equipment or workmanship and establish standards by which the Work will be judged.

3.14.4 Coordination Drawings are drawings for the integration of the Work, including work first shown in detail on shop drawings or product data. Coordination drawings show sequencing and relationship of separate units of work which must interface in a restricted manner to fit in the space provided, or function as indicated. Coordination Drawings are the responsibility of the contractor and are submitted for informational purposes. The Special Conditions will state whether coordination drawings are required. BIM models may be used for coordination in lieu of coordination drawings at the contractor's discretion, unless required in the Special Conditions. The final coordination drawings/BIM Model will not change the contract documents, unless approved by a fully executed change order describing the specific modifications that are being made to the contract documents.

3.14.5 Shop Drawings, Coordination Drawings/BIM Models, Product Data, Samples and similar submittals (collectively referred to as "Submittals") are not Contract Documents. The purpose of their submittal is to demonstrate for those portions of the Work for which submittals are

required the way the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents.

3.14.6 The Contractor shall schedule submittal of Shop Drawings and Product Data to the Architect so that no delays will result in delivery of materials and equipment, advising the Architect of priority for checking of Shop Drawings and Product Data, but a minimum of two weeks shall be provided for this purpose. Because time is of the essence in this contract, unless noted otherwise in the Special Conditions or Technical Specifications, all submittals, shop drawings and samples must be submitted as required to maintain the contractor's plan for proceeding but must be submitted within 90 days of the Notice to Proceed. If Contractor believes that this milestone is unreasonable for any submittal, Contractor shall request an extension of this milestone, within 60 days of Notice to Proceed, for each submittal that cannot meet the milestone. The request shall contain a reasonable explanation as to why the 90-day milestone is unrealistic, and shall specify a date on which the submittal will be provided, for approval by the Owner's Representative. Failure of the Contractor to comply with this section may result in delays in the submittal approval process and/or charges for expediting approval, both of which will be the responsibility of the Contractor.

3.14.7 The Contractor, at its own expense, shall submit Samples required by the Contract Documents with reasonable promptness as to cause no delay in the Work or the activities of separate contractors and no later than twenty (20) days before materials are required to be ordered for scheduled delivery to the Work site. Samples shall be labeled to designate material or products represented, grade, place of origin, name of producer, name of Contractor and the name and number of the Owner's project. Quantities of Samples shall be twice the number required for testing so that Architect can return one set of the Samples. Materials delivered before receipt of Architect's approval may be rejected by Architect and in such event, Contractor shall immediately remove all such materials from the Work site. When requested by Architect or Owner's Representative, samples of finished masonry and field applied paints and finishes shall be located as directed and shall include sample panels built at the site of approximately twenty (20) square feet each.

3.14.8 The Contractor shall perform no portion of the Work requiring submittal and review of Shop Drawings, Product Data, Samples, or similar submittals until the respective submittal has been approved by the Architect. Such Work shall be in accordance with approved submittals.

3.14.9 By approving and submitting Shop Drawings, Product Data, Samples and similar submittals, the Contractor represents such Submittals strictly comply with the requirements of the Contract Documents and that the Contractor has determined and verified field measurements and field construction criteria related thereto, that materials are fit for their intended use and that the fabrication, shipping, handling, storage, assembly and installation of all materials, systems and equipment are in accordance with best practices in the industry and are in strict compliance with any applicable requirements of the Contract Documents. Contractor shall also coordinate each Submittal with other Submittals.

3.14.10 Contractor shall be responsible for the correctness and accuracy of the dimensions, measurements and other information contained in the Submittals.

3.14.11 Each Submittal will bear a stamp or specific indication that the Submittal complies with the Contract Documents and Contractor has satisfied its obligations under the Contract Documents with respect to Contractor's review and approval of that Submittal. Each Submittal shall bear the signature of the representative of Contractor who approved the Submittal, together with the Contractor's name, Owner's name, number of the Project, and the item name and specification section number.

3.14.12 The Contractor shall not be relieved of responsibility for deviations from requirements of the Contract Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals. The Contractor shall not be relieved of responsibility for errors or omissions in Shop Drawings, Product Data, Samples, or similar submittals by the Architect's approval thereof. Specifically, but not by way of limitation, Contractor acknowledges that Architect's approval of Shop Drawings shall not relieve Contractor for responsibility for errors and omissions in the Shop Drawings since Contractor is responsible for the correctness of dimensions, details and the design of adequate connections and details contained in the Shop Drawings.

3.14.13 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous Submittals.

3.14.14 The Contractor represents and warrants that all Shop Drawings shall be prepared by persons and entities possessing expertise and experience in the trade for which the Shop Drawing is prepared and, if required by the Architect or applicable Laws, by a licensed engineer or other design professional.

3.15 Record Drawings

3.15.1 The Contractor shall maintain a set of Record Drawings on site in good condition and shall use colored pencils to mark up said set with "record information" in a legible manner to show: (1) bidding addendums, (2) executed change orders, (3)deviations from the Drawings made during construction; (4) details in the Work not previously shown; (5) changes to existing conditions or existing conditions found to differ from those shown on any existing drawings; (6) the actual installed position of equipment, piping, conduits, light switches, electric fixtures, circuiting, ducts, dampers, access

panels, control valves, drains, openings, and stub-outs; and (7) such other information as either Owner or Architect may reasonably request. The prints for Record Drawing use will be a set of "blue line" prints provided by Architect to Contractor at the start of construction. Upon Substantial Completion of the Work, Contractor shall deliver all Record Drawings to Owner and Architect for approval. If not approved, Contractor shall make the revisions requested by Architect or Owner's Representative. Final payment and any retainage shall not be due and owing to Contractor until the final Record Drawings marked by Contractor as required above are delivered to Owner.

3.16 Operating Instructions and Service Manuals

3.16.1 The Contractor shall submit four (4) volumes of operating instructions and service manuals to the Architect before completing 50% of the adjusted contract amount. Payments beyond 50% of the adjusted contract amount may be withheld until all operating instructions and service manuals are received. The operating instructions and service manuals shall contain:

.1 Start-up and Shutdown 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 include model number, capacities, flow rate, and name-plate data.

.4 Service Instructions: The Contractor shall be required to provide the following information for all pieces of equipment.

(a) Recommended spare parts including catalog number and name of local suppliers or factory representative.

(b) Belt sizes, types, and lengths.

(c) Wiring diagrams.

.5 Manufacturer's Certificate of Warranty: Manufacturer's certificates of warranty shall be obtained for all major equipment. Warranty shall be obtained for at least one year from the date of Substantial Completion. Where longer period is required by the Contract Documents, the longer period shall govern.

.6 Parts catalogs: For each piece of equipment furnished, a parts catalog or similar document shall be provided which identifies the components by number for replacement ordering.

3.16.2 Submission

.1 Manuals shall be bound into volumes of standard 8 1/2" x 11" hard binders. Large drawings too bulky to be folded into 8 1/2" x 11" shall be separately bound or folded and in brown envelopes, cross-referenced and indexed with the manuals.

.2 The manuals shall identify the Owner's project name, project number, and include the name and address of the Contractor and major Subcontractors of any tier who were involved with the activity described in that particular manual.

3.17 Taxes

3.17.1 The Contractor shall pay all applicable sales, consumer, use, and similar taxes for the Work which are legally enacted when the bids are received, whether or not yet effective or scheduled to go into effect. However, certain purchases by the Contractor of materials incorporated in or consumed in the Work are exempt from certain sales tax pursuant to RSMo § 144.062. The Contractor shall be issued a Project Tax Exemption Certificate for this Work to obtain the benefits of RSMo § 144.062.

3.17.2 The Contractor shall furnish this certificate to all subcontractors, and any person or entity purchasing materials for the Work shall present such certificate to all material suppliers as authorization to purchase, on behalf of the Owner, all tangible personal property and materials to be incorporated into or consumed in the Work and no other on a tax-exempt basis. Such suppliers shall provide to the purchasing party invoices bearing the name of the exempt entity and the project identification number. Nothing in this section shall be deemed to exempt from any sales or similar tax the purchase of any construction machinery, equipment or tools used in construction, repairing or remodeling facilities for the Owner. All invoices for all personal property and materials purchased under a Project Tax Exemption Certificate shall be retained by the Contractor for a period of five years and shall be subject to audit by the Director of Revenue.

3.17.3 Any excess resalable tangible personal property or materials which were purchased for the project under this Project Tax Exemption Certificate but which were not incorporated into or consumed in the Work shall either be returned to the supplier for credit or the appropriate sales or use tax on such excess property or materials shall be reported on a return and paid by such purchasing party not later than the due date of the purchasing party's Missouri sales or use tax return following the month in which it was determined that the materials were not used in the Work.

3.17.4 If it is determined that sales tax is owed by the Contractor on property and materials due to the failure of the Owner to revise the certificate expiration date to cover the applicable date of purchase, Owner shall be liable for the tax owed.

3.17.5 The Owner shall not be responsible for any tax liability due to Contractor's neglect to make timely orders, payments, etc. or Contractor's misuse of the Project Tax Exemption Certificate. Contractor represents that the Project Tax Exemption Certificate shall be used in accordance with RSMo § 144.062 and the terms of the Project Tax Exemption

Certificate. Contractor shall indemnify the Owner for any loss or expense, including but not limited to, reasonable attorneys' fees, arising out of Contractor's use of the Project Tax Exemption Certificate.

3.18 Contractor's Construction Schedules

3.18.1 The Contractor, within fifteen (15) days after the issuance of the Notice to Proceed, shall prepare and submit for the Owner's and Architect's information Contractor's construction schedule for the Work and shall set forth interim dates for completion of various components of the Work and Work Milestone Dates as defined herein. The schedule shall not exceed time limits current under the Contract Documents, shall be revised on a monthly basis or as requested by the Owner's Representative as required by the conditions of the Work, and shall provide for expeditious and practicable execution of the Work. The Contractor shall conform to the most recent schedule.

3.18.2 The construction schedule shall be in a detailed format satisfactory to the Owner's Representative and the Architect and in accordance with the detailed schedule requirements set forth in this document and the Special Conditions. If the Owner's Representative or Architect has a reasonable objection to the schedule submitted by Contractor, the construction schedule shall be promptly revised by the Contractor. The Contractor shall monitor the progress of the Work for conformance with the requirements of the construction schedule and shall promptly advise the Owner of any delays or potential delays.

3.18.3 As time is of the essence to this contract, the University expects that the Contractor will take all necessary steps to ensure that the project construction schedule shall be prepared in accordance with the specific requirements of the Special Conditions to this contract. At a minimum, contractor shall comply with the following:

.1 The schedule shall be prepared using Primavera P3, Oracle P6, Microsoft Project or other software acceptable to the Owner's Representative.

.2 The schedule shall be prepared and maintained in CPM format, in accordance with Construction CPM Scheduling, published by the Associated General Contractors of American (AGC).

.3 Prior to submittal to the Owner's Representative for review, Contractor shall obtain full buy-in to the schedule from all major subcontractors, in writing if so, requested by Owner's Representative.

.4 Schedule shall be updated, in accordance with Construction CPM Scheduling, published by the AGC, on a monthly basis at minimum, prior to, and submitted with, the monthly pay application or as requested by the Owner's Representative.

.5 Along with the update the Contractor shall submit a narrative report addressing all changes, delays and impacts, including weather to the schedule during the last month, and explain how the end date has been impacted by same.

.6 The submission of the updated schedule certifies that all delays and impacts that have occurred on or to the project during the previous month have been factored into the update and are fully integrated into the schedule and the projected completion date.

Failure to comply with any of these requirements will be considered a material breach of this contract. See Special Conditions for detailed scheduling requirements.

3.18. 4 In the event the Owner's Representative or Architect determines that the performance of the Work, as of a Milestone Date, has not progressed or reached the level of completion required by the Contract Documents, the Owner shall have the right to order the Contractor to take corrective measures necessary to expedite the progress of construction, including, without limitation, (1) working additional shifts or overtime, (2) supplying additional manpower, equipment, facilities, (3) expediting delivery of materials, and (4) other similar measures (hereinafter referred to collectively as Extraordinary Measures). Such Extraordinary Measures shall continue until the progress of the Work complies with the stage of completion required by the Contract Documents. The Owner's right to require Extraordinary Measures is solely for the purpose of ensuring the Contractor's compliance with the construction schedule. The Contractor shall not be entitled to an adjustment in the Contract Sum concerning Extraordinary Measures required by the Owner under or pursuant to this Paragraph 3.17.3. The Owner may exercise the rights furnished the Owner under or pursuant to this Paragraph 3.17.3 as frequently as the Owner deems necessary to ensure that the Contractor's performance of the Work will comply with any Milestone Date or completion date set forth in the Contract Documents.

ARTICLE 4
ADMINISTRATION OF THE CONTRACT

4.1 Rights of the Owner

4.1.1 The Owner's Representative will administer the Construction Contract. The Architect will assist the Owner's Representative with the administration of the Contract as indicated in these Contract Documents.

4.1.2 If, in the judgment of the Owner's Representative, it becomes necessary to accelerate the work, the Contractor, when directed by the Owner's Representative in writing, shall cease work at any point and transfer its workers to such point or points and execute such portions of the work as may be required to enable others to hasten and properly engage and carry out the work, all as directed by the Owner's Representative. The additional cost of accelerating the work, if any, will be borne by the Owner, unless the Contractor's work progress is behind schedule as shown on the most recent progress schedule.

4.1.3 If the Contractor refuses, for any reason, to proceed with what the Owner believes to be contract work, the Owner may issue a Construction Directive, directing the Contractor to proceed. Contractor shall be obligated to promptly proceed with this work. If Contractor feels that it is entitled to additional compensation for this work, it may file a claim for additional compensation and/or time, in accordance with 4.4 of this Document.

4.1.4 The Owner's Representative, may, by written notice, require a Contractor to remove from involvement with the Work, any of Contractor's personnel or the personnel of its Subcontractors of any tier whom the Owner's Representative may deem abusive, incompetent, careless, or a hindrance to proper and timely execution of the Work. The Contractor shall comply with such notice promptly, but without detriment to the Work or its progress.

4.1.5 The Owner's Representative will schedule Work status meetings that shall be attended by representatives of the Contractor and appropriate Subcontractors of any tier. Material suppliers shall attend status meetings if required by the Owner's Representative. These meetings shall include preconstruction meetings.

4.1.6 The Owner does not allow smoking on university property.

4.2 Rights of the Architect

4.2.1 The Architect will interpret requirements of the Contract Documents with respect to the quality, quantity, and other technical requirements of the Work itself within a reasonable time after written request of the Contractor. Contractor shall provide Owner's Representative a copy of such written request.

4.3 Review of the Work

4.3.1 The Architect, the Owner's Representative, and the Owner's Authorized Agent shall, at all times, have access to the Work; and the Contractor shall provide proper and safe facilities for such access.

4.3.2 The Owner's Representative shall have authority to reject Work that does not strictly comply with the requirements of the Contract Documents. Whenever the Owner's Representative considers it necessary or advisable for implementation of the intent of the Contract Documents, Owner's Representative shall have the authority to require additional inspection or testing of the Work, whether or not such Work is fabricated, installed, or completed.

4.3.3 The fact that the Architect or the Owner's Representative observed, or failed to observe, faulty Work, or Work done which is not in accordance with the Contract Documents, regardless of whether or not the Owner has released final payment, shall not relieve the Contractor from responsibility for all damages and additional costs of the Owner as a result of defective or faulty Work.

4.4 Claims

4.4.1 A Claim is a demand or assertion by Contractor seeking, as a matter of right, adjustment or interpretation of Contract terms, payment of money, extension of time or any other relief with respect to the terms of the Contract. The term "Claim(s)" also includes demands and assertions of Contractor arising out of or relating to the Contract Documents, including Claims based upon breach of contract, mistake, misrepresentation, or other cause for Contract Modification or recision. Claims must be made by written notice. Contractor shall have the responsibility to substantiate Claims.

4.4.2 Claims by Contractor must be made promptly, and no later than within fourteen (14) days after occurrence of the event giving rise to such Claim. Claims must be made by written notice. Such notice shall include a detailed statement setting forth all reasons for the Claim and the amount of additional money and additional time claimed by Contractor. The notice of Claims shall also strictly comply with all other provisions of the Contract Documents. Contractor shall not be entitled to rely upon any grounds or basis for additional money on additional time not specifically set forth in the notice of Claim. All Claims not made in the manner provided herein shall be deemed waived and of no effect. Contractor shall furnish the Owner and Architect such timely written notice of any Claim provided for herein, including, without limitation, those in connection with alleged concealed or unknown conditions, and shall cooperate with the Owner and Architect in any effort to mitigate the alleged or potential damages, delay or other adverse consequences arising out of the condition which is the cause of such a Claim.

4.4.3 Pending final resolution of a Claim, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments that are not in dispute in accordance with the Contract Documents.

4.5 Claims for Concealed or Unknown Conditions

4.5.1 If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the Contractor shall be given to the Owner's Representative promptly before conditions are disturbed, and in no event later than three (3) days after first observance of the conditions. The Owner's Representative will promptly investigate such conditions. If such conditions differ materially, as provided for above and cause an increase or decrease in the Contractor's cost, or time, required for performance of the Work, an equitable adjustment in the Contract sum or Contract Time, or both, shall be made, subject to the provisions and restrictions set for herein. If the Owner's Representative determines that the

conditions at the site are not materially different from those indicated in the Contract Documents, and that no change in the terms of the Contract is justified, the Owner's Representative will so notify the Contractor in writing. If the Contractor disputes the finding of the Owner's Representative that no change in the terms of the Contract terms is justified, Contractor shall proceed with the Work, taking whatever steps are necessary to overcome or correct such conditions so that Contractor can proceed in a timely manner. The Contractor may have the right to file a Claim in accordance with the Contract Documents.

4.5.2 It is expressly agreed that no adjustment in the Contract Time or Contract Sum shall be permitted, however, in connection with a concealed or unknown condition which does not differ materially from those conditions disclosed or which reasonably should have been disclosed by the Contractor's (1) prior inspections, tests, reviews and preconstruction investigations for the Project, or (2) inspections, tests, reviews and preconstruction inspections which the Contractor had the opportunity to make or should have performed in connection with the Project.

4.6 Claim for Additional Cost

4.6.1 If the Contractor makes a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. In addition to all other requirements for notice of a Claim, said notice shall detail and itemize the amount of all Claims and shall contain sufficient data to permit evaluation of same by Owner.

4.7 Claims for Additional Time

4.7.1 If the Contractor makes a Claim for an increase in the Contract Time, written notice as provided herein shall be given. In addition to other requirements for notice of a Claim, Contractor shall include an estimate of the probable effect of delay upon the progress of the Work, utilizing a CPM Time Impact Schedule Analysis, (TIA) as defined in the AGC Scheduling Manual. In the case of a continuing delay, only one Claim is necessary.

.1 Time extensions will be considered for excusable delays only. That is, delays that are beyond the control and/or contractual responsibility of the Contractor.

4.7.2 If weather days are the basis for a Claim for additional time, such Claim shall be documented by the Contractor by data acceptable to the Owner's Representative substantiating that weather conditions for the period of time in question, had an adverse effect on the critical path of the scheduled construction. Weather days shall be defined as days on which critical path work cannot proceed due to weather conditions (including but not limited to rain, snow, etc.), in excess of the number of days shown on the Anticipated Weather Day schedule in the Special Conditions. To be considered a weather day, at least four working hours must be lost due to the weather conditions on a critical path scope item for that day.-Weather days and Anticipated weather days listed in the Special Conditions shall only apply to Monday through Friday. A weather day claim cannot be made for Saturdays, Sundays, New Year's Day, Martin Luther King Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, the day after Thanksgiving Day and Christmas Day, unless that specific day was approved in writing for work by the Owner's Representative.

.1 The Contractor must have fulfilled its contract obligations with respect to temporary facilities and protection of its work, and worker protection for hot and cold weather per OSHA guidelines.

.2 If the contract obligations have been satisfied, the Owner will review requests for non-compensable time extensions for critical path activities as follows:

.2.1 If the Contractor cannot work on a critical path activity due to adverse weather, after implementing all reasonable temporary weather protection, the Contractor will so notify the Owner's Representative. Each week, the Contractor will notify the Owner's Representative of the number of adverse weather days that it believes it has experienced in the previous week. As provided in the contract, until such time as the weather days acknowledged by the Owner's Representative exceed the number of days of adverse weather contemplated in the Special Conditions, no request for extension of the contract completion time will be considered.

.2.2 If the Contractor has accumulated in excess of the number of adverse weather days contemplated in the Special Conditions due to the stoppage of work on critical path activities due to adverse weather, the Owner will consider a time extension request from the Contractor that is submitted in accordance with the contract requirements. The Owner will provide a change order extending the time for contract completion or direct an acceleration of the work in accordance with the contract terms and conditions to recover the time lost due to adverse weather in excess of the number of adverse weather working days contemplated in the Special Conditions.

4.7.3 A Force Majeure event or circumstance shall not be the basis of a claim by the Contractor seeking an adjustment in the Contract amount for costs or expenses of any type. With the exception of weather delays which are administered under this Article 4, and not withstanding other requirements of the Contract, all Force Majeure events resulting in a delay

to the critical path of the project shall be administered as provided in Article 8.

4.7.4 The Owner will consider and evaluate requests for time extensions due to changes or other events beyond the control of the Contractor on a monthly basis only, with the submission of the Contractor's updated schedule, in conjunction with the monthly application for payment.

4.8 Resolution of Claims and Disputes

4.8.1 The Owner's Representative will review Claims and take one or more of the following preliminary actions within ten days of receipt of a Claim: (1) request additional supporting data from the Contractor, (2) reject the Claim in whole or in part, (3) approve the Claim, or (4) suggest a compromise.

4.8.2 If a Claim has not been resolved, the Contractor shall, within ten days after the Owner's Representative's preliminary response, take one or more of the following actions: (1) submit additional supporting data requested, (2) modify the initial Claim, or (3) notify the Owner's Representative that the initial Claim stands.

4.8.3 If a Claim has not been resolved after consideration of the foregoing and of further information presented by the Contractor, the Contractor has the right to seek administrative review as set forth in Section 4.9. However, Owner's Representative's decisions on matters relating to aesthetics will be final.

4.9 Administrative Review

4.9.1 Claims not resolved pursuant to the procedures set forth in the Contract Documents except with respect to Owner's Representative's decision on matters relating to aesthetic effect, and except for claims which have been waived by the making or acceptance of final payment, or the Contractor's acceptance of payments in full for changes in work may be submitted to administrative review as provided in this section. All requests for administrative review shall be made in writing.

4.9.2 Upon written request from the Contractor, the Owner's Review Administrator authorized by the Campus Contracting Officer will convene a review meeting between the Contractor and Owner's Representative's within fifteen (15) days of receipt of such written request. The Contractor and Owner's Representative will be allowed to present written documentation with respect to the claim(s) before or during the meeting. The Contractor and Owner's Representative will be allowed to present the testimony of any knowledgeable person regarding the claim at the review meeting. The Owner's Review Administrator will issue a written summary of the review meeting and decision to resolve the Claim within fifteen (15) days. If the Contractor is in agreement with the decision the Contractor shall notify the Owner's Review Administrator in writing within five (5) days, and appropriate documentation will be signed by the parties to resolve the Claim.

4.9.3 If the Contractor is not in agreement with the proposal of the Owner's Review Administrator as to the resolution of the claim, the Contractor may file a written appeal with the UM System Contracting Officer, [in care of the Director of Facilities Planning and Development, University of Missouri, 109 Old Alumni Centers, University of Missouri, Columbia, Missouri 65211] within fifteen (15) days after receipt of the Owner's Review Administrator's proposal. The UM System Contracting Officer will call a meeting of the Contractor, the Owner's Representative, and the Owner's Review Administrator by written notice, within thirty (30) days after receipt of the Contractor's written appeal. The Owner's Review Administrator shall provide the UM System Contracting Officer with a copy of the written decision and summary of the review meeting, the Contractor's corrections or comments regarding the summary of the review meeting, and any written documentation presented by the Contractor and the Owner's Representative at the initial review meeting. The parties may present further documentation and/or present the testimony of any knowledgeable person regarding the claim at the meeting called by the UM System Contracting Officer.

4.9.4 The UM System Contracting Officer will issue a written decision to resolve the claim within fifteen (15) days after the meeting. If the Contractor is in agreement with the UM System Contracting Officer's proposal, the Contractor shall notify the UM System Contracting Officer in writing within five (5) days, and the Contractor and the Owner shall sign appropriate documents. The issuance of the UM System Contracting Officer's written proposal shall conclude the administrative review process even if the Contractor is not in agreement. However, proposals and any opinions expressed in such proposals issued under this section will not be binding on the Contractor nor will the decisions or any opinions expressed be admissible in any legal actions arising from the Claim and will not be deemed to remove any right or remedy of the Contractor as may otherwise exist by virtue of Contract Documents or law. Contractor and Owner agree that the Missouri Circuit Court for the County where the Work is located shall have exclusive jurisdiction to determine all issues between them. Contractor agrees not to file any complaint, petition, lawsuit or legal proceeding against Owner except with such Missouri Circuit Court.

ARTICLE 5
SUBCONTRACTORS

5.1 Award of Subcontracts

5.1.1 Pursuant to Article 9, the Contractor shall furnish the Owner and the Architect, in writing, with the name, and trade for each Subcontractor and the names of all persons or entities proposed as manufacturers of products, materials and equipment identified in the Contract Documents and where applicable, the name of the installing contractor. The

Owner's Representative will reply to the Contractor in writing if the Owner has reasonable objection to any such proposed person or entity. The Contractor shall not contract with a proposed person or entity to whom the Owner has made reasonable and timely objection.

5.1.2 The Contractor may request to change a subcontractor. Any such request shall be made in writing to the Owner's Representative. The Contractor shall not change a Subcontractor, person, or entity previously disclosed if the Owner makes reasonable objection to such change.

5.1.3 The Contractor shall be responsible to the Owner for acts, defaults, and omissions of its Subcontractors of any tier.

5.2 Subcontractual Relations

5.2.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor of any tier, to the extent of the Work to be performed by the Subcontractor of any tier, to be bound to the Contractor by terms of the Contract Documents and to assume toward the Contractor all the obligations and responsibilities which the Contractor, by these Documents, assumes toward the Owner and the Architect. Each subcontract agreement of any tier shall preserve and protect the rights of the Owner and the Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor of any tier so that subcontracting thereof will not prejudice such rights and shall allow to the Subcontractor of any tier, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies, and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with its sub-subcontractors. The Contractor shall make available to each proposed Subcontractor of any tier, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor of any tier shall be bound Subcontractors of any tier shall similarly make copies of applicable portions of such documents available to their respective proposed Subcontractors of any tier.

5.2.2 All agreements between the Contractor and a Subcontractor or supplier shall contain provisions whereby Subcontractor or supplier waives all rights against the Owner, contractor, Owner's representative, Architect and all other additional insureds for all losses and damages caused by, arising out of, or resulting from any of the perils covered by property or builders risk insurance coverage required of the Contractor in the Contract Documents. If Contractor fails to include said provisions in all subcontracts, Contractor shall indemnify, defend and hold all the above entities harmless in the event of any legal action by Subcontractor or supplier. If insureds on any such policies require separate waiver forms to be signed by any Subcontractors of any tier or suppliers, Contractor shall obtain the same.

5.3 Contingent Assignment of Subcontract

5.3.1 No assignment by the Contractor of any amount or any part of the Contract or of the funds to be received thereunder will be recognized unless such assignment has had the written approval of the Owner, and the surety has been given due notice of such assignment and has furnished written consent hereto. 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 the contract and to claims and to 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 6
SEPARATE CONTRACTS AND COOPERATION

6.1 The Owner reserves the right to let other contracts in connection with the Work.

6.2 It shall be the duty of each Contractor to whom Work may be awarded, as well as all Subcontractors of any tier employed by them, to communicate immediately with each other in order to schedule Work, locate storage facilities, etc., in a manner that will permit all Contractors to work in harmony in order that Work may be completed in the manner and within the time specified in the Contract Documents.

6.3 No Contractor shall delay another Contractor by neglecting to perform his work at the proper time. Each Contractor shall be required to coordinate his work with other Contractors to afford others reasonable opportunity for execution of their work. Any costs caused by defective, non-compliant, or ill- timed work, including actual damages and liquidated damages for delay, if applicable, shall be borne by the Contractor responsible therefor.

6.4 Each Contractor shall be responsible for damage to Owner's or other Contractor's property done by him or persons in his employ, through his or their fault or negligence. If any Contractor shall cause damage to any other Contractor, the Contractor causing such damage shall upon notice of any claim, settle with such Contractor.

6.5 The Contractor shall not claim from the Owner money damages or extra compensation under this Contract when delayed in initiating or completing his performance hereunder, when the delay is caused by labor disputes, acts of God, or the failure of any other Contractor to complete his performance under any Contract with the Owner, where any such cause is beyond the Owner's reasonable control.

6.6 Progress schedule of the Contractor for the Work shall be submitted to other Contractors as necessary to permit coordinating their progress schedules.

6.7 If Contractors or Subcontractors of any tier refuse to cooperate with the instructions and reasonable requests of other contractors performing work for the Owner under separate contract, in the overall coordinating of the Work, the Owner's Representative may take such appropriate action and issue such instructions as in his judgement may be required to avoid unnecessary and unwarranted delay.

ARTICLE 7
CHANGES IN THE WORK

7.1 CHANGE ORDERS

7.1.1 A change order is a written instrument prepared by the Owner and signed by the Owner and Contractor formalizing their agreement on the following:

.1 a change in the Work

.2 the amount of an adjustment, if any, in the Contract amount

.3 an adjustment, if any, in the Contract time

7.1.2 The Owner may at any time, order additions, deletions, or revisions in the Work by a Change Order or a Construction Change Directive. Such Change Order or Construction Change Directive shall not invalidate the Contract and requires no notice to the surety. Upon receipt of any such document, or written authorization from the Owner's Representative directing the Contractor to proceed pending receipt of the document, Contractor shall promptly proceed with the Work involved in accordance with the terms set forth therein.

7.1.3 Until such time as the change order is formalized and signed by both the Owner and the Contractor it shall be considered a Change Order Request.

7.1.4 The amount of adjustment in the contract price for authorized Change Orders will be agreed upon before such Change Orders becomes effective and will be determined as follows:

.1 By a lump sum proposal from the Contractor and the Subcontractors of any tier, including overhead and profit.

.2 By a time and material basis with or without a specified maximum. The Contractor shall submit to the Owner's Representative itemized time and material sheets depicting labor, materials, equipment utilized in completing the Work on a daily basis for the Owner's Representative approval. If this pricing option is utilized, the Contractor may be required to submit weekly reports summarizing costs to date on time and material change orders not yet finalized.

.3 By unit prices contained in the Contractor's original bid and incorporated in the Construction Contract or subsequently agreed upon. Such unit prices contained in the Contractor's original proposal are understood to include the Contractor's overhead and profit. If unit prices are stated in the Contract Documents or subsequently agreed upon, and if quantities originally contemplated are so changed in a proposed Change Order that application of such unit prices to quantities of the Work proposed will cause substantial inequity to the Owner or to the Contractor, the applicable unit prices shall be equitably adjusted.

7.1.5 The Contractor shall submit all fully documented change order requests with corresponding back-up documentation within the time requested by the Owner but no later than fourteen (14) working days following 1.) the Owner's request for change order pricing in the case of a lump sum; or 2.) the completion of unit price or time and material work.

7.1.6 The Contractor shall submit change order requests in sufficient detail to allow evaluation by the Owner. Such requests shall be fully itemized by units of labor, material and equipment and overhead and profit. Such breakdowns shall be itemized as follows:

.1 Labor: The Contractor's proposal shall include breakdowns by labor, by trade, indicating number of hours and cost per hour for each Subcontractor as applicable. Such breakdowns shall only include employees in the direct employ of Contractor or Subcontractors in the performance of the Work. Such employees shall only include laborers at the site, mechanics, craftsmen and foremen. Payroll cost shall include base rate salaries and wages plus the cost of fringe benefits required by agreement or custom and social security contributions, unemployment, payroll taxes and workers' or workmen's compensation insurance and other customary and legally required taxes paid by the Contractor or Subcontractors. Any item or expense outside of these categories is not allowed. The expense of performing Work after regular working hours, on Saturdays, Sundays or legal holidays shall not be included in the above, unless approved in writing and in advance by Owner.

.2 Material, supplies, consumables and equipment to be incorporated into the Work at actual invoice cost to the Contractor or Subcontractors; breakdowns showing all material, installed equipment and consumables fully itemized with number of units installed and cost per unit extended. Any singular item or items in aggregate greater than one thousand dollars ($1,000) in cost shall be supported with supplier invoices at the request of the Owner's Representative. Normal hand tools are not compensable.

.3 Equipment: Breakdown for required equipment shall itemize (at a minimum) delivery / pick-up charge, hourly

rate and hours used. Operator hours and rate shall not be included in the equipment breakdown. Contractor must use the most cost-effective equipment available in the area and should not exceed the rates listed in the Rental Rate Blue Book for Construction Equipment (Blue Book). Contractor shall submit documentation for the Blue Book to support the rate being requested.

7.2 Construction Change Directive

7.2.1 A construction change directive is a written order prepared and signed by the Owner, issued with supporting documents prepared by the Architect (if applicable), directing a change in the Work prior to agreement on adjustment of the Contract amount or Contract time, or both. A Construction Change Directive shall be used in the absence of complete agreement between the Owner and Contractor on the terms of a change order. If the Construction Change Directive allows an adjustment of the contract amount or time, such adjustment amount shall be based on one of the following methods:

.1 A lump sum agreement, properly itemized and supported by substantiating documents of sufficient detail to allow evaluation.

.2 By unit prices contained in the Contractor's original proposal and incorporated in the Construction Contract or subsequently agreed upon.

.3 A method agreed to by both the Owner and the contractor with a mutually agreeable fee for overhead and profit.

.4 In the absence of an agreement between the Owner and the Contractor on the method of establishing an adjustment of the contract amount, the Owner, with the assistance of the architect, shall determine the adjustment amount on the basis of expenditures by the Contractor for labor, materials, equipment, and other costs consistent with other provisions of the Contract. The contractor shall keep and submit to the Owner an itemized accounting of all cost components, either expended or saved, while performing the Work covered under the Construction Change Directive.

7.2.2 Upon receipt of a Construction Change Directive, Contractor shall promptly proceed with the change in the Work involved and advise Owner of Contractor's agreement or disagreement with the method, if any, provided in the Construction Change Directive for determining the proposed adjustment in the Contract Sum, Contract Time, or both.

7.2.3 A Construction Change Directive signed by Contractor indicates the agreement of the Contractor therewith, including adjustment in Contract Sum and Contract Time or the method for determining them. Such agreement shall be effective immediately and shall be recorded as a Change Order.

7.3 Overhead and Profit

7.3.1 Overhead and Profit on Change Orders shall be applied as follows:

.1 The overhead and profit charged by the Contractor and Subcontractors shall be considered to include, but not limited to, job site office and clerical expense, normal hand tools, incidental job supervision, field supervision, payroll costs and other compensation for project manager, officers, executives, principals, general managers, estimators, attorneys, auditors, accountants, purchasing and contracting agents, expediters, time-keepers, and other personnel employed whether at the site or in principal or a branch office for general superintendent and administration of the Work.

.2 The percentages for overhead and profit charged on Change Orders shall be negotiated and may vary according to the nature, extent, and complexity of the Work involved but in no case shall exceed the following:

15% To the Contractor or the Subcontractor of any tier for Work performed with their respective forces or materials purchased

5% To the Contractor on Work performed by other than his forces

5% To first tier Subcontractor on Work performed by his Subcontractor

.3 The Contractor will be allowed to add 2% for the cost of bonding and insurance to their cost of work. This 2% shall be allowed on the total cost of the added work, including overhead and profit.

.4 Not more than three mark-ups, not to exceed individual maximums shown above, shall be allowed regardless of the number of tier subcontractors. Overhead and profit shall be shown separately for each subcontractor of any tier and the Contractor.

.5 On proposals covering both increases and decreases in the amount of the Contract, the application of overhead and profit shall be on the net change in direct cost for the Contractor or Subcontractor of any tier performing the Work.

.6 The percentages for overhead and profit credit to the Owner on Change Orders that are strictly decreases in the quantity of work or materials shall be negotiated and may vary according to the nature, extent, and complexity of the Work involved, but shall not be less than the following:

Overhead and Profit

7.5% Credit to the Owner from the Contractor or Subcontractor of any tier for Work performed with their respective forces or materials purchased

2.5% Credit to the Owner from the Contractor on Work performed by other than his forces

2.5% Credit to the Owner from the first tier Subcontractor on Work performed by his Subcontractor of any tier

7.4 Extended General Conditions

7.4.1 The Contractor acknowledges that the percentage mark-up allowed on change orders for overhead and profit cover the Contractor's cost of administering and executing the Work, inclusive of change orders that increase the contract time. Contractor further acknowledges that no compensation beyond the specified mark-up percentages for extended overhead shall be due or payable as a result of an increase in the Contract Time.

7.4.2 The Owner may reimburse the Contractor for extended overhead if an extension of the Contract Time is granted by the Owner, in accordance with Article 4.7.1 and the Owner determines that the extension of the Contract Time creates an inequitable condition for the Contractor. If these conditions are determined by the Owner to exist, the Contractor may be reimbursed by unit prices contained in the Contractor's original bid and incorporated in the Construction Contract or by unit prices subsequently agreed upon.

7.4.3 If unit prices are subsequently agreed upon, the Contractor's compensation shall be limited as follows:

.1 For the portion of the direct payroll cost of the Contractor's project manager expended in completing the Work and the direct payroll cost of other onsite administrative staff not included in Article 7.3.1. Direct payroll cost shall include base rate salaries and wages plus the cost of fringe benefits required by agreement or custom and social security contributions, unemployment, payroll taxes and workers' or workmen's compensation insurance and other customary and legally required taxes paid by the Contractor;

.2 Cost of Contractor's temporary office, including temporary office utilities expense;

.3 Cost of temporary utilities required in the performance of the work;

.4 Profit not to exceed 5% of the total extended overhead direct costs;

7.4.4 All costs not falling into one of these categories and costs of the Contractors staff not employed onsite are not allowed.

7.5 Emergency Work

7.5.1 If, during the course of the Work, the Owner has need to engage the Contractor in emergency work, whether related to the Work or not, the Contractor shall immediately proceed with the emergency work as directed by the Owner under the applicable provisions of the contract. In so doing, Contractor agrees that all provisions of the contract remain in full force and effect and the schedule for the Work is not impacted in any way unless explicitly agreed to in writing by the Owner.

ARTICLE 8
TIME

8.1 Progress and Completion

8.1.1 Contractor acknowledges and agrees that time is of the essence of this Contract

8.1.2 Contract Time is the period of time set forth in the Contract for Construction required for Substantial Completion and Final Completion of the entire Work or portions of the Work as defined in the Contract Documents. Time limits stated in the Contract Documents are of the essence of the Contract. The Contract Time may only be changed by a Change Order. By executing the Contract, the Contractor confirms that the Contract Time is a sufficient period for performing the Work in its entirety.

8.1.3 The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance and bonds required by Article 11 to be furnished by the Contractor.

8.1.4 The Contractor shall proceed expeditiously and diligently with adequate forces and shall achieve Substantial Completion and Final Completion within the time specified in the Contract Documents.

8.2 Delay in Completion

8.2.1 The Contractor shall be liable for all of the Owner's damages for delay in achieving Substantial Completion and/or Final Completion of the entire Work or portions of Work as set forth in the Contract Documents within the Contract Time unless liquidated damages are specifically provided for in the Contract Documents. If liquidated damages are specifically provided for in the Contract for Construction, Contractor shall be liable for such liquidated damages as set forth in Paragraph 8.3

8.2.2 All time limits stated in the Contract are of the essence of the Contract. However, if the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or by the Owner's Representative, by changes ordered in the Work, Force Majeure including but not limited to war, armed conflict, riot, civil commotion or disorder, act of terrorism or sabotage; epidemic, pandemic, outbreaks of infectious disease or any other public health crisis, including quarantine or other employee restrictions, compliance with any law or governmental order, rule, regulation or direction, curfew restriction, act of God or natural disaster such as earthquake, volcanic activity, landslide, tidal wave, tsunami, flood, damage or destruction by lightning, drought; explosion, fire, destruction of machines, equipment, prolonged break-down of transport, telecommunication or electric current; general labor disturbance such as but not limited to boycott, strike and lock-out, occupation of factories and premises, or any other causes beyond the Contractor's reasonable control which the Owner's Representative determines may justify

delay then, upon submission of the Time Impact Schedule Analysis (TIA) justifying the delay called out in Section 4.7 of these General Conditions, the Contract Time may be extended for a reasonable time to the extent such delay will prevent Contractor from achieving Substantial Completion and/or Final Completion within the Contract Time and if performance of the Work is not, was not or would not have been delayed by any other cause for which the Contractor is not entitled to an extension of the Contract Time under the Contract Documents. It shall be a condition precedent to any adjustment of the Contract Time that Contractor provide the Owner's Representative with written notice of the cause of delay within seven (7) days from the occurrence of the event or condition which caused the claimed delay. If a Force Majeure is approved by the Owner as the basis for a delay claim, an adjustment in the contract time to the extent the Force Majeure impacts the schedule is the only remedy. No increase in the contract sum for any reason shall be allowed due to a Force Majeure.

8.2.3 The Contractor further acknowledges and agrees that adjustments in the Contract Time will be permitted for a delay only to the extent such delay (1) is not caused, or could not have been anticipated, by the Contractor, (2) could not be limited or avoided by the Contractor's timely notice to the Owner of the delay, (3) prevents Contractor from completing its Work by the Contract Time, and (4) is of a duration not less than one (1) day. Delays attributable to and within the control of a Subcontractor or supplier shall not justify an extension of the Contract Time.

8.2.4 Notwithstanding anything to the contrary in the Contract Documents, except as otherwise noted in these General Conditions, an extension in the Contract Time, to the extent permitted under this Article, shall be the sole remedy of the Contractor for any (1) delay in the commencement, prosecution or completion of the Work, (2) hindrance or obstruction in the performance of the Work, (3) loss of productivity, or (4) other claims due to or caused by any events beyond the control of both the Owner and Contractor defined herein as Force Majeure. In no event shall the Contractor be entitled to any compensation or recovery of any damages or any portion of damages resulting from delays caused by or within the control of Contractor or by acts or omissions of Contractor or its Subcontractors of any tier or delays beyond the control of both Owner and Contractor. If the Contractor contends that delay, hindrance, obstruction or other adverse condition results from acts or omissions of the Owner, the Owner's Representative or the Architect, Contractor shall provide written notice to the Owner within seven (7) calendar days of the event giving rise to such claim. Contractor shall only be entitled to an adjustment in the Contract Sum to the extent that such acts or omissions continue after the Contractor's written notice to the Owner of such acts or omissions, but in no case shall Force Majeure be the basis of an increase in the Contract sum. The Owner's exercise of any of its rights or remedies under the Contract Documents (including, without limitation, ordering changes in the Work, or directing suspension, rescheduling or correction of the Work) regardless of the extent or frequency of the Owner's exercise of such rights or remedies, shall not be the basis of any Claim for an increase in the Contract Sum or Contract Time. In the event Contractor is entitled to an adjustment in the Contract Sum for any delay, hindrance, obstruction or other adverse condition caused by the acts or omissions of the Owner, the Owner's Representative or the Architect, Contractor shall only be entitled to its actual direct costs caused thereby and Contractor shall not be entitled to and waives any right to special, indirect, or consequential damages including loss of profits, loss of savings or revenues, loss of anticipated profits, labor inefficiencies, idle equipment, home office overhead, and similar type of damages.

8.2.5 If the Contractor submits a progress report or any construction schedule indicating, or otherwise expressing an intention to achieve completion of the Work prior to any completion date required by the Contract Documents or expiration of the Contract Time, no liability of the Owner to the Contractor for any failure of the Contractor to so complete the Work shall be created or implied. Further, the Contractor acknowledges and agrees that even if Contractor intends or is able to complete the Work prior to the Contract Time, it shall assert no Claim and the Owner shall not be liable to Contractor for any failure of the Contractor, regardless of the cause of the failure, to complete the Work prior to the Contract Time.

8.3 Liquidated Damages

8.3.1 If Liquidated Damages are prescribed on the Bid Form and Special Conditions in the Contract Documents, the Owner may deduct from the Contract Sum and retain as Liquidated Damages, and not as penalty or forfeiture, the sum stipulated in the Contract Documents for each calendar day after the date specified for completion of the Work that the entire Work is not substantially complete and/or finally complete.

8.3.2 The Owner's Representative shall establish the date of Substantial completion and the date of Final Completion of the Work which shall be conclusive and binding on the Owner and Contractor for the purpose of determining whether or not Liquidated Damages shall be assessed under terms hereof and the sum total amount due.

8.3.3 Liquidated Damages or any matter related thereto shall not relieve the Contractor or his surety of any responsibility or obligation under this Contract.

ARTICLE 9
PAYMENTS AND COMPLETION

9.1 Commencement, Prosecution, and Completion

9.1.1 The Contractor shall commence Work within five (5) days upon the date of a "Notice to Proceed" from the Owner or the date fixed in the Notice to Proceed. Contractor shall prosecute the Work with faithfulness and diligence, and the

Contractor shall complete the Work within the Contract Time set forth in the Contract Documents.

9.1.2 The Owner will prepare and forward three (3) copies of the Contract and Performance Bond to the bidder to whom the contract for the Work is awarded and such bidder shall return two (2) properly executed prescribed copies of the Contract and Bond to the Owner.

9.1.3 The construction period, when specified in consecutive calendar days, shall begin when the Contractor receives notice requesting the instruments listed in below. Before the Owner will issue Notice to Proceed to permit the Contractor to begin Work, the Owner shall have received the following instruments, properly executed as described in the Contract Documents. The documents below shall have been received by the Owner within fifteen (15) days after receipt of request for documents:

.1 Contract
.2 Bond (See Article 11)
.3 Insurance (See Article 11)
.4 List of Subcontractors of any tier
.5 Affirmative Action Plan (see Article 13.4)

9.1.4 In the event Contractor fails to provide Owner such documents, Contractor may not enter upon the site of the Work until such documents are provided. The date the Contractor is required to commence and complete the Work shall not be affected by the Owner denying Contractor access to the site as a result of Contractor's failure to provide such documents and Contractor shall not be entitled to an adjustment of the Contract Time or Contract sum as a result of its failure to comply with the provisions of this Paragraph

9.1.5 Contracts executed by partnerships shall be signed by all general partners of the partnership. Contracts signed by corporations shall be signed by the President or Vice President and the Secretary or Assistant Secretary. In case the Assistant Secretary or Vice President signs, it shall be so indicated by writing the word "Asst." or "Vice" in front of the words "Secretary" and "President". The corporate seal of the corporation shall be affixed. For all other types of entities, the Contractor and the person signing the Contract on behalf of Contractor represent and warrant that the person signing the Contract has the legal authority to bind Contractor to the Contract.

9.1.6 Any successful bidder which is a corporation organized in a state other than Missouri or any bidder doing business in the State of Missouri under a fictitious name shall furnish, at no cost to the Owner, no later than the time at which the executed Contract for Construction, the Payment Bond, and the Performance Bond are returned, a properly certified copy of its current Certificate of Authority and License to do business in the State of Missouri. No contract will be executed by the Owner until such certificate is furnished by the bidder, unless there already is on file with the Owner a current certificate, in which event, no additional certificate will be required during the period of time for which such current certificate remains in effect.

9.1.7 Within fifteen (15) calendar days of the issuance of a Notice to Proceed, the Contractor shall submit one (1) signed copy of the following instruments. No payment will be processed until all of these instruments are received and approved by the Owner's Representative.

.1 Reproducible progress and payment schedule
.2 Contractor's Schedule of Values
.3 List of material suppliers
.4 Itemized breakdown of all labor rates for each classification. Overhead and profit shall not be included. Payroll cost shall include base rate salaries and wages plus the cost of fringe benefits required by agreement or custom and social security contributions, unemployment, payroll taxes and workers' or workmen's compensation insurance and other customary and legally required taxes paid by the Contractor or Subcontractors. Any item or expense outside of these categories is not allowed. The expense of performing Work after regular working hours, on Saturdays, Sundays or legal holidays shall not be included in the above, unless approved in writing and in advance by Owner.
.5 Itemized breakdown of anticipated equipment rates (breakout operator rate). Overhead and profit shall not be included. Breakdown for required equipment shall itemize (at a minimum) delivery/ pick-up charge, hourly rate and hours used. Operator hours and rate shall not be included in the equipment breakdown. Contractor must use the most cost-effective equipment available in the area and should not exceed the rates listed in the Rental Rate Blue Book for Construction Equipment (Blue Book). Contractor shall submit documentation for the Blue Book to support the rate being requested.

9.1.8 The Contractor shall be paid electronically using the Owner's web-based payment program with a direct electronic transfer from the Owner's account into the Contractor's account. The Contractor must submit the following information to the Owner's Representative:

.1 Bank Transit Number for the Contractor's bank into which the electronic deposit will be made.
.2 Bank Account Number for the Contractor's account into which the electronic deposit will be made.
.3 Contractor's E-Mail address so that formal notification of the deposit by the Owner can be provided.

9.2 Contract Sum

9.2.1 The Owner shall compensate Contractor for all Work described herein, and in the Contract Documents the Contract

Sum set forth in the Contract for Construction, subject to additions and deletions as provided hereunder.

9.3 Schedule of Values

9.3.1 Within fifteen (15) days after receipt of the Notice to Proceed, the Contractor shall submit to the Owner's Representative a schedule of values allocated to various portions of the Work, prepared in such form and supported by such data to substantiate its accuracy as the Owner's Representative may require. This schedule, unless objected to by the Owner's Representative, shall be used as a basis for reviewing the Contractor's Applications for Payment. The values set forth in such schedule may, at the Owner's option be used in any manner as fixing a basis for additions to or deletions from the Contract Sum.

9.3.2 The progress and payment schedule of values shall show the following:

.1 Enough detail as necessary to adequately evaluate the actual percent complete of any line item on a monthly basis, as determined by the Owner's Representative.

.2 Line items, when being performed by a subcontractor or material supplier, shall correlate directly back to the subcontract or purchase order amount if requested by the Owner's Representative.

9.4 Applications for Payment

9.4.1 The Contractor shall submit monthly to the Owner's Representative and the Architect an itemized Application for Payment for operations completed in accordance with the Schedule of Values. Such application shall be supported by such data substantiating the Contractor's right to payment as the Owner's Representative or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and reflecting retainage as provided for herein.

9.4.2 Such applications shall not include requests for payment of amounts the Contractor does not intend to pay to a Subcontractor or material supplier

9.4.3 Progress payments shall be made on account of materials and equipment delivered to the site and incorporated in the Work. No payments will be made for materials and equipment stored at the Project site but not yet incorporated into the Work except as provided in Paragraph 9.4.4.

9.4.4 If approved in writing and in advance by Owner, progress payments may be made on account of materials and equipment delivered and suitably stored at the site for subsequent incorporation in the Work. Owner may in its sole discretion refuse to grant approval for payments for materials and equipment stored at the Project site but not yet incorporated in the Work. Any approval by Owner for payment for materials and equipment delivered and suitably stored at the site, or stored offsite as noted below, for subsequent incorporation in the Work shall be conditioned upon Contractor's demonstrating that such materials and equipment are adequately protected from weather, damage, vandalism and theft and that such materials and equipment have been inventoried and stored in accordance with procedures established by or approved by the Owner. Nothing in this clause shall imply or create any liability on the part of the Owner for the Contractor's inventory and storage procedures or for any loss or damage to material, equipment or supplies stored on the site, whether incorporated into the work or not. In the event any such loss or damage occurs, the Contractor remains solely responsible for all costs associated with replacement of the affected materials, supplies and equipment including labor and incidental costs, and shall have no claim against the Owner for such loss.

No allowance shall be made in the project pay requests for materials not delivered to the site of the work and incorporated into the work, except as noted below. For the purposes of this Article, Offsite is defined as any location not owned or leased by the Owner. Contractor shall submit a list of materials that they are requesting payment for offsite storage within 60 days of Notice to Proceed.

.1 Items considered to be major items of considerable magnitude, if suitably stored, may be allowed in project pay requests on the basis of ninety percent (90%) of invoices

.2 Determination of acceptable "major items of considerable magnitude" and "suitably stored" shall be made by the Owner's Representative.

.3 Aggregate quantities of materials not considered unique to this project will not be considered for offsite storage payment.

.4 Contractor shall submit to the Owner's Representative a list of the material for which application for payment for offsite storage is anticipated no less than forty-five days prior to the submission of the applicable pay request. The list shall include a material description, applicable division, quantity, and discounts offered to the Owner for early payment. Contractor shall also submit the location the material will be stored and the method of protection

.5 The storage facility shall be subject to approval by the Owner's representative, shall be located within an acceptable distance of the project sites as established by the Owner's Representative and all materials for the Owner's project must be stored separately from all other items within the storage facility and shall be labeled and stored in the name of The Curators of the University of Missouri.

.6 The Owner's representative shall be provided a minimum of two weeks' notice to visit the storage facility and inspect the stored material prior to submission of the pay request.

.7 Upon favorable inspection by the Owner's Representative, the Contractor shall, at the Owner's option, submit a Bill of Sale and Bailment Agreement on forms provided by the Owner's

Representative, transferring title of the material or equipment to The Curators of the University of Missouri.

.8 An invoice provided by the supplier shall be included with the applicable pay request.

.9 The contractor shall remain fully responsible for all items, until acceptance of the project by the Owner.

.10 The contractor shall reimburse all costs incurred by the Owner in inspecting and verifying all material stored offsite, including mileage, airfare, meals, lodging and time, charged at a reasonable hourly rate.

.11 The Contractor shall furnish and maintain insurance covering the replacement cost of the material stored offsite against all losses and shall furnish proof of coverage with the application for payment for material stored offsite.

.12 The Contractor is responsible for all costs related to storage and handling of material stored offsite unless otherwise directed by the Owner's Representative.

9.4.5 The Application for Payment shall constitute a representation by the Contractor to the Owner that the Work has progressed to the point indicated; the quality of the Work covered by the Application for Payment is in accordance with the Contract Documents; and the Contractor is entitled to payment in the amount requested.

9.4.6 The Contractor will be reimbursed for ninety-five percent (95%) of the value of all labor furnished and material installed and computed in the same manner, less all previous payments made. On projects where a bond is not required, the contractor will be reimbursed for ninety percent (90%) of the value of all labor furnished and material installed and computed in the same manner, less all previous payments made

9.5 Approval for Payment

9.5.1 The Owner's Representative will, within fifteen (15) days after receipt of the Contractor's Application for Payment, either approve Contractor's Application for Payment for such amount as the Owner's Representative determines is properly due or notify the Contractor of the Owner's Representative's reasons for withholding certification in whole or in part as provided in Section 9.6.

9.6 Decisions to Withhold Approval

9.6.1 The Owner's Representative may decide not to certify payment and may withhold approval in whole or in part, to the extent reasonably necessary to protect the Owner. If the Owner's Representative is unable to approve payment in the amount of the Application, the Owner's Representative will notify the Contractor as provided in Paragraph 9.5.1. If the Contractor and Owner's Representative cannot agree on a revised amount, the Owner's Representative will promptly issue approval for payment for the amount for which the Owner's Representative is able to determine is due Contractor. The Owner's Representative may also decide not to approve payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of approval for payment previously issued, to such extent as may be necessary in the Owner's Representative opinion to protect the Owner from loss because of:

.1 defective or non-compliant Work not remedied, or damage to completed Work;

.2 failure to supply sufficient skilled workers or suitable materials;

.3 third party claims filed or reasonable evidence indicating probable filing of such claims;

.4 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment, Owner may, at its sole option issue joint checks to subcontractors who have presented evidence that it has not been paid in accordance with the Contract;

.5 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

.6 damage to the Owner or another contractor;

.7 reasonable evidence that the Work will not be completed within the Contract Time or an unsatisfactory rate of progress made by Contractor;

.8 Contractor's failure to comply with applicable Laws;

.9 Contractor's or Subcontractor's failure to comply with contract Prevailing Wage requirements; or

.10 Contractor's failure to carry out the Work in strict accordance with the Contract Documents.

9.6.2 When the above reasons for withholding approval are removed, approval will be made for amounts previously withheld.

9.7 Progress Payments

9.7.1 Based upon Applications for Payment submitted to the Owner by the Contractor and approvals issued by the Owner's Representative, the Owner shall make progress payments on account of the Contract Sum to the Contractor as provided below and elsewhere in the Contract Documents.

9.7.2 The period covered by each Application for Payment shall be one (1) calendar month.

9.7.3 The Owner shall make payment to Contractor for amounts due and approved by Owner's Representative not later than thirty (30) days after the Owner approves a properly detailed Application for Payment which is in compliance with the Contract Documents. The Owner shall not have the obligation to process or pay such Application for Payment until it receives an Application for Payment satisfying such requirements.

9.7.4 Based on the Schedule of Values submitted by Contractor, Applications for Payment submitted by Contractor

shall indicate the actual percentage of completion of each portion of Contractor's Work as of the end of the period covered by the Application for Payment.

9.7.5 The Contractor shall promptly pay each Subcontractor and Supplier, upon receipt of payment from the Owner, out of the amount paid to the Contractor on account of such Subcontractor's or supplier's portion of the Work, the amount to which said Subcontractor or supplier is entitled, reflecting percentages actually retained from payments to the Contractor on account of each Subcontractor's or supplier's portion of the Work, in full compliance with state statute. The Contractor shall, by appropriate agreement with each Subcontractor or supplier, require each Subcontractor or supplier to make payments to Sub-subcontractors in similar manner.

9.7.6 Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor of any tier nor a laborer or employee of Contractor except to the extent required by law. Retainage provided for by the Contract Documents are to be retained and held for the sole protection of Owner, and no other person, firm or corporation shall have any claim or right whatsoever thereto.

9.7.7 An approval for payment by Owner's Representative, a progress payment, or partial or entire use or occupancy of the Project by the Owner shall not constitute acceptance of Work not in accordance with the Contract Documents.

9.8 Failure of Payment

9.8.1 If the Owner is entitled to reimbursement or payment from the Contractor under or pursuant to the Contract Documents, such payment by Contractor shall be made promptly upon demand by the Owner. Notwithstanding anything contained in the Contract Documents to the contrary, if the Contractor fails to promptly make any payment due the Owner, or the Owner incurs any costs and expenses to cure any default of the Contractor or to correct defective Work, the Owner shall have an absolute right to offset such amount against the Contract Sum and may, in the Owner's sole discretion, elect either to: (1) deduct an amount equal to that to which the Owner is entitled from any payment then or thereafter due the Contractor from the Owner, or (2) issue a written notice to the Contractor reducing the Contract Sum by an amount equal to that to which the Owner is entitled.

9.9 Substantial Completion

9.9.1 Substantial Completion is the stage in the progress of the Work as defined in Paragraph 1.1.14 as certified by the Owner.

9.9.2 When the Contractor considers the Work, or a portion thereof which the Owner agrees to accept separately, is substantially complete, the Contractor shall notify the Owner and the Architect. The Owner's Representative will make an inspection to determine whether the Work or designated portion thereof is substantially complete. If the Owner's Representative's inspection discloses any item which is not in accordance with the requirements of the Contract Documents, the Contractor shall complete or correct such item upon notification by the Owner's Representative. The Contractor shall then submit a request for another inspection by the Owner's Representative to determine Substantial Completion. When the Work or designated portion thereof is substantially complete, the Owner will issue a Certificate of Substantial Completion. Substantial Completion shall transfer from the Contractor to the Owner responsibilities for security, maintenance, heat, utilities, damage to the Work and insurance. In no event shall Contractor have more than thirty (30) days to complete all items on the Punch List and achieve Final Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion or as agreed otherwise.

9.9.3 At the date of Substantial Completion, the Contractor may apply for, and if approved by Owner's Representative, the Owner, subject to the provisions herein, shall increase total payments to one hundred percent (100%) of the Contract Sum less one hundred fifty percent (150%) of the value of any incomplete Work and unsettled claims, as determined by the Owner's Representative.

9.10 Partial Occupancy or Use

9.10.1 The Owner may occupy or use any completed or partially completed portion of the Work at any stage when such portion is designated by separate agreement with the Contractor. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, security, maintenance, heat, utilities, damage to the Work and insurance. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by the Owner's Representative.

9.10.2 Immediately before such partial occupancy or use, the Owner, and Contractor shall jointly inspect the area to be occupied or portion of the Work to be used in order to determine and record the condition of the Work. Unless otherwise agreed upon, partial occupancy or use of a portion or portions of the Work shall not constitute acceptance of Work not complying with the requirements of the Contract Documents.

9.11 Final Completion and Final Payment

9.11.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner's Representative and the Architect will promptly make such inspection and, when the Owner's Representative and Architect find the Work acceptable under the Contract Documents and the Contract fully performed, the Owner's Representative will promptly issue a final approval for payment; otherwise, Owner's

Representative will return Contractor's Final Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Submission of a Final Application for Payment shall constitute a further representation that conditions listed in Paragraph 9.11.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Owner's Representative as part of the final Application for Payment. The final approval for payment will not be issued by the Owner's Representative until all warranties and guarantees have been received and accepted by the Owner.

9.11.2 The Owner will request the Contractor to submit the application for final payment along with a manually signed notarized letter on the Contractor's letterhead certifying that:

.1 Labor costs, prevailing wage rates, fringe benefits and material costs have been paid.

.2 Subcontractors of any tier and manufacturers furnishing materials and labor for the project have fully completed their Work and have been paid in full.

.3 The project has been fully completed in accordance with the Contract Documents as modified by Change Orders.

.4 The acceptance by Contractor of its Final Payment, by check or electronic transfer, shall be and operate as a release of all claims of Contractor against Owner for all things done or furnished or relating to the Work and for every act or alleged neglect of Owner arising out of the Work.

9.11.3 Final Payment constituting the entire unpaid balance due shall be paid by the Owner to the Contractor within thirty (30) days after Owner's receipt of Contractor's Final Application for Payment which satisfies all the requirements of the Contract Documents and Owner's receipt of all information and documents set forth in Section 9.11.

9.11.4 No payment under this Contract, including but not limited to final payment, shall constitute acceptance by Owner of any Work or act not in accordance with the requirements of the Contract Documents.

9.11.5 No recourse shall be had against any member of the Board of Curators, or officer thereof, for any payment under the Contract or any claim based thereon.

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.1 Safety Precautions and Programs

10.1.1 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.

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

10.1.3 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.

10.2 Safety Of Persons and Property

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

.1 students, faculty, staff, the public, construction personnel, and other persons who may be affected thereby;

.2 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

.3 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.

10.2.2 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.

10.2.3 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.

10.2.4 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.

10.2.5 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 Article 10 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 Article 10, 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.

10.2.6 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.

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

10.2.8 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.

10.2.9 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.

ARTICLE 11
INSURANCE & BONDS

11.1 Insurance

11.1.1 Contractor shall secure from the date of the Contract for Construction and maintain for such periods of time as set forth below, insurance of such types and in such amounts specified below, to protect Contractor, Owner and others against all hazards or risks of loss described below. The form of such insurance together with carriers thereof, in each case, shall be approved by Owner, but, regardless of such approval, it shall be the responsibility of Contractor to maintain the insurance coverages set forth herein.

11.1.2 The contractor shall not be allowed on the Owners property without proof of the insurance coverages set forth herein

11.2 Commercial General Liability

11.2.1 Contractor shall secure and maintain from the date of the Contract and for a period of at least five (5) years from the date of Final Completion of the entire Work Commercial General Liability insurance ("CGL") with a combined single limit of not less than $2,000,000 per occurrence, $5,000,000 general aggregate, $5,000,000 products and completed operations aggregate and $1,000,000 personal injury and advertising injury. General Aggregate should apply per project. An umbrella policy may be used to satisfy these limits. If the General Aggregate is not on a per project basis, the contractor shall provide an additional $2,000,000 general aggregate.

11.2.2 CGL insurance shall be written on a comprehensive form and shall cover claims and liability in connection with or resulting from the Contractor's operations and activities under the Contract, for personal injuries, occupational sickness, disease, death or damage to property of others, including loss of use resulting therefrom, arising out of any operations or activities of the Contractor, its agents, or any Subcontractors of any tier or by anyone directly or indirectly employed by either of them.

11.2.3 CGL insurance shall include premises, operations, independent contractors, products-completed operations, personal injury and advertising injury and liability assumed under an insured contract (including the tort liability of another assumed in a business contract) coverages. In particular, and not by way of any limitation, the CGL

insurance shall cover the Contractor's indemnity obligations contained in the Contract Documents.

11.2.4 There shall be no endorsement or modification of the CGL policy limiting the scope of coverage for liability arising from blasting, explosion, collapse, or underground property damage.

11.2.5 "The officers, employees, and agents of The Curators of the University of Missouri" shall be endorsed as an "additional insured" under the CGL policy. The additional insured status must be conveyed by using the ISO CG 2 10 (2004) edition or equivalent and the ISO CG 20 37 (2004) edition. The policy shall be endorsed to be primary coverage and any other insurance carried by the Owner shall be excess only and will not contribute with Contractors' insurance. To confirm, the Endorsement should accompany the insurance certificate.

11.2.6 Contractor waives all rights against Owner and its agents, officers, representatives, and employees for recovery of damages to the extent those damages are covered by the CGL policy required hereunder.

11.3 Licensed for Use Vehicle Liability

11.3.1 Contractor shall secure and maintain from the date of the Contract for Construction until the date of Final Completion of the entire Work, insurance, to be on comprehensive form, which shall protect Contractor against any and all claims for all injuries and all damage to property arising from the use of automobiles, trucks and motorized vehicles, in connection with the performance of Work under this Contract, and shall cover the operation on or off the site of the Work of all motor vehicles licensed for highway use whether they are owned, non-owned or hired. Such insurance shall include contractual liability coverage and shall provide coverage on the basis of the date of any accident. The liability limits under such policy shall not be less than $2,000,000 combined single limit for bodily injury and property damage per accident.

11.3.2 Contractor waives all rights against Owner and its agents, officers, directors, and employees for recovery of damages to the extent such damages are covered by the automobile liability insurance required hereunder.

11.4 Workers' Compensation Insurance

11.4.1 Contractor shall purchase and maintain workers' compensation insurance and employers' liability insurance which shall protect Contractor from claims for injury, sickness, disease or death of Contractor's employees or statutory employees. The insurance policies required hereunder shall include an "all states" or "other states" endorsement. In case any Work is sublet, Contractor shall require any Subcontractor of any tier to provide the insurance coverages required under this Section 11.4.

11.4.2 Contractor's workers' compensation insurance coverage shall be in compliance with all applicable Laws, including the statutes of the State of Missouri. Contractor's employers' liability coverage limits shall not be less than $1,000,000 each accident for bodily injury by accident or $1,000,000 each employee for bodily injury by disease.

11.5 Liability Insurance General/Other Requirements

11.5.1 Any Consultant/Contractor providing professional design services as part of the contract shall be required to provide and maintain, from the date of this Contract and for a period of ten (10) years after the date of Final Completion, Professional Liability insurance to cover any claims, including but not limited to errors, omissions, and negligence, which may arise from the Design and related Services performed by the Consultant. The minimum limits for such Policy shall be $1,000,000.00 per occurrence/$1,000,000.00 aggregate. The insurance afforded by the policy shall meet the requirements of this Section 11.2 and Section 11.5 relating to CGL Policies, and without limiting the foregoing, shall be extended to cover the liability of "The officers, employees, and agents of The Curators of the University of Missouri", who shall be named as additional insureds therein, and this liability is assumed in writing by the Contractor's Consultant under the written Subcontract described herein. All insurance coverages procured by Contractor shall be provided by agencies and insurance companies acceptable to and approved by Owner. Any insurance coverage shall be provided by insurance companies that are duly licensed to conduct business in the State of Missouri as an admitted carrier. The form and content of all insurance coverage provided by Contractor are subject to the approval of Owner. All required insurance coverages shall be obtained and paid for by Contractor. Any approval of the form, content or insurance company by Owner shall not relieve the Contractor from the obligation to provide the coverages required herein.

11.5.2 All insurance coverage procured by the Contractor shall be provided by insurance companies having policyholder ratings no lower than "A-" and financial ratings not lower than "XI" in the Best's Insurance Guide, latest edition in effect as of the date of the Contract, and subsequently in effect at the time of renewal of any policies required by the Contract Documents. Insurance coverages required hereunder shall not be subject to a deductible amount on a per-claim basis of more than $10,000.00 and shall not be subject to a per-occurrence deductible of more than $25,000.00. Insurance procured by Contractor covering the additional insureds shall be primary insurance and any insurance maintained by Owner shall be excess insurance.

11.5.3 All insurance required hereunder shall provide that the insurer's cost of providing the insureds a defense and appeal, including attorneys' fees, shall be supplementary and shall not be included as part of the policy limits but shall remain the insurer's separate responsibility. Contractor shall cause its insurance carriers to waive all rights of subrogation,

except for Workers' Compensation, against the Owner and its officers, employees and agents.

11.5.4 The Contractor shall furnish the Owner with certificates, Additional Insured endorsements, policies, or binders which indicate the Contractor and/or the Owner and other Contractors (where required) are covered by the required insurance showing type, amount, class of operations covered, effective dates and dates of expiration of policies prior to commencement of the work. Contractor is required to maintain coverages as stated and required to notify the University of a Carrier Change or cancellation within 2 business days. The University reserves the right to request a copy of the policy. Contractor fails to provide, procure, and deliver acceptable policies of insurance or satisfactory certificates or other evidence thereof, the Owner may obtain such insurance at the cost and expense of the Contractor without notice to the Contractor.

11.5.5 With respect to all insurance coverages required to remain in force and affect after final payment, Contractor shall provide Owner additional certificates, policies and binders evidencing continuation of such insurance coverages along with Contractor's application for final payment and shall provide certificates, policies and binders thereafter as requested by Owner.

11.5.6 The maintenance in full current force and effect of such forms and amounts of insurance and bonds required by the Contract Documents shall be a condition precedent to Contractor's exercise or enforcement of any rights under the Contract Documents.

11.5.7 Failure of Owner to demand certificates, policies and binders evidencing insurance coverages required by the Contract Documents, approval by Owner of such certificates, policies and binders or failure of Owner to identify a deficiency from evidence that is provided by Contractor shall not be construed as a waiver of Contractor's obligations to maintain the insurance required by the Contract Documents.

11.5.8 The Owner shall have the right to terminate the Contract if Contractor fails to maintain the insurance required by the Contract Documents.

11.5.9 If Contractor fails to maintain the insurance required by the Contract Document, Owner shall have the right, but not the obligation, to purchase said insurance at Contractor's expense. If Owner is damaged by Contractor's failure to maintain the insurance required by the Contract Documents, Contractor shall bear all reasonable costs properly attributable to such failure.

11.5.10 By requiring the insurance set forth herein and in the Contract Documents, Owner does not represent or warrant that coverage and limits will necessarily be adequate to protect Contractor, and such coverages and limits shall not be deemed as a limitation on Contractor's liability under the indemnities granted to Owner in the Contract Documents.

11.5.11 If Contractor's liability policies do not contain a standard separation of insureds provision, such policies shall be endorsed to provide cross-liability coverage.

11.5.12 If a part of the Work hereunder is to be subcontracted, the Contractor shall: (1) cover any and all Subcontractors in its insurance policies; (2) require each Subcontractor to secure insurance which will protect said Subcontractor and supplier against all applicable hazards or risks of loss designated in accordance with Article 11 hereunder; and (3) require each Subcontractor or supplier to assist in every manner possible in the reporting and investigation of any accident, and upon request, to cooperate with any insurance carrier in the handling of any claim by securing and giving evidence and obtaining the attendance of witnesses as required by any claim or suit.

11.5.13 It is understood and agreed that the insurance coverages required by the provisions of this Article 11 are required in the public interest and that the Owner does not assume any liability for acts of Contractor or Subcontractors of any tier or their employees in the performance of the Contract or Work.

11.6 Builder's Risk Insurance

11.6.1 The Contractor shall purchase and maintain, in a company or companies lawfully authorized to do business in the State of Missouri, as an admitted carrier, builder's risk insurance on the entire Work. Such insurance shall be written on a completed value form for the entire Work. The insurance shall apply on a replacement cost basis.

11.6.2 The insurance as required herein shall name as insureds the Owner, Contractor, and all Subcontractors of any tier. The insurance policy shall contain a provision that the insurance will not be canceled, allowed to expire or materially changed until at least thirty (30) days prior written notice has been given to Owner.

11.6.3 The insurance as required herein shall cover the entire Work, including reasonable compensation for Architect's services and expenses made necessary by an insured loss. Insured property shall include portions of the Work located away from the site (including all offsite stored materials) but intended for use at the site and shall also cover portions of the Work in transit, including ocean transit. The policy shall include as insured property scaffolding, falsework, and temporary buildings located at the site. The policy shall cover the cost of removing debris, including demolition as may be made legally necessary by the operation of any law, ordinance, or regulation.

11.6.4 The insurance required herein shall be on an all risk form and shall be written to cover all risks of physical loss or damage to the insured party and shall insure at least against the perils of fire and extended coverage, theft, vandalism,

malicious mischief, collapse, lightening, earthquake, flood, frost, water damage, windstorm and freezing.

11.6.5 If there are any deductibles applicable to the insurance required herein, Contractor shall pay any part of any loss not covered because of the operation of such deductibles.

11.6.6 The insurance as required herein shall be maintained in effect until the earliest of the following dates:

.1 the date which all persons and organization who are insureds under the policy agree in writing that it shall be terminated;

.2 the date on which final payment of this Contract has been made by Owner to Contractor; or

.3 the date on which the insurable interests in the property of all insureds other than the Owner have ceased.

11.6.7 The Owner and Contractor waive all rights against (1) each other and any of their subcontractors of any tier, suppliers, agents and employees, each of the other, (2) the Architect and Architect's consultants, and (3) separate contractors described in Article 6, if any, and any of their subcontractors of any tier, suppliers, agents and employees, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this Section 11.7 or other insurance applicable to the Work, except such rights as they have to proceeds of such insurance. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors of any tier, suppliers, agents, and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, was at fault or was negligent in causing the loss and whether or not the person or entity had an interest in the property damaged.

11.6.8 A loss insured under Contractor's property insurance shall be adjusted by the Owner in good faith and made payable to the Owner for the insureds, subject to requirements of the Contract Documents. The Contractor shall pay Subcontractors of any tier their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors of any tier to make payments to their Sub-subcontractors in similar manner.

11.7 Bonds

11.7.1 When the Contract sum exceeds Fifty Thousand Dollars ($50,000), the Contractor shall procure and furnish a Performance Bond and a Payment Bond in the form prepared by the Owner, each in an amount equal to one hundred percent (100%) of the Contract Sum, as well as adjustments to the Contract Sum. The Performance Bond shall secure and guarantee Contractor's faithful performance of this Contract, including but not limited to Contractor's obligation to correct defects after final payment has been made as required by the Contract Documents. The Payment Bond shall secure and guarantee payment of all persons performing labor on the Project under this Contract and furnishing materials in connection with this Contract. These Bonds shall be in effect through the duration of the Contract plus the Guaranty Period as required by the Contract Documents.

11.7.2 The bonds required hereunder shall be executed by a responsible surety licensed in the State of Missouri, with a Best's rating of no less than A-/XI. The Contractor shall require the attorney in fact who executes the required bonds on behalf of the surety to affix thereto a certified and current copy of this power of attorney indicating the monetary limit of such power.

11.7.3 If the surety of any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to conduct business in the State of Missouri is terminated, or it ceases to meet the requirements of this paragraph, Contractor shall within ten (10) days substitute another bond and surety, both of which must be acceptable to Owner. If Contractor fails to make such substitution, Owner may procure such required bonds on behalf of Contractor at Contractor's expense.

11.7.4 Upon the request of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds to such person or entity.

11.7.5 The Contractor shall keep the surety informed of the progress of the Work, and, where necessary, obtain the surety's consent to or waiver of: (1) notice of changes in the Work; (2) request for reduction or release of retention; (3) request for final payment; and (4) any other material required by the surety. The Owner shall be notified by the Contractor, in writing, of all communications with the surety, as it relates to items one through four. The Owner may, in the Owner's sole discretion, inform surety of the progress of the Work, any defects in the Work, or any defaults of Contractor under the Contract Documents and obtain consents as necessary to protect the Owner's rights, interest, privileges and benefits under and pursuant to any bond issued in connection with the Work.

11.7.6 Contractor shall indemnify and hold harmless the Owner and any agents, employees, representative or member of the Board of Curators from and against any claims, expenses, losses, costs, including reasonable attorneys' fees, as a result of any failure of Contractor to procure the bonds required herein.

ARTICLE 12
UNCOVERING AND CORRECTION OF THE WORK

12.1 Uncovering of the Work

12.1.1 If a portion of the Work is covered contrary to the Architect's request or to requirements specifically expressed in the Contract Documents, it shall, if required in writing by the Architect or the Owner's Representative, be uncovered for the Architect's observation and be replaced at the Contractor's expense without change in the Contract Time.

12.1.2 If a portion of the Work has been covered which the Architect or the Owner's Representative has not specifically requested to observe, prior to its being covered, the Architect or the Owner's Representative may request to see such Work, and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be charged to the Owner. If such Work is not in accordance with the Contract Documents, the Contractor shall pay such costs unless the condition was caused by the Owner or a separate contractor in which event the Owner will be responsible for payment of such costs.

12.2 Correction of the Work

12.2.1 The Architect or Owner's Representative shall have the right to reject Work not in strict compliance with the requirements of the Contract Documents. The Contractor shall promptly correct Work rejected by the Architect or the Owner's Representative for failing to conform to the requirements of the Contract Documents, whether observed before or after final completion and whether or not fabricated, installed, or completed. If Work has been rejected by Architect or Owner's Representative, the Architect or Owner's Representative shall have the right to require the Contractor to remove it from the Project site and replace it with Work that strictly conforms to the requirements of the Contract Documents regardless, if such removal and replacement results in "economic waste." Contractor shall pay all claims, costs, losses and damages caused by or resulting from the correction, removal or replacement of defective, or non-compliant Work, including but not limited to, all costs of repair or replacement of Work of others. The Contractor shall bear costs of correcting, removing and replacing such rejected Work, including additional testing and inspections and compensation for the Architect's services and expenses made necessary thereby. If prior to the date of final payment, the Contractor, a Subcontractor, or anyone for whom either is responsible uses or damages any portion of the Work, including, without limitation, mechanical, electrical, plumbing, and other building systems, machinery, equipment or other mechanical device, the Contractor shall cause such item to be restored to "like new" condition at no expense to the Owner.

12.2.2 If, within twelve (12) months after the date of Final Completion of the Work or designated portion thereof, or after the date for commencement of warranties, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found not to be in strict accordance with the requirements of the Contract Documents, the Contractor shall correct or remove and replace such defective Work, at the Owner's discretion. Such twelve (12) month period is referred to as the "Guarantee Period." The obligations under this Paragraph 12.2.2 shall cover any repairs, removal, and replacement to any part of the Work or other property caused by the defective Work.

12.2.3 The Contractor shall remove from the site portions of the Work which are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

12.2.4 If the Contractor fails to correct nonconforming Work within a reasonable time, the Owner may correct or remove it and replace such nonconforming Work. If the Contractor does not proceed with correction of such nonconforming Work within a reasonable time fixed by written notice from the Owner, the Owner may take action to correct or remove the nonconforming work at the contractor's expense.

12.2.5 The Contractor shall bear the cost of correcting destroyed or damaged Work or property, whether completed or partially completed, of the Owner or of others caused by the Contractor's correction or removal of Work which is not in accordance with the requirements of the Contract Documents.

12.2.6 Nothing contained in Article 12 shall be construed to establish a period of limitation with respect to other obligations that the Contractor might have under the Contract Documents. Establishment of the twelve (12) month Guarantee Period as described in Article 12 relates only to the specific obligation of the Contractor to correct, remove or replace the Work, and has no relationship to the time within which the obligation to comply with the Contract Documents may be sought to be enforced, nor to the time within which proceedings may be commenced to establish the Contractor's liability with respect to the Contractor's obligations under the Contract Documents. The requirements of Article 12 are in addition to and not in limitation of any of the other requirements of the Contract for warranties or conformance of the Work to the requirements of the Contract Documents.

12.3 Acceptance of Nonconforming Work

12.3.1 The Owner may accept Work which is not in accordance with the Contract Documents, instead of requiring its removal and correction, in its sole discretion. In Such case the Contract Sum will be adjusted as appropriate and equitable. Such adjustment shall be made whether or not final payment has been made. Nothing contained herein shall impose any obligation upon the Owner to accept nonconforming or defective Work.

ARTICLE 13
MISCELLANEOUS PROVISIONS

13.1 Written Notice

13.1.1 All notices required to be given by the contractor under the terms of this Contract shall be made in writing. Written notice when served by the Owner will be deemed to have been duly served if delivered in person to the individual or a member of the firm or entity or to an office of the corporation for which it was intended, or if delivered at or sent to the last business address known to the party giving notice.

13.2 Rights and Remedies

13.2.1 Duties and obligations imposed by the Contract Documents, and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights, and remedies otherwise imposed or available by law.

13.2.2 No action or failure to act by the Owner, the Architect, or the Owner's Representative will constitute a waiver of a right or duty afforded to the Owner under the Contract Documents, nor will such action or failure to act constitute approval of or acquiescence in a breach thereunder, except as may be specifically agreed in writing.

13.2.3 The terms of this Contract and all representations, indemnifications, warranties and guarantees made in, required by, or given in accordance with the Contract Documents, as well as all continuing obligations indicated in the Contract Documents, will survive final payment, completion and acceptance of the Work and termination or completion of the Work and shall remain in effect so long as the Owner is entitled to protection of its rights under applicable law.

13.2.4 Contractor shall carry out the Work and adhere to the current construction schedule during all disputes or disagreements with the Owner. No Work shall be delayed or postponed pending resolution of any disputes or disagreements except as the Owner and Contractor may otherwise agree to in writing.

13.3 Tests and Inspections

13.3.1 Tests, inspections, and approvals of portions of the Work required by the Contract Documents or by laws, ordinances, rules, codes, or regulations shall be made at an appropriate time. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory, the Owner's Authorized Agent, or entity acceptable to the Owner, and the Contractor shall bear related costs of tests, inspections, and approvals as required in the Contract Documents. The Contractor shall give the Architect, Owner's Representative, and the Owner's Authorized Agent timely notice of when and where tests and inspections are to be made so the Architect, the Owner's Representative and/or the Owner's Authorized Agent may observe procedures or perform the necessary tests or inspections.

13.3.2 If the Architect, Owner's Representative, or the Owner's Authorized Agent determine that portions of the Work require additional testing, inspection or approval not included in the Contract Documents, or required by law, the Architect, or the Owner's Representative will instruct the Contractor to make arrangements for such additional testing, inspection, or approval by an entity acceptable to the Owner's Representative and the Contractor shall give timely notice to the Architect, the Owner's Representative or the Owner's Authorized Agent, of when and where tests and inspections are to be made so the Architect, Owner's Representative and/or the Owner's Authorized Agent , ~~so~~ may choose that the tests or inspections can be performed or observed. The Owner will bear such costs except as provided elsewhere in Article 13.

13.3.3 If such procedures for testing, inspection, or approval under Article 13 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, the Contractor shall bear all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's and Owner's Authorized Agent's services and expenses.

13.3.4 Required certificates of testing, inspection, or approval shall, unless otherwise required by the Contract Documents, be secured by the Contractor, and promptly delivered to the Owner's Representative and Architect.

13.3.5 Contractor shall take all necessary actions to ensure that all tests or inspections conducted pursuant to the Contract Documents shall be made promptly to avoid unreasonable delay in the Work.

13.3.6 Contractor shall arrange for and pay for all costs of all testing required by the Contract Documents or any applicable Laws for materials to be tested or certified at or on the place or premises of the source of the material to be supplied. The Owner shall have the right to require testing of all materials at the place of the source of the material to be supplied if not required by the Contract Documents or any applicable Laws. The Owner shall bear the costs of such tests and inspections not required by the Contract Documents or by applicable Laws unless prior defective Work provides Architect or Owner with a reasonable belief that additional defective Work may be found, in which case Contractor shall be responsible for all costs of tests and inspections ordered by the Owner or Architect, whether or not such tests or inspection reveals that Work is in compliance with the Contract Documents.

13.4 Nondiscrimination in Employment Equal Opportunity

13.4.1 The University serves from time to time as a contractor for the United States government. Accordingly, the provider of goods and/or services shall comply with

federal laws, rules and regulations applicable to subcontractors of government contracts including those relating to equal employment opportunity and affirmative action in the employment of minorities (Executive Order 11246), women (Executive Order 11375), persons with disabilities (29 USC 706) and Executive Order 11758, and certain veterans (38 USC 4212 formerly [2012]) contracting with business concerns with small disadvantaged business concerns (Publication L. 95-507). Contract clauses required by the Government in such circumstances are incorporated herein by reference.

13.5 Supplier Diversity Goal Program

13.5.1 The Contractor shall subcontract with diverse firms no less than the amount pledged in the Contractor's Bid and/or the amount accepted by the Owner.

13.5.2 If the Contractor must remove any diverse subcontractor of any tier, the Contractor shall replace the diverse subcontractor of any tier with another diverse subcontractor(s) of equal dollar value to the diverse supplier removed. The Contractor shall immediately notify the Owner's Representative in writing of the Contractor's intent to remove any, and the Contractor's plan to maintain subcontracts with diverse firms of no less than amount pledged in the Contractor's Bid and/or the amount accepted by the Owner. All changes of diverse subcontractor of any tier shall be approved by the Director of Facilities Planning & Development.

13.5.3 If the Contractor fails to meet or maintain the contractor's Supplier Diversity subcontracting pledge, the Contractor shall immediately notify in writing the Owner's Representative, and the Director of Facilities Planning & Development. Such notice shall include a description of the Contractor's good faith effort to comply with their Supplier Diversity subcontracting pledge.

13.5.4 If the Director of Facilities Planning & Development finds the Contractor has failed to comply in good faith with the Owner's Supplier Diversity goal program, the Director may take appropriate action, including but not limited to, declaring the Contractor ineligible to participate in any contracts with the Owner for a period not to exceed six (6) months, and/or directing that the Contractor's actions be declared a material breach of the Contract and that the Contract be terminated.

13.5.5 The Contractor and his subcontractors shall develop, implement, maintain, and submit in writing to the Director of Facilities Planning & Development, an affirmative action program if at least fifty (50) persons in the aggregate are employed under this contract. If less than fifty (50) persons in the aggregate are to be employed under this contract, the Contractor shall submit, in lieu of the written affirmative action program, a properly executed "Affidavit for Affirmative Action" in the form as included in the Contract Documents. For the purpose of this section, an "Affirmative Action Program" means positive actions to influence all employment practices (including, but not limited to, recruiting, hiring, promoting, and training) in providing equal employment opportunity regardless of race, color, sex, national origin, religion, age (where the person affected is between 40 and 70), disabled and Vietnam-era veteran status, and handicapped otherwise qualified status. Such affirmative action program shall include:

.1 A written policy statement committing the total organization to affirmative action and assigning management responsibilities and procedures for evaluation and dissemination.

.2 The identification of a person designated to handle affirmative action.

.3 The establishment of non-discriminatory selection standards, objective measures to analyze recruitment, an upward mobility system, a wage and salary structure, and standards applicable to lay-off, recall, discharge, demotion, and discipline.

.4 The exclusion of discrimination from collective bargaining agreements.

.5 Performance of an internal audit of the reporting system to monitor execution and to provide for future planning.

13.5.6 In the enforcement of this non-discrimination requirement, the Owner may use any reasonable procedures available, including but not limited to: requests, reports, site visits, and inspection of relevant documents of Contractors and Subcontractors of any tier. The contractor shall submit a final Affidavit of Supplier Diversity Participation for each diverse firm at the end of the project stating the actual amount paid to the diverse firm.

13.6 Wage Rates (If the contract amount is less than $75,000, the requirements of this section will not apply. Any contract adjustments that increase the contract above $75,000 will be subject to this section.)

13.6.1 The Contractor shall pay workers employed in the execution of this contract in full each week and not less than the predetermined wage rates and overtime for work of a similar character that have been made a part of this Contract. These rates are determined by the University of Missouri Director of Facilities Planning and Development. The rates are based on wage rates published in the Annual Wage Orders of the Missouri Department of Labor and Industrial Relations (MDLIR). The Contractor is to use MDLIR 8 CSR 30-3.020; .030; .040, .060 in determining the appropriate occupational titles and rates for workers used in the execution of this contract. All determinations and/or interpretations regarding wage rates and classification of workers will be made by the office of the University of Missouri Director of Facilities Planning and Development. The Contractor is responsible for the payment of the aggregate of the Basic Hourly Rate and the Total Fringe Benefits to the workers on the project. Fringe benefit payments may be made to the worker in cash, or irrevocably made by a Contractor or Subcontractor to a trustee or to a third person pursuant to a fund, plan or program, or pursuant to an enforceable

commitment, or any combination thereof, to carry out a financially responsible plan or program which was communicated in writing to the workmen affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the Contractor or Subcontractor is not required by other federal or state law to provide any of the benefits as referenced in §290.210(5) RSMo 1994. Pay for travel, mileage, meals, bonuses, or other expenses are not fringe benefits and cannot be considered part of the workers wage rate. The Contractor shall not make any deductions for food, sleeping accommodations, transportation, use of small tools, uniforms, or anything of any kind or description, unless the Contractor and employee enter into an agreement in writing at the beginning of the worker's term of employment, and such agreement is approved by the Owner. In the event the contract contains more than one wage determination the Contractor shall comply with both.

13.6.2 The Contractor shall submit to the Owner with the Contractor's periodic pay request, certified payroll records for labor performed by the Contractor and Subcontractors of any tier. The Contractor shall submit all required certified payroll information records electronically in pdf format using the Owner's web-based payment program. The certified payroll forms shall contain the name, address, personal identification number, and occupational title of the workers as well as the hours they work each day. The Owner's acceptance of certified payroll records does not in any way relieve the Contractor of any responsibility for the payment of prevailing wages to workers on the project. The Contractor shall also maintain copies of the certified payroll records. The Owner may, at any time, request copies of, and/or inspect all of the Contractor's payroll records for the Work to verify compliance. The Contractor shall furnish the Owner copies of payroll records within 10 days of the Owner's written request. The Contractor shall provide copies of workers I-9 forms within 24 hours of written notice. (If applicable, and required by Owner, the Contractor will demonstrate that the Contractor is enrolled and participating in a federal work authorization program with respect to the employees working in connection with this project.) Such payroll records shall be maintained in accordance with Article 13.7.1 and shall be available for inspection for two (2) years after final completion of the Work. The contractor further agrees, in the event the records are not presented as requested, he will abide by any decision made by the Owner regarding underpayment of wages to workers and amounts owed them as well as liquidated damages for underpayment of wages. Falsification of the certified payroll records may result in the debarment of the contractor or subcontractor from future work with the University.

13.6.3 The acquisition of products or services is subject to the supplier's conformance to the rules and regulations of the President's Committee on Equal Employment Opportunity (41 CFR, Ch. 60).

13.6.4 The Contractor shall comply with the Copeland Regulations of the Secretary of Labor (29 CFR, Part 3), which are incorporated herein by reference. In addition, the Weekly Statement of Compliance required by these Regulations shall also contain a statement that the applicable fringe benefits paid are equal to or greater than those set forth in the minimum wage decision.

13.6.5 Contractor acknowledges that violation of the requirements of Article 13.6 result in additional costs to Owner, including, but not limited to, cost of construction delays, of additional work for Owner's staff and legal expense. The cost of Contractor's violation of the provisions of Article 13.6 would be and is difficult to determine and establish. In the event that Contractor fails to comply with the provisions of this Article 13.6, Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of Fifty Dollars ($50.00) per day per individual who is paid less than the applicable prevailing wage, to approximate the investigative cost resulting to the Owner for such violations. To approximate the delay costs, Owner shall be entitled to retain or recover from the Contractor, as liquidated damages and not as a penalty, the sum of One Hundred Dollars ($100.00) per day for each day the Contract cannot be closed out and final payment made because of Contractor's failure to comply with the provisions of this Article 13.6. Such liquidated damages shall be collected regardless of whether the Work has been completed. The liquidated damages and other amounts set forth in this Article 13.6 shall be in addition to all other liquidated damages the Owner may be entitled as set forth in the Contract Documents.

13.6.6 The Owner may deduct liquidated damages described Article 13 and the amounts set forth in Article 13 from any unpaid amounts then or thereafter due the Contractor under the Contract. Any liquidated damages not so deducted from any unpaid amounts due the Contractor shall be payable to the Owner at the demand of the Owner.

13.6.7 The Contractor shall specifically incorporate the obligations of Article 13 into the subcontracts, supply agreements and purchase orders for the Work and require the same of any Subcontractors of any tier.

13.6.8 Contractor acknowledges and recognizes that a material factor in its selection by the Owner is the Contractor's willingness to undertake and comply with the requirements of this Article 13.6. If Contractor fails to comply with the provisions of this Article 13.6, Owner may, in its sole discretion, immediately terminate the Contract

upon written notice. The rights and remedies of Owner provided herein shall not be exclusive and are in addition to other rights and remedies provided by law or under this Contract.

13.6.9 Only such workers who are individually registered in a bona fide apprenticeship program approved by the U.S. Department of Labor, Office of Apprenticeship can be paid less than the journeyperson rate of pay. "Entry Level Workers; must be registered apprentices. The apprenticeship ratio will be one to one with a journeyperson of the same classification. Any worker not registered as an apprentice per this section will be paid as a journeyperson.

13.6.10 The Contractor shall post the wage rates for the contract in a conspicuous place at the field office on the project. On projects where there is no field office the Contractor may post the wage rates at their local office, as long as they provide a copy of the wage rates to a worker upon request. The wage rates shall be kept in a clearly legible condition for the duration of the project.

13.6.11 Neither the Contractor, nor any Subcontractor of any tier, nor any person hired by them or acting on their behalf, shall request or demand that workers pay back, return, donate, contribute, or give any part, or all, of said workers wages, salary, or any thing of value, upon the statement, representation or understanding that failure to comply with such request or demand will prevent such worker from procuring or retaining employment. The exception being to an agent or representative of a duly constituted labor organization acting in the collection of dues or assessments of such organization.

13.6.12 No contractor or subcontractor may directly or indirectly receive a wage subsidy, bid supplement, or rebate for employment on this project if such wage subsidy, bid supplement, or rebate has the effect of reducing the wage rate paid by the employer on a given occupational title below the prevailing wage rate as provided in contract. In the event a wage subsidy, bid supplement, or rebate is provided or received, the entity receiving such subsidy, supplement, or rebate shall report the date and amount of such subsidy, supplement, or rebate to the University within thirty days of receipt of payment. This disclosure report shall be a matter of public record. Any employer not in compliance with this Article shall owe to the University double the dollar amount per hour that the wage subsidy, bid supplement, or rebate has reduced the wage rate paid by the employer below the prevailing wage rate for each hour that work was performed.

13.6.13 Time and one-half overtime will be paid on all hours over 10 hours per day or 40 hours per week. The wage rate is the total of the "Basic Hourly Rate" plus "Total Fringe Benefits" or the "public works contracting minimum wage". For all work performed on a Sunday or Holiday, not less than twice the prevailing hourly rate of pay or public works contracting minimum wage will apply. Holidays are as follows: January first, the last Monday in May, July fourth, the first Monday in September, November 11, the fourth Thursday in November, December twenty-fifth. If any holiday falls on a Sunday, the following Monday shall be considered a holiday.

13.7 Records

13.7.1 The Owner, or any parties it deems necessary, shall have access to and the right to examine any accounting or other records of the Contractor involving transactions and Work related to this Contract for five (5) years after final payment or five (5) years after the final resolution of any on going disputes at the time of final payment. All records shall be maintained in accordance with generally accepted accounting procedures, consistently applied. Subcontractors of any tier shall be required by Contractor to maintain records and to permit audits as required of Contractor herein.

13.8 Codes and Standards

13.8.1 The Work shall be performed to comply with the International Code Council (ICC) Codes, and the codes and standards noted below. The latest editions and supplements of these Codes and Standards in effect on the date of the execution of the Contract for Construction shall be applicable unless otherwise designated in the Contract Documents. Codes and standards required by accreditation agencies will also be used unless the ICC requirements are more stringent. In the event that special design features and/or construction systems are not covered in the ICC codes, the applicable edition of the National Fire Protection Association (NFPA) family of standards and/or the NFPA 101 Life Safety Code shall be used.

.1 ICC International Building Code and reference standards
.2 ICC International Plumbing Code
.3 ICC International Mechanical Code
.4 ICC International Fire Code
.5 ICC International Fuel Gas Code
.6 NFPA 70 National Electric Code (NEC)
.7 Americans with Disabilities Act – Standards for Accessible Design.
.8 American National Standard Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks as published by the American Society of Mechanical Engineers (ASME), American National Standards Institute (ANSI) A17.1
.9 NFPA 101 Life Safety Code (as noted above)
.10 American Concrete Institute (ACI)
.11 American National Standards Institute (ANSI)
.12 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.13 American Refrigeration Institute (ARI)
.14 American Society for Testing and Materials (ASTM)
.15 Missouri Standard Specification for Highway Construction, Missouri State Highway Commission

.16 National Electrical Manufacturers Association (NEMA)

.17 Underwriter's Laboratories, Inc. (UL), Federal Specifications

.18 Williams Steiger Occupational Safety and Health Act of 1970 (OSHA)

13.9 General Provisions

13.9.1 Any specific requirement in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and are also hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

13.9.2 This Contract shall be interpreted, construed, enforced, and regulated under and by the laws of the State of Missouri. Whenever possible, each provision of this Contract shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Contract, or a portion thereof, is prohibited by law or found invalid under any law, only such provision or portion thereof shall be ineffective, without invalidating or affecting the remaining provisions of this Contract or valid portions of such provision, which are hereby deemed severable. Contractor and Owner further agree that in the event any provision of this Contract, or a portion thereof, is prohibited by law or found invalid under any law, this Contract shall be reformed to replace such prohibited or invalid provision or portion thereof with a valid and enforceable provision which comes as close as possible to expressing the intention of the prohibited or invalid provision.

13.9.3 Contractor and Owner each agree that the State of Missouri Circuit Court for the County where the Project is located shall have exclusive jurisdiction to resolve all Claims and any issue and disputes between Contractor and Owner. Contractor agrees that it shall not file any petition, complaint, lawsuit or legal proceeding against Owner in any other court other than the State of Missouri Circuit Court for the County where the Project is located.

13.9.4 Owner's total liability to Contractor and anyone claiming by, through, or under Contractor for any Claim, cost, loss, expense, or damage caused in part by the fault of Owner and in part by the fault of Contractor or any other entity or individual shall not exceed the percentage share that Owner's fault bears to the total fault of Owner, Contractor and all other entities and individuals as determined on the basis of comparative fault principles.

13.9.5 Contractor agrees that Owner shall not be liable to Contractor for any special, indirect, incidental, or consequential damage whatsoever, whether caused by Owner's negligence, fault, errors or omissions, strict liability, breach of contract, breach of warranty or other cause or causes whatsoever. Such special, indirect, incidental or consequential damages include, but are not limited to loss of profits, loss of savings or revenue, loss of anticipated profits, labor inefficiencies, idle equipment, home office overhead, and similar types of damages.

13.9.6 Nothing contained in this Contract, or the Contract Documents shall create any contractual relationship with or cause of action in favor of a third party against the Owner.

13.9.7 No member or officer of the Board of Curators of the University incurs or assumes any individual or personal liability under the Contract or by reason of the default of the Owner in the performance of any terms thereof. Contractor releases and discharges all members or officers of the Board of Curators of the University from any liability as a condition of and as consideration for the award of the Contract to Contractor.

13.9.8 The Contractor hereby binds itself, its partners, successors, assigns and legal representatives to the Owner in respect to covenants, agreements and obligations contained in the Contract Documents. Contractor shall not assign the Contract or proceeds hereof without written consent of the Owner. If Contractor attempts to make such an assignment without such consent, it shall be void and confer no rights on third parties, and Contractor shall nevertheless remain legally responsible for all obligations under the Contract. The Owner's consent to any assignment is conditioned upon Contractor entering into a written assignment which contains the following language: "it is agreed that the funds to be paid to the assignee under this assignment are subject to performance by the Contractor and to claims and to liens for services rendered or materials supplied for the performance of the Work required in said Contract in favor of all persons, firms, corporations rendering such services or supplying such materials."

13.10 Certification

13.10.1 The contractor certifies to the best of its knowledge and belief that it and its principals are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency in accordance with Executive Order 12549 (2/18/86).

13.10.2 If this contract is for $100,000 or more, and if the Contractor is a company with ten (10) or more employees, then Contractor certifies that it, and any company affiliated with it, does not boycott Israel, and will not boycott Israel during the term of this Contract. In this paragraph, the terms "company" and "boycott Israel" shall have the meanings described in Section 34.600 of the Missouri Revised Statutes.

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 Termination by Owner for Cause

14.1.1 In addition to other rights and remedies granted to Owner under the Contract Documents and by law, the Owner may terminate the Contract if the Contractor:

.1 refuses or fails to supply enough properly skilled workers, superintendents, foremen, or managers;

.2 refuses or fails to supply sufficient or proper materials;

.3 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;

.4 disregards laws, ordinances, rules, codes, regulations or orders of an authority having jurisdiction;

.5 disregards the authority of the Owner's Representative, Architect, or Owner's Authorized Agent;

.6 breaches any warranty or representations made by the Contractor under or pursuant to the Contract Documents;

.7 fails to furnish the Owner with assurances satisfactory to the Owner evidencing the Contractor's ability to complete the Work in compliance with all the requirements of the Contract Documents;

.8 fails after commencement of the Work to proceed continuously with the construction and completion of the Work for more than ten (10) days, except as permitted under the Contract Documents;

.9 fails to maintain a satisfactory rate of progress with the Work or fails to comply with approved progress schedules; or

.10 violates in any substantial way any provisions of the Contract Documents.

14.1.2 When any of the above reasons exist, the Owner may, without prejudice to any other rights or remedies of the Owner, terminate this Contract by delivering a written notice of termination to Contractor and Contractor's surety, and may:

.1 take possession of the site and of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;

.2 accept assignment of subcontracts pursuant to Paragraph 5.3; and

.3 finish the Work by whatever reasonable method the Owner may deem expedient, including turning the Work over to the surety.

14.1.3 The Contractor, in the event of a termination under Section 14.1, shall not be entitled to receive any further payments under the Contract until the Work is completed in its entirety. Then, if the unpaid balance under the Contract shall exceed all expenses of the Owner in finishing the Work, including additional compensation for the Architects services and expenses made necessary thereby, such excess will be paid to the Contractor; but, if such expenses of Owner to finish the Work shall exceed the unpaid balance, the Contractor and its surety shall be liable for, and shall pay the difference and any damages to the Owner. The obligation of the Contractor and its surety for payment of said amounts shall survive termination of the Contract.

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

14.1.5 The rights of the Owner to terminate pursuant to Article 14.1 will be cumulative and not exclusive and shall be in addition to any other remedy provided by law or the Contract Documents.

14.1.6 Should the Contractor fail to achieve Final Completion of the Work within thirty (30) calendar days following the date of Substantial Completion, the Owner may exercise its rights under Article 14.1.

14.2 Suspension by the Owner for Convenience

14.2.1 The Owner may, without cause, order the Contractor in writing to suspend, delay, or interrupt the Work in whole or in part for such period of time as the Owner may determine.

14.2.2 An adjustment will be made to the Contract Sum for increases in the cost of performance of the Contract caused by suspension, delay or interruption. However, in the event of a suspension under this Article 14.2, Contractor hereby waives and forfeits any claims for payment of any special, indirect, incidental or consequential damages such as lost profits, loss of savings or revenue, loss of anticipated profits, idle labor or equipment, home office overhead, and similar type damages. No adjustment will be made to the extent:

.1 that performance is, was, or would have been so suspended, delayed or interrupted by another cause for which the Contractor in whole or in part is responsible, or

.2 that an equitable adjustment is made or denied under another provision of this Contract.

14.3 Owner's Termination for Convenience

14.3.1 The Owner may, at any time, terminate the Contract in whole or in part for the Owner's convenience and without cause. Termination by the Owner under this Paragraph shall be by a notice of termination delivered to the Contractor specifying the extent of termination and the effective date.

14.3.2 Upon receipt of a notice of termination for convenience, the Contractor shall immediately, in accordance with instructions from the Owner, proceed with performance

of the following duties regardless of delay in determining or adjusting amounts due under this Paragraph:

.1 cease operation as specified in the notice;

.2 place no further orders and enter into no further subcontracts for materials, labor, services or facilities except as necessary to complete Work not terminated;

.3 terminate all subcontracts and orders to the extent they relate to the Work terminated;

.4 proceed to complete the performance of Work not terminated; and

.5 take actions that may be necessary, or that the Owner may direct, for the protection and preservation of the terminated Work.

14.3.3 Upon such termination, the Contractor shall recover as its sole remedy payment for Work properly performed in connection with the terminated portion of the Work prior to the effective date of termination and for items properly and timely fabricated off the Project site, delivered and stored in accordance with the Owner's instructions and for all Owner approved claims, costs, losses and damages incurred in settlement of terminated contracts with Subcontractors and suppliers. The Contractor hereby waives and forfeits all other claims for payment and damages, including, without limitation, anticipated profits, consequential damages and other economic losses.

14.3.4 The Owner shall be credited for (1) payments previously made to the Contractor for the terminated portion of the Work, (2) claims which the Owner has against the Contractor under the Contract and (3) the value of the materials, supplies, equipment, or other items that are to be disposed of by the Contractor that are part of the Contract Sum.

14.3.5 Upon determination by a court that termination of Contractor or its successor in interest pursuant to Paragraph 14.1 was wrongful, such termination will be deemed converted to a termination for convenience pursuant to Paragraph 14.3, and Contractor's sole and exclusive remedy for wrongful termination is limited to recovery of the payments permitted for termination for convenience as set forth in Paragraph 14.3.

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SECTION 1.E
SPECIAL CONDITIONS

1. DEFINITIONS

a. "Drawings"
Drawings referred to in and accompanying Project Manual consist of Drawings prepared by and bearing name of below defined Architect, bearing:

b. Architect
Clark & Enersen
2020 Baltimore, Suite 300
Kansas City, Missouri 64108
816-474-8237 p.

c. Mechanical, Plumbing & Electrical Engineer
Clark & Enersen
2020 Baltimore, Suite 300
Kansas City, Missouri 64108
816-474-8237 p.

d. Structural Engineer
Leigh + O'Kane
250 NE Mulburry Street, Suite 201
Lee's Summit, MO 64086
816.444.3144

e. Civil Engineer
SK Design Group, Inc.
4600 College Blvd. Suite 100
Overland Park, KS 66211
913-451-1818 p.

f. Other Definitions: See Article 1., General Conditions.

2. SPECIAL SCHEDULING REQUIREMENTS

a. Special scheduling requirements supplemental to the bid form.

(1) Contractor will not have access to the construction area prior to Owner's notice to proceed to perform any demolition or construction activities, unless notified otherwise by Owner's Representative.

(2) Project sequence and inter-project dependencies must be maintained in successful bidder's schedule. Schedule development shall include, but not limited to MU work activities of Controls, TAB, 3rd Party Commissioning, and Inspections and Testing.

(3) During the construction period all heating ventilation & air conditioning air distribution system components including but not limited to the air handler, supply & return duct, variable volume devices and dampers shall be protected from environmental contaminants including but not limited to dust, debris and fungi during transportation, installation and project activities prior to system start-up.

(4) Prior to start-up of the HVAC equipment/system, including but not limited to, make-up air units, air handling units, supply, return, and exhaust duct for any purpose, the construction project area shall be complete of all dirty work

activities. The entire work area in which the system serves shall be thoroughly cleaned by the contractor.

(5) Owner has specific requirements for notifications regarding coordination and utility shut-downs and tie-ins. These are described further in Division1

(6) Working Hours

a) Normal working hours are defined as weekdays, 7:00 am to 5:00 pm.
b) Night hours are defined as Monday thru Thursday after 5:00 pm and before 6:00 am.
c) Weekend Hours are defined as after 6:00 pm Friday until 4:00 am Monday

(7) Owner has retained a 3rd party commissioning agent. Contractor shall allow for and incorporate commissioning agent's tasks into their construction schedule.

(8) Utility shut-downs, outages and tie-ins: All such work may be done during normal, night, and/or weekend hours. All such work shall be done continuously until fully restored. Contractor shall submit a written plan outlining the required shut-downs, outages, and tie-in at least fourteen (14) days prior to starting the work. Utility shut-downs shall be reviewed, coordinated and approved by the Owner's Representative. Utility outage request is available from owner and must be filled out by the contractor. Steam work requiring prolonged shutdown is restricted to summer months and chilled water work requiring prolonged shutdown is restricted to Oct-Mar.

(9) Owner installed equipment provision: owner will complete connections of Owner supplied equipment as coordinated and approved by Owner's Representative.

3. SCOPE OF WORK

a. The Contractor shall furnish all labor, materials, tools, equipment necessary for, and incidental to, construction of this project as indicated on Drawings and specified herein.

b. Work shall include everything requisite and necessary to finish work properly, notwithstanding that every item of labor or materials or accessories required to make project complete may not be specifically mentioned.

c. General Description of Work:

(1) Project consists of a new 1 story addition to the existing NextGen Center of Excellence for Influenza Research.

(2) Demolition shall consist of interior ceiling and wall construction and exterior walls for connection to new proposed addition.

(3) Architectural work shall consist of new exterior enclosure, interior walls, doors, ceilings, flooring, laboratory casework.

(4) Structural work shall consist of new piers, concrete foundations, and interior wall and ceiling framing.

(5) Mechanical work shall consist of new AHU's, VAV's, exhaust fans, ductwork, piping, control wiring, and other associated items per the contract documents.

(6) Electrical work shall consist of new normal and emergency power systems including a new transformer location and a new generator. Electrical work also

includes new lighting, electrical devices, and low voltage rough in.

(7) New plumbing work shall consist of new fixtures and piping along with new sanitary tie in. Piping shall include domestic and animal supply and waste water systems.

(8) Fire protection work shall consist of a new fire sprinkler system throughout the new addition along with tie in to the existing fire alarm system.

4. LOCATION

Work shall be performed under this Contract on campus of the University of Missouri - Columbia at the Middlebush Farm Extension Site.

5. NUMBER OF CONSTRUCTION DOCUMENTS

a. The Owner's Representative will furnish the Contractor a digital copy of executed Contract and a complete set of Drawings and Specifications in pdf format.

b. Hard copy prints of any documents (bid or explanatory) will be printed at the Contractor's expense through a printer of their choosing.

c. The Owner will furnish explanatory and changed Drawings in pdf format to Contractor as issued during project.

d. The Owner will provide electronic data files to the Contractor for their convenience and use in progressing the Work and the preparation of shop drawings or other submittal requirements required for construction of the referenced project. The electronic data files shall reflect Construction Documents and Bid Addenda only. These files will be transmitted subject to the following terms and conditions:

(1) The Owner makes no representation as to the compatibility of these files with the Contractor's hardware or software.

(2) Data contained on these electronic files shall not be used by the Contractor or anyone else for any purpose other than as a convenience in progressing the Work or in the preparation of shop drawings or other required submittals for the referenced project. Any other use or reuse by the Contractor or by others will be at their own sole risk and without liability or legal exposure to Owner. The Contractor agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against the Owner and its consultants, contractors, agents, employees, and representatives that may arise out of or in connection with the use of the electronic files transmitted.

(3) Furthermore, the Contractor shall, to the fullest extent permitted by law, indemnify and hold harmless the Owner and its consultants, contractors, agents, employees, and representatives, against all damages, liabilities or costs, including reasonable attorney's fees and defense costs, arising out of or resulting from the use of these electronic files.

(4) These electronic files are not contract documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. The Owner makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents prepared by the Consultant and the electronic files, the signed and sealed hard-copy construction documents shall govern. The Contractor is responsible for determining if any conflict exists. By use of these electronic files, the Contractor is not relieved of their duty to fully comply with the contract documents.

(5) Because information presented on the electronic files can be modified, unintentionally or otherwise, the Owner reserves the right to remove all indications of ownership and/or involvement from each electronic display.

(6) Under no circumstances shall delivery of the electronic files be deemed a sale by the Owner and no warranties are made, either expressed or implied, of merchantability and fitness for any particular purpose. In no event shall the Owner be liable for any loss of profit, or any consequential damages as a result of use or reuse of these electronic files.

6. SUBMITTALS

a. The Contractor shall submit for approval to the Architect, equipment lists and Shop Drawings, as expediently as possible. Failure of the Contractor to submit Shop Drawings in a timely manner will result in the Owner holding back Contractor payments. (See General Conditions)

b. The material and equipment lists shall be submitted and approved before any material or equipment is purchased and shall be corrected to as-built conditions before the completion of the project.

c. The Contractor shall submit electronic versions of all required Shop Drawings, material and equipment lists. The Contractor shall upload all Shop Drawings to a secure information sharing website determined by the Owner notifying the Owner and Consultant that these shop drawings are available for review. Each submittal shall have the General Contractors digital stamp affixed to the first page signifying their review and acceptance. Review comments, approvals, and rejections will be posted on this same site with notification to the contractor. Submittals requiring a professional seal shall be submitted hard copy with a manual seal affixed.

(1) The Contractor shall identify each submittal item with the following:

(a) Project Title and Location
(b) Project Number
(c) Supplier's Name
(d) Manufacturer's Name
(e) Contract Specification Section and Article Number
(f) Contract Drawing Number
(g) Acrobat file name: Spec Section Times Submitted-Spec Title: 033000 _01-Cast In Place Concrete.pdf

(2) Reference the accompanying Shop Drawing and Submittal Log at the end of this section (1.E.3) for required submittal information.

d. The Contractor shall submit to the Architect four (4) bound copies of all required Operating Instructions and Service Manuals for the Architect's and the Owner's sole use prior to completing 50% of the adjusted contract. Payments beyond 50% of the contract amount may be withheld until all Operating Instructions and Service Manuals are received as referenced in the accompanying Operating Instructions and Service Manual Log at the end of this section (1.E.4).

e. The Contractor shall submit to the Owner's Representative all items referenced in the accompanying Closeout Log (1.E.5) within 30 days following substantial completion of the work. The Owner's Representative will maintain the closeout log and include as an agenda item at all coordination meetings.

7. NOTIFICATION

Before beginning Demolition Work or service outages, the Contractor shall provide, at minimum, seventy-two (72) hours advance notice to Owner's Representative for purpose of verifying utility

locations including, but not limited to, gas, telecommunications, electric, water, and sewer. Contractor shall minimize the number of outages, minimize the length of outages and related work shall be continuous until the utility is restored.

8. USE OF PREMISES

a. Access: Access to construction site shall be as indicated on Drawings and as directed by the Owner's Representative.

b. Parking:

(1) Parking or driving on sidewalks, landscaped areas, within fire and service lanes or generally in areas not designated for vehicular traffic is prohibited except as allowed in the contract documents. Violation of this requirement may result in ticketing and/or towing at the vehicle owner's expense and suspension of progress payments.

c. Storage of materials: The Contractor shall store all materials within project limits. The Contractor shall confine apparatus, materials, and operation of workers to location established by the Owner's Representative. The Contractor shall not unreasonably encumber premises with materials. In addition, storage trailer locations may be available within 1-1/2 miles of project site as directed by the Owner's Representative. Storage trailer locations shall be subject to approval by the Owner's Representative and are available to the Contractor without cost.

Provisions for obtaining power, including temporary extensions, shall be furnished and maintained by the Contractor. Upon completion of the work, such extensions shall be removed and any damage caused by use of such extensions shall be repaired to the satisfaction of the Owner's Representative, at no cost to the Owner.

d. Restroom: The Contractor shall provide and maintain, in a sanitary condition, chemical type portable toilet facilities at work site for use by his personnel. Toilets and toilet location shall be subject to approval by the Owner's Representative.

e. Smoking is prohibited at the University of Missouri and all properties owned, operated, leased or controlled by the University of Missouri. Violation of the policy is defined as smoking any tobacco products, including e-cigarettes.

f. Landfill: The Contractor shall not use the Owner's landfill. Dumping or disposal of excavated or demolition materials on Owner's property shall not be permitted. The Contractor shall remove and legally dispose of excavated or demolished materials off the Owner's property.

g. Care of Project Work Site: The contractor shall be responsible for maintaining the construction site in a reasonably neat and orderly condition by regular cleaning and mowing of the premises as determined by the Owner's Representative.

h. Discharge to Sewer Request: The University of Missouri's MS4 permit and NPDES Storm Water Discharge Permits along with the City of Columbia's POTW Operating Permit as well as local ordinances, and state and federal environmental regulations prohibit hazardous materials from being disposed into either the storm water or sanitary sewer systems. Unless specifically approved, all chemical products such as paints, dyes, lawn care products, maintenance products, and oil ~~is~~ are prohibited from drain disposal. Any product, including contaminated water, being discarded into the storm water or sanitary sewer systems requires written approval from the Owner through a formal "Discharge to Sewer Request" form obtained at Discharge to Sewer Request Form. The contractor should submit the form to the Owner's Representative, not to the Department of Environmental Health and Safety as the form indicates.

j. All concrete waste material including washout water shall be totally contained and removed from the Owner's property.

k. Artifacts Found During Construction: Contractor shall immediately notify the Owner's Representative when artifacts are uncovered or found during the demolition or construction process. Artifacts include, but are not limited to, tools, drawings (construction or other), photographs, books and other objects/devices which may hold historical importance/significance. Do not remove or disturb the object(s) in question. Artifacts are not considered part of demolished materials and shall remain the property of the University of Missouri.

l. **"Permit Required Confined Space" Entry Communication and Coordination**
(See OSHA 1926 subpart aa – Construction Confined Space for the definition of "permit required confined spaces" - Note: OSHA does not apply to the University. However, the University will provide a list of all known "permit required confined spaces")

The following are the known locations of "permit required confined spaces" currently identified withing the project limits:

i. Sanitary Waste Holding Tanks
ii. Storm Sewer Structures

The hazards or potential hazards in each "permit required confined space" or the reason it is a "permit required confined space":

(1) Air quality, elevated temperatures, access / egress
(2) Steam, heat, electricity, atmosphere.

Any precautions that the owner or previous contractors have implemented for the protection of employees in the "permit required controlled space":

(1) Air quality monitor, ventilation, gas detector, proper personal protective equipment, and confined space permit.

The above list of known confined spaces withing the project limits may not be a complete listing.

The Contractor shall notify the Owner's Representative if 1) conditions change resulting in a non-permit required confined space being reclassified to a "permit required confined space" after evaluation of the space by a competent person; 2) a space previously thought to be non-permit required space is classified as a "permit required confined space"; or 3) during the course of construction a "permit required confined space" is created after evaluation by a competent person.

The Contractor shall submit to the Owner's Representative a copy of the cancelled confined space entry permit and a written report summarizing the permit space program followed and all hazards confronted or created during entry operations. This information shall be submitted within one week of cancelling the permit.

m. Contractors and Subcontractors shall not have access within 10'-0" of the existing Middlebush building if they have been in contact with or proximity to swine, swine carcasses, animal diagnostic laboratories, and veterinary facilities within 48 hours of arrival to the construction site.

n. Contractors and Subcontractors requiring access to shower-in areas of the existing Middlebush building must follow the shower-in and wipe down policies as defined by

Middlebush Farm. Escorted access by Middlebush representatives will be required for shower-in areas.

9. PROTECTION OF OWNER'S PROPERTY

a. The Contractor shall be responsible for repair of damage to building exterior and interior, drives, curbs, streets, walks, grass, shrubbery and trees, which was caused by workmen or equipment employed during progress of work. All such repairs shall be made to satisfaction of the Owner's Representative, at no cost to the Owner, or reimburse the Owner if the Owner elects to make repairs. For landscape damage, the Owner shall make such repairs. Compensation for these repairs shall be determined by the Owner's Representative using the "Valuation of Landscape Trees, Shrubs, and other Plants" as published by the International Society of Arboriculture, as last revised.

b. Construction Project Fencing:

(1) Fencing requirements, as indicated on Drawings, shall be constructed of 9 or 11-gauge chain link not less than six (6) feet in height and not more than 2-inch mesh with posts spaced not more than ten (10) feet apart and all corner and gate posts imbedded in concrete. All other posts shall be sufficiently secured in ground to maintain proper and adequate support of fence. Fenced in area shall have at least two (2) access gates and all gates shall be lockable.

(2) Using existing landmarks, lamp posts, trees or other Owner property for support of fencing is strictly prohibited unless a written waiver is obtained from Owner's Representative.

(3) Use of ribbon, snow fence, chicken wire, rope, and wooden barricades as fencing is prohibited.

(4) Fencing shall be maintained in an "as-installed" condition throughout the life of the project.

(5) The Contractor may use used fencing provided it is in good condition and is satisfactory to the Owner's Representative.

c. Preserving and Protecting Existing Vegetation:

(1) Protection and compensation for damages:

(a) Trees and shrubs within work area designated to remain shall be protected from damage during construction by fixed chain link fencing or armoring as indicated on Drawings or specified herein. Plant protection devices shall be installed before work has begun and shall be maintained for duration of work unless otherwise directed by Owner's Representative.

(b) In the event that damage(s) to the Owner's trees, shrubs or vegetation occurs as a result of the Contractor's unauthorized operations, the Contractor shall pay or allow to the Owner compensation for said damage(s). Compensation shall be determined by the Owner's Representative using the "Valuation of Landscape Trees, Shrubs, and other Plants" as published by the International Society of Arboriculture, as last revised.

(2) Plants within work area designated for removal shall be removed by Contractor.

(3) To prevent compaction of soil over tree roots, vehicles or equipment shall not at any time park or travel over, nor shall any materials be stored within drip line of

trees designated to remain.

(4) Owner's Representative will stop work immediately when proper measures are not being employed to protect trees and shrubs. Contractor will be notified to resume work after required protection measures are implemented.

(5) Pruning of limbs necessary to repair damage or provide clearance for work shall be done by the MU Landscape Services Department at the direction of the Owner's Representative. Limbs shall be cut off cleanly and cut surfaces treated according to established horticultural standards.

10. SUBSTITUTIONS and EQUALS

a. Substitutions are defined in General Conditions article 3.11.8 and Equals are defined in General Conditions Article 3.12 .

b. Use of materials, products or equipment other than those named and described in the Contract Documents are substitutions and/or equal. Substitutions and/or equals submitted during the bidding period shall be received by both the Architect and the Owner at least ten calendar days prior to the date for receipt of bids. To be considered, bidder's proposal shall include a complete description of the proposed substitution and/or equal and a comparison of significant qualities of the proposed substitution and/or equal with those specified including drawings, performance and test data, and other information necessary for an evaluation. The Architect's decision on the approval or disapproval of a proposed substitution and/or equal shall be final.

c. If the Architect and Owner approve a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approval made in any other manner.

c. No substitutions and/or equal will be allowed for the following items:

Item	Specification Section
Lock Cylinders - Best	08 71 00
Control System – Johnson Controls	23 09 00
Fire Alarm Systems - FCI	28 31 11

11. CODES AND STANDARDS

The Contractor shall comply with applicable codes and standards as listed in General Conditions. The following codes and standards shall also apply:

a. City of Columbia - Sewer Line Installation Standards - Department of Public Works

"All sanitary sewer construction shall be in accordance with the City of Columbia Specifications and Standards and in conformance with the rules and regulations of the Missouri Clean Water Commission."

12. PERMITS

a. Permits and inspection for work UM property are required.
b. The owners Representative shall secure University Authority Having Jurisdiction building permits required for the project and shall provide a list of required inspection to the Contractor.
   (1) The contractor shall coordinate and provide reasonable scheduling and access to the Work for the Owner's Inspection.
   (2) Re-inspection of work as a result of either failed inspection or work not ready as scheduled may be at the Contractor's expense.

c. The Contractor shall comply with applicable codes and standards as listed in the Contract

Documents and General Conditions.

d. All permits, including, but not limited to Hot Work, Fire Alarm, Energized Work and HVAC interruption shall be coordinated and scheduled with the Owner's Representative or designee prior to commencement of the work.

e. Permits for Boilers, Water Heaters and Pressure Vessels require an installation permit from the State of Missouri. Before commencement of Boilers, Water Heaters or Pressure Vessels the Contractor must obtain an installation permit from the State of Missouri, Division of Fire Safety, Boiler and Pressure Unit as required by 11 CSR 40-2.010 through 11 CSR 40-2.065. The permit applications are available at http://www.dfs.dps.mo.gov/programs/bpv/ .

13. SPECIALTIES – NOT USED

14. PRE-BID INSPECTION

All pre-bid inspections of work areas shall be scheduled with pre-bid inspection guide, telephone: (573) 882-2228.

15. ROOF WARRANTY REQUIREMENT

a. The Contractor shall submit, before the first progress payment, a copy of University of Missouri Roof System Manufacturer's Certification, which shall be manually signed by an authorized representative of Manufacturer of each proposed roofing system. Certification shall have original signature.

b. Following final inspection and acceptance of the roofing system(s) by the Owner and the roofing system manufacturer(s), the Contractor shall submit a manually signed standard warranty agreement provided and executed by the roofing system manufacturer for each roofing system provided.

c. University of Missouri three (3) year Contractor's Roofing/Flashing/ Sheetmetal Guarantee shall be signed by the roofing contractor after final inspection and acceptance of each roofing system by Manufacturer and by Owner.

d. The Roofing contractor or subcontractor shall provide the Owner with an Application for a Roof Warranty.

16. MODIFICATIONS TO INFORMATION TO BIDDERS

a. Information to Bidders:

(1) Referenced Information to Bidders, Page IFB/5.
Add new Article 15.8.5 as follows:

15.8.5 Within 48 hours of the receipt of bids, the apparent low bidder shall submit to the Director of Facilities Planning and Development an "Affidavit of Supplier Diversity Participation" for every diverse subcontractor or supplier the bidder intends to award work to on the contract. The affidavit will be signed by both the bidder and the diverse firm.

17. MODIFICATION TO INFORMATION FOR BIDDERS: BIDDERS STATEMENT OF QUALIFICATIONS

a. Information For Bidders

(1) Reference: Information for Bidders, Article 8.4

Insert new Article 8.4 to read as follows:

In addition to the Bidder's Statement of Qualifications, the Bidder must also submit evidence and meet the following qualifications:

The project requires the services of a prime contractor who has demonstrated success in completing process/power plant work in an operating plant environment with little or no interruption of plant operations.

(a) MINIMUM QUALIFICATIONS

(i) Successful completion of one project of similar type and scope.

(ii) Successful completion of at least three projects of $15-million or greater value. Submit references for the three most recent projects over $15-million in value.

(iii) Electrical Contractor must have extensive experience installing 13.8-kV equipment and cable.

(iv) Successful and sustained track record of effectively utilizing project/schedule management software for at least the last two years.

(b) QUALIFICATION SUBMITTALS

(i) Submitted qualification packages should include the following information:

- Project and Schedule
  - Management Experience managing projects with equal or greater schedule demands.
  - Demonstrated and consistent on-time completion success
- Project Organization / Personnel
  - Key project team members and their resume
  - Project team roles and responsibilities of team members
  - Reporting/accountability procedures
  - Quality control program and procedures
- Organizational Support
  - Home office support
  - Labor and subcontractor relations
  - Submittal processing procedures
  - Material ordering/tracking/delivery Procedures
  - Cost accounting support
  - Financial stability/capacity
  - Record of mentoring and supporting Supplier Diversity Subcontractor Participation

(ii) Packages must include the following items:

- Corporate Organizational Charts
- Project Organizational Charts
- Summary of Similar Projects
- Client References
- Resumes – resumes for each key individual proposed for the project, include: position in the firm, project responsibility, education, license or registration and relevant experience over the

last five years.
- Financial Statements and/or Evidence of Bonding Capacity
- Sample progress reports and schedules
- Brief Narratives indicating how the Contractor intends to manage this project, including subcontractors.

(c) QUALIFICATION PROCEDURE

(i) All qualification information and supporting materials must be submitted with your bid. Following the bid date, the Owner reserves the right to request additional information material to evaluate qualifications. Failure of the Contractor to demonstrate their ability to comply with these qualifications may be grounds for the Owner not recommending aware of the Contract.

18. MODIFICATIONS TO GENERAL CONDITIONS – NOT USED

19. PROJECT SCHEDULING

The project scheduling specifications for the project are included immediately after the Special Conditions. For this project the Contractor shall meet the following scheduling requirements.

Option 3: Contractor Schedule – Contractor is responsible for the schedule and he may provide with in-house personnel or hire a third-party scheduling consultant. See Contractor Schedule Specification included in these documents.

20. PROJECT COORDINATION

a. Coordinate construction operations included in various Sections of these Specifications to assure efficient and orderly installation of each part of the Work. Coordinate construction operations included under different Sections that depend on each other for proper installation, connection, and operation.

(1) Schedule construction operations in the 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 to assure maximum accessibility for required maintenance, service, and repair.

(3) Make provisions to accommodate items scheduled for later installation.

b. Coordination Drawings: Within sixty (60) days of Notice to Proceed provide coordination drawings for the integration of the Work, including work first shown in detail on shop drawings or product data. Show sequencing and relationship of separate units of work which must interface in a restricted manner to fit in the space provided, or function as indicated.

(1) Show the interrelationship of components shown on separate shop drawings.

(2) Indicate required installation sequences.

(3) Call attention in advance to Architect of any dimensional or detail information needed to complete the coordination drawings.

21. PROJECT PARTNERING – NOT USED

22. VALUE ENGINEERING – NOT USED

23. BUILDING QUALITY ASSURANCE

a. Contractor shall provide all personnel and equipment required to complete the Quality Assurance activities referenced in the Quality Assurance Log. The requirements of the Quality Assurance plan shall be completed in their entirety before substantial completion and submitted as referenced in the Closeout Log.

b. The contractor shall designate a competent person, separate from the superintendent or Project Manager, to act as the contractor's Quality Assurance coordinator. The Quality Assurance coordinator is responsible for planning, scheduling, coordinating, conducting and verifying all Quality Assurance activities required by the Quality Assurance plan and ensuring all building systems are complete, operable and ready for use by the Owner. At a minimum, building ventilation systems, chilled/hot water generation systems, hydronic distribution systems, power distributions systems and fire detection and alarm systems, as applicable.

24. MECHANICAL, ELECTRICAL, PLUMBING (MEP) PRE-INSTALLATION MEETING(S)

a. Before the start of MEP installation, the Owner's Representative will convene an MEP pre-installation meeting. Meeting participants to include contractor (including MEP subcontractors), Owner's Representative and additional contractor and University operational staff invited by the Owner's Representative. Topics will include underground rough-ins, steam piping, chilled water piping, sprinkler piping, hot water piping, electrical system, duct, telephone/data wiring, control wiring. Additional meetings will be conducted as required for the review of coordination drawings and scope specific installations. Cross section drawings of corridor ceilings and other congested areas will be of highest priority and will be reviewed prior to the start of installations in the affected areas. Meeting minutes and sign-up sheet will be transcribed by contractor and distributed to attendees.

25. COST BREAKOUT FOR OWNER'S ACCOUNTING PURPOSES – NOT USED

26. PROJECT MANAGEMENT/COMMUNICATION REQUIREMENTS

a. The Contractor shall be represented at the site by both a competent full-time Project Manager and a full-time, competent superintendent with no other assigned duties or responsibilities from the beginning of the work until its final acceptance, unless otherwise permitted by the Owner's Representative. The superintendent for the Contractor for the general building work shall exercise general supervision over all subcontractors of any tier engaged on the work with decision-making authority of the Contractor.

b. The Contractor shall use a current industry standard (Primavera, Microsoft Project, etc.) project scheduling software which provides as a minimum: Critical paths, milestones, estimated and actual start and completion dates, scheduled vs. actual progress, and detailed task and subtask breakdown. The following schedules shall be provided as a minimum and kept current: Overall project schedule, four- (4-) week look-ahead, and two- (2-) week look-ahead.

c. The Contractor shall furnish on-site Internet access for use by his Project Manager and superintendent. The University is providing an on-line, secure project communications web site which will be used as a major method of communicating and storing project information. This web site will be used to communicate directed and group email, RFIs,

change order requests and authorizations, and general correspondence. It will serve as a project message board, file storage and retrieval system, and will provide access to and storage of digital photos and contract documents and revisions.

d. The Contractor shall provide the on-site superintendent with a handheld cellular telephone.

27. SAFETY PRECAUTIONS AND PROGRAMS

a. The Bidder's Statement of Qualifications includes a requirement that the Bidder provide its Worker's Compensation Experience Modification Rates (EMR) and Incidence Rates for the three recent years. The Bidder shall also include the EMR and Incidence Rates of listed major subcontractors on the Bid for Lump Sum Contract. If the EMR exceeds 1 or the Incidence Rate exceeds 13, the Contractor or major subcontractor shall take additional safety measures including, but not limited to, developing a site-specific safety plan and assigning a Safety Manager to the Project to perform inspections on a schedule as determined acceptable by the Owner with written reports to be submitted to the Owner. The Owner reserves the right to reject a Bidder or major subcontractor whose rates exceed these stated rates.

b. The contractor shall provide Emergency Contact Information for the Contractor's on-site staff and home office management as well as contact information for all major subcontractor personnel. This information shall contain business and personal phone numbers for each individual for contact during or after hours in case of an emergency. This information shall be submitted within 15 days of the Notice to Proceed.

28. HOT WORK PERMITTING AND GENERAL REQUIREMENTS

Hot work Requirements: The contractor shall comply with the following hot work requirements and the requirements of the International Fire Code and 2014 NFPA 51B.

a. Hot work shall be defined as any work involving burning, welding, grinding, cutting, or similar operations that are capable of initiating fires or explosions.

a. The Contractor shall utilize the hot work permit decision tree and permit provided in the 2014 NFPA 51B for all Hot Work operations.

b. A hot work permit shall be used on all hot work performed outside a designated hot work area. The hot work permit shall be posted and clearly visible within proximity of the hot work area. The hot work permit authorizing individual (PAI) shall be as designated by the Contractor.

c. Notify the Owner's Representative 24 hours prior to starting hot work in buildings with operational fire alarm or fire suppression systems. The Owner's Representative will coordinate the appropriate system outage with Campus Maintenance personnel.

d. Unless otherwise instructed by the Owner's Representative, the Contractor shall post a copy of each completed hot work permit to the Owner's project management file system the following business day.

29. GENERAL REQUIREMENTS FOR CRANE AND HOISTING OPERATIONS

All crane and hoisting operations shall be performed in compliance with OSHA 29 CFR 1926. All Operators, riggers, and signal persons must have the proper qualifications and training necessary to perform the intended hoisting activities for this project.

a. Only fully certified and evaluated Operators shall perform equipment operations. Operators in an

"Operator in Training" status shall not be used.

b. Submittal requirements:

1. Submit copies of Operator certifications, licenses, and evaluations to the Owners Representative.

2. Submit Rigger and Signal Person qualifications to the Owners Representative.

3. Unless otherwise directed by the Owners Representative, submit a lift plan and conduct a lift coordination meeting for hoisting or crane operations for any lift greater than 2,000 pounds, or for any multi pick lift. Include protective measures for existing underground utilities, occupied buildings, pedestrian and vehicle pathways, adjacent buildings and overhead power lines. If the lift is to occur over an occupied building, provide a registered structural engineer's review and verification that the building can resist the impact of a dropped load for the intended lift. If evacuation of an occupied building is necessary to conduct the lift, the decision for building evacuation or scheduling the lift for off-hours will be determined by the Owner.

30. CONSTRUCTION WASTE MANAGEMENT

The goal of Construction Waste Management is to divert waste from the sanitary landfill. This shall be accomplished through reuse, recycling and/or salvage of non-hazardous construction and demolition debris to the greatest extent practical. Track and report all efforts related to reuse, recycling and/or salvage materials from the project (including clean fill material). Report all material types and weights, where material was diverted, type of diversion, documentation of diversion (eg: waste or recycling tickets), and applicable dates. In order to calculate the diversion percentage, total weights of all non-hazardous landfill material must be reported. This information shall be updated monthly utilizing the Construction Waste Management Worksheet provided here: http://www.cf.missouri.edu/cf/pdc/contractor_information. Copies of all applicable receipts, tickets and tracking logs shall be uploaded to the Owner's information sharing website or reported as required by the Construction Project Manager.

(A summary worksheet is required prior to substantial completion).

31. WARRANTY WALKTHROUGH

Contractor shall attend a walk-thru with the Owner at 11 months after acceptance to review and document any warranty items to be addressed as part of the 12 month warranty stated in article 3.1 of the General Conditions.

END OF SECTION

Option #3 – Contractor Schedule

1. GENERAL
   a) Time is of the essence for this contract.
      The time frames spelled out in this contract are essential to the success of this project. The University understands that effective schedule management, in accordance with the General Conditions and these Special Conditions is necessary to insure to that the critical milestone and end dates spelled out in the contract are achieved.
   b) Related Documents
      Drawings and general provisions of the Contract, including General Conditions' Article 3.17 shall apply to this Section.
   c) Stakeholders
      A Stakeholder is anyone with a stake in the outcome of the Project, including the University, the University Department utilizing the facility, the Design Professionals, the Contractor and subcontractors.
   d) Weather
      (1) Contractor acknowledges that there will be days in which work cannot be completed due to the weather, and that a certain number of these lost days are to be expected under normal weather conditions in Missouri.
      (2) Rather than speculate as to what comprises "normal" weather at the location of the project, Contractor agrees that it will assume a total of 44 lost days due to weather over the course of a calendar year, and include same in its as planned schedule. For projects of less than a calendar year, lost weather days should be prorated for the months of construction in accordance with the following schedule.
      (3) Anticipated weather days for allocation/proration only. For projects lasting 12 months or longer, the 44 days per year plus whatever additional months are included will constitute normal weather.

Jan – 5 days	Feb – 5 days	Mar – 4 days	Apr – 4 days
May – 3 days	Jun – 3 days	Jul – 2 days	Aug – 2 days
Sep – 3 days	Oct – 4 days	Nov – 4 days	Dec – 5 days

2. SCHEDULING PROCESS
   a) The intent of this section is to ensure that a well-conceived plan, that addresses the milestone and completion dates spelled out in these documents, is developed with input from all stakeholders in the project. Input is limited to all reasonable requests that are consistent with the requirements of the contract documents, and do not prejudice the Contractor's ability to perform its work consistent with the contract documents.
      Further, the plan must be documented in an understandable format that allows for each stakeholder in the project to understand the plan for the construction and/or renovation contained in the Project.

   b) Contractor Requirements
      (1) Schedule Development
          Contractor shall prepare the Project Schedule using Primavera P3 or Oracle P6.
      (2) Schedule Development
          Within 4 weeks of the NTP, contractor shall prepare a schedule, in CPM format, that reflects the contractor's and each subcontractor's plan for performing the contract work.

          Contractor shall review each major subcontractor's schedule with the sub and obtain the subcontractor's concurrence with the schedule, prior to submitting to the University.
      (3) Schedule Updates.
          (a) Schedule Updates will be conducted once a month, at a minimum.
              Actual Start and Finish dates should be recorded regularly during the month. Percent Complete, or Remaining Duration shall be updated as of the data date, just prior to Contractor's submittal of the update data.

(b) Contractor will copy the previous months schedule and will input update information into the new monthly update version.
(c) Contractor will meet with the Owner's Representative to review the draft of the updated schedule. At this meeting, Owner's Representative and Contractor will:
(i) Review out of sequence progress, making adjustments as necessary,
(ii) Add any fragnets necessary to describe changes or other impacts to the project schedule and
(iii) Review the resultant critical and near critical paths to determine any impact of the occurrences encountered over the last month.

(4) Schedule Narrative
After finalization of the update, the Contractor will prepare a Narrative that describes progress for the month, impacts to the schedule and an assessment as to the Contractor's entitlement to a time extension for occurrences beyond its control during the month and submit in accordance with this Section.

(5) Progress Meetings
(a) Review the updated schedule at each monthly progress meeting. Payments to the Contractor may be suspended if the progress schedule is not adequately updated to reflect actual conditions.
(b) Submit progress schedules to subcontractors to permit coordinating their progress schedules to the general construction work. Include 4 week look ahead schedules to allow subs to focus on critical upcoming work.

3. CRITICAL PATH METHOD (CPM)
a) This Section includes administrative and procedural requirements for the critical path method (CPM) of scheduling and reporting progress of the Work.
b) Refer to the General and Special Conditions and the Agreement for definitions and specific dates of Contract Time.
c) Critical Path Method (CPM): A method of planning and scheduling a construction project where activities are arranged based on activity relationships and network calculations determine when activities can be performed and the critical path of the Project.
d) Critical Path: The longest continuous chain of activities through the network schedule that establishes the minimum overall project duration.
e) Network Diagram: A graphic diagram of a network schedule, showing the activities and activity relationships.
f) Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling, the construction project. Activities included in a construction schedule consume time and resources.
g) Critical activities are activities on the critical path.
h) Predecessor activity is an activity that must be completed before a given activity can be started.
i) Milestone: A key or critical point in time for reference or measurement.
j) Float or Slack Time: The measure of leeway in activity performance. Accumulative float time is not for the exclusive use or benefit of the Owner or Contractor, but is a project resource available to both parties as needed to meet contract milestones and the completion date.
k) Total float is herein defined as the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.
l) Weather: Adverse weather that is normal for the area must be taken into account in the Contractor's Project Schedule. See 1.d.3, above.
m) Force Majeure Event: Any event that delays the project but is beyond the control and/or contractual responsibility of either party.
n) Schedule shall including the following, in addition to Contractor's work.
(1) Phasing: Provide notations on the schedule to show how the sequence of the Work is affected by the following:
(a) Requirements for phased completion and milestone dates.
(b) Work by separate contractors.
(c) Work by the Owner.

(d) Coordination with existing construction.
(e) Limitations of continued occupancies.
(f) Uninterruptible services.
(g) Partial occupancy prior to Substantial Completion.
(h) Area Separations: Use Activity Codes 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.

4. TIME EXTENSION REQUESTS
   a) Refer to General Conditions of the Contract for Construction, Article 4.7 Claims for Additional Time.
   b) Changes or Other Impacts to the Contractor's Work Plan
      The Owner will consider and evaluate requests for time extensions due to changes or other events beyond the control of the Contractor on a monthly basis only, with the submission of the Contractor's updated schedule, in conjunction with the monthly application for payment. The Update must include:
      (1) An activity depicting the event(s) impacting the Contractors work plan shall be added to the CPM schedule, using the actual start date of the impact, along with actually required predecessors and successors.
      (2) After the addition of the impact activity(ies), the Contractor will identify subsequent activities on the critical path, with finish to start relationships that can be realistically adjusted to overlap using good, standard construction practice.
         (a) If the adjustments above result in the completion date being brought back within the contract time period, no adjustment will be made in the contract time.
         (b) If the adjustments above still result in a completion date beyond the contract completion date, the delay shall be deemed excusable and the contract completion date shall be extended by the number of days indicated by the analysis.
         (c) Contractor agrees to continue to utilize its best efforts to make up the time caused by the delays. However, the Contractor is not expected to expend costs not contemplated in its contract, in making those efforts.

   c) Questions of compensability of any delays shall be held until the actual completion of the project. If the actual substantial completion date of the project based on excusable delays, excluding weather delays, exceeds the original contract completion date, AND there are no delays that are the responsibility of the contractor to consider, the delays days shall be considered compensable. The actual costs, if any, of the Contractor's time sensitive jobsite supervision and general conditions costs, shall be quantified and a change order issued for these costs.

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UNIVERSITY OF MISSOURI
ROOF SYSTEM MANUFACTURERS CERTIFICATION
(Revised 12/94)

TO:_____Title_____
Project No. _____
Location _____

Our technical staff has examined the Architect/Engineer's Drawings, Specifications and required warranty for the roofing work on this project. We do not wholly endorse the building design or any materials or services not part of our advertised roofing system.

CERTIFICATION

We hereby certify that:

1. All materials we will furnish and deliver to the project shall be of good merchantable quality, shall meet or exceed the Specifications required and shall, if properly applied by one of our approved roofing applicator firms in accord with our instructions, provide a sound weather/watertight roofing system.
2. Upon completion of the installation in accord with the Drawings and specifications and our recommended installation procedures, we shall issue a total system warranty specified in the project Specifications.
3. The Drawings and Specifications follow the recommendations of our roofing manual for this type of roofing system with:

   No exceptions.

   The following exceptions: (The roofing system will be approved for this project if the following changes are made to the Contract Documents. The bid provided with this Document includes the required changes).

   NOTE: Exceptions may cause Owner to reject bid.
   Exceptions are as follows:

_____
_____
_____
_____
_____
_____

4. The Warranty will be issued for the following proposed roofing system:

_____
_____
_____

ROOFING SYSTEM MANUFACTURER: _____

Authorized Signature: _____

Title: _____Date _____

Telephone Number: ( )_____

Fax Number: ( )_____

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UNIVERSITY OF MISSOURI
CONTRACTORS ROOFING/FLASHING/SHEET METAL GUARANTEE
(Revised 12/94)

WHEREAS (NAME AND ADDRESS OF COMPANY)_____
herein referred to as Roofing Contractor, certify that they have furnished and installed all roofing, flashing, sheet metal and related components in accordance with the Contract Documents and as required by the Roofing System Manufacturer=s installation instructions on the facility described below:

Facility: _____

Owner: University of Missouri-(CAMPUS)
(CAMPUS ADDRESS)

Date of Full Completion: _____

Approximate Area of Roof: _____

Type of Roofing Material: _____

Manufacturer's Specification Number: _____

Thickness and Type of Roof Insulation: _____

NOW, THEREFORE, Roofing Contractor guaranties to the Owner, subject only to the exclusions stated hereinafter, that all roofing, flashing and sheet metal work is fully and integrally watertight and is free from faults and defects in material or workmanship, and is guaranteed for a period of three (3) years from date of full completion of work.

EXCLUSIONS: This guarantee does not cover, and Roofing Contractor shall not be liable for the following:

1. Damage to the roofing system caused by fire, lightning, tornado, hurricane or hailstorm.

2. Damage to roofing system caused by significant settlement, distortion or failure of roof deck, walls, or foundations of building, excepting normal building expansion and contraction is not a part of this exclusion.

3. Abuse by the Owner and/or third parties.

REPAIRS: Owner shall promptly notify Roofing Contractor, in writing, of the need for repair of roofing, flashing, or sheet metal:

1. Roofing Contractor, within eight (8) hours after receipt of such notice, shall make emergency repairs at its expense, as required to render the facility watertight.

2. Within five (5) days after receipt of such notice, Roofing Contractor shall at its expense correct any faults or defects in material or workmanship.

3. Should needed repairs not be covered by this guarantee, Roofing Contractor, after having obtained Owner's written consent, shall make such repairs at Owner's expense. Following said repairs, this guarantee shall thereafter remain in effect for the unexpired portion of the original term. If Owner does not so consent or repairs are made by others than the Roofing Contractor, this guarantee shall terminate for those parts of the roof affected by the repair.

4. In the event that Owner has notified the Roofing Contractor of the need for repairs and (i) Roofing Contractor does not immediately make repairs, or (ii) Roofing Contractor disclaims responsibility

for the repairs and Owner disagrees, or (iii) Owner considers Roofing Contractor=s quoted cost for repairs not covered by this guarantee to be unreasonable and, an emergency condition exists which requires prompt repair to avoid substantial damage or loss to Owner, then, Owner may make such temporary repairs as he finds necessary and such action shall not be a breach of the provisions of this guarantee.

ANNUAL INSPECTIONS: Roofing Contractor shall inspect roof installation prior to each of the three anniversary dates from date of full completion of the work.

1. Inspection team to include Roofing Contractor, Roof Manufacturer, and Owner=s Representative.

2. Inspection of total roof system will be included in the annual inspections.

3. All defects in total roof system will be corrected by the Roofing Contractor within 30 days of inspection.

4. Roof manufacturer will certify by a written report that roof inspection has been completed, defects are acknowledged, and will warrant any repairs.

5. All corrective work completed by Roofing Contractor shall be warranted as approved by the Roofing Manufacturer.

ROOF MODIFICATION: Should Owner require work to be done on roof of said facility including modifications, alternations, extensions or additions to roof and including installation of vents, platforms, equipment, bracings or fastenings, Owner shall notify Roofing Contractor and give Roofing Contractor an opportunity to make recommendations as to methods necessary to safeguard against damage to roofing covered by this guarantee. Failure of Owner to give Roofing Contractor such opportunity or failure to follow methods recommended by Roofing Contractor shall render this guarantee null and void to the extent such failure should result in damage to roofing covered by this guarantee.

NOTICES: Notification of Roofing Contractor by Owner, shall be fulfilled by sending notice to Roofing Contractor.

IN WITNESS WHEREOF, we set our hands this _____ day of _____, 20___.

By:_____

Title:_____

For Roofing Contractor

Name:_____

Address:_____

Phone:_____

END OF SECTION

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
024119	Proposed protection measures; Schedule of selective demolition; Pre-demolition photos										
031000	Product Data; Field Reports										
032000	Product Data, Shop Drawings										
033000	Product Data; Shop Drawing; Qualification Data; Material Certificates; Test Reports; Quality Contol Reports; Vapor Barrier install documentation										
042200	Product data/Material certificates; Mix design;Statement of compressive strength; Weather proceedures										
054000	Product Data, Certificates, Shop Drawings, Delegated Design										
05500	Shop drawings; Qualification data										
72100	Product data; Samples; Product test and evaluation reports										
076200	Product data; Shop drawings; Samples;										
077253	Product data; Shop drawings										
079200	Product data; Samples; Product test reports; Sample warranties										
079500	Shop drawings; Samples; Product test reports										
081113	Product data; Shop drawings; Schedule; Product test reports;										
081613	Product data										
083113	Product data; Shop drawings										
084113	Product data; Shop drawings; Energy performance certificates; Product test reports; Sample warranties										
087100	Product data; Shop drawings; Hardware schedule										
088000	Product data; Samples										
092216	Product data										
092900	Product data										
093000	Product data; Samples										
096733	Product data; Samples; Test data; Installer's qualifications										
096813	Product data; Samples; Warranty sample										
099113	Product data; Samples; Product list										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
099123	Product data; Samples										
099600	Product data; Samples										
102600	Product data; Shop drawings; Samples										
102800	Product data & schedule										
104413	Product data & schedule										
115319	Product data; Shop drawings; Sample warranty										
115320	Product data; Shop drawings; Sample warranty										
115353	Shop drawings; product data; manufacturer's qualifications; installer qualification										
123553	Shop drawings; Keying schedule; Samples; Mfr. Qualification data; Product test reports										
133419	Product data; Shop drawings; Samples; Qualifications data; Manufacturer accreditation and certificates; Systems certificates; Erector certificates; test reports; QC reports; Sample warranties										
210500-01	Shop Drawings										
210500-02	Coordination Drawings										
210500-03	Permits										
210500-04	Welding Certificates										
210500-05	Warranties										
210500-06	As-built Documents										
210500-07	Pipe Pressure Test Logs										
210500-08	O&Ms										
210500-09	Training Seminar										
210519-01	Product Data										
210529-01	Product Data										
210529-02	Mechanical Seals										
210529-03	Fire Sealants										
210553-01	Identification Materials										
210553-02	Valve Schedule										
211313-01	Product Data										
211313-02	Shop Drawings										
211313-03	Hydraulic Calculations										
211313-04	Hydraulic Test Reports										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
220500-01	Plumbing Permits										
220500-02	Plumbing Licenses										
220500-03	EPA/ASHRAE 34 Refrigeration Certification										
220500-04	Welding Certificates										
220500-05	Warranties										
220500-06	As-built Documents										
220500-07	Pipe Pressure Test Logs										
220500-08	O&Ms										
220500-09	Close Out/ Walk through Documentation										
220500-10	Training Seminar Documentation										
220519-01	Flow Meters										
220519-02	Calibrated Balance Valves										
220519-03	Pressure Gauges										
220519-04	Thermomoeters										
220519-05	Pressure/ Temperature test plugs										
220519-06	Warranties										
220519-07	O&Ms										
220529-01	Product Data										
220529-02	Pipe Supports, Anchors, Sleeves, and Hangers										
220529-03	Equipment curbs, supports, and hangers										
220529-06	Fire Sealants										
220548-01	Vibration Controls										
220553-01	Plumbing Indentification Material										
220553-02	Valve Schedule										
220553-03	Record Documents										
220716-01	Equipment Insulation Materials										
220716-02	Insulation Schedule										
220719-01	Pipe Insulation Materials										
220719-02	Insulation Schedule										
220719-03	Project Record Documents										
221000-01	Piping Material and Schedule										
221000-02	Fitting Schedule										
221000-03	Valve Material										
221000-04	Valve Schedule										
221000-05	piping accessories										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
221000-06	Hydrostatic test reports										
221000-07	Domestic water sample test reports										
221000-08	O&M Manuals										
221000-09	As-builts										
221119-01	Product Data										
221119-02	O&M Manuals										
221343-01	Product Data										
221343-02	Warranties										
222123-01	Product Data										
222123-02	Warranties										
223000-01	Product Data										
223000-02	Warranties										
223000-03	Start Up Service										
224000-01	Product Data										
224000-02	Product Accessories										
224000-03	O&Ms										
226700-01	Installer Factory Training and Certification										
226700-02	O&M Manuals										
226700-03	As-built valve locations										
226700-04	RO water piping material and fitting schedule										
226700-05	RO water valves										
226700-06	RO water pipe accessories										
226700-07	RO water hydrostatic test reports										
226701-01	Product Data										
226701-02	Warranty										
226701-03	O&Ms										
226701-04	Testing & start up										
230500-01	Welder Certificates										
230500-02	Coordination Drawings										
230500-03	Pipe Pressure Test Log										
230519-01	Product Data-Meters										
230519-02	Product Data-Sight Flow Indicators										
230519-03	Product Data-Gauges										
230519-04	Product Data-Thermometers										
230519-05	Product Data-Test Plugs										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
230529-01	Product Data-Hangers and Supports										
230529-02	Product Data-Equipment Curbs										
230529-03	Product Data-Sleeves,sealants ans seals										
230529-04	Product Data-Pipe Stands										
230548-01	Product Data - Vibration Controls										
230553-01	Product Data/Schedule - Pipe/Duct Markers										
230553-02	Product Data - Equip Mark Nameplates										
230713-01	Product Data - Ductwork Insulation										
230713-02	Ductwork Insulation - Qualifications										
230713-03	Ductwork Insulation Schedule										
230716-01	Insulation and Accessories										
230716-02	HVAC Equipment Insulation Schedule										
230719-01	Product Data - Insulation and Accessories										
230719-02	HVAC Piping Insulation Schedule										
230900-01	Product Data - BAS System and Accessories										
230900-02	Product Data - Control Dampers										
230900-03	Product Data - Control Valves										
230900-04	Product Data - Acuators										
230900-05	Product Data - Sensors/Transmitters										
230900-06	Product Data - Control Wiring										
230900-07	Qualifications, Certificates, and Reports										
230900-08	Maintance Data										
230900-09	Wiring Diagram										
230900-10	Sequence of Operations										
232113-01	Product Data - Steel Piping, Fittings, and Joints										
232113-02	Product Data - Copper Tubing, Fittings, and Joints										
232113-03	Product Data - Dielectric Nipple										
232113-04	Product Data - Valves										
232113-05	Pipe/fittings/joints - Schedule										
232116-01	Product Data - Expansion tanks										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
232116-02	Product Data - Air vents										
232116-03	Product Data - Air/Dirt separators										
232116-04	Product Data - Strainers										
232116-05	Product Data - Relief valves										
232116-06	Product Data - Flexible connections										
232116-07	Product Data - Chemical pot feeders										
232123-01	Product Data - Pumps and Fittings										
232123-02	Product Data - Qualifications										
233113-01	Product Data - Sheet Metal Materials										
233113-02	Product Data - Sealant and Gaskets										
233113-03	Product Data - Fasteners										
233113-04	Product Data - Insulated Flexible Ducts										
233113-05	Ductwork Schedule										
233113-06	CAD-Generated Shop Drawings										
233300-01	Product Data - Turning Vanes										
233300-02	Product Data - Duct access doors										
233300-03	Product Data - Duct test holes										
233300-04	Product Data - Flexible duct connections										
233300-08	Product Data - Manual balancing dampers										
233300-09	Product Data - Gravity backdraft dampers										
233300-11	Product Data - Remote damper operators										
233423-01	Product Data/Shop Drawings - Power Ventilators										
233423-02	Fan Curves/Sound Data/AMCA Rating Power Ventilators										
233600-01	Product Data - ATUs and Accessories										
233600-02	Unit Schedule										
233700-01	Product Data - Diffusers										
233700-02	Product Data - Registers/grilles										
235200-01	Product Data/Shop Drawings - Heating Boilers										
235200-02	Wiring Diagrams - Heating Boilers										
235200-03	Warranty Information- Heating Boilers										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
237413-01	Product Data/Shop Drawings - Dedicated Outdoor Air Systems										
237413-02	Wiring Diagrams - Dedicated Outdoor Air Systems										
237313-03	Performance Data - Filters/Burner/Evaporator/Dampers/Heat Exchanger/Fans/Sound Power										
238126-01	Product Data, Shop Drawings - Split Systems										
238126-02	Manufacturer's Installation Instructions - Split Systems										
238126-03	Warranty - Split Systems										
238413-01	Product Data, Shop Drawings - Gas-to-Steam Humidifier										
238413-02	Manufacturer's Installation Instructions - Gas-to-Steam Humidifier										
238413-03	Product Data, Shop Drawings - Humidifier Dispersion Grid										
238413-04	Manufacturer's Installation Instructions - Humidifier Dispersion Grid										
238413-05	Warranty - Gas-to-Steam Humidifier										
260501	Product Data, Shop Drawings										
260519	Product Data, Shop Drawings										
260526	Product Data, Shop Drawings										
260533	Product Data, Shop Drawings										
260573	Shop Drawings										
262200	Product Data, Shop Drawings										
262413	Product Data, Shop Drawings, Warranty, Qualification Data, Field Quality-control Reports										
262416	Product Data, Shop Drawings, Warranty, Qualification Data, Field Quality-control Reports, Panelboard Schedules										
262550	Produt Data, Shop Drawings, Field Quality Control Reports										
262726	Product Data										
262913	Product Data, Shop Drawings										

SHOP DRAWING AND SUBMITTAL LOG

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor	Date Rec'd	#	Date Sent to Cons.	Date Ret'd	Remarks	Date Ret'd2	Cont'r	Copies To	File
262923	Product Data, Shop Drawings, Test Reports										
263213	Product Data, Spec. Compliance, Certs., Warranty, Shop Drawings, Wiring Diagrams,										
263623	Product Data, Shop Drawings, Wiring Diagrams, Test and Certifications, Warranty										
264100	Product Data, Shop Drawings										
265100	Product Data										
270000	Product Data, Shop Drawings										
283111	Product Data, Shop Drawings, Qualification Data - Installer										
285500	Test Reports										
312000	Product data										
312319	Product data										
316329	Product data; Mixtures; Shop drawings										
321216	Product data										
321313	Product data										
321373	Product data; Samples; Schedule										
321733	Product data; Shop drawings; Samples										
323136	Shop drawings; Certifications; Installer qualification data										
331100	Product data										
334100	Product data; Shop drawings										
334600	Product data; Samples										
334613	Product data; Samples										

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Project: Nextgen Center of Excellence for Influenza Research Phase II

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Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions
081113	Hollow Metal Doors and Frames	x		x			
081113	Fiberglass-Reinforced Plastic Doors	x		x			
083113	Access Doors and Frames	x		x			
084113	Aluminum-Framed Storefronts	x					
088000	Glazing	x					
093000	Tile	x		x			
096813	Resinous Flooring	x		x			
096813	Tile Carpet	x		x			
102600	Wall Protection	x					
102800	Toilet and Bath Accessories	x					
104413	Fire Protection Cabinets	x					
115319	Dry Heat Sterilizer	x	x	x			x
115320	Steam Heat Sterilizer	x	x	x			x
115353	Biological Safety Cabinets	x		x			x
123553	Stainless Steel Laboratory Casework	x		x			
133419	Metal Building Systems	x		x			
210529	Fire Suppression Hangers and Supports	x					
210553	Pipe Markers	x					
211313	Valves	x					
211313	Sprinklers	x					
220529	Plumbing Hangers and Supports	x					
220553	Pipe Markers	x					
220716	Plumbing Equipment Insulation	x					
220719	Plumbing Piping Insulation	x					
221000	Valves	x		x	x		
221119	Backflow Preventers	x		x	x		x
221119	Expansion Tanks	x		x			x
221119	Cleanouts	x					
221119	Water Hammer Arrestors	x		x			
221343	Facility Packaged Sewage Pumping Stations	x	x	x	x	x	x
222123	Plumbing Pumps	x	x	x	x	x	x
223000	Water Heater	x	x	x	x		x
223000	Thermal Mixing Valve	x	x	x	x		x
224000	Plumbing Fixtures	x	x	x	x		x
226700	Reverse Osmosis Water Piping and Valves	x		x	x		
226701	Water Purification System	x	x	x	x	x	x

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions
230519	HVAC Meters and Gauges	x					
230529	HVAC Hangers and Supports	x					
230548	Vibration Isolators	x					
230553	Duct/Pipe Markers	x					
230713	Dcutwork Insulation	x					
230716	HVAC Equipment Insulation	x					
230719	HVAC Piping Insulation	x					
230900	EMCS Devices/Controllers	x	x	x	x		x
230900	Control Wiring	x					
230900	Control Valves / Dampers + Actuators	x	x	x	x		x
230900	Airflow/Temperature Measurement Devices	x	x	x	x		x
232113	Dielectric Nipple	x					
232113	Calibrated Balance Valves	x					x
232113	Ball Valves	x					
232113	Butterfly Valves	x					
232113	Check Valves	x					
232116	Expansion Tanks	x		x	x		
232116	Air/Dirt Separators	x		x	x		
232116	Strainers	x		x	x		
232116	Safety Relief Valves	x		x	x		
232116	Flexible Connections	x					
232116	Chemical Pot Feeders	x		x	x		x
232123	HVAC Pumps	x	x	x	x	x	x
233300	Ductwork Accessories	x		x	x		x
233423	HVAC Power Ventilators	x	x	x	x	x	x
233600	Air Terminal Units	x	x	x	x		x
233700	Air Outlets and Inlets	x					
235200	Heating Boilers	x	x	x	x	x	x
237413	Dedicated Outdoor Air Systems	x	x	x	x	x	x
238126	Split Systems	x	x	x	x		x
238413	Humidifiers	x	x	x	x		x
260500	Electrical General Provisions			X			X
260501	Basic Materials and Methods	X		X			
260519	Conductors	X					
260526	Grounding System	X		X			
260533	Raceways	X		X			

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions
260573	Low Voltage Electrical Systems Studies					x	
262200	Dry-Type Transformers	X	X	X			
262413	Switchboards	X	X	X	X		X
262416	Panelboards	X	X	X	X		X
262550	Dual Purpose Docking Station	X	X	X	X		X
262726	Wiring Devices	X		X			
262913	Motor Controllers	X	X	X			X
262923	Variable Frequency Drives	X	X	X			X
263213	Emergency Standby Power System Generator Set	X	X	X	X		X
263623	Automatic Transfer Switch	X	X	X	X		X
264100	Lightning Protection System	X					
265100	Lighting	X		X	X		
283111	Digital Addressable Fire Alarm System	X	X	X	X		X
285500	RF Survey for In-Building Two Way Emergency Responder Communication Enhancement System						

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor/Subcontractor	Date Received	# of Copies	Remarks
024119	SELECTIVE DEMOLITION: Non-disruction of existing warranty for existing building elements included in demolition				
076200	Sheet Metal Fabrications; Warranty information - 5 year finish, 3 year weathertightness.				
079200	Joint Sealants: Warranty information - 2 year installer, 5 year manufacturer				
084113	Hollow Metal Doors & Frames: Maintenance data; Warranty 5 years.				
081613	Fiberglass-Rienforced Polymer Doors; Lifetime Warrenty.				
087111	Door Hardware: Maintenance data; Warranty 3 year				
088000	Glazing: Warranty 10 year				
096733	Resinous Floor and Walls: Maintenance data, extra materials; Warranty 5 year				
099113	Exterior Paint: Maintenance data, extra materials				
099600	High-performance Coating: Maintenance data, extra materials				
115319	Dry Heat Sterilizer: Operation manuals; Service agreement; Warranty				
115320	Steam Heast Sterilizer: Warranty				
115353	Product operation and maintenance data, warranty data, start-up reports.				
123553	Lab Casework: Extra materials				
133419	Metal Building: Finishes maintenance manuals; Warranties 25 years				
210500	BASIC FIRE SUPPRESSION REQUIREMENTS: Pressue Test Log				
211313	FIRE SUPPRESSION SYSTEM: Maintenance Information, Pipe Pressure Test Log, Contractors Material and Test Certificate, Extra Materials, Hydraulic Calcs/Shop Drawings stamped by AHJ				
220500	BASIC PLUMBING REQUIREMENTS: Pressue Test Log				
221000	PLUMBING PIPING: Pipe Pressure Test Reports, Water disinfection test reports,,				
221119	PLUMBING SPECIALTIES: Maintenance information, Backflow Preventer Test Report				
221343	FACIILTY PACKAGED SEWAGE PUMPING STATIONS: Maintenance information, Extra materials, Installation/startup reports				
223000	PLUMBING EQUIPMENT: Installation/Startup Reports				
226700	REVERSE OSMOSIS WATER PIPING: Pipe Pressure Report, Owner Training				
226701	WATER PURIFICATION SYSTEM EQUIPMENT: Installation/Startup Reports, Sampling Reports				
230500	BASIC HVAC REQUIREMENTS: Pipe Pressure Logs				
230553	HVAC IDENTIFICATION: Record Documentation of Tagged Valves				
230519	HVAC METERS AND GAUGES: Maintenance information				

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

Contractor:

Section	Description	Contractor/Subcontractor	Date Received	# of Copies	Remarks
230900	DIGITAL CONTROLS EQUIPMENT: As-built Sequence of Ops, Controls diagrams framed and protected by glass, mounted next to controller				
232113	HYDRONIC PIPING: Extra materials, maintenance information, Pressure test reports				
232116	HYDRONIC SPECIALTIES: Maintenance data				
232123	HVAC PUMPS: Maintenance information, Extra Materials - (1) set of mech seals/gaskets for each pump				
233113	DUCTWORK: Pressure Test				
233300	DUCTWORK ACCESSORIES: Maintenance information				
233423	HVAC POWER VENTILATORS: Maintenance information, Installation reports				
233600	AIR TERMINAL UNITS: Maintenance information				
235200	HEATING BOILERS: Maintenance data, Warranty Information, Installation/Startup Reports, Product Demonstration/Owner Training				
237413	DEDICATED OUTDOOR AIR SYSTEMS: Maintenance data, Warranty Information, Startup Report				
238126	SPLIT SYSTEMS: Maintenance data, Warranty 5 year				
238413	HUMIDIFIERS: Maintenance data, Warranty 2 year, Start-up Letter, Owner Training				
260500	ELECTRICAL GENERAL PROVISIONS Electrical Test Reports and Motor Test Reports, Record Documents				
260501	BASICS MATERIALS AND METHODS Extra materials, Record Documents				
260533	RACEWAYS Record Documents				
262200	DRY TYPE TRANSFORMERS Record Documents				
262413	SWITCHBOARDS Record Documents, Warranty				
262416	PANELBOARDS Record Documents, Warranty				
262550	DUAL PURPOSE DOCKING STATION Record Documents, Warranty				
262726	WIRING DEVICES Record Documents				
262913	MOTOR CONTROLLERS Record Documents				
262923	VARIABLE-FREQUENCY MOTOR CONTROLLERS Test Reports, Extra Materials, Service/Maintenance Agreement, Record Documents				
263213	ELECTRICAL EMERGENCY STANDBY POWER SYSTEM GENERATOR SET Record Documents, Warranty, Service Agreement				

Project: Nextgen Center of Excellence for Influenza Research Phase II

Project Number: CP230831

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Section	Description	Contractor/Subcontractor	Date Received	# of Copies	Remarks
263623	ELECTRICAL EMERGENCY STANDBY POWER SYSTEM GENERATOR SET Record Documents, Warranty, Service Agreement				
263623	AUTOMATIC TRANSFER SWITCH Record Documents, Warranty				
264100	LIGHTNING PROTECTION SYSTEM Record Documents, Warranty				
265100	LIGHTING Record Documents				
270000	TELECOMMUNICATIONS Record Documents				
283111	ADDRESSABLE FIRE ALARM SYSTEM Record Documents				
285500	RF SURVEY FOR IN-BUILDING TWO WAY EMERGENCY RESPONDER COMMUNICATION ENHANCEMENT SYSTEM Test Reports				
323113	Maintenance manual				

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Sustainability Report

Material Description	Ticket No.	Date	Material Type	Weight	Notes

Total weight of all demolition material: _____

Percentage of total material diverted: _____

END OF SECTION

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CP230831 NextGen Influenza Research PhII Quality Assurance Check List

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
1						
Building System Commissioning						
Commissioning Agent - Conduct pre-installation meetings per specifications.					Meeting Minutes	☑
15713						
Temporary Erosion and Sediment Control						
Inspect at least once a week and after any rain event					Inspection Report	☑
24119						
Selective Demolition						
Return adjacent areas to condition existing before demolition operations began					Pre-construction video or digital photos	☑
32000						
Concrete Reinforcing						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
33000						
Cast-In-Place Concrete						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Provide a Copy Of Field Cured Concrete Cylinder Test Report to Owner's Rep Prior to Stripping Any Load Bearing Formwork					Test Report From Independent Testing Lab	☑
Sampling and testing shall be done in accordance with contract documents						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Submit concrete mix designs prepared by a qualified testing laboratory for approval prior to placement.					mix design reports	☐
42200						
Concrete Unit Masonry						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Perform Field Quality Control section of specifications					Test Report	☑
54000						
Cold-Formed Metal Framing						
Hold Preinstallation Conference as specified					Meeting Minutes	☑
Provide welder qualification report for each welder on site					Welder Qualifications	☑
55000						
Metal Fabrications						
Provide welder qualification report for each welder on site					Welder Qualifications	☑
79200						
Joint Sealants						
Clean out joints immediately before installing joint sealant						☑
87111						
Door Hardware						
Perform Demonstration and Training section of specifications					Sign-in Sheet	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Perform Field Quality Control section of specifications					Test Report	☑
Verify door closures comply with ADA requirements						☐
88000						
Glazing						
Wash clear glass on both faces not more than 4 days prior to punch list inspection						☐
92216						
Non-Structural Metal Framing						
Provide welder qualification report for each welder on site					Welder Certificates	☑
92900						
Gypsum Board						
Provide Protection as specified					Inspection Report	☑
93000						
Tile						
Provide Extra Material as specified					Transmittal	☑
96733						
Trowel-Applied Resinous Flooring and Wall Coating						
Build Mockup as specified					Inspection Report	☑
Conduct Pre-Installation Meetings					Meeting Minutes	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
96813						
Tile Carpeting						
Provide Extra Material as specified					Transmittal	☑
99113						
Exterior Painting						
Periodically Check Wet Film Thickness To Assure Conformance With Manufacturer's Requirements To Achieve Dry Film Thickness					field report	☑
Provide Extra Material as specified					Transmittal	☑
99123						
Interior Painting						
Periodically Check Wet Film Thickness To Assure Conformance With Manufacturer's Requirements To Achieve Dry Film Thickness					field report	☑
99600						
High-Performance Coatings						
Build Mockups as specified					Inspection Report	☑
Provide Extra Material as specified					Transmittal	☑
115320						
Steam Heat Sterilizer						
Hold Preinstallation meetings as specified					Meeting Minutes	☑
115519						
Dry Heat Sterilizer						
Perform Testing and Acceptance section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
123553						
Stainless Steel Laboratory Casework						
Provide Extra Material as specified					Transmittal	☑
133419						
Metal Building Systems						
Hold Preinstallation Meetings as specified					Meeting Minutes	☑
Perform all testing required in specifications.					Test Report	☑
210500						
Basic Fire Suppression Requirements						
Perform Start-up section of specifications					NFPA13 Certification	☑
211313						
Fire Suppression System						
Flush, test and inspect sprinkler piping per Field Quality Control section of specifications					test report and NFPA 13	☑
Perform Identification Signs section of specifications					NFPA 13 Certification	☑
Provide Extra Material as specified					Transmittal	☑
220500						
Basic Plumbing Requirement						
Hold MEP pre-installation meeting(s).					Meeting Minutes and Sign-up Sheet	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Perform Piping Systems Pressure Testing section of specifications					Test Report	☑
220519						
Plumbing Meters and Gages						
Verify calibration, adjustment and cleanliness of specified meters and gauges						☐
220553						
Plumbing Identification						
Install valve tags on valves and control devices per specifications					Valve Schedule framed/posted	☐
220716						
Plumbing Equipment Insulation						
Verify correct type, thickness and jacket installed						☐
220719						
Plumbing Piping Insulation						
Verify correct type, thickness and jacket installed						☐
221000						
Plumbing Piping						
Obtain domestic water bacteria test and certification; Notify City of Columbia 48 hours prior to testing if city water is affected					Bacteria Test Certification	☑
Perform plumbing pressure testing section of specifications					Test Report	☑
221119						
Plumbing Specialties						
Perform Testing section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
221343						
Facility Packaged Sewage Pumping Stations						
Perform Startup section of specifications					Startup Report	☑
Provide Extra Material as specified					Transmittal	☑
222123						
Plumbing Pumps						
Perform Startup section of specifications					Startup Report	☑
Provide Extra Material as specified					Transmittal	☑
223000						
Plumbing Equipment						
Perform Demonstration section of specifications					Sign-in Sheet	☑
Perform Startup Service section of specifications					Startup Report	☑
226700						
Reverse Osmosis (RO) Water Piping						
Perform Pipe System Cleaning section of specifications					Cleaning Report	☑
Perform Piping System Pressure Testing section of specifications					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
226701						
Water Purification System Equipment						
Perform Field Quality Control section of specifications					Test Report	☑
230500						
Basic HVAC Requirements						
Hold MEP pre-installation meeting(s).					Meeting Minutes	☑
Perform Close Out and Operation Instructions section of specifications					SignIn Sheet	☑
Perform Piping Systems Pressure Testing section of specifications					Test Report	☑
230513						
Electrical Requirements for Mechanical Equipment						
Check each motor for alignment, lubrication, rotation, voltage, current and efficiency					List of motors	☐
230519						
HVAC Meters and Gages						
Provide Test Plugs as specified and as directed by MU owners representative						☐
230593						
Testing, Adjusting, and Balancing						
Coordinate temperature control testing and adjusting with temperature controls contractor						☐
Ensure pre-test requirements as specified in paragraph 1.2C have been completed						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Hold Pre-Balancing Conference as specified					Meeting Minutes	☑
Verify TAB Engineer notified of differences between design and installed equipment						☐
230713						
Ductwork Insulation						
Install pins as specified					Inspection report	☑
230719						
HVAC Piping Insulation						
Verify all piping unions are accessible for maintenance						☐
230900						
Digital Control Equipment						
Calibrate/fine tune circuits & equipment to achieve specified sequence of operation						☐
Check and record amp draw on supply transformers of I/O panels					Test Report	☑
Ensure shipping material has been removed from thermostats and other control devices						☐
Post laminated control diagram in mechanical room						☐
Test and adjust temperature controls in coordination with TAB engineer						☐

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
232113						
Hydronic Piping						
Drain, flush and refill system with clean water.					Flush Report	☑
Pressure test piping per specifications					test report	☑
Provide Extra Material as specified					Transmittal	☑
232123						
HVAC Pumps						
Align all horizontal pumps as specified					Alignment Report	☑
Flush systems until strainers are clean, change strainers and clean vents						☑
Lubricate all motors and bearings						☐
Perform Startup per specifications					Startup Report	☑
Provide Extra Materials as specified					Transmittal	☑
233113						
Ductwork						
Perform Pressure Testing Section of specifications. Leakage class of 4 if no other is specified					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
233300						
Ductwork Accessories						
Perform Field Quality Control Section of spec					Test Report	☑
Test Fire Dampers as specified					Test Report	☑
233423						
HVAC Power Ventilators						
Start-up per manufacturer's written checklist (lubrication, shipping blocks removed, rotation checked, free-turning, etc.) per field quality control section of specs					Startup Report	☑
233600						
Air Terminal Units						
Notify owner's rep after fully installing a representative unit (in-place mockup) for approval. Coordinate and cooperate with owner's commissioning of the boxes.						☐
235200						
Heating Boilers						
Perform Demonstration section of specifications					SignIn Sheet	☑
Perform Field Quality Control section of specifications					O&M Manuals and start-up report	☑
237413						
Dedicated Outdoor Air System						
Perform Manufacturers Field Service section of specs.					field report	☑
Perform Training on System					Sign In Sheet	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
238126						
Split Systems						
Perform Demonstration and Instructions section of spec					SignIn Sheet	☑
Perform Pipe pressure test on refrigeration piping					Test Report	☑
238413						
Humidifiers						
Perform Field Quality Control section of spec					Test Report	☑
Perform Training section of spec					SignIn Sheet	☑
260500						
Basic Electrical Requirements						
Train all End Users on the equipment they will use on a periodic basis per startup, adjustment and instructions section of spec					Sign-in Sheet	☑
Verify underground splices are performed per NEC article 110-14(b) ensuring connections and insulation are rated for underground use						☐
260526						
Grounding System						
Perform resistance test as described in spec					test report	☑
260573						
Low Voltage Electrical System Studies						
Factory certified technician to set electronic overcurrent devices to approved coordination study setpoints					Inspection Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Place arcflash labels on equipment as specified						☑
SKM data to be e-mailed to MU Commissioning Engineer					SKM Data	☑
Train owners representatives in setting of overcurrent devices					Sign-up Sheet	☑
262200						
Low-Voltage Transformers						
Perform checks and tests as noted in spec					Test Report	☑
262413						
Switchboards						
Perform checks per spec					Test Report	☑
262416						
Panelboards						
Perform checks per spec						☑
262550						
Dual Purpose Docking Station						
Perform Field Quality Control section of specifications					test report	☑
262726						
Wiring Devices						
Operate All Devices per spec to verify correct operation					Test Report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
262913						
Motor Controllers						
Perform "Field Quality Control" section of spec to verify correct operation					test report	☑
262923						
Variable Frequency Drives						
Provide factory training.					Sign in sheet	☑
Start-up of VFD's shall be by factory rep. Perform all checks per manufacturer's written start-up checklist					field report, certification	☑
263213						
Electrical Emergency Standby Power System Generator Set						
Perform tests per "Onsite Acceptance Testing" section of spec					Test Report	☑
Provide factory training per training section of specs.					Sign in sheet	☑
Verify load is voltage balanced and phasing is correct						☐
Verify proper rotation of generator						☐
264100						
Lightning Protection Systems						
Provide periodic and final inspections as required by LPI-177 in order to obtain UL Master Label					field report, certification, and Master Label	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
265100						
Lighting						
Illuminate emergency lights for 90 minutes on battery power.					Test Report	☑
Perform Field Quality Control section of specifications					Test reports	☑
Test Emergency Lighting fixtures for proper operation					Test Report	☑
283111						
Addressable Fire Alarm System						
Perform Field Quality Control section of specifications					Test Report	☑
Pretest system and ensure all bugs have been rectified					Pretest Checklist	☐
Provide factory training					Sign in sheet	☑
Test system operation of pull stations horns/strobes by factory trained representative					Written certification of fire alarm system per NFP	☑
Verify battery power available						☐
Verify door hardware interlock						☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
285500						
RF Survey for In-Building Two-Way Emergency Responder Communication Enhancement System						
Perform Survey Submittals section of specs					Survey Results	☑
312000						
Earth Moving						
Conduct site compaction tests per contract documents					test report	☐
Help 3rd party with field quality control section of specs					Third Party Report	☑
Hold PreExcavation Conference as specified					Meeting Minutes	☑
Verify correct warning tape type and location prior to backfilling						☑
321313						
Concrete Paving						
Help 3rd party with field quality control section of specs					Third Party Report	☑
329219						
Seeding						
Perform Acceptance section of specifications					Acceptance Report	☑
331100						
Water Utility Distribution Piping						
Perform Cleaning section of specs					Flush report	☑

Commissioning Items by CSI Division	Verified by: Name	Firm	Date compl	Coord Initial	Documentation Required	Owner Witness Required
Provide testing as specified in fire hydrant testing section of specs.					test report	☑
333100						
Sanitary Utility Sewarage Piping						
Perform Field Quality Control section of specifications					test report	☑
334100						
Storm Utility Drainage Piping						
Provide testing as specified in Field Quality Control section.					Test Report	☑

Please see following website for suggested commissioning forms:

https://operations.missouri.edu/facilities/commissioning-forms

Construction Management Checklist for Energizing Utilities

(Contractor to initial each item upon completion and provide completed form to the Owner's Representative prior to energizing utility)

Water – turned on to the first valve past Energy Management's last valve.

- ☐ Review all piping and equipment being turned on for proper installation and completed testing.
- ☐ Insulation installed (preferred but not required)
- ☐ Meter & sensors properly installed, working, remote read operational, and in readable location.
- ☐ Contractor has swabbed out with chlorine all piping from the backflow preventer to the source while installing.
- ☐ All bacteriological tests have been completed and passed.
- ☐ Backflow preventer installed and tested. (will need water pressure to test)
- ☐ Pressure test completed for piping being turned on.
- ☐ Contractor has method to communicate "Services On" to other contractor personnel and Owner's personnel.
- ☐ Consultant has signed off.
- ☐ Permitting/Inspection authority has signed off and provided documentation of approval to energize.

Steam – turned on to the first valve past Energy Management's last valve.

- ☐ Review all piping, equipment, valves, reducing stations, relief valves, etc. for proper installation and complete testing.
- ☐ Piping protected from the weather/water.
- ☐ Insulation must be installed.
- ☐ All hangers and bolts have been installed.
- ☐ Meter & sensors installed, working, remote read operational and in readable location.
- ☐ All needed traps are installed and able to be tested as they are turned on.
- ☐ Condensate system is installed and operating including the pumping system.
- ☐ Pressure test completed in piping being turned on.
- ☐ Contractor has method to communicate "Services On" to other contractor personnel and
- ☐ Owner's personnel.
- ☐ Consultant has signed off.
- ☐ Permitting/Inspection authority has signed off and provided documentation of approval to energize.

Condensate – turned on to the first valve past Energy Management's last valve.

- ☐ Review all piping and equipment being turned on for proper installation and completed testing.
- ☐ Piping protected from the weather/water.
- ☐ Insulation must be installed.
- ☐ Pressure test completed in piping being turned on.
- ☐ Contractor has method to communicate "Services On" to other contractor personnel and
- ☐ Owner's personnel.
- ☐ Consultant has signed off.
- ☐ Permitting/Inspection authority has signed off and provided documentation of approval to energize.

Electric – turned on to the first breaker past 13.8kV transformer.

- ☐ Review all wiring and equipment being turned on for proper installation and completed testing.
- ☐ Coordination & Arc Flash studies complete with owner approvals and appropriate labels installed on equipment being energized.
- ☐ GFCI set and tested.
- ☐ Breakers & remote operators set and tested per approved studies.
- ☐ All needed permanent grounds are installed.
- ☐ Meter installed, working and in readable location.
- ☐ Main switchgear protected from the weather/water.
- ☐ Contractor has method to communicate "Services On" to other contractor & Owner's personnel.
- ☐ Consultant has signed off.
- ☐ Permitting/Inspection authority has signed off and provided documentation of approval to energize.

Chilled Water – turned on to the first valve inside of building.

- ☐ Review all piping and equipment being turned on for proper installation and completed testing.
- ☐ Pressure test completed in piping being turned on.
- ☐ Insulation must be installed.
- ☐ Meter installed, working and connected to remote read.
- ☐ Building pump and automatic isolation/control valve must be installed and under control.
- ☐ If chillers are installed, automatic loop pump isolation must be installed.
- ☐ Control valves must be installed and automatically controlled on all loads.
- ☐ Contractor has method to communicate “Services On” to other contractor personnel and Owner’s personnel.
- ☐ Consultant has signed off.
- ☐ Permitting/Inspection authority has signed off and provided documentation of approval to energize.

*Fill out all form fields before signing!

Name	Organization	Title	Signature
University of Missouri Commissioning Authority			

(Place Digital Locking Stamp Here)

END OF SECTION I.E.8

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SECTION 1.F

INDEX OF DRAWINGS

Drawings referred to in and accompanying Project Manual consist of following sheets dated 05/06/2024.

Sheet 1	of 93	G0.00	Title Sheet & Drawing Index
Sheet 2	of 93	G0.01	General Notes, Symbols & Abbreviations
Sheet 3	of 93	G0.10	Code Compliance Plan
Sheet 4	of 93	G0.20	Accessibility Details
Sheet 5	of 93	G0.21	Accessibility Details
Sheet 6	of 93	C0.51	Site Erosion Control Plan
Sheet 7	of 93	C0.61	Site Erosion Control Details
Sheet 8	of 93	C1.01	Site Demolition Plan
Sheet 9	of 93	C2.01	Site Layout Plan
Sheet 10	of 93	C3.01	Site Grading Plan
Sheet 11	of 93	C3.11	Enlarged Grading Plan - 1
Sheet 12	of 93	C4.01	Site Utility Plan
Sheet 13	of 93	C4.11	Site Utility Profile
Sheet 14	of 93	C4.12	Site Utility Profiles
Sheet 15	of 93	C5.01	Site Details – 1
Sheet 16	of 93	C5.02	Site Details – 2
Sheet 17	of 93	C6.01	Drainage Area Map & Calculations
Sheet 18	of 93	A0.00	Wall Type Schedule & Details
Sheet 19	of 93	A0.10	First Floor Demolition Floor & Ceiling Plan
Sheet 20	of 93	A1.10	First Floor Plan
Sheet 21	of 93	A1.11	First Floor Plan Area 1
Sheet 22	of 93	A1.12	First Floor Plan Area 2
Sheet 23	of 93	A1.15	Service Access Plan Above Ceiling
Sheet 24	of 93	A1.20	First Floor Reflected Ceiling Plan
Sheet 25	of 93	A1.21	First Floor Reflected Ceiling Plan Enlarged Area 1
Sheet 26	of 93	A1.22	First Floor Reflected Ceiling Plan Enlarged Area 2
Sheet 27	of 93	A1.30	Roof Plan
Sheet 28	of 93	A1.40	First Floor Plan & Reflected Ceiling Plan – Alternate 1
Sheet 29	of 93	A2.10	Exterior Elevations
Sheet 30	of 93	A3.10	Building Cross Sections
Sheet 31	of 93	A4.10	Wall Sections
Sheet 32	of 93	A6.10	Interior Elevations
Sheet 33	of 93	A6.40	Door Schedule, Door & Window Types, Frame Types
Sheet 34	of 93	A7.10	Plan Details
Sheet 35	of 93	A8.10	Section Details
Sheet 36	of 93	F1.11	First Floor Finishes Plan & Schedule
Sheet 37	of 93	S0.01	General Notes
Sheet 38	of 93	S1.10	Foundation Plan
Sheet 39	of 93	S1.11	T.O.W. Framing Plan
Sheet 40	of 93	S2.10	Foundation Sections
Sheet 41	of 93	S2.20	Framing Sections
Sheet 42	of 93	S5.10	Typical Details
Sheet 43	of 93	S5.11	Typical Cold Form Details
Sheet 44	of 93	S5.12	Exterior Duct Support Details
Sheet 45	of 93	FS1.01	Fire Suppression First Floor Plan - Area B
Sheet 46	of 93	FS1.02	Fire Suppression Schematic
Sheet 47	of 93	FS1.03	Fire Suppression Schematic
Sheet 48	of 93	M0.00	Mechanical Abbreviations, Symbols & Notes
Sheet 49	of 93	M0.02	First Floor HVAC Piping Demolition Plan - Area A
Sheet 50	of 93	M1.01	First Floor HVAC Plan - Area B
Sheet 51	of 93	M1.02	First Floor HVAC Piping Plan - Area B (Alt 1)
Sheet 52	of 93	M1.03	First Floor HVAC Piping Plan - Area A
Sheet 53	of 93	M1.04	First Floor HVAC Piping Plan – Area B

END OF SECTION

SECTION 1.G

PREVAILING WAGE RATES

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 30

Section 010
BOONE COUNTY

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
Todd Smith, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2023**

Last Date Objections May Be Filed: **April 10, 2023**

Prepared by Missouri Department of Labor and Industrial Relations

Building Construction Rates for
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$58.05
Boilermaker	$73.87
Bricklayer	$53.18
Carpenter	$49.00
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$47.52
Plasterer	
Communications Technician	$57.48
Electrician (Inside Wireman)	$58.51
Electrician Outside Lineman	$76.79
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	$31.16*
Glazier	$65.21
Ironworker	$65.92
Laborer	$42.86
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	$31.16*
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$64.73
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$40.26
Plumber	$69.73
Pipe Fitter	
Roofer	$53.14
Sheet Metal Worker	$56.02
Sprinkler Fitter	$61.21
Truck Driver	$31.16*
Truck Control Service Driver	
Group I	
Group II	
Group III	
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.

Heavy Construction Rates for
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$48.97
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$74.24
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$44.32
General Laborer	
Skilled Laborer	
Operating Engineer	$56.12
Group I	
Group II	
Group III	
Group IV	
Truck Driver	*$29.89
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

Use Heavy Construction Rates on Highway and Heavy construction in accordance with 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 as shown on the Building Construction Rate Sheet.

*The Division of Labor Standards received less 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.

END OF SECTION

SECTION 1.H

ALTERNATES

Base Bid may be increased in accordance with following Additive Alternate proposal(s) as Owner may elect:

1. Additive Alternate No. 1: **Fit-Out of Shower, Procedure, & Holding Rooms: 202, 202A, 202B, 204, 204A, 204b, 206, 206A, 206B**

Base Bid: Provide shell space in rooms 202, 202A, 202B, 204, 204A, 204B, 206, & 206B. Include plumbing and electrical rough-ins.

Add Alternate: Fit-out rooms 202, 202A, 202B, 204, 204A, 204B, 206, & 206B with ceilings, finishes, and fixtures. Refer to drawings on A1.40.

2. Additive Alternate No. 2: **Generator**
Base Bid: Provide generator pad and conduit for future install.

Add Alternate: Procure and install generator. Includes ATS, docking station, and associated cabling.

3. Additive Alternate No. 3: **FRP Doors**
Base Bid: Provide stainless steel doors per door schedule.

Add Alternate: Provide FRP doors in lieu of stainless steel.

4. Additive Alternate No. 4: **Reverse-osmosis piping for animal watering**
Base Bid: Provide piping, connections and terminations to domestic water supply to holding rooms.

Add Alternate: Install piping, connections and terminations from reverse-osmosis equipment to holding rooms in lieu of domestic water piping, connections and terminations.

END OF SECTION

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Geotechnical Report

Proposed Middlebush Farm Building and Parking Lot (CP191901)

Tom Bass Road

Boone County, Missouri

November 12, 2020

Project No. 20120.02

For

The University of Missouri

Columbia, Missouri

Prepared By:

ALLSTATE CONSULTANTS

3312 LeMone Industrial Blvd.,
Columbia, MO 65201

Engineering Our Community

ALLSTATE CONSULTANTS

November 12, 2020

Mr. Kenneth Keane, P.E.
133B General Services Building
900 E Stadium Blvd
Columbia, Missouri 65211

RE: Geotechnical Report
Proposed Middlebush Farm Building and Parking Lot (CP191901)
Boone County, Missouri
Allstate Project No. 20120.02

Dear Mr. Keane;

We have completed the subsurface exploration, laboratory testing and geotechnical engineering report for the Proposed Middlebush Farm Building and Parking Lot to be constructed on the west side of Tom Bass Road in Boone County, south of Columbia, Missouri. The accompanying geotechnical report presents the findings of the subsurface exploration, the results of the laboratory tests and our engineering recommendations regarding earthwork and the design and construction of foundations, floor slab and subgrades for the proposed building and pavement areas.

It has been a pleasure to be of service during the initial phase of this project. If you have any questions regarding this geotechnical report, or if we may be of further service during the design or construction phases, please feel free to contact our office.

Sincerely,

Allstate Consultants LLC

Cassidy Mathews, P.E.
Geotechnical Manager
Missouri: E-2011015772
Enclosures

STATE OF MISSOURI
CASSIDY C. MATHEWS
NUMBER PE-2011015772
PROFESSIONAL ENGINEER
11/12/2020

3312 LeMone Industrial Blvd., Columbia, MO 65201 | P: 573-875-8799 | F: 573-875-8850 | allstateconsultants.net

TABLE OF CONTENTS

Proposed Middlebush Farm Building and Parking Lot (CP191901)
Tom Bass Road Boone County, Missouri
Allstate Consultants Project No. 20120.02

APPENDIX

Test Boring Location Plan
Test Boring Logs – TB-1 to TB-27

Test Boring Log Notes
Soil and Rock Symbols For Boring Logs
Unified Soil Classification System

Swell Test Reports

GEOTECHNICAL REPORT

PROPOSED MIDDLEBUSH FARM BUILDING AND PARKING LOT (CP191901)
TOM BASS ROAD
BOONE COUNTY, MISSOURI

ALLSTATE PROJECT NO. 20120.02
NOVEMBER 12, 2020

INTRODUCTION

Allstate Consultants LLC has completed the subsurface exploration for the proposed building, parking lot and associated pavements to be constructed at the University of Missouri's Middlebush Farm on the west side of Tom Bass Road in Boone County, Missouri.

Twenty-seven (27) test borings, designated TB-1 through TB-27 were performed to depths ranging from approximately 5 to 20 feet below the existing ground surface in the building, pavement and general site areas in the requested locations. Laboratory tests were performed on soil samples recovered from the borings and the soil samples were visually classified. The Test Boring Logs and Test Boring Location Plan are included in the Appendix.

The purpose of this geotechnical engineering report is to describe the subsurface conditions encountered in the borings, evaluate the field and laboratory test data and to provide recommendations regarding earthwork, the design and construction of foundations, floor slabs and pavement subgrades for the proposed facility.

PROJECT DESCRIPTION

We understand the proposed building will consist of a single story, slab on grade, metal building supported by steel columns. The building will have a footprint of approximately 13,000 square feet and an approximate finished floor elevation of 857.65 feet. Based on our discussions with the Client, there are three concrete pits located on the west side of the proposed building and each will have dimensions of approximately 10 feet by 10 feet wide and will be 10 feet deep. In addition to the currently proposed footprint, there are future additions planned, one to the north and one to the south, each having approximate footprints of 10,000 square feet. A proposed passenger vehicle parking area is planned for the east side of the building and a drive encircling the building is included. The proposed building and pavement areas are shown on the attached Test Boring Location Plan.

Based on the results of Allstate's topographic survey and the proposed finished floor elevation of 857.65 feet, it appears cuts and fills of on the order of 5 feet will be required to develop the floor slab and pavement subgrades. Final structural loads are not yet available, however, based on discussions with the Structural Engineer of Record we estimate wall and column loads will be less than 2 kips/linear foot and 100 kips respectively. If actual structural loads exceed those estimated, we should be notified when loads become available.

FIELD EXPLORATION AND LABORATORY TESTING PROCEDURES

Test borings were staked by an Allstate Consultants survey crew using traditional surveying methods, in the requested locations depicted on the preliminary site plan provided by the Client. Ground surface elevations at the boring locations were determined by the survey crew during staking. Approximate boring locations are shown on the Test Boring Location Plan in the Appendix.

Test borings were performed using Allstate's truck-mounted, Mobile B47 rotary drilling rig and by our drilling subcontractor, Palmerton & Parrish's track-mounted CME 550 ATV rotary drilling rig. Hollow stem augers with a center plug were used to advance the borings. At relatively close vertical intervals, the center plug was removed from the hollow augers and samples of the subsurface materials were obtained using the thin-walled tube and split-barrel sampling methods. Standard Penetration Tests (SPT) were performed during the split-barrel sampling procedure.

As the borings were advanced, a geotechnical engineer recorded the results of the subsurface exploration on field boring logs. Information reported on the field logs included the number, type, depth, recovery, penetration resistance and/or calibrated hand penetrometer reading for each sample. The field logs also included visual descriptions of the recovered soil samples; the geotechnical engineer's interpretation of subsurface conditions between samples based on drilling observations and the drill crew's groundwater observations. Recovered soil samples were sealed to reduce moisture loss and transported to the laboratory for further testing and classification.

Thin-walled tube samples were tested in the laboratory to determine the field water content, dry unit weight and unconfined compressive strength at the time of exploration. The unconfined compressive strength of some of the samples was estimated using a calibrated hand penetrometer. The strength estimated using this device is approximate and was considered accordingly. Split-barrel samples were tested in the laboratory to determine the field water content.

On completion of laboratory testing, the soil samples were described and classified in general accordance with the Unified Soil Classification System (USCS) using visual-manual procedures. USCS Group Letter Symbols and Group Names were also assigned based on visual-manual estimates. Atterberg limit tests were performed on selected samples to assist in soil classification and evaluating the engineering characteristics of the site soils and the results of these tests are shown on the test boring logs.

Six (6) swell tests were conducted on thin-walled tube samples of the subgrade soils to assist in evaluating the potential for future heave of foundations and floors slabs since expansive soils are common to the project area. Swell tests were conducted by trimming soil samples, at the in-situ moisture content and density prevailing at the time of exploration, into fixed ring consolidometers; applying surcharge pressures approximately equal to the effective vertical stresses anticipated after construction is complete and measuring the amount of vertical swell resulting from inundating the samples with water.

The final Test Boring Logs included in this report present the results of the field exploration and the laboratory testing program. The final logs delineate the soil strata encountered in the borings and represent the geotechnical engineer's interpretation of subsurface conditions at the boring locations. These interpretations were developed from a review of the field boring logs with modifications based on the laboratory test results and on visual observations of the recovered samples. Graphical symbols depicting the soil strata are shown on the boring logs for illustrative purposes. It should be recognized that differing soil types could be present between samples and between borings.

The Test Boring Log Notes included in the Appendix describe the symbols used on the Test Boring Logs and provide additional information regarding sampling procedures; soil and rock descriptions and classification; Standard Penetration Tests; laboratory test results; the consistency of fine grained soils; the relative density of coarse grained soils; bedrock quality and borehole water level observations.

The Unified Soil Classification System is also described in the Appendix and a legend is included relating graphical symbols used on the boring logs to the USCS Group Letter Symbols and Names and to the principal rock types encountered in the project area.

SITE DESCRIPTION

The proposed building will be located on a very gently sloping upland site on the west side of Tom Bass Road and US Highway 63, south of Columbia, Missouri as shown on

the Test Boring Location Plan. The building site was covered with perennial grass at the time of exploration and no trees were observed in the building area.

Ground surface elevations in the proposed project area typically ranged from 870 feet on the south to 850 feet on the north and surface drainage was generally from the higher terrain on the south to the lower topography on the north.

SUBSURFACE CONDITIONS

Subsurface conditions encountered at the individual boring locations are indicated on the Test Boring Logs. Stratification lines shown on these logs represent approximate boundaries between soil types. In-situ, the change between material types may be more gradual. Based on a review of the Test Boring Logs, subsurface conditions at the project site can be characterized as follows:

Soil Conditions

Test borings TB-1 to TB-12 and TB-24 to TB-27, located in the proposed building and future building addition areas, generally encountered some 12 inches of topsoil over native loessial, post-glacial, and glacial soil deposits. These building area borings were terminated in glacial drift at depths of approximately 20 feet beneath the existing ground surface. Pavement area and general site borings, TB-13 to TB-23, typically encountered 12 inches of topsoil over native loessial soil deposits extending to approximately 5 feet below the existing ground surface.

The surficial native loessial deposits had a well-developed weathering profile and typically extended to depths of about 5 to 8 feet beneath the existing ground surface in most of the borings. These windblown deposits have been preconsolidated by repeated cycles of wetting and drying since deposition and have a well-developed soil profile as a result of long-term leaching and weathering. The weathered loess profile encountered in the borings generally consisted of an A horizon composed of topsoil over a thin B horizon consisting of highly weathered, lean clay and fat clay and the underlying parent soil or C horizon composed primarily of the parent lean clay loess.

The relatively thick topsoil or A horizon loess encountered in the test borings typically extended to depths of about 12 inches beneath the surface and consisted chiefly of lean clay. Although the root zone and most of the organic matter was observed in the upper several inches of the A horizon, the underlying material was also silty and had some of the textural characteristics of a silty lean clay topsoil. These type soils typically become low in strength when wet and can be spongy and elastic under construction traffic.

Below the A horizon, many of the test borings encountered the highly weathered, B horizon loess. These high plastic, lean clays and fat clays were observed in most of the borings and extended to depths of about 2.5 to 5 feet beneath the existing ground surface. The soils encountered in the B horizon were typically moist and stiff to very stiff and occasionally medium or hard in consistency at the time of exploration.

The highly weathered, lean clay and fat clay loess was generally underlain by the parent C horizon soil in the borings. These loessial materials typically consisted of lean clay of stiff to very stiff and occasionally medium or hard consistency soils. The C horizon loess extended to depths of about 5 to 8 feet beneath the surface in most of the borings.

Beneath the weathered loess, most borings encountered a few feet of a post-glacial soil deposit known as the Ferrelview Formation. The post-glacial waterlain soils have been preconsolidated by past desiccation since deposition and consisted of predominantly fat clays of stiff to very stiff consistency.

At depths ranging from about 8 to 13 feet, most of the deeper building borings transitioned from the thin Ferrelview Formation to the underlying Pre-Illinoian glacial drift. The preconsolidated, glacial drift typically consisted of stiff to very stiff or occasionally hard, lean clay with a higher sand content than the overlying soils. One test boring, TB-8, encountered a zone of loose to medium dense clayey sand. It is not uncommon for the underlying glacial drift of the project area to contain extensive lenses and zones of medium dense to very dense, silty sand, clayey sand and silt. These semi-pervious deposits are often semi-confined in the deeper glacial drift and can bear groundwater under artesian pressure.

Groundwater Conditions

Field observations were periodically made during drilling and sampling and immediately after boring completion to measure borehole water levels. Groundwater was not observed at these times in the test borings. Extended water levels were not observed prior to backfilling the boreholes with auger cuttings.

It should be recognized that short term water level observations in open boreholes, drilled into low permeability soil, may not represent actual groundwater conditions in these materials. In fact, a considerable length of time may be required for a groundwater level to be detected and to stabilize in an open borehole extending into materials similar to those encountered in the test borings at this site.

Installation and long-term observation of piezometers or groundwater observation wells, screened in the hydrologic units of interest and sealed to prevent the entrance of surface water, would be required to more accurately characterize and evaluate groundwater

levels and fluctuations in these levels in this geologic setting. While these services can be provided if requested, they are beyond the scope of this investigation.

Groundwater levels often vary across a project site and typically fluctuate at individual locations with variations in seasonal and climatological conditions. Perched water tables can develop and groundwater levels can be influenced by alterations in site grades, other construction activities, modifications to adjacent sites, leaking utility piping, water following utility trench backfill and other factors not readily evident at the time the borings are performed.

During construction and at other times during the life of the proposed development, groundwater levels may be higher or lower than the levels reported on the boring logs. The likelihood of fluctuating groundwater levels and the potential occurrence of seasonally perched groundwater in the near surface soils, such as the silty A horizon and C horizon loess, should be appropriately considered during development of design and construction plans for this project.

GEOTECHNICAL EVALUATION AND RECOMMENDATIONS

Geotechnical Evaluation

Building area test borings TB-1 to TB-12 and TB-24 to TB-27, encountered native loessial soils with a well-developed soil profile and underlying post-glacial and glacial soil deposits. Beneath the approximate 12 inch thick A horizon topsoil, borings typically encountered highly weathered and higher plastic B horizon soils chiefly composed of lean clays and fat clays extending to depths of about 2.5 to 5 feet over parent C horizon loess generally consisting of lean clays extending to depths of about 5 to 8 feet beneath the surface. The loessial soils were typically underlain by stiff to very stiff, predominantly fat clays of the Ferrelview Formation and underlying Pre-Illinoian glacial drift comprised of stiff to hard lean clays and occasional clayey sands.

The A horizon topsoil was dry to moist at the time of exploration while the underlying B horizon soils were typically moist and stiff to very stiff in consistency where they were identified. The deeper C horizon lean clays were generally moist and stiff to very stiff and occasionally hard at the time of exploration.

Preliminary plans indicate the floor slab and interior foundations of the proposed building may be supported by the higher plastic B horizon clays or controlled compacted fill and the exterior foundations by either controlled compacted fill, B horizon clays or C horizon lean clays depending on location.

Since expansive soils are commonly encountered in the project area, Atterberg limits tests were performed on samples of the native soils to assist in evaluating the general engineering characteristics of these loessial site soils. Atterberg limit testing indicated samples of the highly weathered, B horizon lean clays and fat clay were moderately to highly plastic having a liquid limits ranging from approximately 44 to 63 and plasticity indices or PI's of 24 to 38 which are considered to be high.

Past experience indicates the highly weathered, B horizon clays can have a high to very high swell potential and the underlying C horizon lean clays can have a low to moderate swell potential if these soils have low moisture levels prior to construction. The low to moderate moisture levels, high densities and strengths encountered in some of the borings at the time of exploration tend to indicate moderate to high swell potentials in the B horizon clays.

To assist in evaluating the swell potential of the site soils in their current condition, laboratory swell tests were performed on representative soil samples obtained from the upper portion of the soil profile in borings TB-1, TB-6, TB-7 and TB-12. Swell tests were performed on soil samples at the in-situ moisture and density under surcharge pressures of 125 to 750 psf to simulate future effective stresses due to combined floor loads and the weight of the existing overburden soils. The results of these tests are provided in the Appendix.

Following inundation with water under surcharge pressures of 125 to 750 psf, samples of the dry to moist, B horizon clays from depths of 1 to 5 feet beneath the existing ground surface had a measured swell potential of approximately 0.1 to 3.1 percent which considered to be low to high. Under surcharge pressures of 500 psf, a sample of the deeper C horizon lean clays from a depth of about 5 feet beneath the existing ground surface had a swell potential of 0.3 percent indicating these soils have a relatively low swell potential.

Based on the results of our limited swell testing program, the site soils appear to have a moderate swell potential or tendency to cause heaving of floor slabs and lightly loaded foundations. The variability of the swell potential due to the gently sloping nature of the existing terrain and the anticipated cuts and fills will likely cause differential moisture induced volume change that could cause undesirable floor slab performance if these soils are not addressed. Subgrade drying and moisture loss could also result in higher swell potentials than were measured.

Based on the type of structure planned and our experience with expansive soils in the project area, we recommend establishing a 24-inch-thick, low volume change zone beneath the proposed building floor slab to reduce future floor slab heave to tolerable levels. While a less substantial low volume change zone, such as one having thickness

of 12 to 18 inches, could be used, there is a potential that building floor movements would be more significant and more noticeable with a thinner low volume change zone. Additionally, we are of the opinion that shallow foundations can be used for support of the building as recommended in later sections of this report.

For this project, close attention will need to be paid to removal of any unsuitable site soils; controlled placement and compaction of fill materials and any low volume change zones; and observation of foundation bearing surfaces. Detailed recommendations for design and construction of earthwork, foundations and floor slab subgrades are provided below.

Earthwork

Prior to earthwork, existing vegetation and any low strength topsoil should be undercut from the proposed fill areas, pavement areas and from the footprint of the proposed building and for a horizontal distance of 5 feet beyond the building limits.

After vegetation and topsoil stripping, any remaining loose or otherwise unsuitable material that may be present should be removed from the proposed building and pavement areas. Undercutting in the building area should extend to the bottom of the 24-inch-thick low volume change zone beneath the building floor slab.

Prior to controlled compacted fill placement, the exposed native soils in the pavement areas and the building area undercut should be systematically proof-rolled with a loaded tandem axle dump truck or loaded scraper in the presence of the geotechnical engineer of record or his on-site representative. If additional unsuitable materials are identified in the bottom of the building area undercut during controlled proof-rolling, these unsuitable materials should also be removed to stiff, native clay as determined by the geotechnical engineer of record or his on-site representative. The bottom of the undercut should be scarified to a minimum depth of 4 inches; moisture conditioned to the optimum moisture content or above; recompacted with a sheepsfoot or padfoot roller and backfilled with controlled, compacted fill as described below.

Controlled, compacted fill should be placed in lifts having a maximum loose thickness of 8 inches. Lean clay soils, suitable for reuse as controlled, compacted fill, should be placed and moisture conditioned to within the range of the optimum moisture content to 3 percent above the optimum moisture content and compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). Fat clay soils, suitable for reuse as controlled, compacted fill placed at least 5 feet beyond the proposed building footprint, should be placed and moisture conditioned to within the range of 2 percent above to 5 percent above the optimum moisture content and should be compacted to the same requirements. Silty lean clay soils, suitable for use as controlled, compacted fill

that have liquid limits less than 40, should be placed and moisture conditioned to within the range of 1 percent below to 2 percent above the optimum moisture content and compacted to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). Sheepsfoot and/or padfoot rollers are recommended for compaction of clay soils.

We recommended establishing a 24-inch-thick low volume change zone beneath the building floor slab consisting of approved densely graded granular materials containing at least 15 percent low plasticity fines passing the No. 200 sieve such as MODOT Type 1 crushed limestone, limestone screenings or wastelime. Approved granular materials should be placed in 8-inch-thick loose lifts and compacted at workable moisture contents to at least 95 percent of the standard Proctor maximum dry density (ASTM D698). Vibratory rollers are recommended for compaction of granular soils. In any confined areas, such as plumbing trenches, hand operated compactors and 4-inch-thick lifts are recommended.

Samples of on-site or off-site clays or off-site granular fill, proposed for use in controlled compacted fills or the low volume change zone should be obtained by the geotechnical engineer for evaluation prior to being used at the site.

Each lift of controlled, compacted fill or low volume change material should be observed during placement and compaction and should be subjected to in-place field density testing by the geotechnical engineer of record's on-site representative. Should the field density test results indicate the recommended moisture and compaction levels have not been achieved, the area(s) represented by the test(s) should be reworked and/or recompacted and retested until the moisture and compaction requirements are met.

New utility trench backfill located within 5 feet of the outside of the proposed building should consist of clay soils placed and compacted at the optimum moisture content or above and to the compaction requirements described in this report for controlled, compacted fill.

We recommend the geotechnical engineer of record be retained by the Owner during earthwork construction to perform necessary tests and observations during removal of unsuitable materials; proof-rolling of subgrades; placement and compaction of controlled compacted fills and granular low volume change zones, if used; backfilling of utility trench, foundation and other excavations and final subgrade preparation just prior to floor slab construction.

Building Foundations

In our opinion, the proposed building can be supported on shallow foundations if the recommendations of this report are followed. Building foundations can be supported on stiff native site soils similar to those encountered below a depth of 2 to 4 feet in the borings or on controlled, compacted fill constructed as recommended in the ***Earthwork*** section of this report.

Shallow building foundations supported as described above should be proportioned using a net allowable total load design bearing pressure of 2,000 psf. The net allowable bearing pressure refers to the pressure at the footing bearing level in excess of the minimum surrounding overburden pressure.

Footings beneath unheated areas and footings around the perimeter of the building should extend to a minimum depth of at least 3 feet below the lowest adjacent finished grade for frost protection and to reduce the effects of seasonal, moisture-related volume change in the supporting soils. We recommend isolated footings have a minimum width of 30 inches and continuous wall footings a minimum width of at least 18 inches and such additional width as necessary to support total design loads.

The foundation subgrade soils will be sensitive to moisture changes and construction traffic and every effort should be made to minimize disturbance and wetting of these soils during excavation, final cleanup, observation of bearing surfaces and placement of reinforcement and concrete. We recommend any foundation excavation opened on a given day be reinforced and provided with concrete on the same day.

New building foundations may be subjected to lateral loading. For lateral loads of short duration, we recommend sliding be resisted by an allowable base adhesion of 350 psf acting on the bottom contact area of the foundation that is in compression or by an allowable passive resistance of 700 psf acting on the vertical face of the foundation element in the direction perpendicular to the lateral load. Passive resistance should not be relied upon within 3 feet of finished grade. For any sustained lateral loads of long duration, we recommend an ultimate coefficient of friction of 0.3 be used on the bearing area of the foundation that is in compression. An appropriate factor of safety should be applied to the ultimate base resistance calculated using this value.

Surface water and/or perched groundwater may enter foundation excavations during construction. In our opinion, water entering foundation excavations from these sources can and should be promptly removed using sump pumps.

The bearing surface of all foundation excavations should be free of water and loose or unsuitable soil prior to placing concrete. Reinforcement and concrete should be placed

soon after excavation to minimize disturbance of the bearing surface and supporting soils. Should the bearing soils become dry, disturbed, saturated, or frozen, the impacted soil should be removed to suitable material prior to placing concrete. The geotechnical engineer of record should be retained to observe and test the foundation bearing materials during construction as low strength materials may be encountered requiring undercutting and/or modification of footing depths.

Use of the site preparation procedures recommended in this report will greatly reduce the potential that unsuitable soils will be encountered in foundation excavations. However, if unsuitable bearing materials are identified by the geotechnical engineer or his on-site representative, the foundation excavations should be extended deeper to suitable soils. Foundations could bear directly on these deeper suitable materials or on lean concrete backfill placed in the excavations. Foundations could also bear on controlled compacted clay fill extending down to the suitable materials and placed and compacted as recommended in this report. Over-excavations for placement of compacted backfill below foundations should extend at least 1 foot horizontally beyond all footing edges for each foot of over-excavation depth below the footing bearing elevation. Where controlled compacted backfill is placed in confined spaces and compacted with hand operated equipment, the lift thickness will need to be reduced to 4 inches to achieve the recommended compaction levels.

Foundations designed and constructed on subgrades prepared as recommended in this report are expected to experience total settlements on the order of approximately 1 inch or less and differential settlements between adjacent foundation elements of approximately ½ to ¾ of an inch or less.

Seismicity

Building foundations should be capable of supporting earthquake loads as stipulated in the International Building Code (IBC) or other such applicable code as determined by the structural engineer of record. Based on the results of the subsurface exploration and our experience with geologic conditions in the project area, we recommend the proposed site be classified as Site Class C as defined in Table 20.3-1 and Section 20.3 of the ASCE *Minimum Design Loads for Buildings and Other Structures* if IBC, 2018 governs the design.

Floor Slab Subgrades

After floor slab subgrade construction is complete, care should be taken to maintain the recommended subgrade moisture and density prior to placement of the building floor slab. Completed subgrades that experience moisture loss or become saturated, frozen,

disturbed or altered by plumbing installations or other construction activity should be reconditioned to meet the recommendations of this report prior to floor slab placement.

We recommend a free-draining, compacted, granular leveling course be placed below the floor slabs to provide a capillary break and uniform floor slab support. The thickness of this layer should be at least 4 to 6 inches and the layer can be considered a part of the low volume change zone. For floor slab subgrades prepared as recommended in this report, the concrete slab can be designed using a modulus of subgrade reaction, k, of 100 pounds per square inch per inch (psi/in).

Pavement Subgrades

Pavement subgrades should be developed and prepared as recommended in the ***Earthwork*** section of this report. Fill should consist of moisture conditioned, controlled compacted lean clay fill free of organic matter and debris. We recommend that at least the upper 12 inches of the soil subgrade in cut and shallow fill areas consist of moisture conditioned, controlled compacted lean clay fill placed and compacted at the optimum moisture content to 4 percent above the optimum moisture content and to at least 95 percent of the standard Proctor maximum dry density (ASTM D698).

Pavement subgrades prepared properly during the early stages of construction may be altered by the passage of time, weather and ongoing construction activities. These subgrades should be carefully evaluated by the geotechnical engineer or his on-site representative and should be properly reconditioned prior to base course placement and paving. Close attention should be paid to restoration of heavily traveled areas that were rutted and disturbed during construction and to areas where utility trenches have been backfilled. We recommend these areas and all other pavement subgrades be moisture conditioned and re-compacted to meet the requirements of controlled compacted fill just prior to finish grading, base course placement and paving. Unsuitable subgrades identified in this process should be reworked and re-compacted or removed and replaced with materials meeting the requirements of controlled compacted fill.

Based on the results of the test borings and our previous experience with the types of soils encountered at the project site and proposed in this report for use in the moisture conditioned, controlled compacted subgrades, we recommend a soaked CBR value of about 2 or a resilient modulus, M_r, of about 3000 psi be used to develop any flexible asphalt pavement sections. A modulus of subgrade reaction, k, of about 75 to 100 psi/in can be used to develop rigid pavement designs. Geogrids such as Tensar TX 160 used in conjunction with nonwoven geotextiles and crushed stone base material are recommended to remediate soft subgrades; enhance pavement performance and to reduce the overall thickness of the pavement sections. If pavement subgrade preparation does not follow the recommendations of this report, lower CBR values and

subgrade reaction moduli may be encountered and unsatisfactory pavement performance may develop.

Lateral Earth Pressures for Below Grade Walls

We understand the concrete pits could retain up to 10 feet of backfill and may be cast in place concrete or precast concrete construction. Walls retaining earth backfill and surcharge loads on one side will be subjected to lateral earth pressures. Concrete walls that are provided with appropriate lateral support at the top and bottom are commonly designed for the “at rest” lateral earth pressure. This earth pressure is the minimum lateral pressure that should be used to design restrained walls that will experience essentially no wall rotation. Additional lateral earth pressures can develop that exceed the “at rest” earth pressures. The actual earth pressures developed will depend on the structural design, wall bracing and restraint, construction sequence and methods, backfill compaction procedures and the shear strength of the wall backfill.

For the “at rest” condition, we recommend the concrete walls be designed for an earth pressure equivalent to that of a fluid exerting a lateral pressure of at least 90 pounds per cubic foot (pcf) and 100 pounds per cubic foot (pcf) per foot of wall height for granular backfill and lean clay backfill respectively.

The above minimum design earth pressures do not include a factor of safety and assume the wall backfill will consist of controlled, compacted, lean clay or granular fill placed in horizontal lifts as recommended in this report. The recommended minimum design earth pressures do not include the additional lateral stresses that can develop during compaction of the wall backfill or due to heavy construction equipment that may be operated too close to walls or other surcharge loads that may be present above or below finished grade. The minimum design earth pressures also do not account for possible hydrostatic forces that may develop on the walls due to the presence of groundwater.

In our opinion, the backfill placed behind these type walls should consist of granular fill. The design earth pressures recommended for granular backfill are only valid if the granular backfill extends out from the heel of the wall footing at an angle of 45 degrees or less from the horizontal.

Surface Drainage and Plantings

We recommend final grading plans rapidly direct surface run-off away from building and pavement areas wherever possible. Roof gutter and downspout discharge should be channeled well away from building and pavement areas to reduce the potential that water will accumulate adjacent to these facilities. Any future foundation and/or utility

trench backfill settlement around the perimeter of the building should be corrected to prevent ponding of water in the building and pavement areas. We recommend that plants and trees with significant moisture requirements not be located adjacent to the building.

Additional Considerations

The clay soils in the project area are prone to shrinkage and swelling with variations in moisture content. High plasticity soils such as fat clay generally have a greater potential for moisture induced volume change than less plastic materials such as lean clay. However, even lean clay can shrink and swell with variations in moisture levels. We recommend subgrades be constructed as recommended in this report and that close attention be paid to maintaining moisture levels in subgrades prior to installation of floor slabs and sidewalks; providing adequate surface drainage and keeping plants and trees well outside the area where they can adversely influence building performance.

The procedures recommended in this report may not eliminate all future subgrade volume change and resultant foundation and floor slab movement. However, the recommendations described in this report should reduce the potential for consolidation settlement, subgrade volume change and future building movements to reasonably uniform and tolerable levels. If minor floor movements and occasional cosmetic cracks are not tolerable, then other site preparation procedures would need to be implemented.

CONCLUSION AND LIMITATIONS

The authorized geotechnical engineering services have been completed. The resulting geotechnical recommendations included in this report provide a basis for development of earthwork, foundation, and floor slab and pavement subgrade designs for the proposed facility. We recommend that Allstate Consultants be retained to review the final project plans and specifications so that we can comment on and assist in the interpretation and implementation of our geotechnical recommendations.

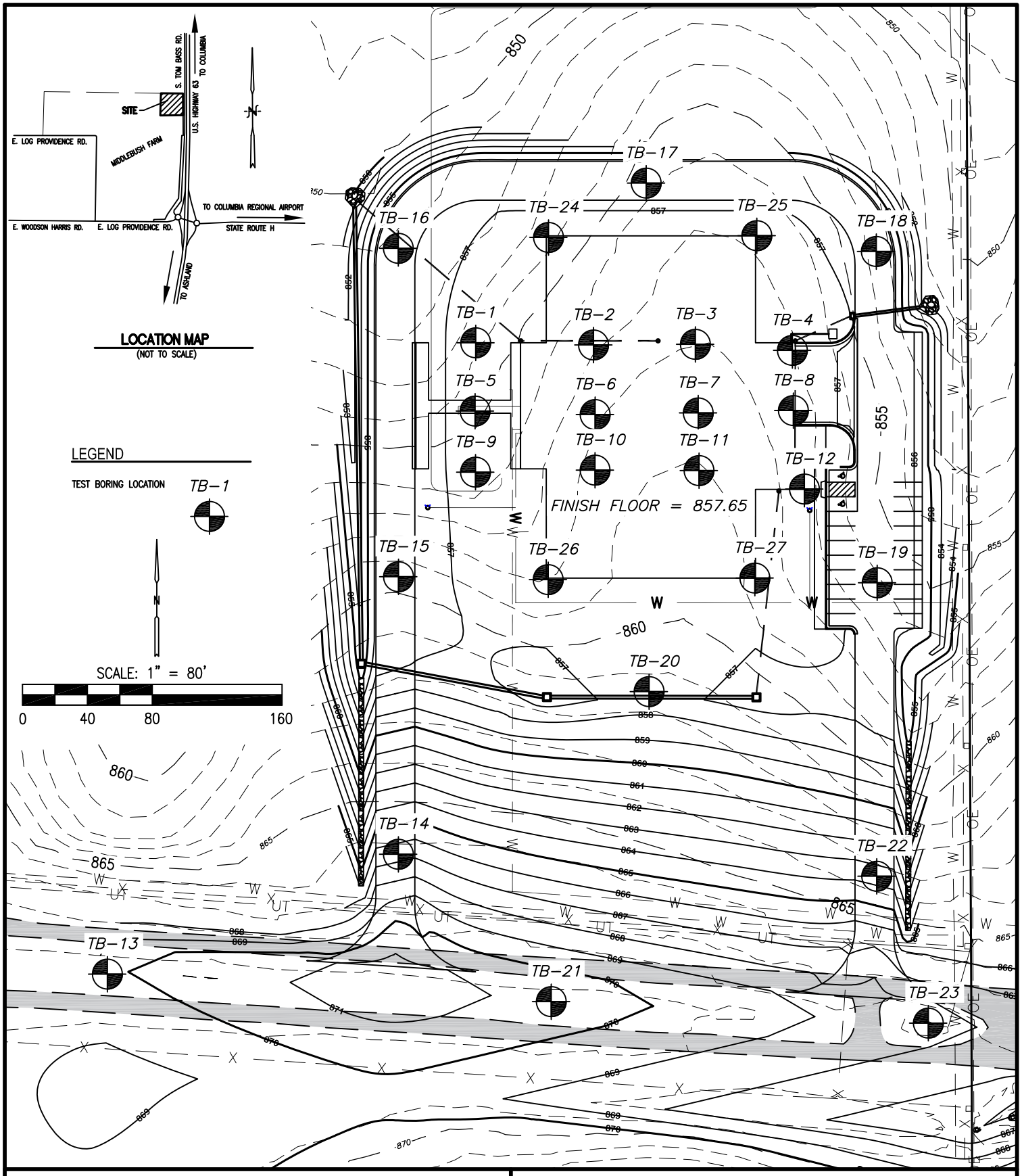
Allstate Consultants should be retained during construction of this project to provide geotechnical observation and testing services for earthwork, foundation, and floor slab construction.

The evaluations, analyses and recommendations provided in this report are based on the subsurface conditions encountered in the test borings performed at the locations indicated on the Test Boring Location Plan and from other information discussed in this report. Our geotechnical report does not consider variations that could occur between boring locations or changes that may occur due to the passage of time, the modifying effects of weather or adjacent construction activities. The character and extent of such

variations may not become evident until during or after construction. Should variations be identified, we should be notified immediately so that further evaluations and additional recommendations can be developed.

The scope of our geotechnical engineering services does not include either specifically or by implication any environmental evaluation of this site nor identification of contaminated or hazardous materials or conditions. Further, we have performed no assessment of the possible presence of bacteria or fungi nor the potential for development of problems associated with mold. If the Owner is concerned about the potential for such issues, other environmental studies should be performed.

This geotechnical report has been prepared for the exclusive use of our client for specific application to this project only and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either expressed or implied, are intended to be made. During construction, site safety, excavation support, and dewatering will be the responsibility of others. Should changes occur in the nature, design or location of the proposed building and pavement areas, as described in this report, the evaluations, recommendations and conclusions contained herein shall not be considered valid unless Allstate Consultants reviews the changes and provides written verification or modification of the conclusions of this report.



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TEST BORING LOCATION PLAN
PROPOSED MIDDLEBUSH FARM BUILDING AND PARKING LOT (CP191901)

BOONE COUNTY, MISSOURI

PROJECT NUMBER:	SCALE	DATE
20120.02	1"=80'	10–30–2020

TEST BORING LOG

BORING NO. 1

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 853.6		PL 10 20 30 40 50 60 LL		
						12" TOPSOIL				
	1	3ST	23	CH		**FAT CLAY,** Brown Mottled Tan,		PL 22.1 LL	95	3730
						3 Jointed, Stiff, CH 850.6		20 54		
	2	3ST	22	CL		**LEAN CLAY,** With Silt,		17.9	104	3940
5						5 Gray Mottled Tan, Stiff, CL 848.6				
	3	3ST	21	CH		**FAT CLAY,** Trace Sand,		26.5	98	1990
						Gray Mottled Tan, Jointed,				
						8 Medium, CH 845.6				
	4	3ST	23	CL		**LEAN CLAY,** With Sand,		17.9	111	3350
10						Yellow Brown Mottled Gray,				
						Stiff, CL				
						Grading Very Stiff to Hard				
15	5	SS	18	CL			3/6/6	17.4		*8000
						Grading Very Stiff				
20	6	SS	18	CL		20 833.6	3/6/6	17.9		*7500
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/26/2020
COMPLETED: 10/26/2020 **BORING NO. 1**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 2

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 856.7				
						12" TOPSOIL				
	1	SS	12	CL		**LEAN CLAY,** With Silt,	3/4/4	20.5		*9000+
						3 Gray, Hard, CL 853.7				
						FAT CLAY, Brown Mottled Tan,				
5	2	SS	14	CH		5 Very Stiff to Hard, CH 851.7	4/6/7	17.6		*8000
	3	SS	18	CH		**FAT CLAY,** Trace Sand,	2/3/4	25.7		*4500
						Gray Mottled Tan, Very Stiff, CH				
10	4	SS	18	CH			2/3/4	23.4		*5500
						12 844.7				
						LEAN CLAY,				
15	5	SS	18	CL		Trace Sand & Gravel,	3/3/4	19.3		*5500
						Yellow Brown Mottled Gray,				
						Very Stiff, CL				
20	6	SS	18	CL		20 836.7	3/5/7	18.2		*6000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/26/2020
COMPLETED: 10/26/2020 **BORING NO. 2**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 3

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 858.0				
						12" TOPSOIL				
	1	SS	14	CH		**FAT CLAY,** Brown Mottled Tan,	3/3/5	18.3		*6000
						3 Very Stiff, CH 855.0				
5	2	SS	18	CL		**LEAN CLAY,** Gray Mottled Tan, Very Stiff, CL	3/3/5	18.7		*6000
	3	SS	18	CL		Grading Stiff to Very Stiff	2/3/4	23.1		*4000
						8 850.0				
10	4	SS	18	CH		**FAT CLAY,** Trace Sand, Gray Mottled Tan, Very Stiff, CH	2/3/3	26.0		*4500
						13 845.0				
15	5	SS	16	CL		**LEAN CLAY,** With Sand, Trace Gravel, Yellow Brown Mottled Gray, Stiff, CL	2/3/2	22.4		*3000
	6	SS	13	CL		With Gravel, Yellow Brown Mottled Tan,	8/8/12	18.5		*6000
20						20 Very Stiff 838.0				
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 3**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 4

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION		SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation:	856.9				
						12" TOPSOIL					
	1	3ST	15	CH		**FAT CLAY,** Brown Mottled Tan, Jointed, Medium, CH	853.9		28.0	92	1860
5	2	3ST	15	CL		**LEAN CLAY,** Gray Mottled Tan, Very Stiff, CL	851.9		18.4	111	*5500
	3	3ST	23	CH		**FAT CLAY,** Trace Sand, Gray Mottled Tan, Jointed, Stiff, CH			21.2	106	3190
10	4	3ST	23	CH					24.8	99	3020
							843.9				
15	5	SS	18	CL		**LEAN CLAY,** With Sand, Trace Gravel, Yellow Brown Mottled Gray, Very Stiff, CL		3/3/6	20.7		*5500
20	6	SS	6	CL		Grading Medium to Stiff	836.9	4/6/7	17.7		*2000
						BOTTOM OF BORING AT 20 FT.					
25											
30											
35											

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 4**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 5

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 854.7				
						12" TOPSOIL				
	1	SS	6	CL		LEAN CLAY, Brown, Hard, CL	5/6/5	17.8		*9000+
						3 851.7				
5	2	SS	8	CH		FAT CLAY, Tan Mottled Gray, Very Stiff, CH 5 849.7	3/3/4	23.9		*6000
	3	SS	18	CH		FAT CLAY, Trace Sand, Gray Mottled Tan, Very Stiff, CH 8 846.7	3/3/4	22.7		*5000
10	4	SS	18	CL		LEAN CLAY, With Sand, Yellow Brown Mottled Gray, Very Stiff, CL	2/4/5	18.3		*7000
15	5	SS	18	CL		Grading Very Stiff to Hard	4/5/7	17.4		*8000
20	6	SS	18	CL		Grading Hard 20 834.7	4/6/7	17.5		*8500
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/26/2020
COMPLETED: 10/26/2020 **BORING NO. 5**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 6

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 857.8		PL — LL (10 20 30 40 50 60)		
						12" TOPSOIL				
	1	3ST	24	CL		**LEAN CLAY,** Brown Mottled Tan, 3 Jointed, Stiff CL — 854.8		PL 18.7, 19; LL 47	99	3970
	2	3ST	23	CL		**LEAN CLAY,** Gray Mottled Tan, 5 Very Stiff, CL — 852.8		PL 17.0, 17; LL 44	108	5370
5	3	3ST	18	CH		**FAT CLAY,** Trace Sand, Gray Mottled Tan, Jointed, Stiff, CH		22.0	104	3070
	4	3ST	22	CH		Grading Medium		28.1	96	1760
10						13 — 844.8				
	5	SS	18	CL		**LEAN CLAY,** With Sand, Yellow Brown Mottled Gray, Very Stiff, CL	3/3/5	20.1		*4500
15										
20	6	SS	18	CL		20 — 837.8	3/6/6	17.9		*7000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/26/2020
COMPLETED: 10/26/2020 **BORING NO. 6**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 7

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 858.5		PL — LL (10 20 30 40 50 60)		
						12" TOPSOIL				
	1	3ST	18	CH		**FAT CLAY,** With Organics,		PL 25 — 36.5 — LL 63	74	870
						3 Brown, Soft, CH 855.5				
5	2	3ST	20	CL		**LEAN CLAY,** Gray Mottled Tan, Stiff, CL		22.1	102	2210
	3	3ST	13	CL		Grading Medium		23.1	103	*1500
						8 850.5				
10	4	3ST	22	CH		**FAT CLAY,** Trace Silt, Gray, Soft, CH		31.5	90	990
						13 845.5				
15	5	SS	18	CL		**LEAN CLAY,** With Sand, Trace Gravel, Yellow Brown Mottled Gray, Very Stiff, CL	2/3/4	20.7		*4500
20	6	SS	18	CL		20 838.5	3/4/5	18.4		*6000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 7**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 8

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 857.4				
						12" TOPSOIL				
	1	SS	14	CH		FAT CLAY, Tan Mottled Orange,	1/3/4	26.6		*4500
						3 Very Stiff, CH 854.4				
5	2	SS	18	CL		LEAN CLAY, Tan Mottled Gray, Very Stiff, CL	2/4/6	19.7		*6500
	3	SS	18	CL		Grading Gray, Stiff	2/3/3	24.3		*2500
						8 849.4				
10	4	SS	18	CH		FAT CLAY, Trace Sand, Gray Mottled Tan, Stiff to Very Stiff, CH	2/2/4	24.6		*4000
						13 844.4				
15	5	SS	17	SC		CLAYEY SAND, Orange Tan, Loose to Medium Dense, SC	3/5/5	17.5		
	6	SS	18	SC		Grading Loose	2/4/3	22.2		
20						20 837.4 BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 8**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 9

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 855.2				
						12" TOPSOIL				
	1	3ST	24	CL		**LEAN CLAY,** Gray, Medium, CL		23.0	103	1950
	2	3ST	22	CL		Grading Dark Gray Mottled Brown, Stiff		22.6	101	2760
5	3	3ST	24	CL		Grading Gray Mottled Tan		23.0	102	3170
						8 847.2				
	4	3ST	22	CL		**LEAN CLAY,** With Sand, Yellow Brown Mottled Gray, Jointed, Stiff, CL		20.7	108	3670
10										
						Grading Very Stiff				
15	5	SS	17	CL		(Glacial Drift)	4/9/10	17.7		*7000
						Grading Yellow Brown Very Stiff to Hard				
20	6	SS	18	CL		20 835.2	7/9/15	17.0		*8000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC
DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/15/2020
COMPLETED: 10/15/2020 **BORING NO. 9**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 10

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 858.2				
						12" TOPSOIL				
	1	SS	17	CH		**FAT CLAY,** Tan Mottled Gray,	1/2/3	29.1		*2000
						3 Medium to Stiff, CH 855.2				
						LEAN CLAY,				
5	2	SS	15	CL		Gray Mottled Tan, Stiff, CL	2/3/5	22.2		*3500
						6 852.2				
	3	SS	18	CH		**FAT CLAY,** Trace Sand, Gray Mottled Tan, Stiff to Very Stiff, CH	2/3/4	23.5		*4000
10	4	SS	18	CH		Grading Stiff	2/2/3	24.7		*3500
						13 845.2				
15	5	SS	16	CL		**LEAN CLAY,** With Sand, Yellow Brown Mottled Gray, Very Stiff, CL	3/4/4	19.4		*5000
20	6	SS	18	CL		20 838.2	3/5/6	18.7		*6500
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 10**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 11

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 859.0				
						12" TOPSOIL				
	1	SS	14	CH		**FAT CLAY,** Brown Mottled Tan,	2/3/3	29.5		*4000
						3 Stiff to Very Stiff, CH 856.0				
5	2	SS	17	CL		**LEAN CLAY,** Gray Mottled Tan, Stiff, CL	3/4/4	20.7		*3500
	3	SS	18	CL			3/2/4	23.3		*3500
						8 851.0				
10	4	SS	18	CH		**FAT CLAY,** Trace Sand, Gray, Stiff to Very Stiff, CH	2/2/4	25.1		*4000
						13 846.0				
15	5	SS	18	CL		**LEAN CLAY,** With Sand, Yellow Brown, Very Stiff, CL	3/5/7	17.9		*7500
20	6	SS	18	CL		20 839.0	3/5/7	17.7		*7000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 11**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 12

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 857.2		PL — LL (10 20 30 40 50 60)		
						12" TOPSOIL				
	1	3ST	14	CL		**LEAN CLAY,** Brown Mottled Orange,		PL 24, 29.0, LL 48	94	1250
						3 Medium, CL 854.2				
	2	3ST	16	CH		**FAT CLAY,**		PL 19, 28.4, LL 62	97	*3500
5						5 Gray Mottled Tan, Stiff, CH 852.2				
	3	3ST	17	CL		**LEAN CLAY,** Trace Silt, Gray, Stiff, CL		19.9	108	3360
						8 849.2				
	4	3ST	22	CH		**FAT CLAY,** Gray Mottled Tan, Stiff, CH		23.6	102	2610
10						13 844.2				
	5	SS	18	CL		**LEAN CLAY,** With Sand, Trace Gravel, Yellow Brown Mottled Gray, Very Stiff, CL	3/3/5	19.1		*5500
15										
	6	SS	17	CL		20 837.2	3/5/7	17.2		*6500
20						**BOTTOM OF BORING AT 20 FT.**				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/28/2020
COMPLETED: 10/28/2020 **BORING NO. 12**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 13

PROJECT: Proposed Middlebush Farm Building (CP191901)

CLIENT: The University of Missouri

SITE LOCATION: Tom Bass Road, Boone County, MO

PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 869.9				
						12" TOPSOIL				
	1	SS	13	CL		**LEAN CLAY,**	4/7/8	● 16.3		*9000+
						3 Brown, Hard, CL 866.9				
						FAT CLAY, Gray Mottled Tan,				
5	2	SS	13	CH		5 Very Stiff, CH 864.9	3/3/4	● 26.4		*6000
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC

DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS

DEPTH WATER FIRST ENCOUNTERED: NONE ▽

DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼

DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC

BORING **COLUMBIA, MISSOURI**

STARTED: 10/15/2020

COMPLETED: 10/15/2020 **BORING NO. 13**

LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 14

PROJECT: Proposed Middlebush Farm Building (CP191901)

CLIENT: The University of Missouri

SITE LOCATION: Tom Bass Road, Boone County, MO

PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 866.2				
						12" TOPSOIL				
	1	SS	9	CH		**FAT CLAY,** Tan Mottled Gray,	4/5/7	● 23.7		*9000+
						3 Hard, CH 863.2				
						LEAN CLAY, Gray Mottled Tan,				
5	2	SS	18	CL		5 Very Stiff, CL 861.2	4/5/7	● 23.7		*5000
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC

DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS

DEPTH WATER FIRST ENCOUNTERED: NONE ▽

DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼

DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC

BORING **COLUMBIA, MISSOURI**

STARTED: 10/15/2020

COMPLETED: 10/15/2020 **BORING NO. 14**

LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 15

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 859.4				
						12" TOPSOIL				
	1	SS	9	CH		**FAT CLAY,** Trace Silt,	5/6/10	19.0		*9000+
						3 Tan Mottled Brown, Hard, CH 856.4				
						LEAN CLAY, Gray Mottled Tan,				
5	2	SS	15	CL		5 Very Stiff, CL 854.4	7/7/9	18.0		*7500
						BOTTOM OF BORING AT 5 FT.				

10 15 20 25 30 35

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC
DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/15/2020
COMPLETED: 10/15/2020 **BORING NO. 15**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 16

PROJECT: Proposed Middlebush Farm Building (CP191901)

CLIENT: The University of Missouri

SITE LOCATION: Tom Bass Road, Boone County, MO

PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 851.1				
						12" TOPSOIL				
	1	SS	12	CL		**LEAN CLAY,** Brown Mottled Tan,	2/5/6	● 21.8		*5000
						3 Very Stiff, CL 848.1				
						FAT CLAY, Gray Mottled Tan,				
5	2	SS	12	CH		5 Very Stiff, CH 846.1	3/3/5	● 22.4		*5500
						BOTTOM OF BORING AT 5 FT.				

10 15 20 25 30 35

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC

DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS

DEPTH WATER FIRST ENCOUNTERED: NONE ▽

DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼

DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC

BORING **COLUMBIA, MISSOURI**

STARTED: 10/15/2020

COMPLETED: 10/15/2020 **BORING NO. 16**

LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 17

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 855.6				
						12" TOPSOIL				
	1	SS	6	CH		FAT CLAY, Brown, Very Stiff, CH	3/3/5	● 23.8		*9000
						3 852.6				
5	2	SS	18	CL		LEAN CLAY, Gray Mottled Orange, Very Stiff, CL 5 850.6	3/3/4	● 22.1		*5500
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 17**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 18

PROJECT: Proposed Middlebush Farm Building (CP191901)

CLIENT: The University of Missouri

SITE LOCATION: Tom Bass Road, Boone County, MO

PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 853.5				
						12" TOPSOIL				
	1	SS	8	CH		FAT CLAY, Brown Mottled Tan,	3/4/5	20.2		*9000
						3 Hard, CH 850.5				
						LEAN CLAY, Gray Mottled Tan,				
5	2	SS	15	CL		5 Very Stiff to Hard, CL 848.5	3/4/5	17.5		*8000
						BOTTOM OF BORING AT 5 FT.				

10 15 20 25 30 35

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.

DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS

DEPTH WATER FIRST ENCOUNTERED: NONE ▽

DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼

DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC

BORING **COLUMBIA, MISSOURI**

STARTED: 10/28/2020

COMPLETED: 10/28/2020 **BORING NO. 18**

LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 19

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 856.0				
						12" TOPSOIL				
	1	SS	4	CL		LEAN CLAY, Gray, Stiff, CL	3/3/3			*3000
						Grading Gray Mottled Tan,				
5	2	SS	13	CL		5 Very Stiff 851.0	2/3/4	20.1		*5000
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/28/2020
COMPLETED: 10/28/2020 **BORING NO. 19**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 20

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 861.3				
						12" TOPSOIL				
	1	SS	12	CH		FAT CLAY, Gray Mottled Orange,	3/3/5	25.6		*7500
						3 Very Stiff, CH 858.3				
						LEAN CLAY, Gray Mottled Tan,				
5	2	SS	16	CL		5 Very Stiff, CL 856.3	3/3/6	21.8		*5500
						BOTTOM OF BORING AT 5 FT.				

10 15 20 25 30 35

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 20**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 21

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 869.5				
						12" TOPSOIL				
	1	SS	8	CL		LEAN CLAY, Brown, Hard, CL	5/5/8	18.7		*9000+
						With Silt,				
5	2	SS	14	CL		5 Gray Mottled Brown 864.5	9/12/13	18.0		*9000+
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC
DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/15/2020
COMPLETED: 10/15/2020 **BORING NO. 21**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 22

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 863.4				
						12" TOPSOIL				
	1	SS	12	CH		**FAT CLAY,** Tan Mottled Orange,	4/5/9	● 21.9		*9000+
						3 Hard, CH 860.4				
						LEAN CLAY, Gray Mottled Orange,				
5	2	SS	18	CL		5 Very Stiff, CL 858.4	2/3/5	● 21.2		*5500
						BOTTOM OF BORING AT 5 FT.				
10										
15										
20										
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/28/2020
COMPLETED: 10/28/2020 **BORING NO. 22**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 23

PROJECT: Proposed Middlebush Farm Building (CP191901)

CLIENT: The University of Missouri

SITE LOCATION: Tom Bass Road, Boone County, MO

PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 869.3				
						12" TOPSOIL				
	1	SS	10	CL		LEAN CLAY,	3/4/5	19.4		*5500
						3 Brown, Very Stiff, CL 866.3				
						FAT CLAY, Gray Mottled Orange,				
5	2	SS	17	CH		5 Very Stiff, CH 864.3	4/8/10	23.2		*6500
						BOTTOM OF BORING AT 5 FT.				

10 15 20 25 30 35

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: ALLSTATE CONSULTANTS LLC

DRILLING METHOD: MOBILE B47 WITH 7" HOLLOW STEM AUGERS

DEPTH WATER FIRST ENCOUNTERED: NONE ▽

DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼

DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC

BORING **COLUMBIA, MISSOURI**

STARTED: 10/15/2020

COMPLETED: 10/15/2020 **BORING NO. 23**

LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 24

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 853.5				
						12" TOPSOIL				
	1	SS	7	CH		**FAT CLAY,** Brown, Hard, CH	4/6/5	20.3		*9000+
						3 850.5				
						LEAN CLAY, Trace Silt, Gray, Hard, CL				
5	2	SS	18	CL		5 848.5	2/5/6	19.9		*8500
						FAT CLAY, Trace Sand,				
	3	SS	18	CH		Gray Mottled Tan, Very Stiff, CH	3/2/4	21.4		*6000
						8 845.5				
						LEAN CLAY, With Sand,				
10	4	SS	18	CL		Yellow Brown Mottled Gray,	2/4/5	20.8		*8000
						Very Stiff to Hard, CL				
15	5	SS	18	CL			3/4/5	17.4		*8000
20	6	SS	18	CL		20 833.5	3/6/7	17.7		*8000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/26/2020
COMPLETED: 10/26/2020 **BORING NO. 24**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG
BORING NO. 25

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 856.6				
						12" TOPSOIL				
	1	SS	12	CH		FAT CLAY, Tan Mottled Gray,	3/5/6	26.2		*8500
						3 Hard, CH 853.6				
5	2	SS	13	CL		LEAN CLAY, Gray Mottled Tan, Stiff, CL	3/3/4	21.0		*3500
	3	SS	18	CL		Grading Very Stiff	3/3/5	20.4		*5500
						8 848.6				
10	4	SS	18	CH		FAT CLAY, Trace Sand, Gray Mottled Tan, Very Stiff, CH	2/3/5	21.7		*5000
						13 843.6				
15	5	SS	18	CL		LEAN CLAY, With Sand, Yellow Brown, Very Stiff, CL	2/5/6	19.0		*6500
	6	SS	18	CL		Grading Stiff	3/6/8	17.1		*3500
20						20 836.6				
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 25**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 26

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 857.9				
						12" TOPSOIL				
	1	SS	12	CL		**LEAN CLAY,** Brown, Very Stiff, CL	3/4/4	18.4		*4500
						3 854.9				
						FAT CLAY, Gray Mottled Tan,				
5	2	SS	18	CH		5 Medium to Stiff, CH 852.9	3/3/5	25.8		*2000
	3	SS	18	CL		**LEAN CLAY,** Tan Mottled Gray,	3/3/4	24.1		*4500
						8 Very Stiff, CL 849.9				
						FAT CLAY, Trace Sand,				
10	4	SS	18	CH		Stiff to Very Stiff, CH	3/3/5	23.8		*4000
						13 844.9				
						LEAN CLAY,				
15	5	SS	17	CL		Trace Sand & Gravel,	2/4/6	19.6		*5500
						Yellow Brown Mottled Gray,				
						Very Stiff, CL				
						Grading Hard				
20	6	SS	18	CL		20 837.9	3/7/8	17.3		*9000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/27/2020
COMPLETED: 10/27/2020 **BORING NO. 26**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG

BORING NO. 27

PROJECT: Proposed Middlebush Farm Building (CP191901)
CLIENT: The University of Missouri
SITE LOCATION: Tom Bass Road, Boone County, MO
PROJECT NO: 20120.02

ALLSTATE CONSULTANTS

DEPTH (feet)	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES RECOVERY (inches)	USCS SYMBOL	GRAPHICAL SYMBOL	MATERIAL DESCRIPTION	SPT BLOW COUNTS (Blows/6")	PLASTIC LIMIT / FIELD WATER CONTENT / LIQUID LIMIT (PL, LL; 10 20 30 40 50 60)	DRY UNIT WEIGHT pcf	UNCONFINED COMPRESSIVE STRENGTH psf
						Approx. Surface Elevation: 858.5				
						12" TOPSOIL				
	1	SS	9	CH		**FAT CLAY,** Tan Mottled Orange,	3/4/5	20.9		*6000
						3 Very Stiff, CH 855.5				
						LEAN CLAY,				
5	2	SS	16	CL		Gray Mottled Tan,	3/5/6	19.5		*7500
						Very Stiff, CL				
	3	SS	18	CL		Grading Stiff to Very Stiff	2/3/3	22.0		*4000
						8 850.5				
						FAT CLAY, Trace Sand,				
10	4	SS	18	CH		Tan Mottled Gray,	2/2/4	24.5		*4000
						Stiff to Very Stiff, CH				
						13 845.5				
						LEAN CLAY, With Sand,				
15	5	SS	18	CL		Yellow Brown Mottled Gray,	3/4/5	19.8		*6500
						Very Stiff, CL				
20	6	SS	17	CL		20 838.5	2/5/7	17.8		*7000
						BOTTOM OF BORING AT 20 FT.				
25										
30										
35										

Note: Stratification lines represent approximate boundaries between soil and rock types. In-situ, the transition between strata may be gradual. Rock types based on visual classification. Petrographic analysis may indicate other rock types. * Based on Calibrated Hand Penetrometer.

DRILLING CONTRACTOR: PALMERTON & PARRISH, INC.
DRILLING METHOD: CME 550 WITH 4.25" I.D. HOLLOW STEM AUGERS
DEPTH WATER FIRST ENCOUNTERED: NONE ▽
DEPTH TO WATER AFTER BORING COMPLETION (AB): NONE ▼
DEPTH TO WATER HOURS AFTER BORING COMPLETION: ▼

ALLSTATE CONSULTANTS, LLC
BORING **COLUMBIA, MISSOURI**
STARTED: 10/28/2020
COMPLETED: 10/28/2020 **BORING NO. 27**
LOG APPROVED BY: CCM **PAGE 1 OF 1**

TEST BORING LOG NOTES

SAMPLE TYPE

3ST	SHELBY TUBE SAMPLE – Obtained by pushing a standard 3 inch OD thin-walled tube sampler using the hydraulic stroke of the drilling rig.
S S	SPLIT-SPOON SAMPLE – Obtained by driving a standard 2 inch OD by 1 3/8 inch ID split-barrel sampler during performance of a Standard Penetration Test (SPT).
C S	CONTINUOUS SAMPLE - Obtained by inserting a 3 inch OD by 2 ¼ ID continuous split-barrel sampler into the lead section of a hollow stem auger string and advancing the sampler with the hollow stem auger as the auger penetrates into the underlying soil.
N X	ROCK CORE SAMPLE - Obtained by coring the rock with an NX size core barrel and diamond bit. The NX size core is approximately 2 1/8 inches in diameter. An NQ size core is approximately 2 inches in diameter.

SOIL AND ROCK DESCRIPTIONS AND CLASSIFICATION

Soil samples are described and classified in general accordance with the Unified Soil Classification System (USCS) using visual-manual procedures. All USCS Group Letter Symbols and Group Names are based on visual-manual estimates except where accompanied by results of Atterberg limits tests and grain size analyses. A brief description of the USCS is attached.

Fine-grained soils are also described in terms of their consistency and coarse-grained soils in terms of their in-place relative density. For fine-grained soils, the consistency is based on the unconfined compressive strength (Table 1). For coarse-grained soils the relative density is related to the N value determined from the Standard Penetration Test (Table 2).

Rock strata penetrated by flight augers or rock bits and intermittently sampled with a split-barrel sampler are described and classified based on drilling performance and visual observation of disturbed samples. Rock cores may reveal other rock types.

Rock core samples, obtained with a core barrel and diamond bit, are visually described and classified based on lithology, bedding, structure, degree of weathering, and hardness. All rock descriptions and classifications are based on visual observations. Petrographic analyses may indicate other rock types. Rock core recovery is expressed as the ratio of the length of core recovered to the length of the core run. Rock Quality Designation (RQD) is the ratio of the total length of the pieces of core that are hard, sound and 4 inches or longer to the length of the core run. Both core recovery and RQD are expressed as a percentage.

Soil and rock strata, delineated on the boring log, represent the geotechnical engineer's interpretation of subsurface conditions at the boring location. The interpretation is developed from the field boring log with modifications based on the laboratory test results and visual observations of the soil and rock samples. Graphical symbols depicting the soil and rock strata are shown on the boring logs for illustrative purposes. Different soil or rock types could be present between samples. A legend relating the graphical symbols to the USCS Group Letter Symbols and Group Names and the principal rock types encountered in the project area is attached. Stratification lines shown on the boring logs represent approximate boundaries between the various soil and rock types. In-situ, the transition between the soil and rock strata may be gradual.

STANDARD PENETRATION TEST

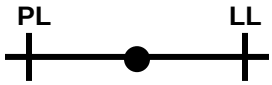
A standard split-barrel sampler (2 inch OD by 1 3/8 inch ID) is driven 18 inches into the soil by a 140 pound hammer repeatedly dropped from a height of 30 inches. The hammer blows are recorded for each 6 inches of penetration and the penetration resistance or N Value is considered the number of blows required for the final 12 inches of sampler penetration. Blows per 6 inch interval are recorded as 8/18/23 etc. under the Test Boring Log heading *SPT Blow Counts*. Where the sampler penetrated less than 6 inches under 50 hammer blows for one of the intervals, the results are recorded as 8/18/50-3".

LABORATORY TEST RESULTS AND SYMBOLS

PLASTIC LIMIT (PL) - Water content at which a soil will just begin to crumble when rolled into a thread approximately 1/8 inch in diameter. Generally represents the water content below which the soil develops cracks upon significant deformation.

LIQUID LIMIT (LL) - Water content at which a pat of soil, cut by a groove of standard dimensions, will flow together for a distance of ½ inch under the impact of 25 blows in a standard liquid limit apparatus. Generally represents the water content above which the soil is in suspension and has minimal shear strength.

FIELD WATER CONTENT - Water content of the soil or rock at depth indicated at time of exploration. The water content may fluctuate with seasonal and climatological conditions and may be altered by excavation, exposure and other construction activities or by conditions not apparent during exploration.



- Relationship between plastic limit (PL), field water content, and liquid limit (LL). The plasticity index, (PI), is the difference between the liquid and plastic limits. In general, the higher the liquid limit and PI, the more a soil is inherently prone to volume change. However, soils with lower liquid limits and PI's can also experience volume change.

Soils having field water contents approaching the liquid limit typically have low shear strength and high compressibility. Soils having water contents near the plastic limit typically have higher shear strength and lower compressibility.

UNCONFINED COMPRESSIVE STRENGTH _ The load per unit area at which an unconfined cylindrical specimen of soil will fail in a simple, quick compression test without lateral support. Expressed in pounds per square foot on the boring log.

* Indicates unconfined compressive strength estimated using a calibrated hand penetrometer.

TABLE 1

CONSISTENCY OF FINE-GRAINED SOILS

UNCONFINED COMPRESSIVE STRENGTH, Qu, psf	CONSISTENCY
Less than 500 psf	Very Soft
500 - 1,000	Soft
1,000 - 2,000	Medium
2,000 - 4,000	Stiff
4,000 - 8,000	Very Stiff
Above - 8,000	Hard

TABLE 2

RELATIVE DENSITY OF COARSE-GRAINED SOILS

SPT N VALUE Blows/ft.	RELATIVE DENSITY
0 - 4	Very Loose
4 - 10	Loose
10 - 30	Medium Dense
30 - 50	Dense
Above 50	Very Dense

TABLE 3

ROCK QUALITY DESIGNATION RQD

RQD (%)	ROCK QUALITY
0 - 25	Very Poor
25 - 50	Poor
50 - 75	Fair
75 - 90	Good
90 – 100	Excellent

WATER LEVEL SYMBOLS AND OBSERVATIONS:

WS or WD - Borehole water level observation *While Sampling* or *While Drilling* - ▽ WCI - *Wet Cave In*

AB - Borehole water level observation *After Boring* completion - ▼ DCI - *Dry Cave In*

24 Hrs AB – Water level observation *24 Hrs After Boring* completion - ▼
or other such time as recorded on the boring log.

Borehole water level measurements were made at the times and under the conditions indicated on the boring logs. Groundwater levels may vary across the site and will fluctuate with seasonal and climatological conditions. Groundwater levels may also be altered by site grading and/or other construction activities. Borehole water level measurements in highly pervious soils may represent groundwater conditions in these units at the time of the observations. In semi-pervious and fine-grained soils, short term water level measurements in borings may not represent actual groundwater conditions. Long term observations of piezometers, screened in the hydrologic units of interest, and sealed from the influence of surface water are typically required to evaluate groundwater conditions and fluctuations in groundwater levels in low permeability soils.

SOIL AND ROCK SYMBOLS FOR BORING LOGS

SOIL SYMBOLS

GRAPHICAL SYMBOL	USCS Group Symbol	USCS Group Name
	GW	Well–graded gravel
	GP	Poorly graded gravel
	GM	Silty gravel
	GC	Clayey gravel
	SW	Well–graded sand
	SP	Poorly graded sand
	SM	Silty sand
	SC	Clayey sand
	CL	Lean clay
	ML	Silt
	CL–ML	Silty Clay
	OL	Organic clay / Organic silt
	CH	Fat clay
	MH	Elastic silt
	OH	Organic clay / Organic silt
	PT	Peat

ROCK SYMBOLS

GRAPHICAL SYMBOL	MAJOR ROCK TYPE
	SILTSTONE
	SHALE
	SANDSTONE
	LIMESTONE
	DOLOMITE
	COAL
	UNDERCLAY
	CLAYSTONE

OTHER SYMBOLS

CL Lean Clay, with Sand and Gravel (Glacial Drift)

CH Fat Clay, with Sand and Gravel (Glacial Drift)

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UNIFIED SOIL CLASSIFICATION SYSTEM

Soil Classification Chart

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests[A]				Soil Classification	
				Group Symbol	Group Name
COARSE-GRAINED SOILS More than 50% retained on No. 200 sieve	**Gravels** More than 50% of coarse fraction retained on No. 4 sieve	Clean Gravels Less than 5% fines[C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$[E]	GW	Well-graded gravel[F]
			$Cu < 4$ and/or $1 > Cc > 3$[E]	GP	Poorly graded gravel[F]
		Gravels with Fines More than 12% fines[C]	Fines classify as ML or MH	GM	Silty gravel[F,G,H]
			Fines classify as CL or CH	GC	Clayey gravel[F,G,H]
	Sands 50% or more of coarse fraction passes No. 4 sieve	Clean Sands Less than 5% fines[D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$[E]	SW	Well-graded sand[I]
			$Cu < 6$ and/or $1 > Cc > 3$[E]	SP	Poorly graded sand[I]
		Sands with Fines More than 12% fines[D]	Fines classify as ML or MH	SM	Silty sand[G,H,I]
			Fines classify as CL or CH	SC	Clayey sand[G,H,I]
FINE-GRAINED SOILS 50% or more passes the No. 200 sieve	**Silts and Clays Liquid limit less than 50**	inorganic	PI > 7 and plots on or above "A" line[J]	CL	Lean clay[K,L,M]
			PI < 4 or plots below "A" line[J]	ML	Silt[K,L,M]
		organic	Liquid limit – oven dried / Liquid limit – not dried < 0.75	OL	Organic clay[K,L,M,N] / Organic silt[K,L,M,O]
	Silts and Clays Liquid limit 50 or more	inorganic	PI plots on or above "A" line	CH	Fat clay[K,L,M]
			PI plots below "A" line	MH	Elastic silt[K,L,M]
		organic	Liquid limit – oven dried / Liquid limit – not dried < 0.75	OH	Organic clay[K,L,M,P] / Organic silt[K,L,M,Q]
HIGHLY ORGANIC SOILS		Primarily organic matter, dark in color, and organic odor		PT	Peat

Footnotes

[A] Based on the material passing the 3-in. (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols:
GW-GM well-graded gravel with silt
GW-GC well-graded gravel with clay
GP-GM poorly graded gravel with silt
GP-GC poorly graded gravel with clay

[D] Sands with 5 to 12% fines require dual symbols:
SW-SM well-graded sand with silt
SW-SC well-graded sand with clay
SP-SM poorly graded sand with silt
SP-SC poorly graded sand with clay

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains $\geq$ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains $\geq$ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in hatched area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains $\geq$ 30% plus No. 200, predominantly sand, add "sandy" to group name.

[M] If soil contains $\geq$ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI $\geq$ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.

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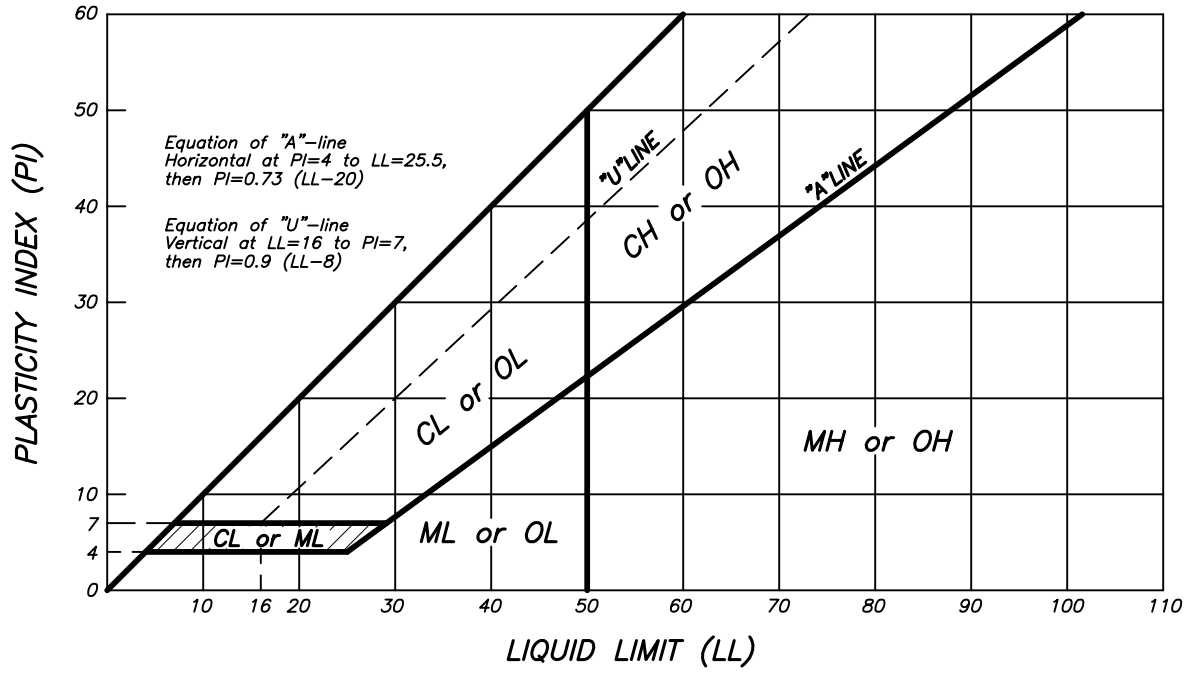
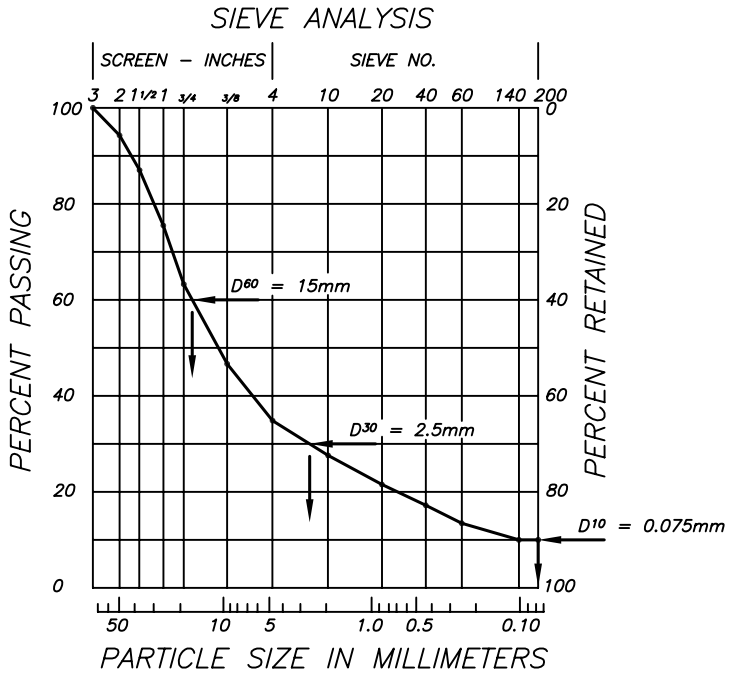
UNIFIED SOIL CLASSIFICATION SYSTEM



PLASTICITY CHART FOR CLASSIFICATION OF FINE–GRAINED SOILS AND FINE–GRAINED FRACTION OF COARSE–GRAINED SOILS.



$$Cu = \frac{D_{60}}{D_{10}} = \frac{15}{0.075} = 200$$

$$Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}} = \frac{(2.5)^2}{0.075 \times 15} = 5.6$$

Cumulative Particle–Size Plot

FOR CLASSIFICATION OF COARSE–GRAINED SOILS WITH 12% OR LESS FINES.

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LABORATORY SWELL TEST REPORT

Allstate Consultants, LLC
3312 LeMone Industrial Blvd.
Columbia, Missouri 65201
(573) 875-8799

ALLSTATE CONSULTANTS

Client: University of Missouri
Project: Proposed Middlebush Farms Building and Parking Lot (CP191901)
Location: Tom Bass Road, Columbia, MO

Report Date: November 10, 2020
Project No.: 20120.02

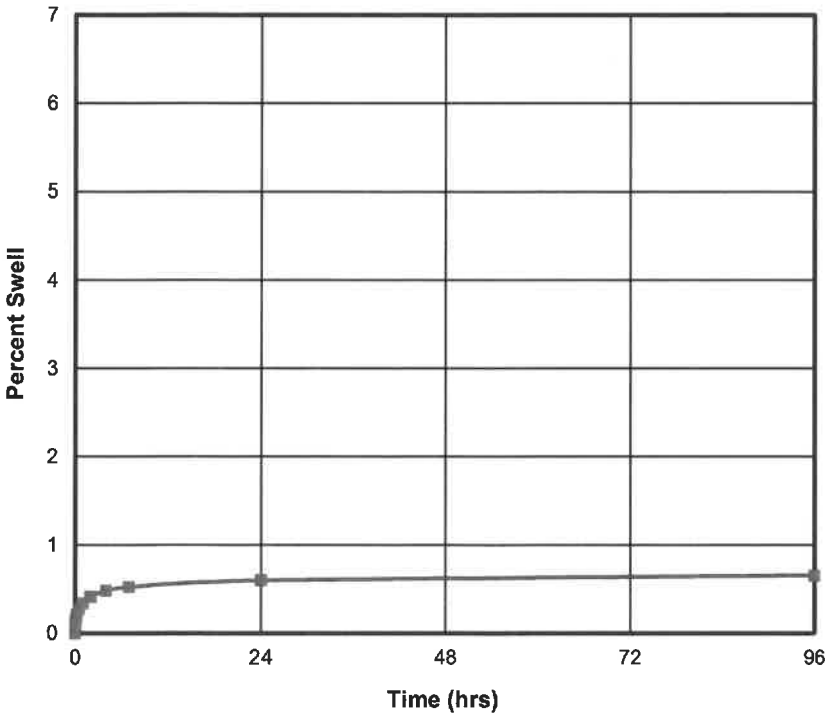
MATERIAL INFORMATION

Boring No.: TB-1 **Date:** November 5, 2020
Sample No.: ST-1
Depth: 1' - 3'
Description: FAT CLAY, With Roots, Trace Gravel, Gray Mottled Brown, Hard, CH

TEST INFORMATION

Test Method: ASTM D 4546
Test Procedure: Method B (Modified)
Sample Preparation: Undisturbed

LABORATORY TEST RESULTS



SWELL
0.7 %
SURCHARGE PRESSURE
750 PSF

Sample Diameter (in):	2.48
Sample Height (in):	0.93
Initial Moisture Content (%):	21.5
Initial Dry Density (pcf):	104.7
Final Moisture Content (%):	26.0
Final Dry Density (pcf);	105.5

Atterberg Limits

Liquid limit:	(LL)	54
Plastic limit:	(PL)	20
Plasticity Index:	(PI)	34

USCS Classification
Group Symbol: CH

Comments:

Reviewed by:

Cassidy Mathews, P.E.
Geotechnical Manager

LABORATORY SWELL TEST REPORT

Allstate Consultants, LLC
3312 LeMone Industrial Blvd.
Columbia, Missouri 65201
(573) 875-8799

ALLSTATE CONSULTANTS

Client: University of Missouri
Project: Proposed Middlebush Farms Building and Parking Lot (CP191901)
Location: Tom Bass Road, Columbia, MO

Report Date: November 9, 2020
Project No.: 20120.02

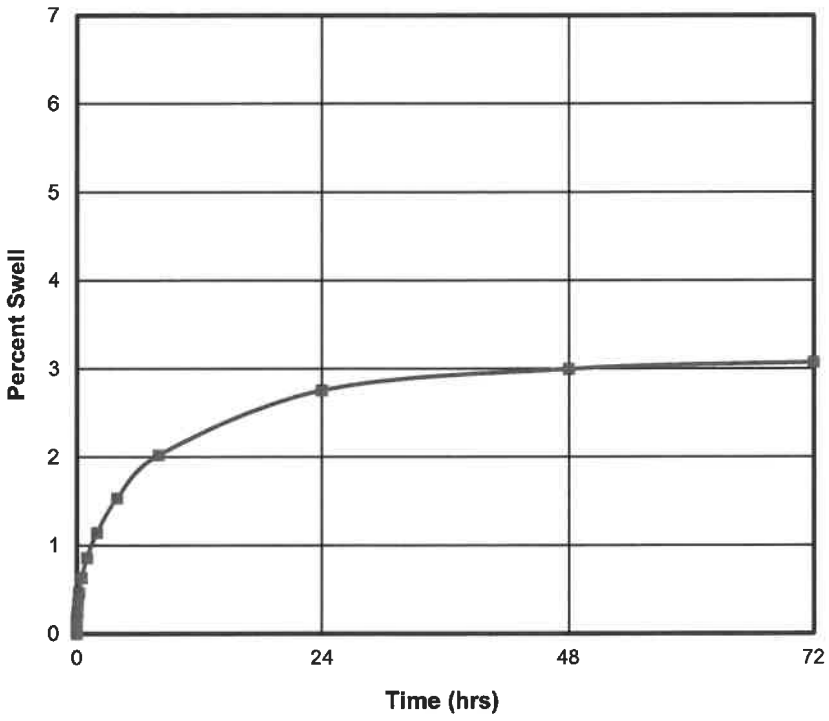
MATERIAL INFORMATION

Boring No.: TB-6
Sample No.: ST-1
Depth: 1' - 3'
Date: November 3, 2020
Description: LEAN CLAY, Trace Roots, Trace Gravel, Gray Mottled Tan, Hard, CL

TEST INFORMATION

Test Method: ASTM D 4546
Test Procedure: Method B (Modified)
Sample Preparation: Undisturbed

LABORATORY TEST RESULTS



SWELL
3.1 %
SURCHARGE PRESSURE
125 PSF

Sample Diameter (in):	2.49
Sample Height (in):	0.95
Initial Moisture Content (%):	16.6
Initial Dry Density (pcf):	115.0
Final Moisture Content (%):	20.8
Final Dry Density (pcf);	111.7

Atterberg Limits

Liquid limit:	(LL)	47
Plastic limit:	(PL)	19
Plasticity Index:	(PI)	28

USCS Classification
Group Symbol: CL

Comments:

Reviewed by:

Cassidy Mathews, P.E.
Geotechnical Manager

LABORATORY SWELL TEST REPORT

Allstate Consultants, LLC
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ALLSTATE CONSULTANTS

Client:	University of Missouri	**Report Date:**	November 6, 2020
Project:	Proposed Middlebush Farms Building and Parking Lot (CP191901)	**Project No.:**	20120.02
Location:	Tom Bass Road, Columbia, MO		

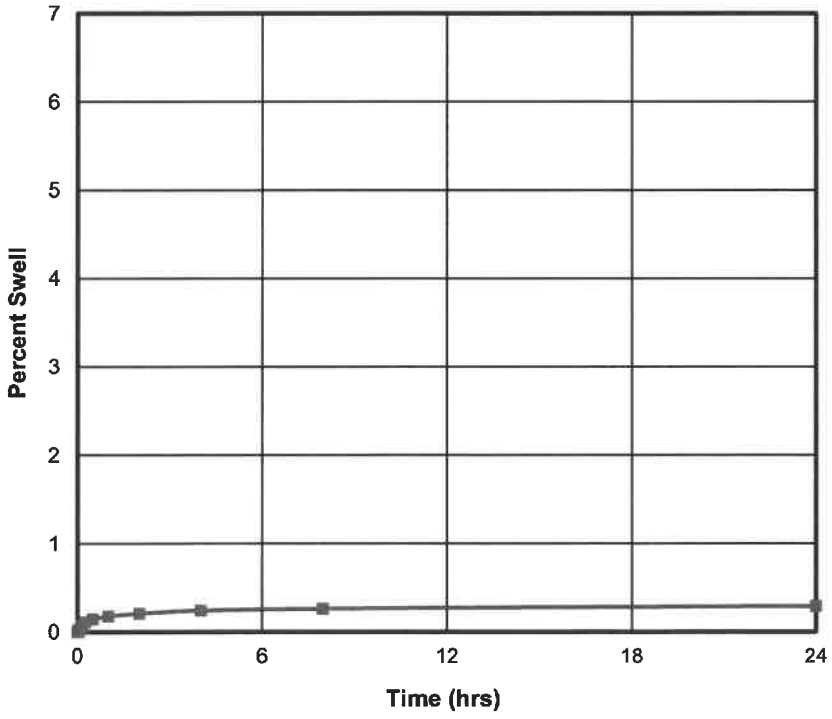
MATERIAL INFORMATION

Boring No.:	TB-6	**Date:**	November 3, 2020
Sample No.:	ST-2		
Depth:	3' - 5'		
Description:	LEAN CLAY, Trace Roots, Trace Gravel, Gray Mottled Tan, Hard, CL		

TEST INFORMATION

Test Method:	ASTM D 4546
Test Procedure:	Method B (Modified)
Sample Preparation:	Undisturbed

LABORATORY TEST RESULTS



SWELL
0.3 %
SURCHARGE PRESSURE
500 PSF

Sample Diameter (in):	2.49
Sample Height (in):	0.92
Initial Moisture Content (%):	17.4
Initial Dry Density (pcf):	117.6
Final Moisture Content (%):	19.0
Final Dry Density (pcf);	118.2

Atterberg Limits

Liquid limit:	(LL)	44
Plastic limit:	(PL)	17
Plasticity Index:	(PI)	27

USCS Classification
Group Symbol: CL

Comments:

Reviewed by:

Cassidy Mathews, P.E.
Geotechnical Manager

LABORATORY SWELL TEST REPORT

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ALLSTATE CONSULTANTS

Client: University of Missouri
Project: Proposed Middlebush Farms Building and Parking Lot (CP191901)
Location: Tom Bass Road, Columbia, MO

Report Date: November 9, 2020
Project No.: 20120.02

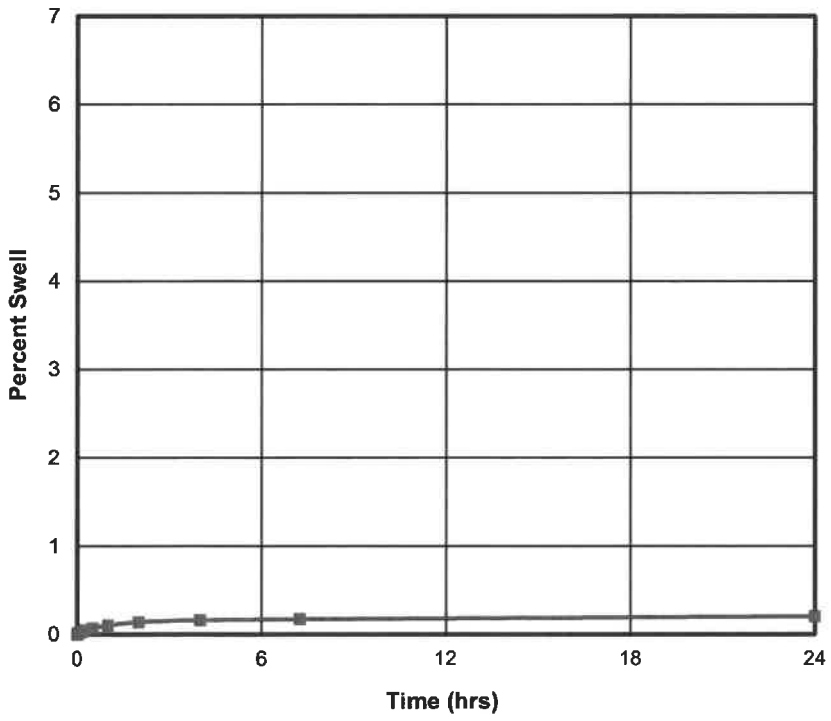
MATERIAL INFORMATION

Boring No.: TB-7
Sample No.: ST-1
Depth: 1' - 3'
Date: November 3, 2020
Description: FAT CLAY, Trace Roots, Brown Mottled Gray, Stiff, CH

TEST INFORMATION

Test Method: ASTM D 4546
Test Procedure: Method B (Modified)
Sample Preparation: Undisturbed

LABORATORY TEST RESULTS



SWELL
0.2 %
SURCHARGE PRESSURE
125 PSF

Sample Diameter (in):	2.48
Sample Height (in):	0.93
Initial Moisture Content (%):	29.5
Initial Dry Density (pcf):	95.8
Final Moisture Content (%):	31.4
Final Dry Density (pcf);	96.0

Atterberg Limits

Liquid limit:	(LL)	63
Plastic limit:	(PL)	25
Plasticity Index:	(PI)	38

USCS Classification
Group Symbol: CH

Comments:

Reviewed by:

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LABORATORY SWELL TEST REPORT

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ALLSTATE CONSULTANTS

Client: University of Missouri
Project: Proposed Middlebush Farms Building and Parking Lot (CP191901)
Location: Tom Bass Road, Columbia, MO

Report Date: November 9, 2020
Project No.: 20120.02

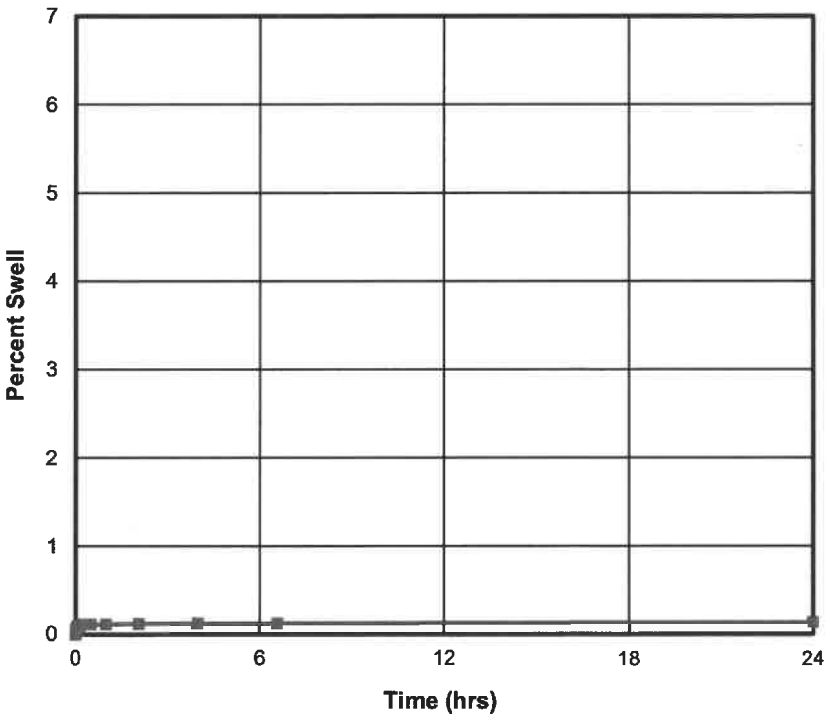
MATERIAL INFORMATION

Boring No.: TB-12
Sample No.: ST-1
Depth: 1' - 3'
Date: November 3, 2020
Description: LEAN CLAY,With Roots, Brown Mottled Gray, Stiff, CL

TEST INFORMATION

Test Method: ASTM D 4546
Test Procedure: Method B (Modified)
Sample Preparation: Undisturbed

LABORATORY TEST RESULTS



SWELL
0.1 %
SURCHARGE PRESSURE
125 PSF

Sample Diameter (in):	2.49
Sample Height (in):	0.96
Initial Moisture Content (%):	28.1
Initial Dry Density (pcf):	94.7
Final Moisture Content (%):	29.3
Final Dry Density (pcf);	94.9

Atterberg Limits

Liquid limit:	(LL)	48
Plastic limit:	(PL)	24
Plasticity Index:	(PI)	24

USCS Classification
Group Symbol: CL

Comments:

Reviewed by:

Cassidy Mathews, P.E.
Geotechnical Manager

LABORATORY SWELL TEST REPORT

Allstate Consultants, LLC
3312 LeMone Industrial Blvd.
Columbia, Missouri 65201
(573) 875-8799

ALLSTATE CONSULTANTS

Client:	University of Missouri	**Report Date:**	November 10, 2020
Project:	Proposed Middlebush Farms Building and Parking Lot (CP191901)	**Project No.:**	20120.02
Location:	Tom Bass Road, Columbia, MO		

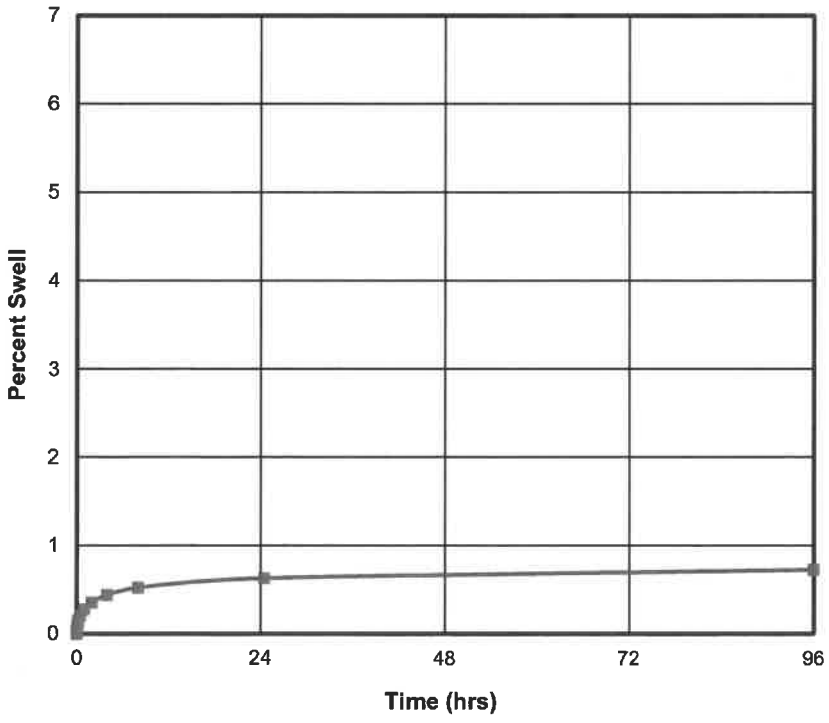
MATERIAL INFORMATION

Boring No.:	TB-12	**Date:**	November 5, 2020
Sample No.:	ST-2		
Depth:	3' - 5'		
Description:	FAT CLAY, Trace Roots & Gravel, Gray Mottled Tan, Stiff, CH		

TEST INFORMATION

Test Method:	ASTM D 4546
Test Procedure:	Method B (Modified)
Sample Preparation:	Undisturbed

LABORATORY TEST RESULTS



SWELL
0.7 %
SURCHARGE PRESSURE
500 PSF

Sample Diameter (in):	2.49
Sample Height (in):	0.92
Initial Moisture Content (%):	27.6
Initial Dry Density (pcf):	103.1
Final Moisture Content (%):	28.6
Final Dry Density (pcf);	103.2

Atterberg Limits

Liquid limit:	(LL)	62
Plastic limit:	(PL)	19
Plasticity Index:	(PI)	43

USCS Classification
Group Symbol: CH

Comments:

Reviewed by:

Cassidy Mathews, P.E.
Geotechnical Manager

SECTION 015713
TEMPORARY EROSION AND SEDIMENT CONTROL AND SWPPP

PART 1 GENERAL

1.01 SUMMARY

A. Section includes:
   1. Silt fence erosion protection.
   2. Hay bale silt fence erosion protection.
   3. Storm Water Pollution Prevention Plan (SWPPP) included in this project manual is part of the contract and Contractor is responsible for all items indicated therein.

B. Related Sections:
   1. Section 311000 – Site Clearing.
   2. Section 312000 – Earth Moving.
   3. Section 329119 – Landscape Grading.

1.02 QUALITY ASSURANCE

A. Regulatory Requirements;
   1. Comply with all requirements, exemptions, regulations and outflow sampling requirements set forth by local and state agencies.

PART 2 PRODUCTS

2.01 MATERIALS

A. Straw Bale Fence: As indicated on Drawings.

B. Silt Fence Fabric: Synthetic filter fabric or a pervious sheet of polypropylene, nylon, polyester, or polyethylene yard, containing ultraviolet ray inhibitors and stabilizers providing a minimum of six months usable construction life at a temperature range from 0 to 120 degrees F., and meeting the following requirements:
   1. Sediment retention efficiency: Not less than 85 percent.
   2. Grab strength at 20 percent maximum elongation:
      a. Standard strength fabric: 30 pounds per lineal inch.
      b. Extra strength fabric: 50 pounds per lineal inch.
   3. Flow rate: Not less than 0.30 gallons per square foot per minute.

C. Silt Fence Posts: Contractor has option of the following:
   1. 4 inch diameter pine.
   2. 2 inch diameter pine.
   3. 1.33 pound per lineal foot steel posts a minimum of 4 feet in length.
      a. Steel posts shall have projections for fastening the fabric.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion:
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 PREPARATION

A. Protection:
   1. Protect trees, shrubs, lawns, other vegetation and other features indicated on Drawings to remain, or not indicated to be removed.
      a. Provide temporary guards to protect trees and vegetation which is to remain.

b. Protect roots over 1-1/2 inch diameter which are cut during construction operations.
   1) Coat cut faces with emulsified asphalt or other acceptable coating formulated for use on damaged plan tissues.
   2) Temporarily cover exposed roots with wet burlap to prevent roots from drying out. Cover with earth as soon as possible.

2. Protect bench marks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement.
   a. If damaged or displaced, notify Engineer and correct defects as directed by Engineer.
3. Protect above and below grade utilities which are to remain.

B. Preparation:
1. Use all means necessary to control dust on and near the Work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the Work of this Section, or if resulting from the condition in which Project Site is left by Contractor..
2. Moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other Work on Project Site.

3.03 INSTALLATION

A. Install erosion control devices at locations indicated on Drawings, and where required to protect adjacent and downstream properties from damage and pollution resulting from erosion caused by the Work of this Contract.
1. Implement erosion control measures indicated on Drawings and additional erosion control measures necessary to prevent damage to adjacent and downstream properties.

B. Install silt fence located along perimeter of Site or grading limits immediately following site clearing operations specified under Section 311000.
1. Install silt fence fabric from a continuous roll for the length of the silt fence whenever possible to minimize the number of joints.
   a. Create joints in fabric by securely fastening fabric at the support post with overlap extending to the next post.
2. Drive support post into ground not less than 18 inches.
3. Excavate a 4 inch wide by 8 inch deep trench on up-slope side of silt fence.
   a. Line trench with silt fence fabric materials.
   b. Backfill trench with soil or gravel.

C. Install straw bale fence at completion of grading operations in affected area.
1. Install erosion control devices at storm sewer inlets immediately after completion of the storm sewer.
2. Place straw bales in a single row, lengthwise on the contour, and embedded 4 inches into soil.
3. Secure each individual bale in place by stakes or reinforcement bars driven through bales into the ground to a depth not less than 18 inches.

3.04 MAINTENANCE

A. Check silt fences and straw bale fences after each rainfall event to ensure that they are in proper working order:
1. Check embankments and spillways for erosion, settlement or other damage.
2. Immediately make all necessary repairs.

B. Inspect silt and straw bale fences at least once a week.

1. Immediately replace damaged portions of the silt fences, including portions which have collapsed, contain tears, have decomposed, or have become ineffective.

C. Remove sediment deposits as necessary to provide adequate sediment storage and to maintain the integrity of fences.

D. Maintain erosion control devices in places as specified until Site is stabilized by pavement, vegetation, or other means.

E. After site is stabilized, remove erosion control devices, sediment, and debris from Site prior to final grading specified under Section 312000 and Section 329119.

3.05 SWPPP

A. A Storm Water Pollution Prevention Plan (SWPPP), follows this section.

B. The General Contractor shall be responsible for meeting the requirements of the SWPPP and the land disturbance plans.

C. SWPPP Coordinator shall be the Contractor or someone hired by the Contractor.

D. The Coordinator shall be responsible for the inspection and maintenance of the erosion control measures in accordance with the SWPPP.

E. Contractor shall be responsible for employee training per the SWPPP.

F. Notification to All Contractors: The permittee shall be responsible for notifying each contractor or entity (including utility crews and city employees or their agents) who will perform work at the site of the existence of the SWPPP and what action or precautions shall be taken while on-site to minimize the potential for erosion and the potential for damaging any BMP. The SWPPP shall contain a list of contractors or entities that have been notified. The permittee is responsible for any damage a subcontractor may do to established BMPs and any subsequent water quality violation resulting from damage.

END OF SECTION

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University of Missouri - Columbia
Middlebush Nextgen Center of Excellence for Influenza Research – Phase II
CP# 230831

Columbia, Missouri

NPDES Storm Water Pollution Prevention Plan for
Storm Water Discharges Associated with
Construction Activity

SK Design Group, Inc.

June 2024

Table of Contents

1.0 Purpose of Plan

The purpose of this Construction Storm Water Pollution Prevention Plan (Plan) is to demonstrate compliance with the requirements of the National Pollutant Discharge Elimination System (NPDES) for General Permit MOR 100039 for storm water discharges associated with construction activity. The General Permit requires the preparation and implementation of such a plan to prevent, as much as practicable, the release of pollutants in storm water runoff from the construction site to waters of the United States.

This Plan provides information about the University of Missouri CP #230831 project located in Columbia, Missouri. Administrative requirements and potential storm water and non-storm water pollutant sources are identified. Best management practices to prevent the discharge of non-storm water materials in storm water runoff are also described.

The University of Missouri CP #230831 project site consists of approximately 5 acres of land located northeast of the intersection of University Lane and the future extension of Discovery Ridge. The future extension of Discovery Ridge is approximately 300' north of E Sugar Grove Road at the location of the site. The site is in Columbia, Missouri. This SWPPP addresses construction of the Swine Research Facility with site/utility improvements and disturbs approximately 2.5. A project location map is attached as Exhibit 1.

Site Evaluation

2.0 Project Information

Project Name and Location: CP #230831, Columbia, Missouri

MU Designated Representatives for Environmental Issues: Michael Stornello

Owner Name: University of Missouri Columbia

General Project Description: Construction of the South Farm Swine Research and Education Facility addition with site/utility improvements at the northeast corner of the intersection of University Lane and Discovery Ridge Parkway.

Project Location: Northeast of the intersection of University Lane and Discovery Ridge Parkway. Refer to Exhibit 1.

General Construction Activity Description: Grading, building construction, underground utility construction, drive and sidewalk construction.

2.1 Topography and Drainage

The topography of the existing property slopes from the west to the east of the site. There is approximately 4-6 feet of vertical relief between the west and east side of the site.

2.2 Soils

The soils on this project site were identified according to the Geotechnical Engineering Report for CP #230831. The soil in the area consists of a combination of silty clay and silty clay with sand and gravel.

2.3 Runoff Water Quality

No surface water quality data is available for the project site. However, due to the nature of the site runoff could be expected to contain some suspended solids.

2.4 Receiving Waters

The site is collected by a concrete flume on site and flows above ground to an unnamed tributary along the east side of the property. The unnamed tributary drains to the northeast, 0.52 miles to Grindstone Creek. See attached map of tributary in appendix A.

Section 404 Permit and associated 401 Water Quality Certification were considered but they are not applicable.

2.5 Buffer Exceptions

No natural buffer exists due to preexisting development disturbances that occurred prior to the initiation of planning for this project.

3.0 Site Construction Plan

The following sections describe the proposed development and the site construction plan.

3.1 Construction Activities

The project site will include construction of the South Farm Swine Research and Education Facility addition with gravel drive, sidewalk and utility improvements. The project will require pavement/utility demolition, soil removal, and site grading to support the planned development. Soil disturbing activities will include clearing, grubbing, and pavement/utility demolition. The project will have construction access off the existing gravel driveway around the Phase 1 building. The project construction traffic will utilize University Lane on the west side of the site. The contractor shall be responsible for minimizing soils tracked onto the surrounding roadway and their cleaning.

A record of the project site construction activities must be maintained as a part of this Plan. Appendix A includes a form and instructions to record such information on an ongoing basis.

3.2 Construction Sequence

The project will be constructed generally following the sequence indicated below.

Site Best Management Practices will be installed.
The site will be cleared and grubbed.
The site utilities and pavements will be constructed.
Remove BMP’s after site is stabilized.

4.0 Storm Water Management Plan

This storm water management plan was designed following EPA guidelines. Structural sediment control devices will be the main means of storm water management. Storm water sediment controls will be installed before any construction begins.
The proposed construction activities do not impact any Waters of the US and Section 404 Permit and associated Section 40 Water Quality Certifications are not required for the project.

4.1 General Description of Storm Water Management System

The potential for storm water runoff pollution will be present during construction of the site. This risk will be minimized through the use of several control measures implemented before and during the construction sequence.

The storm water management system was designed in accordance with the EPA's guidance document entitled *Storm Water Management for Construction Activities- Developing Pollution Prevention Plans And Best Management Practices* (EPA 832-R-92-005, September 1992). Structural measures are the main means of storm water management. Storm water control measures are described and shown on the Erosion Control Plan Drawing. This document is available at the USEPA internet site; and

The latest version of ***Protecting Water Quality: A field guide to erosion, sediment and storm water best management practices for development sites in Missouri***, published by the Missouri Department of Natural Resources. This manual is available on the department's internet site at: http://www.dnr.mo.gov.env/wpp/wpcp-guide.htm.

It will be the responsibility of the Construction Manager to revise the Erosion Control Plan Drawing if the location or types of control measures are changed in the field.

4.2 Runoff Coefficient

In determining the runoff coefficient for the project site the method described City of Columbia's Stormwater Management & Water Quality Manual. This method is based on the pavement areas and vegetative cover of both the existing and proposed conditions.

4.3 Project Site

The surface water management during construction will be through the use of silt fences, inlet protection and soil stabilization measures. Storm water will be conveyed by overland surface flow to silt fences or inlet protection. The silt fences or inlet protection will remove suspended solids before entering the public storm system.

4.3.1 Stabilization Practices

Temporary and permanent stabilization methods will be used on the project site. Two major stabilization methods that will be used on the site are preserving existing vegetation where possible and disturbing only the area needed for project construction. Disturbed portions of the site will be stabilized within 7 days after construction activity has temporarily or permanently ceased, with two exceptions –when snow cover precludes construction or construction will resume within 21 days. Stabilization practices may include temporary or permanent seeding,

mulching, geotextiles, sodding, or aggregate surfacing. Site access facilities (entrances/exits and parking areas) will be surfaced with aggregate to reduce sediment tracking.

4.3.2 Structural Practices

Temporary devices to divert, store, or limit runoff from disturbed areas will be used on the project site. Such devices may include silt fences, triangular silt dike and catch basin inlet protection. Details of the control measures are shown on the site plan, erosion control plans, and detail sheets (Appendix D)

Wash and/or rinse waters from concrete mixing equipment including ready mix concrete tracks shall be collected in a concrete washout with vehicle tracking control as shown on standard detail "ESC-01 construction entrance and concrete washout". Material from the concrete washout shall be removed and properly disposed of off site. The concrete washout shall remain in place until all concrete for the project is placed.

Any dewatering required for construction shall be pumped to a straw bale/sediment fence pit for filtering, see standard drawing "ESC-41 straw bale/sediment fence pit" detail in Appendix D. Once the wet storage area becomes filled to half of the excavated depth, accumulated sediment shall be removed and properly disposed of.

5.0 Potential Storm Water Pollutant Sources and Control Measures

Pollutants from various sources have the potential to enter the storm water system during project construction. A description of these potential pollutants and control measures to reduce the risk of storm water contamination is provided below.

5.1 Construction Silt and Dust

The pre-developed site is collected by a drainage system on site and flows above ground and through a pipe system to the northeast into un-named tributaries, 0.52 miles from Grindstone Creek. Construction of the project will generate silt and fugitive dust.

Silt barriers (fences/dikes) will be installed along perpendicular to the storm runoff on all disturbed slopes as shown on the Erosion Control Plan to control offsite discharges of silt. The silt barrier will be installed after the clearing and grubbing necessary for placement of the silt barrier is complete, but before the clearing and grubbing of the remaining work area is started. The silt barrier will remain in place until the up slope surface is permanently stabilized. If construction in a particular area will cease temporarily, temporary soil stabilization will be implemented no more than 7 days after the construction has ceased unless activity will resume in that area within 21 days. Permanent stabilization will take place no later than 7 days after construction activities have permanently ceased in an area.

Fugitive dust may be generated during dry weather conditions. Dust control will be directed by the construction manager. Water sprays will be used for dust control.

5.2 Offsite Sediment Tracking

Contractor is responsible for keeping all public roadways adjacent to the construction site free of dirt and debris resulting from activities related to the construction of this project. The site access drive will be aggregate construction and maintained to reduce tracking of sediment offsite.

5.3 Petroleum Products

Construction equipment will require diesel fuel and oil on a regular basis, so the potential exists for spills or leaks. All onsite vehicles will be monitored for leaks and receive regular preventative maintenance to ensure proper operation and reduce the chance of leaks. No "*topping off*" of fuel tanks will be allowed to reduce the possibility of spills.

Petroleum products will be stored in clearly labeled and tightly sealed containers or tanks. Any asphalt used onsite will be applied according to the manufacturer's recommendations. Any soil Contaminated by fuel or oil spills will be removed and disposed of at an approved disposal site by MU Environmental Health & Safety. The contractor shall not remove or dispose contaminated soils.

5.4 Sanitary Wastes

A licensed sanitary waste management contractor will collect all construction or temporary sanitary wastes from portable units. The units will be maintained on a regular basis.

5.5 Hazardous Wastes

MU Environmental Health & Safety will remove and dispose of any hazardous waste according to local or state regulation or the manufacturer's recommendations. The contractor shall not remove or dispose any hazardous waste materials. The Construction Manager who will also be responsible for their implementation will instruct site personnel of these regulations and recommendations.

5.6 Fertilizers

Fertilizers will be applied as recommended by the manufacturer. After application the fertilizer will be worked into the soil to limit exposure to storm waters. Fertilizers will be stored in a covered area or in watertight containers. Any partially used bags or containers will be properly sealed and stored to avoid spills or leaks.

5.7 Paints

All paint containers will be tightly sealed and properly stored to prevent leaks or spills. Paint will not be discharged to the storm water system. MU Environmental & Health Safety will remove and dispose of any unused paints according to local and/or state regulations. The contractor shall not remove or dispose any unused paints. Spray painting will not occur on windy days and a drop cloth will be used to collect and dispose of drips and over-spray associated with all painting activities.

5.8 Concrete Trucks

Concrete trucks will be allowed to discharge surplus concrete or drum wash water on the site in such a manner that prevents contact with storm waters discharging from the site. Dikes or barriers will be constructed around such an area to contain these materials until stable, at which time the materials will be disposed of in a manner acceptable to the Construction Manager and the construction site inspector.

5.9 Waste Materials

All construction waste material will be collected, deposited and stored in metal dumpsters from a licensed solid waste management contractor. No construction waste materials will be buried onsite. Burning of waste construction materials on site is not allowed. For burning allowances, see the MU Burn Permit in Appendix A. The MU Burn Permit must be filled out and submitted to MU-EHS for approval prior to any burning on site. All site personnel will be instructed of the proper waste disposal procedures by the Construction Manager.

5.10 Allowable Non-Storm Water Discharges

The following sources of non-storm water discharges from project construction activities may be combined with storm water discharges.

- Washing vehicles is only allowed if no cleaning agents are used. Sediment must settle before reaching the storm drain.
- Waters used to control dust
- Pavement wash waters not containing toxic or hazardous substances
- Uncontaminated dewatering discharges
- Fire fighting waters
- Vegetation watering
- Potable or spring water discharges

6.0 Best Management Practices

Chemicals, petroleum products and other materials will be used and stored on the project site. Best Management Practices, such as good housekeeping measures, inspections, containment, and spill prevention practices will be used to limit contact between storm water and potential pollutants.

6.1 Good Housekeeping

The good housekeeping practices listed below will be followed to reduce the risk of potential pollutants entering storm water discharges. All construction personnel will be responsible for monitoring and maintaining housekeeping tasks or notifying the appropriate person of a problem.

- Store only enough products to do the job.
- Store all materials in a neat and orderly manner, in the appropriate containers and, if possible, under a roof or within an enclosure
- Keep products in the original container with original manufactures label.
- Do not mix products unless recommended by the manufacturer
- Use all of a product before disposing of the container.

- Use and dispose of products according to the manufacture's recommendations or the Construction Manager's direction.
- Perform regular inspections of the storm water system and the material storage areas.
- When and where appropriate, use posters, bulletin boards, meetings, etc. to remind and inform construction personnel of required procedures.

6.2 Hazardous Materials

Storage areas for hazardous materials such as oils, greases, paints, fuels, and chemicals must be provided with secondary containment to ensure that spills in these areas do not reach waters of the State. MU-EHS must be contacted in the event any soil becomes contaminated. MU-EHS will dispose of any contaminated soil. The contractor shall not dispose of any contaminated soil without consulting MU-EHS.

6.3 Spill Prevention and Response

In addition to the good housekeeping and hazardous materials storage procedures described above, spill prevention and cleanup practices will be as follows.

- Construction personnel will be informed of the manufacturer's recommended spill cleanup methods and the location of that information and clean up supplies.
- Materials and equipment for the cleanup of a relatively small spill will be kept in the materials storage area. These facilities may include brooms, rags, gloves, shovels, goggles, sand, sawdust, plastic or metal trash containers, and protective clothing.
- All containers will be labeled, tightly sealed, and stacked or stored neatly and securely.

The spill response procedure will be as follows:
Step 1. Upon discovery of a spill, stop the source of the spill.
Step 2. Cease all spill material transfer until the release is stopped and waste removed from the spill site.
Step 3. Initiate containment to prevent spill from reaching State waters.
Step 4. Notify a Supervisor or the Construction Manager of the spill.
Step 5. The Construction Manager will coordinate further cleanup activities
Step 6. In case of significant spill of hazardous material, the Construction Manager should call 911 in case of immediate danger to life or health and MU EHS, but MU EHS will decide if a reportable spill has occurred and will make the appropriate notifications to other agencies as necessary.
Step 7. Review the construction storm water pollution prevention plan and amend if needed. Step 8. Record a description of the spill, cause, and cleanup measures taken.

7.0 Inspection, Maintenance, and Reporting Procedures

Site inspection and facility maintenance are important features of an effective storm water management system. Qualified personnel will inspect disturbed areas of the site not finally stabilized, storage areas exposed to precipitation, all control measures, and site access areas to determine if the control measures and storm water management system are effective in preventing significant impacts to receiving waters.

7.1 Erosion and Sediment Controls

The following procedures will be used to maintain erosion and sedimentation controls.

- The contractor in conjunction with the MU inspector shall perform inspections of erosion and sediment control measures at least once per seven calendar days. If a rainfall causes stormwater runoff to occur onsite, the BMPs must be inspected. These inspections must occur within 48 hours after the rain event has ceased during a normal work day and within 72 hours on the next business day if the rain event ceases during a non-work day such as a weekend or holiday.
- The contractor is responsible for providing erosion and sediment control BMPs to prevent sediment from reaching paved areas, storm sewer systems, drainage courses and adjacent properties. In the event the prevention measures are not effective, the contractor shall remove any debris, silt or mud and restore the right of way, or adjacent properties to original or better condition.
- The contractor shall seed, mulch or otherwise stabilize where soil disturbing activities will cease on any portion of the site and are not planned to resume for a period exceeding 14 calendar days. Temporary stabilization must be initiated immediately upon knowing the duration is more than 14 days. Temporary stabilization must be completed within 7 calendar days.
- The contractor is responsible for providing erosion and sediment control for the duration of the project.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts and healthy growth.
- Inspect riprap and aggregate covered areas for bare spots and washouts.
- The Construction Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated individuals will receive necessary training from the Construction Manager to properly inspect and maintain the controls in good working order.
- Inspection Form 1 will be completed after each inspection.

7.2 Non-Storm Water Controls

The following procedures will be used to maintain the non-storm water controls.

All control measures will be inspected at least once a week and after each runoff producing rainfall event and daily during prolonged rainfall periods.

All control measures will be maintained in good working order. If a repair is necessary, it will be initiated and repaired within 24 hours of the inspection.

The Construction Manager will select individuals to be responsible for inspections, maintenance, repairs, and reporting. The designated individuals will receive the necessary training from the Construction Manager to properly inspect and maintain the controls in good working order.

Inspection Form 2 will be completed after each inspection.

The completed Inspection Forms will be kept with this Plan in Appendix B.

7.3 Reporting

Two inspection forms are provided on the following pages for recording inspections and maintenance of the control measures: Erosion and Sedimentation Controls (Inspection Form 1), and Non-Storm Water Source Controls (Inspection Form 2). All disturbed areas and materials storage areas require inspection at least once per seven calendar days. If a rainfall causes stormwater runoff to occur onsite, the BMPs must be inspected. Theses inspections must occur within 24 hours after the rain event has ceased during a normal work day and within 48 hours on the next business day if the rain event ceases during a no-work day such as a weekend or holiday. After each inspection, the inspector completes an inspection report and inserts that report in Appendix B of this Plan. Any required maintenance is initiated within 24 hours of the inspection.

A fully signed copy of this Plan and any support materials must be maintained at the project site from the date of the project initiation to the date of final stabilization. All records and supporting documents will be complied in an orderly manner and maintained for a period of three years following final stabilization.

The generation of reports, as part of the construction process and inspection or amendment procedures, provides accurate records that can be used to evaluate the effectiveness of this Plan and document the plans compliance. Changes in design or construction of the storm water management system are documented and included with the Plan to facilitate Plan review or evaluation. Four forms have been developed to assist the Construction Manager with record keeping activities.

- Record of Plan Amendments
- Construction Activity Record
- Erosion and Sedimentation Controls Inspection Form 1
- Non-Storm Water Source Controls Inspection Form 2

Plan amendments will be documented on the form in the front of this Plan and on the drawings. A record of construction activities will be maintained in Appendix A of this Plan. Completed inspection and maintenance forms will be kept in Appendix B of this Plan.

Inspection Form 1

Erosion and Sedimentation Controls

Visually inspect disturbed areas of the construction site that have not been finally stabilized. Inspections to be completed every 7 days and within 24 hours of a rainfall event of ½ inch or more. Maintenance to be preformed within 24 hours of inspection.

Inspector: _____

Inspection Date: _____

Date of last rainfall: _____

Amount of last rainfall: _____inches

Report on the condition of the erosion and sedimentation controls installed at the construction site. Check for tears in silt barriers, for securely attached fabric to fence posts, and for depth of sediment in front of the silt barriers. The depth of sediment should not exceed one-half of the barrier height. Seeding/planting areas and rip-rap aggregate areas should be inspected for bare spots and washouts.

Area	Condition of Control	Maintenance Required/Completion Date

Inspection Form 2

Non-Storm Water Source Controls

Visually inspect material storage and construction areas. Inspections to be completed every 7 days and within 24 hours of a rainfall event of ½ inch or more. Maintenance to be performed within 24 hours of inspection.

Inspector: _____

Inspection Date: _____

Date of last rainfall: _____

Amount of last rainfall: _____inches

Construction Dust- Is there excessive dust at the site that requires watering?

_____

_____

Sediment Tracking – Is Street mostly free from mud, dirt, or rock?

Is wash down required? _____

Are graveled areas adequately covered? _____

Petroleum/Chemical Products – Are spill containment structures secure? Product containers securely sealed? _____

Sanitary Waste – Do portable sanitary units need service? _____

Hazardous waste – Are hazardous wastes stored and disposed of in compliance with state and local regulations? _____

Inspection Form 2
Non-Storm Water Source Controls
(Continued)

Construction Waste – Are all construction waste materials collected and stored in approved dumpsters? _____

Material Storage Areas Exposed to precipitation – Are materials handled and stored in a manner to prevent leakage and prevent pollutants from entering the storm water system? _____

Other Non-Storm Water Discharges – Are waters from line flushing, pavement wash down, and dewatering directed to the storm water system prior to discharge? _____

Maintenance Required	Maintenance Completed Date

8.0 Certification of Compliance

This Construction Storm Water Pollution Prevention Plan reflects best management practices and erosion and sedimentation control measures for storm water management as practices and erosion and sedimentation control measures for storm water management as recommended by the Environmental Protection Agency.

8.1 Contractor Certifications

The Contractor Certification forms provided in this section indicate that each contractor or subcontractor working on the project site understands the terms, conditions, and intent of the NPDES General Permit for Construction Storm Water Discharges Associated with Construction Activity and will implement the measures described in this Plan appropriate to his area of work.

If additional sheets are needed due to more subcontractors on site than sheets provided herein, additional sheets may be copied and inserted into booklet at the job site.

9.0 Project Completion

Construction is considered complete when the project is 70% of fully established plant density over 100% of the disturbed area. The Construction Manager may terminate construction erosion and sediment control measures at this time. MU Construction Management will submit a Request for Closure to MU EHS to make the final determination to close the site disturbance permit.

Permanent storm water control measures incorporated into the project site design include vegetated swales, aggregate surfacing of facility areas, culvert inlet/outlet protection and a storm water retention basin.

10.0 References

The references used to develop this plan and provide further details on items mentioned in this plan are as follows:

1) *Storm Water Management for Construction Activities- Developing Pollution Prevention Plans And Best Management Practices* (EPA 832-R-92-005, September 1992)

2) *Protecting Water Quality: A field guide to erosion, sediment and storm water best management practices for development sites in Missouri***,** published by the Missouri Department of Natural Resources. This manual is available on the department's internet site at: http://www.dnr.mo.gov.env/wpp/wpcp-guide.htm.

3) SECTION 015713 – TEMPORARY EROSION AND SEDIMENT CONTROL AND SWPPP. Available in the set of specifications in the project package.

4) Drawing Sheet C0.51, Erosion Control Plan and C0.52, Erosion Control Details. Available in the drawing set in the project package.

5) Drawing Sheet C3.01, SITE GRADING PLAN. Available in the drawing set in the project package.

Appendix A

Location Map
USGS Map

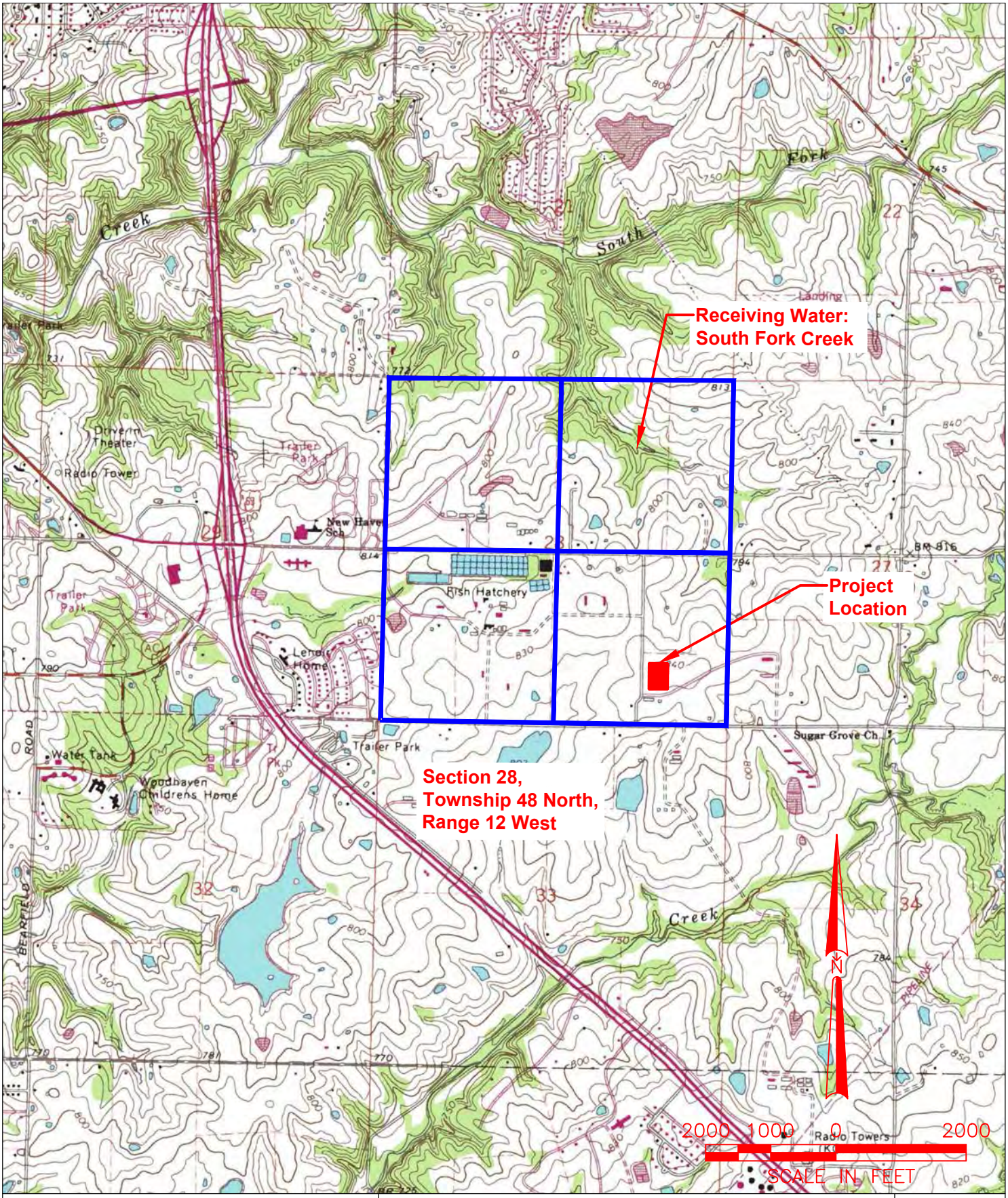
SK Design Group, Inc.
4600 College Boulevard,
Suite 100
Overland Park, Kansas 66211
Tel: 913-451-1818
Fax: 913-451-7599

LOCATION MAP

CP201372
University of Missouri Swine Research Facility
South Farm Columbia, MO 6520

Appendix A
EXHIBIT
1

February 2021



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USGS MAP

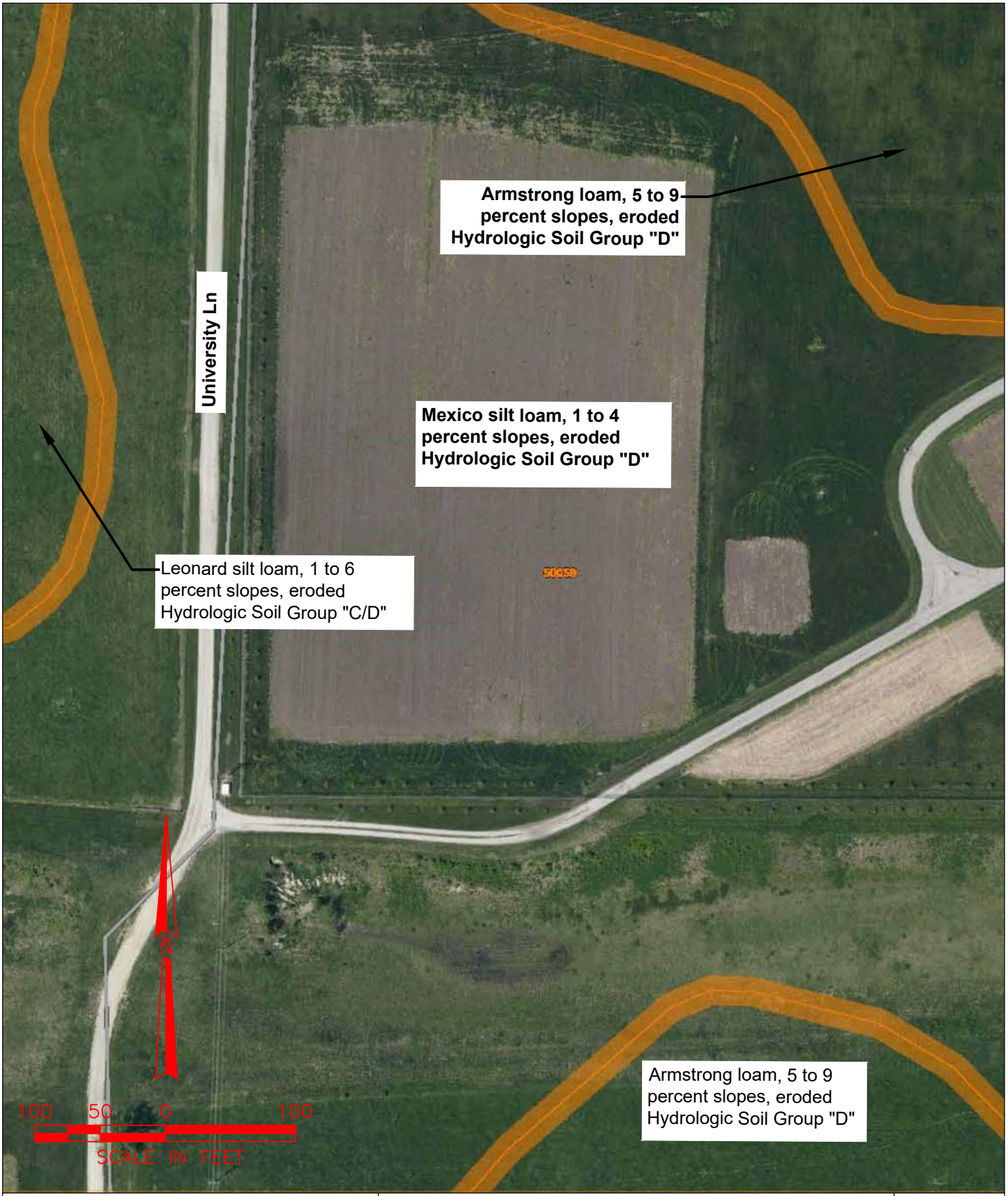
CP201372
University of Missouri Swine Research Facility
South Farm Columbia, MO 65201

Appendix A
EXHIBIT
2

February 2021

Appendix B

USDA Soil Report



SK Design Group, Inc.
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Fax: 913-451-7599

SOIL MAP

CP201372
University of Missouri Swine Research Facility
South Farm Columbia, MO 65201

Appendix A
EXHIBIT
3

February 2021

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Boone County, Missouri

February 2, 2021

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:1,610 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 15N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Boone County, Missouri
Survey Area Data: Version 26, May 29, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Data not available.

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
50001	Armstrong loam, 5 to 9 percent slopes, eroded	1.9	13.9%
50059	Mexico silt loam, 1 to 4 percent slopes, eroded	11.7	86.1%
60022	Leonard silt loam, 1 to 6 percent slopes, eroded	0.0	0.0%
Totals for Area of Interest		**13.6**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or

landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Boone County, Missouri

50001—Armstrong loam, 5 to 9 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2x425
Elevation: 560 to 920 feet
Mean annual precipitation: 37 to 45 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 175 to 195 days
Farmland classification: Not prime farmland

Map Unit Composition

Armstrong and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Armstrong

Setting

Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loess over red palesol and underlying subglacial till

Typical profile

Ap - 0 to 8 inches: loam
BE - 8 to 11 inches: loam
Bt1 - 11 to 14 inches: clay loam
2Bt2 - 14 to 18 inches: clay loam
2Bt3 - 18 to 26 inches: clay
2Bt4 - 26 to 54 inches: clay loam
2C - 54 to 79 inches: clay loam

Properties and qualities

Slope: 5 to 9 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.01 in/hr)
Depth to water table: About 12 to 16 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: D
Ecological site: R109XY046MO - Till Upland Savanna
Hydric soil rating: No

Minor Components

Leonard

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R113XY002MO - Loess Upland Prairie
Hydric soil rating: Yes

Lindley

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F109XY009MO - Till Protected Backslope Forest, F109XY022MO - Till Exposed Backslope Woodland
Hydric soil rating: No

Keswick

Percent of map unit: 5 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F109XY007MO - Till Upland Woodland
Hydric soil rating: No

50059—Mexico silt loam, 1 to 4 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2wvc5
Elevation: 570 to 920 feet
Mean annual precipitation: 37 to 41 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 189 to 212 days
Farmland classification: Not prime farmland

Map Unit Composition

Mexico and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mexico

Setting

Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Loess over pedisediment

Typical profile

Ap - 0 to 7 inches: silt loam
Btg1 - 7 to 15 inches: silt loam
Btg2 - 15 to 34 inches: clay
Btg3 - 34 to 42 inches: silty clay loam
2Btg4 - 42 to 79 inches: silty clay loam

Properties and qualities

Slope: 1 to 4 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.06 in/hr)
Depth to water table: About 6 to 18 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: High (about 9.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Ecological site: R113XY001MO - Claypan Summit Prairie
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: Yes

Minor Components

Armstrong

Percent of map unit: 7 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY006MO - Till Upland Prairie
Hydric soil rating: No

Putnam

Percent of map unit: 5 percent
Landform: Divides
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Linear

Ecological site: R113XY001MO - Claypan Summit Prairie
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: Yes

Leonard

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Ecological site: R113XY002MO - Loess Upland Prairie
Hydric soil rating: Yes

60022—Leonard silt loam, 1 to 6 percent slopes, eroded

Map Unit Setting

National map unit symbol: 2x41x
Elevation: 570 to 980 feet
Mean annual precipitation: 35 to 43 inches
Mean annual air temperature: 52 to 57 degrees F
Frost-free period: 190 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Leonard and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leonard

Setting

Landform: Hillslopes
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Head slope
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loess over till

Typical profile

Ap - 0 to 8 inches: silt loam
2Btg1 - 8 to 26 inches: silty clay
2Btg2 - 26 to 79 inches: silty clay loam

Properties and qualities

Slope: 1 to 6 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 6 to 18 inches

Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water capacity: Moderate (about 8.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C/D
Ecological site: R113XY002MO - Loess Upland Prairie
Hydric soil rating: Yes

Minor Components

Armstrong

Percent of map unit: 7 percent
Landform: Interfluves
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Interfluve
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: R109XY006MO - Till Upland Prairie
Hydric soil rating: No

Mexico

Percent of map unit: 5 percent
Landform: Ridges
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Ecological site: R113XY001MO - Claypan Summit Prairie
Other vegetative classification: Grass/Prairie (Herbaceous Vegetation)
Hydric soil rating: Yes

Keswick

Percent of map unit: 3 percent
Landform: Hillslopes
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F109XY007MO - Till Upland Woodland
Hydric soil rating: No

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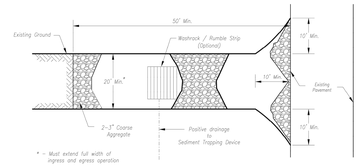
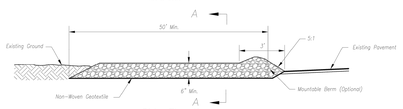
Appendix C

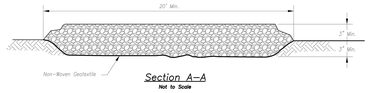
SWPPP Details



Plan View
Not to Scale



Side Elevation
Not to Scale



Section A–A
Not to Scale

Notes for Construction Entrance:

1. Avoid locating on steep slopes, at curves on public roads, or downhill of disturbed area.
2. Remove all vegetation and other unsuitable material from the foundation area, grade, and crown for positive drainage.
3. If slope towards the public road exceeds 2%, construct a 6– to 8–inch high ridge with 3H:1V side slopes across the foundation approximately 15 feet from the edge of the public road to divert runoff from it.
4. Install pipe under the entrance if needed to maintain drainage ditches along public roads.
5. Place stone to dimensions and grade as shown on plans. Leave surface sloped for drainage.
6. Divert all surface runoff and drainage from the entrance to a sediment control device.
7. If conditions warrant, place geotextile fabric on the graded foundation to improve stability.

Maintenance for Construction Entrance:

1. Reshape entrance as needed to maintain function and integrity of installation. Top dress with clean aggregate as needed.

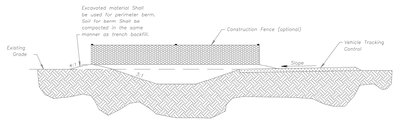
CONSTRUCTION ENTRANCE

Notes for Concrete Washout:

1. Concrete washout areas shall be installed prior to any concrete placement on site.
2. Concrete washout area shall include a flat subsurface pit sized appropriately for the concrete truck and pump truck chutes. The slopes leading out of the subsurface pit shall be 3:1. The vehicle tracking pad shall be sloped towards the concrete washout area.
3. Vehicle tracking control is required at the access point to all concrete washout areas.
4. Signs shall be placed at the construction site entrance, washout area and elsewhere as necessary to clearly indicate the location(s) of the concrete washout area(s) to operators of concrete truck and pump rigs.
5. A one–piece impervious liner may be required along the bottom and sides of the subsurface pit in sandy or gravelly soils.

Maintenance for Concrete Washout:

1. Concrete washout materials shall be removed once the materials have filled the washout to approximately 75% full.
2. Concrete washout areas shall be enlarged as necessary to maintain capacity for wasted concrete.
3. Concrete washout water, wasted pieces of concrete and all other debris in the subsurface pit shall be transported from the job site in a water–tight container and disposed of properly.
4. Concrete washout areas shall remain in place until all concrete for the project is placed.
5. When concrete washout areas are removed, excavations shall be filled with suitable compacted backfill and topsoil, any disturbed areas associated with the installation, maintenance, and/or removal of the concrete washout areas shall be stabilized.

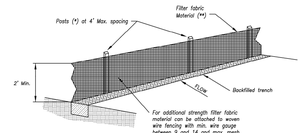


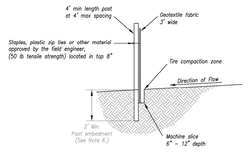
CONCRETE WASHOUT

Construction Entrance modified from 2015 Overland Park Standard Details for Erosion and Sediment Control, Concrete Washout modified from 2009 City of Great Bend Standard Drawings.

AMERICAN PUBLIC WORKS ASSOCIATION	
Kansas City Metro Chapter APWA American Public Works Association	KANSAS CITY METRO CHAPTER
CONSTRUCTION ENTRANCE AND CONCRETE WASHOUT	STANDARD DRAWING NUMBER ESC-01 ADOPTED: 10/24/2016

1 CONCRETE ENTRANCE & CONCRETE WASHOUT
Not to Scale





(*) POSTS
- MIN. LENGTH 4'
- HARDWOOD 1 ¾" x 1 ¾"
- NO.2 SOUTHERN PINE 2 ¾" x 2 ¾"
- STEEL 1.33 LB/FT

(**) – Geotextile Fabric shall meet the requirements of AASHTO M288

Notes:

1. In order to contain water, the ends of the silt fence must be turned uphill (Figure A).
2. Long perimeter runs of silt fence must be limited to 100'. Runs should be broken up into several smaller segments to minimize water concentrations (Figure A).
3. Long slopes should be broken up with intermediate rows of silt fence to slow runoff velocities.
4. Attach fabric to upstream side of post.
5. Install posts a minimum of 2' into the ground.
6. Trenching will only be allowed for small or difficult installation, where slicing machine cannot be reasonably used.

SILT FENCE DETAILS
Not to Scale

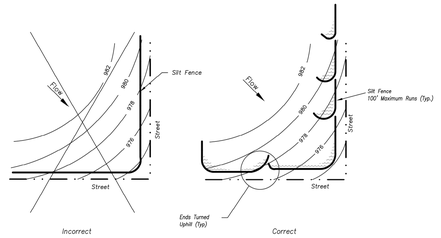
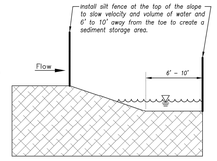
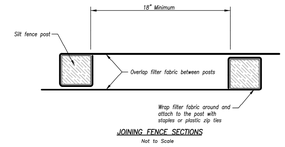


Figure A

SILT FENCE LAYOUT
Not to Scale





JOINING FENCE SECTIONS
Not to Scale

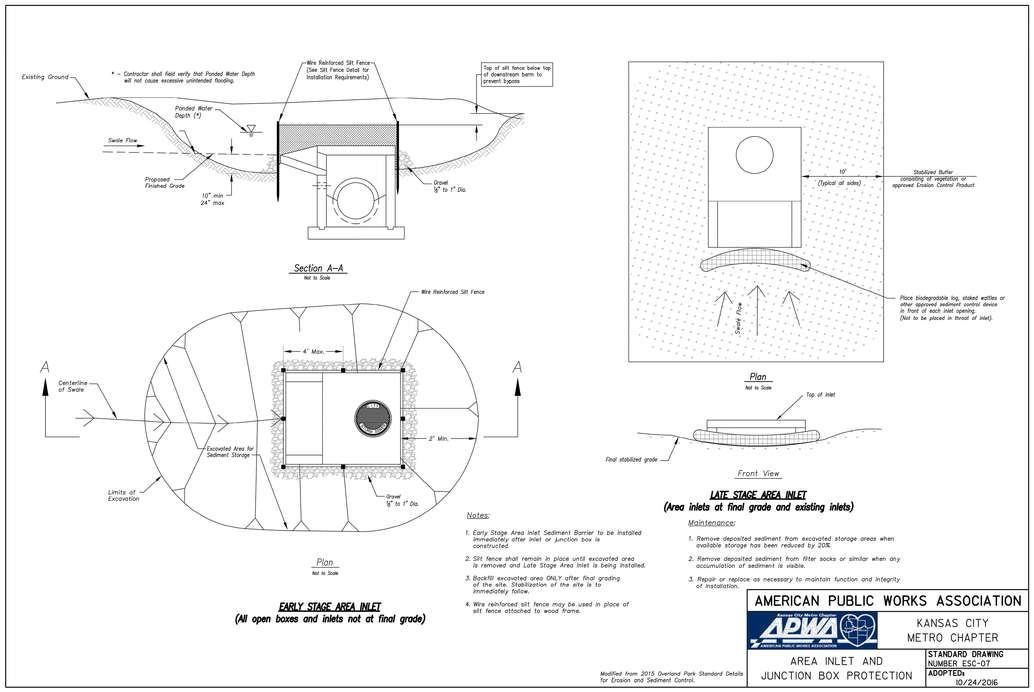
Notes:

1. Remove and dispose of sediment deposits when the deposit approaches ½ the height of silt fence.
2. Repair as necessary to maintain function and structure.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION	
Kansas City Metro Chapter APWA American Public Works Association	KANSAS CITY METRO CHAPTER
SILT FENCE	STANDARD DRAWING NUMBER ESC-03 ADOPTED: 10/24/2016

2 SILT FENCE
Not to Scale



EARLY STAGE AREA INLET
(All open boxes and inlets not at final grade)

Notes:

1. Early Stage Area Inlet Sediment Barrier to be installed immediately after inlet or junction box is constructed.
2. Silt fence shall remain in place until excavated area is removed and Late Stage Area Inlet is being installed.
3. Backfill excavated area ONLY after final grading of the site. Stabilization of the site is to immediately follow.
4. Wire reinforced silt fence may be used in place of silt fence attached to wood frame.

LATE STAGE AREA INLET
(Area inlets at final grade and existing inlets)

Maintenance:

1. Remove deposited sediment from excavated storage areas when available storage has been reduced by 20%.
2. Remove deposited sediment from filter socks or similar when any accumulation of sediment is visible.
3. Repair or replace as necessary to maintain function and integrity of installation.

Modified from 2015 Overland Park Standard Details for Erosion and Sediment Control.

AMERICAN PUBLIC WORKS ASSOCIATION	
Kansas City Metro Chapter APWA American Public Works Association	KANSAS CITY METRO CHAPTER
AREA INLET AND JUNCTION BOX PROTECTION	STANDARD DRAWING NUMBER ESC-07 ADOPTED: 10/24/2016

3 AREA INLET & JUNCTION BOX PROTECTION
Not to Scale

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Overland Park, KS 66211
(913)-451-1818
fax (913)-451-7599
www.skdg.com

SHEET HISTORY:

ISSUED 02/08/2021 CONTRACT DOCUMENTS

Contract Documents

University of Missouri South Farm - Swine Research Facility

South Farm
Columbia, MO 65201

CE No.: 624-187-20
MU No.: CP201372

February 8, 2021

STATE OF MISSOURI
SASSAN MAJDIAN
NUMBER E-20961
REGISTERED PROFESSIONAL ENGINEER

Construction Set
Issued: 05/20/2021

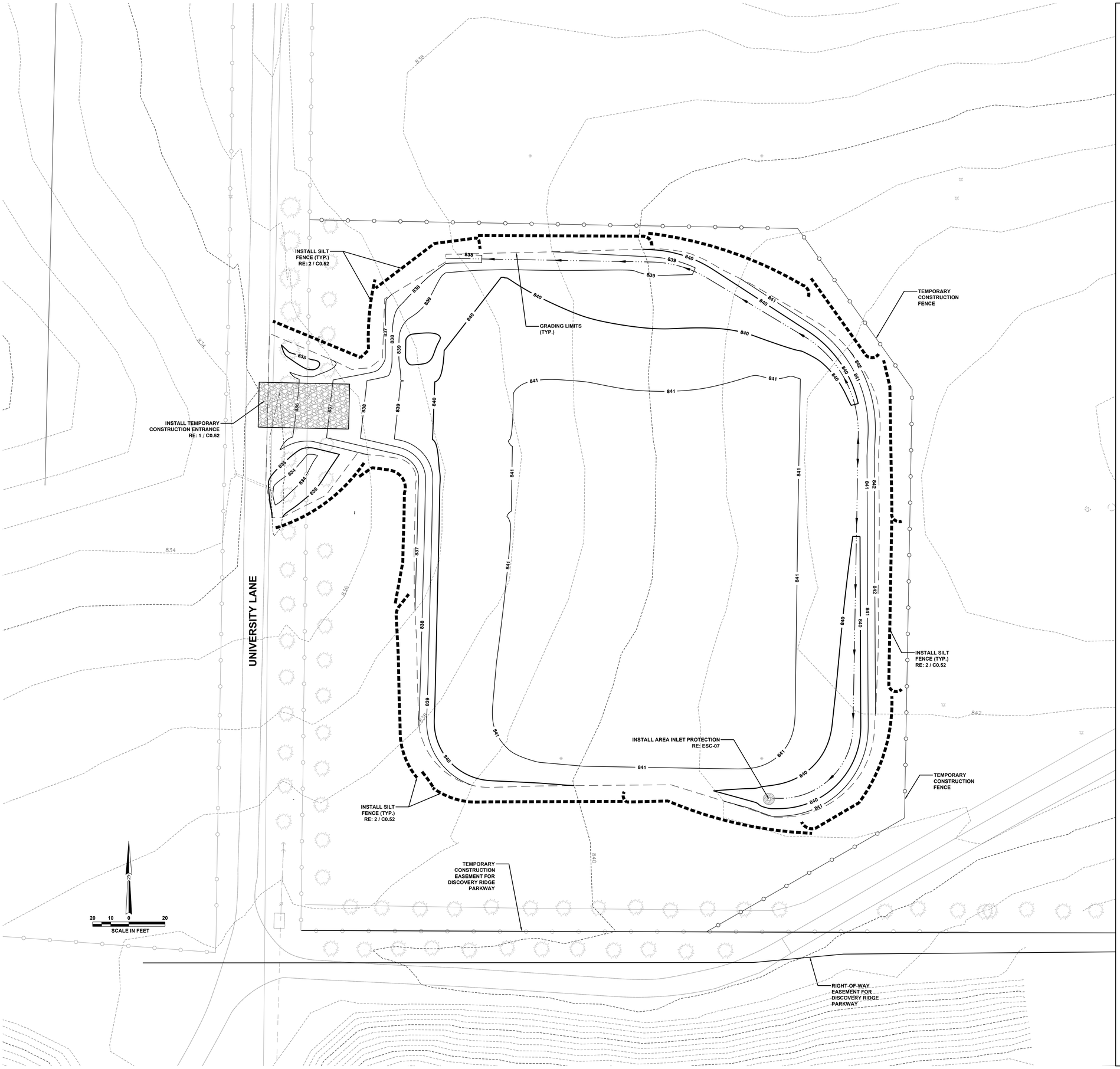
Site Erosion Control Details

C0.52

Plot Time Stamp: 5 / 20 / 2021 11:25:21 AM
File Location/Name: U:\2020\20-124\2021-05-20 For Construction\C052-20124 Erosion Details.dwg

Appendix D

SWPPP Site Plan



Plot Time Stamp: 5 / 20 / 2021 11:24:17 AM
File Location/Name: U:\2020\20-126\2021-05-20 For Construction\C051-20126 Erosion Plan.dwg

EROSION CONTROL NOTES

1. EXCEPT WHERE NECESSARY TO INSTALL EROSION AND SEDIMENT CONTROL DEVICES, CLEARING & DEMOLITION ACTIVITIES SHALL NOT BEGIN UNTIL ALL EROSION CONTROL DEVICES AND CONSTRUCTION FENCING HAVE BEEN INSTALLED AND APPROVED BY THE OWNER'S REPRESENTATIVE.
2. THE CONTRACTOR SHALL PROVIDE FOR CONTROL OF SURFACE EROSION AND SEDIMENT DEPOSITION DURING ALL PHASES OF CONSTRUCTION AND UNTIL THE OWNER ACCEPTS THE WORK AS COMPLETE. THE CONTRACTOR SHALL PROVIDE TEMPORARY SEEDING, BERMS, SILT FENCE, SEDIMENT TRAPS, OR OTHER MEANS TO PREVENT SEDIMENT FROM REACHING THE PUBLIC RIGHT-OF-WAY, STREAMS OR ADJACENT FACILITIES. IN THE EVENT THE PREVENTION MEASURES ARE NOT EFFECTIVE, THE CONTRACTOR SHALL REMOVE ANY DEBRIS SEDIMENT AND RESTORE THE PROPERTY TO IT'S ORIGINAL OR BETTER CONDITION.
3. CONTRACTOR IS RESPONSIBLE FOR KEEPING ALL ROADWAYS & SIDEWALKS ADJACENT TO THE CONSTRUCTION SITE FREE OF DIRT AND DEBRIS RESULTING FROM ACTIVITIES RELATED TO THE CONSTRUCTION OF THIS PROJECT.
4. THE CONTRACTOR SHALL CLEAN THE STREET ONCE PER DAY MINIMUM WHEN HEAVY TRACKOUT OCCURS. CONTRACTOR SHALL PROVIDE ADDITIONAL STREET CLEANING AT HIS OWN EXPENSE TO KEEP STREETS CLEAN FROM MUD AND DEBRIS AS NECESSARY.
5. CONTRACTOR SHALL KEEP THE ENTIRE PROJECT SITE FREE OF DEBRIS AND TRASH AT ALL TIMES. CONTRACTOR SHALL EXECUTE WORK USING METHODS THAT MINIMIZE EXCESSIVE NOISE OR DUST EMISSIONS. CONTRACTOR SHALL PROVIDE METHODS, MEANS AND FACILITIES TO PREVENT CONTAMINATION OF SOIL OR WATER FROM DISCHARGE OF REGULATED MATERIALS (I.E., DIESEL FUEL) USED DURING CONSTRUCTION. CONTRACTOR SHALL PROVIDE SECONDARY CONTAINMENT WHEN MORE THAN 50 GALLONS OF FUEL ARE STORED ON SITE.
6. STOCKPILE AREAS SHALL BE GRADED SUCH THAT THEY DO NOT EXCEED 3:1, SILT FENCE SHALL BE INSTALLED AROUND THE PERIMETER OF THE AREAS AND THE AREAS SHALL BE SEEDED WITHIN 14 DAYS ONCE CONSTRUCTION ACTIVITIES ON THEM CEASE
7. THE CONTRACTOR SHALL REQUEST THE OWNER'S REPRESENTATIVE TO INSPECT AND APPROVE THE SEDIMENT CONTROL MEASURES UPON THE COMPLETION OF VARIOUS STAGES OF THE WORK.
8. CONTRACTOR MUST INSTALL AND MAINTAIN THE EROSION CONTROL MEASURES SHOWN ON THIS PLAN. IF THE ENGINEER, OWNER'S REPRESENTATIVE, DETERMINES THAT THE INSTALLATION OR THE MAINTENANCE IS INADEQUATE, THE CONTRACTOR MUST IMMEDIATELY CORRECT AT THEIR EXPENSE. IF IT IS DETERMINED THAT ADDITIONAL EROSION CONTROL MEASURES ARE NEEDED THE CONTRACTOR WILL BE DIRECTED TO INSTALL AND MAINTAIN THOSE MEASURES
9. FOLLOWING THE FINAL REMOVAL OF ALL EROSION CONTROL MEASURES THE CONTRACTOR SHALL RE-GRADE AND RE-SOD ALL AREAS THAT WERE DISTURBED BY THE REMOVAL.
10. THE CONTRACTOR SHALL INSPECT THE LAND DISTURBANCE SITE AT LEAST ONCE EVERY SEVEN (7) DAYS AND WITHIN TWENTY-FOUR (24) HOURS FOLLOWING EACH RAINFALL EVENT OF 0.25" OR MORE WITHIN ANY TWENTY-FOUR (24) HOUR PERIOD. THE CONTRACTOR SHALL ALSO INSPECT AND ASSURE THAT ALL SEDIMENT CONTROL DEVICES ARE IN WORKING CONDITION PRIOR TO ANY FORECASTED RAINFALL
11. THE CONTRACTOR SHALL REMOVE SEDIMENT FROM THE FLOW AREAS AND MAKE ALL NECESSARY REPAIRS TO MAINTAIN THE INTEGRITY OF THE SEDIMENT CONTROL MEASURES. SEDIMENT SHALL BE REMOVED ONCE IT REACHES 1/2 THE INSTALLED HEIGHT OF MEASURE
12. SOME OF THE EROSION AND SEDIMENT CONTROL MEASURES, WILL REQUIRE THE CONTRACTOR TO INSTALL, REMOVE, AND REINSTALL THE MEASURES AS CONSTRUCTION PROCEEDS. THE PHASING OF THIS WORK IS DEPENDENT ENTIRELY ON THE CONTRACTOR'S SCHEDULE, AND IS NOT SPECIFIED HEREIN. HOWEVER, THE CONTRACTOR SHALL COORDINATE THESE ACTIONS WITH THE ENGINEER AT THE TIMES ADJUSTMENTS ARE NEEDED
13. CONSTRUCTION FENCE SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE IN THE FIELD. CONTRACTOR SHALL SPRAY PAINT PROPOSED FENCE LOCATION FOR OWNER REVIEW AND APPROVAL PRIOR TO INSTALLATION.
14. CONTRACTOR SHALL BE RESPONSIBLE FOR MOWING ALL AREAS WITHIN CONSTRUCTION FENCING.
15. IMMEDIATE INITIATION OF TEMPORARY STABILIZATION BMPS ON DISTURBED AREAS WHERE CONSTRUCTION ACTIVITIES HAVE TEMPORARILY CEASED ON THAT PORTION OF THE PROJECT SITE IF CONSTRUCTION ACTIVITIES WILL NOT RESUME FOR A PERIOD EXCEEDING 14 CALENDAR DAYS. TEMPORARY STABILIZATION MAY INCLUDE ESTABLISHMENT OF VEGETATION, GEOTEXTILES, MULCHES OR OTHER TECHNIQUES TO REDUCE OR ELIMINATE EROSION UNTIL EITHER FINAL STABILIZATION CAN BE ACHIEVED OR UNTIL FURTHER CONSTRUCTION ACTIVITIES TAKE PLACE TO RE-DISTURB THE AREA. THIS STABILIZATION MUST BE COMPLETED WITHIN 14 CALENDAR DAYS.
16. AN INSPECTION LOG SHALL BE MAINTAINED AND SHALL BE AVAILABLE FOR REVIEW BY THE REGULATORY AUTHORITY.
17. CONCRETE WASH OR RINSEWATER FROM CONCRETE MIXING EQUIPMENT, TOOLS AND/OR READY-MIX TRUCKS, TOOLS, ETC. MAY NOT BE DISCHARGED INTO OR BE ALLOWED TO RUN TO ANY EXISTING WATER BODY OR PORTION OF THE STORMWATER SYSTEM. ONE OR MORE LOCATIONS FOR CONCRETE WASH OUT WILL BE DESIGNATED ON SITE, SUCH WAT DISCHARGES DURING CONCRETE WASHOUT WILL BE CONTAINED IN A SMALL AREA WHERE WASTE CONCRETE CAN SOLIDIFY IN PLACE. PROPER SIGNAGE WILL BE INSTALLED TO DIRECT USERS TO THE CONCRETE WASHOUT. CONCRETE WASHOUTS MUST BE INSTALLED PRIOR TO POURING ANY CONCRETE.
18. POLLUTION OF STREAMS, LAKES, WETLANDS, DRAINAGE WAYS OR STORM SEWERS FROM FUEL, OILS, HAZARDOUS CHEMICALS, SEDIMENT, TRASH, DEBRIS, OR OTHER SUBSTANCES RESULTING FROM CONSTRUCTION ACTIVITIES SHALL NOT BE ALLOWED. CONTRACTOR SHALL REPORT ALL SPILLS TO THE UNIVERSITY OF MISSOURI CONSTRUCTION MANAGER.
19. NOTIFICATION TO ALL CONTRACTORS: THE PERMITTEE SHALL BE RESPONSIBLE FOR NOTIFYING EACH CONTRACTOR OR ENTITY (INCLUDING UTILITY CREWS AND CITY EMPLOYEES OR THEIR AGENTS) WHO WILL PERFORM WORK AT THE SITE OF THE EXISTENCE OF THE SWPPP AND WHAT ACTION OR PRECAUTIONS SHALL BE TAKEN WHILE ON-SITE TO MINIMIZE THE POTENTIAL FOR EROSION AND THE POTENTIAL FOR DAMAGING ANY BMP. THE SWPPP SHALL CONTAIN A LIST OF CONTRACTORS OR ENTITIES THAT HAVE BEEN NOTIFIED. THE PERMITTEE IS RESPONSIBLE FOR ANY DAMAGE A SUBCONTRACTOR MAY DO TO ESTABLISHED BMPS AND ANY SUBSEQUENT WATER QUALITY VIOLATION RESULTING FROM DAMAGE.

LEGEND

- SILT FENCE RE: 2 / C0.52
- INLET PROTECTION RE: 3 / C0.52
- 840 EXISTING CONTOUR
- TEMPORARY CONSTRUCTION ENTRANCE RE: 1 / C0.52

DISTURBED AREA = 2.49 ACRES

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SHEET HISTORY:

ISSUED 02/08/2021 CONTRACT DOCUMENTS
ADD 04 04/05/2021 POST BID ADDENDUM 04

Contract Documents

University of Missouri South Farm - Swine Research Facility

South Farm
Columbia, MO 65201

CE No.: 624-187-20
MU No.: CP201372

February 8, 2021

STATE OF MISSOURI · SASSAN MATDJAKI · NUMBER E-24961 · REGISTERED PROFESSIONAL ENGINEER

Construction Set
Issued: 05/20/2021

Site Erosion Control Plan

C0.51

Appendix E

Construction Activity Record

Construction Activity Record

An accurate and up-to-date record of construction activity must be maintained as a part of this plan. Record the information below on an ongoing basis.

- Dates when major soil disturbing activities occur
- Dates when construction activities temporarily cease on a portion of the site
- Dates when construction activities permanently cease on a portion of the site
- Dates when stabilization measures are initiated

Date	Activity

Appendix F
Completed Inspection Forms

SECTION 01 73 29 - CUTTING AND PATCHING

PART 1 GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of 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 cutting and patching.

1.3 QUALITY ASSURANCE

A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce the load-carrying capacity or load-deflection ratio.

B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing the capacity to perform as intended.

C. Visual Requirements: Do not cut and patch exposed work in a manner that results in visual evidence of cutting and patching. Remove and replace work cut and patched in a visually satisfactory manner as determined by Architect.

PART 2 PRODUCTS

2.1 MATERIALS

A. Use materials that are identical to existing materials. If identical materials are not available, use materials that match existing adjacent surfaces to the fullest extend possible. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.1 PREPARATION

A. Temporary Support: Provide temporary support of Work to be cut.

1. Protection: Protect existing construction during cutting and patching.

3.2 PERFORMANCE

A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.

B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction.

C. Patching: Patch with durable seams that are invisible.

1. Restore exposed finishes in a manner that will eliminate evidence of patching and refinishing.
2. Where removal of walls or partitions extends one finished area into another, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. Remove existing floor and wall coverings and replace with new materials as required to achieve uniform color and appearance.

    a. Where patching occurs in a smooth paint surface, extend final paint coat over entire unbroken surface after the patched area has received primer and second coat.

3. Patch, repair or rehabbing existing ceiling as necessary to provide an even plane surface of uniform appearance.

3.3 CLEANING

A. Thoroughly clean areas and spaces where cutting and patching are performed.

END OF SECTION 01 73 29

SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Salvaging nonhazardous demolition and construction waste.
2. Recycling nonhazardous demolition and construction waste.
3. Disposing of nonhazardous demolition and construction waste.

B. See Division 31 Section “Site Clearing” for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.2 DEFINITIONS

A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

1.3 PERFORMANCE GOALS

A. General: Develop waste management plan that results in end-of-Project rates for salvage/recycling of 100 percent by weight of total waste generated by the Work.

B. Salvage/Recycle Goals: Owner’s goal is to salvage and recycle as much nonhazardous demolition and construction waste as possible.

1.4 SUBMITTALS

A. Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-Project rates for salvage, recycling, and disposal as a percentage of total waste generated by the Work.

1.5 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

B. Waste Management Conference: Conduct conference at Project site.

1.6 WASTE MANAGEMENT PLAN

A. General: Develop plan consisting of waste identification and waste reduction work plan. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on Project site where materials separation will be located.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

A. General: Implement waste management plan as approved by Owner. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at the Project Site.

1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 1 Section “Temporary Facilities and Controls” for controlling dust and dirt, environmental protection, and noise control.

3.2 SALVAGING DEMOLITION WASTE

A. Salvaged Items for Reuse in the Work:

1. Clean salvaged items.
2. Pack or crate items after cleaning. Identify contents of containers.
3. Store items in a secure area until installation.
4. Protect items from damage during transport and storage.
5. Install salvaged items to comply with installation requirements for new materials and equipment. Provide connections, support, and miscellaneous materials necessary to make items functional for use indicated.

B. Salvaged Items for Sale and Donation: Not permitted on Project Site.

C. Salvaged Items for Owner’s Use:

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.

3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical.

1. Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from Project site. Include list of acceptable and unacceptable materials at each container and bin.

    a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect them from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.4 RECYCLING DEMOLITION WASTE

A. Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

B. Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

C. Metals: Separate metals by type.

1. Structural Steel: Stack members according to size, type of member, and length.
2. Remove and dispose of bolts, nuts, washers, and other rough hardware.

D. Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

E. Lighting Fixtures: Separate lamps by type and protect from breakage.

1. Remove ballast from fixture and separate non-PCB and PCB ballast. Ballast to be stacked, labeled and shrink wrapped on wood pallets. Owner will pick up from site. Coordinate with Owner the location of material for removal.
2. Owner will provide lamp boxes for Contractors removal and disposal procedure. Owner will pick up from site. Coordinate with Owner the location of material for removal.

F. Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

G. Conduit: Reduce conduit to straight lengths and store by type and size.

3.5 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
2. Polystyrene Packaging: Separate and bag materials.
3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

C. Wood Materials:

1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

3.6 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.

1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

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SECTION 01 91 13 – GENERAL COMMISSIONING REQUIREMENTS

1. GENERAL

1.1 SUMMARY

A. The Owner has retained an independent Commissioning Authority (CxA) to coordinate commissioning activities for this project. The objective of the commissioning process is to verify and document that the performance of facilities, systems, and assemblies installed as part of this project meet defined objectives and criteria.

B. This Section outlines general roles and responsibilities of the CxA, Owner, and General Contractor. Divisions 01, 21, 22, 23, 25, 26, 27, and 28 Sections define roles and responsibilities which are applicable to those divisions' work.

C. The Commissioning Authority is an independent contractor retained directly by the Owner.

D. Commissioning requires support from Contractors. The Commissioning Process does not relieve any Contractors from their obligations to complete all portions of work in a satisfactory manner.

E. Commissioning work shall be a team effort to ensure all commissioned equipment and systems have been completely and properly installed, function together correctly to meet the design intent, and document system performance. Commissioning shall coordinate system documentation, equipment startup, control system calibration, testing and balancing, verification/pre-testing, and performance testing.

F. The Commissioning Team shall be made up of representatives from the Owner, Design Team, General Contractor (GC), Manufacturers, and Construction Trades; trades represented on the Commissioning Team include electrical, sheet metal, piping, control, test and balance, and fire alarm.

G. The General Contractor is responsible for coordinating all Commissioning activities. In the absence of a General Contractor, the Prime Contractor shall take on this role.

H. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:

1. Verify that the work is installed in accordance with Contract Documents and the manufacturer’s recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.

4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.

I. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.

J. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.

1.2 RELATED WORK

A. Section 22 08 16 – Commissioning of Plumbing Systems Support

B. Section 23 08 16 – Commissioning of Mechanical Systems Support

C. Section 26 08 16 – Commissioning of Electrical Systems Support

1.3 DEFINITIONS

A. Acceptance: A formal action, taken by a person with appropriate authority (which may or may not be contractually defined) to declare that some aspect of the project meets defined requirements, thus permitting subsequent activities to proceed.

B. Basis of Design (BOD): A document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process. The BOD typically incorporates the schematic design documents produced early in the design process.

C. Checklists: Project and element-specific checklists that are developed and used during all phases of the Commissioning Process to verify that the Owner's Project Requirements are being achieved. Checklists are used for general evaluation, testing, training, and other design and construction requirements.

D. Commissioning Process or Commissioning (Cx): A quality focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.

E. Commissioning Process Activity: A component of the Commissioning Process.

F. Commissioning Authority (CxA): An entity identified by the Owner who plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.

G. Commissioning Field Report: A written document that identifies the commissioning activities completed during a visit to the project site. The report identifies significant findings, results,

comments and questions that resulted from the visit. This is typically produced by the CxA per site visit.

H. Commissioning Plan: A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.

I. Commissioning Process Activities (Cx Process Activities): Components of the Commissioning Process

J. Commissioning Progress Report (Cx Progress Report): A written document that details activities completed as part of the Commissioning Process and significant findings from those activities, and is continuously updated during the course of a project.

K. Commissioning Request for Information (RFI): Form used by the Commissioning Authority to request information from the design or construction team.

L. Commissioning Team (Cx Team): The individuals and agencies who, through coordinated actions, are responsible for implementing the Commissioning Process.

M. Commissioning Testing (Cx Testing): The Evaluation and documentation of the equipment and assemblies delivery and condition, installation, proper function according to the manufacturer's specifications, and project documentation to meet the criteria in the Owner's Project Requirements.

N. Construction Team: The General Contractor, related sub-contractors, and other contractors working for the Owner during the Construction Phase.

O. Construction Documents: This includes a wide range of documents, which will vary from project to project, and with the owner's needs and regulations, laws, and jurisdictional requirements. Construction documents usually include the project manual (specifications), plans (drawings), and general terms and conditions of the contract.

P. Contract Documents: This includes a wide range of documents, which will vary from project to project and with the owner's needs, regulations, laws, and jurisdictional requirements. Contract documents frequently include price agreements; construction management process; subcontractor agreements or requirements; requirements and procedures for submittals, changes, and other construction requirements; timeline for completion; and the construction documents.

Q. Contractor Commissioning Issues Log: A formal document and ongoing record of problems or concerns identified through the construction phase which deviate from the project's construction documents, applicable codes and/or normal construction industry practices and their resolution. Items on this issues log should be reviewed by the GC and corrected in a timely manner by the applicable trades and contractors.

R. Coordination Drawings: Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for

maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

S. Current Facility Requirements (CFR): A written document that details the current functional requirements of an existing facility and the expectations of how it should be used and operated. This includes goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information to meet the requirements of occupants, users, and owners of the facility.

T. Design Checklist: A form developed by the Commissioning Team to verify that elements of the design are in compliance with the Owner's Project Requirements. Also see checklists.

U. Design Review (Peer): An independent and objective technical review of the design of the project or a part thereof, conducted at specified stages of design completion by one or more qualified professionals, for the purpose of enhancing the quality of the design.

V. Design Review (Constructability): The review of effective and timely integration of construction knowledge into the conceptual planning, design, construction, and field operation of a project to achieve project objectives efficiently and accurately at the most cost-effective levels to reduce or prevent errors, delays, and cost overruns

W. Design Review (Code or Regulatory): A review of a document conducted by staff or designated entity of an authority having jurisdiction to determine whether the content of the document complies with regulations, codes, or other standards administered by the jurisdiction.

X. Design Review (Commissioning): A review of the design documents to determine compliance with the Owner's Project Requirements, including coordination between systems and assemblies being commissioned, features and access for testing, commissioning and maintenance, and other reviews required by the OPR and Commissioning Plan.

Y. Design Team Commissioning Issues Log: A formal and ongoing record of issues pertaining to the project construction documents, from the design phase and through the construction phase of the project, which identifies areas of concern with the design regarding to coordination between divisions, constructability, maintenance clearances, operability or other commissioning concerns, and the issue resolution.

Z. Evaluation: The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems and their performance are confirmed with respect to the criteria required in the Owner's Project Requirements.

AA. Existing Building Commissioning Process: A quality focused process for attaining the Current Facility Requirements of an existing facility and its systems and assemblies being commissioned. The process focuses on planning, investigating, implementing, verifying, and documenting that the facility and/or its systems and assemblies are operated and maintained to meet the Current Facility Requirements, with a program to maintain the enhancements for the remaining life of the facility.

BB. Facility Guide: A basic building systems description and operating plan with general procedures and confirmed facility operating conditions, setpoints, schedules, and operating procedures for use by facility operations to properly operate the facility.

CC. Final Commissioning Report (Final Cx Report): A document that records the activities and results of the Commissioning Process and is developed from the final Commissioning Plan with all of its attached appendices.

DD. Functional Performance Test (FPT): A written protocol that defines methods, personnel, and expectations, for tests conducted on components, equipment, assembles, systems, and interfaces among systems.

EE. Issues and Resolution Log: a formal and ongoing record of problems or concerns and their resolutions that have been compiled by members of the Commissioning Team during the course of the Commissioning Process.

FF. Ongoing Commissioning Process (OCx): A continuation of the Commissioning Process well into occupancy/operations to continually improve the operation and performance of a facility to meet current and evolving CFR or Owner's Project Requirements. Ongoing Commissioning Process Activities occur throughout the life of the facility; some of these will be close to continuous in implementation, and others will be either scheduled or unscheduled as needed.

GG. Owner's Project Requirements (OPR): A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information. This document also identifies end user requirements and expectations for the operation of critical areas, spaces and systems.

HH. Performance Test (PT): Performance testing is the process of verifying that a material, product, assembly, or system meets defined performance criteria. The methods and conditions under which performance is verified are described in one or more test protocols.

II. Pre-Functional Checklist (PFC): A form used by the contractor to verify that appropriate components are on-site, ready for installation, correctly installed, started up, tested and balanced, in compliance with the owner's project requirements, and is ready for functional performance testing. This documentation is available on the WBCS.

JJ. Re-commissioning: An application of the Commissioning Process requirements to a project that has been delivered using the Commissioning Process. (See existing building Commissioning Process.)

KK. Retrocommissioning: The Commissioning Process applied to an existing facility that was not previously commissioned. (See existing building Commissioning Process.)

LL. Submittal Review: A commissioning review of the equipment submittal for relevant mechanical, electrical, plumbing and energy consuming equipment and systems.

MM. Systems Manual: A system-focused composite document that includes the OPR, BOD, design and construction documentation, facility guide and operation manual, maintenance information, approved submittals, training information and materials, Commissioning Process records, and additional information of use to the Owner during the Occupancy and Operation Phase. This is produced for selected projects as additional scope beyond the standard commissioning report.

NN. Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems to verify compliance with the Owner's Project Requirements.

OO. Training Plan: A written document that details the expectations, schedule, duration and deliverables of Commissioning Process Activities related to training of project operating and maintenance personnel, users, and occupants.

PP. Web-based Commissioning Software (WBCS): The web-based software used to manage the commissioning process including design review, construction review, field observations, checklists and tests.

1.4 ROLES AND RESPONSIBILITIES

A. Commissioning Authority (CxA)

1. Develop a Commissioning Plan outlining the organization, schedule, and documentation requirements of the Commissioning Process.
2. Coordinate and direct the commissioning activities in a logical, sequential and efficient manner using consistent protocols and forms, centralized documentation, clear and regular communications with the Cx team, and frequently update timelines and schedules for Cx activities.
3. The CxA is not responsible for the design concept, design criteria, compliance with codes, site safety, construction means and methods, review or approval of change orders, design or general construction scheduling, cost estimating, or construction management.
4. Review contract documents for completeness and quality. Document issues in the Design Team Commissioning Issues Log.
5. The CxA may assist with problem solving, non-conformance or deficiencies, but ultimately that responsibility resides with the General Contractor (GC) and the Architect/Engineer (A/E). The primary role of the CxA is to oversee the commissioning process. This includes site observations of installation of commissioned systems and equipment, development and coordination of the execution of a FPT testing plan and observation and documentation of performance that systems are functioning in accordance with the documented OPR, design intent and in accordance with the Contract Documents. The Contractors will provide all tools and personnel to start and check-out and test equipment and systems, except as noted in this section.
6. Coordinate the commissioning work and work with the GC to incorporate commissioning activities into the master project schedule maintained by the GC.
7. Update and revise the Commissioning Plan as required.
8. Plan and conduct a commissioning scoping meeting and other commissioning meetings with the Cx team. The CxA will record meeting minutes for Cx meetings facilitated by the CxA.

9. Request and review additional information required to perform commissioning tasks, including installation, operations and maintenance (IOM) manuals and materials, contractor start-up and checkout procedures. Document results and incorporate into the commissioning plan.
10. Review Contractor submittals applicable to systems being commissioned, for compliance with the Owner's Project Requirements and for coordination with the Commissioning Process. The CxA review provides information to the Design Team but is not a review for acceptance or rejection of the submitted equipment or system; acceptance or rejection of any submittal remains the responsibility of the Design Team.
11. Conduct periodic construction observations to verify that systems and equipment are installed consistently with Owner's Project Requirements. Document deficiencies on the Web Based Commissioning Software and share it with the Commissioning Team (Note: the Commissioning Authority is responsible for identifying deficiencies but is not responsible for ensuring that deficiencies are corrected).
12. Attend selected planning and job-site meetings to obtain information on construction progress.
13. With necessary assistance and review from installing contractors, write and distribute the pre-functional checklists and functional performance test procedures for systems and equipment.
14. Approve installation checklists completed by GC by reviewing Web Based Commissioning checklist reports and by selected site observation and spot checking to confirm that systems and equipment are ready for Functional Performance Tests.
15. Review start-up and TAB reports to confirm included systems are ready for functional performance testing.
16. Coordinate, witness and document functional performance testing by installing contractors. Coordinate retesting as necessary until satisfactory performance is achieved per design specifications. See 3.11 for extent of retesting included in the commissioning scope.
17. Coordinate, witness and document required seasonal or deferred functional performance testing and any deficiency corrections required.
18. Review equipment warranties and confirm that they are project specific and clearly define the Owner's responsibilities if any.
19. Oversee and review the training of the Owner's operating personnel.
20. Review O&M manuals submitted by the GC.
21. Provide a final commissioning report for review and acceptance by Owner.
22. The CxA is not responsible for construction means and methods or for site safety and security.
23. The CxA will not authorize or approve construction cost amendments, changes to the construction schedule, or changes to the contract documents.

B. General Contractor (GC):

1. Include the cost of commissioning in the total contract price.
2. The GC is responsible for coordinating all commissioning activities of the sub-contractors. Commissioning activities may be completed by the Mechanical Contractor (MC), Electrical Contractor (EC), Controls Contractor (CC), or Test and Balance (TAB) contractor, but the GC is ultimately responsible for completion of all of these tasks.
3. Facilitate the coordination of the commissioning work by the CxA and incorporate commissioning activities into the master schedule.

4. Furnish a copy of all construction documents, addenda, change orders, Requests for Information (RFIs), approved submittals, shop drawings, and IOMs, related to commissioned systems and equipment to the CxA.
5. In each purchase order or subcontract written, include requirements for commissioning.
6. Ensure that all sub-contractor's execute their commissioning responsibilities according to the Contract Documents and schedule.

7. The GC shall designate a staff member who will be knowledgeable and responsible for the construction of the commissioned systems (typically the MEP superintendent) to be their active representative on the commissioning team. This person shall attend the commissioning scoping meeting and other necessary meetings scheduled by the CxA to facilitate the commissioning process.
8. Coordinate and share the issues identified on the Web Based Commissioning Software (WBCS) Cx Issues Log with the appropriate trade sub-contractors. Respond on the WBCS in writing to the CxA with the contractor's response, appropriate trade responsible for the corrective action and anticipated completion date for the corrective action.
9. Follow up with the subcontractors as to the status of the corrective actions to the items on the Web Based Commissioning Software Issues Log, and update the CxA.
10. The GC's designated Cx team staff member shall personally examine, witness and verify that all issues are corrected and complete when the sub-contractor states they have "corrected" an item on the Web Based Commissioning Software Issues Log.
11. After the GC has verified issues are resolved, they shall indicate so on the Web Based Commissioning Software and the CxA accordingly.
12. Notify the CxA one week in advance of all equipment start-ups and tests required by the Contract Documents.
13. Submit test results for tests required by the Contract Documents, including (but not limited to) duct leakage tests, hydronic system pressure tests, plumbing system disinfection certification, generator tests, smoke evacuation system tests, fire pump tests, fire alarm tests, etc. as applicable to the commissioning scope.
14. Coordinate and distribute "copies" (preferably via Web Based Commissioning Software) of the Pre-Functional Checklists to all relevant subcontractors.
15. Remedy any deficiencies identified in the Pre-Functional Checklists and notify the Commissioning Authority (in writing) that deficiencies have been addressed.
16. Notify the CxA when TAB activities will be taking place and have been completed. Provide CxA with TAB report(s).
17. Participate in TAB verification, which may include repeating selected measurements contained in the TAB report(s).
18. Coordinate with subcontractors to ensure qualified technicians are available for performing the functional performance test procedures under direction of the CxA.
19. Coordinate the training of Owner personnel.
20. Verify that subcontractors prepare and submit O&M manuals, according to the Contract Documents, including clarifying and updating the original sequences of operation to as-built conditions.
21. Ensure that subcontractors execute seasonal or deferred functional performance testing, witnessed by the CxA, according to the specifications.
22. Ensure that subcontractors correct deficiencies and make necessary adjustments to O&M manuals and as-built drawings for applicable issues identified in any seasonal testing.
23. Gather and submit all project closeout documentation, including submittals, O&M manuals, as-built drawings, warranties, etc. to CxA for approval.

C. Mechanical Contractor (MC):

1. Designate a staff member who will be knowledgeable and responsible for the construction of the commissioned systems (typically the trade superintendent) to be their active representative on the commissioning team. This person shall attend the commissioning

scoping meeting and other necessary meetings scheduled by the CxA to facilitate the commissioning process.

2. Include cost to complete commissioning requirements for mechanical systems in the contract price.
3. Include requirements for submittal data, O&M data, and training in each purchase order or sub contract written.
4. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
5. Attend Construction Phase coordination meetings scheduled by the Commissioning Authority.
6. Respond to (in writing preferably via WBCS) and address items documented in the Contractor Commissioning Issues Log.
7. Notify the GC a minimum of two weeks in advance of system start-up and testing, so CxA may be on site to witness.
8. Notify the GC a minimum of two weeks in advance, of the time for start of the TAB work. Attend the initial TAB meeting for review of the TAB procedures.
9. Submit copies of all test results to the CxA.
10. Assist the Commissioning Authority in all Functional Performance Tests.
11. Prepare preliminary schedule for mechanical system orientation and inspections, O&M manual submission, training sessions, pipe and duct system testing, flushing and cleaning, equipment start up, TAB, and task completion for use by the GC and Commissioning Authority. Update schedule as appropriate throughout the construction period.
12. Conduct mechanical system orientation and inspection when equipment is set in place.
13. Keep drawings updated as changes in the field are made, and review with the GC and Commissioning Authority.
14. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to GC for review prior to the completion of construction.
15. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
16. Submit training syllabus for approval to Commissioning Authority.
17. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
18. Provide a complete set of as-built records to the GC.

D. Test, Adjust, and Balance Contractor (TAB):

1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Submit the TAB procedures to the GC for review and acceptance.
4. Attend the TAB review meeting scheduled by the GC. Be prepared to discuss the procedures that shall be followed in testing, adjusting and balancing the HVAC system.
5. Participate in training sessions as scheduled by the GC.
6. At the completion of the TAB work, and submittal of final TAB report, notify the Mechanical Contractor.

7. Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB report where required by the Commissioning Authority for verification or diagnostic purposes.

E. Integrated Automation/Controls Contractor:

1. Include cost for commissioning requirements in the contract price.
2. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
3. Provide control submittals in accordance with specifications.
4. Attend Construction Phase coordination meetings scheduled by the Commissioning Authority.
5. Respond to (in writing preferably via WBCS) and address items documented in the Contractor Commissioning Issues Log.
6. Verify proper installation and performance of controls/BAS hardware and software provided by others.
7. Integrate installation and programming schedule with construction and commissioning schedules.
8. Provide thorough training to operating personnel on hardware operations and programming, and the application program for the system.
9. Demonstrate system performance to Commissioning Authority including all modes of system operation (e.g. normal, abnormal, and emergency).
10. Perform system pre-testing for all systems in Cx scope prior to pre-functional with the CxA
11. Provide control system technician for use during Pre-Functional Checklists and Functional Performance Testing.
12. Provide CxA with access to BAS system interface, and any necessary network connection cables, for accessing the direct digital control system field panels for system testing. The controls contractor shall provide the CxA with log-on ID and password for connection to the direct digital control system. All of the software, cables, and modems provided to the CxA will be returned at the successful conclusion of the commissioning effort. See section 2.3 for further details.
13. Provide system modifications as required.
14. Create and provide building automation system trends as requested by the CxA.
15. Provide support and coordination with TAB contractor on all interfaces between their scopes of work. Provide all devices, such as portable operator terminals, for TAB use in completing TAB procedures.
16. Provide trend logs as required to facilitate the Commissioning Process.

F. Electrical Systems:

1. Designate a staff member who will be knowledgeable and responsible for the construction of the commissioned systems (typically the trade superintendent) to be their active representative on the commissioning team. This person shall attend the commissioning scoping meeting and other necessary meetings scheduled by the CxA to facilitate the commissioning process.
2. Include cost to complete commissioning requirements for mechanical systems in the contract price.

3. Include requirements for submittal data, O&M data, and training in each purchase order or sub contract written.
4. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
5. Attend Construction Phase coordination meetings scheduled by the Commissioning Authority.
6. Respond to (in writing preferably via WBCS) and address items documented in the Contractor Commissioning Issues Log.
7. Notify the GC a minimum of two weeks in advance of system start-up and testing, so CxA may be on site to witness.
8. Submit copies of all test results to the CxA.
9. Complete Pre-Functional Checklists for all equipment through WBCS.
10. Assist the Commissioning Authority in all Functional Performance Tests.
11. Prepare preliminary schedule for electrical system orientation and inspections, O&M manual submission, training sessions, pipe and duct system testing, flushing and cleaning, equipment start up, TAB, and task completion for use by the GC and Commissioning Authority. Update schedule as appropriate throughout the construction period.
12. Conduct electrical system orientation and inspection when equipment is set in place.
13. Keep drawings updated as changes in the field are made, and review with the GC and Commissioning Authority.
14. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to GC for review prior to the completion of construction.
15. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
16. Submit training syllabus for approval to Commissioning Authority.
17. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
18. Provide a complete set of as-built records to the GC.

G. Life Safety Systems:

1. Designate a staff member who will be knowledgeable and responsible for the construction of the commissioned systems (typically the trade superintendent) to be their active representative on the commissioning team. This person shall attend the commissioning scoping meeting and other necessary meetings scheduled by the CxA to facilitate the commissioning process.
2. Include cost to complete commissioning requirements for mechanical systems in the contract price.
3. Include requirements for submittal data, O&M data, and training in each purchase order or sub contract written.
4. Ensure participation of major equipment manufacturers in appropriate training and testing activities.
5. Attend Construction Phase coordination meetings scheduled by the Commissioning Authority.
6. Respond to (in writing preferably via WBCS) and address items documented in the Contractor Commissioning Issues Log.

7. Notify the GC a minimum of two weeks in advance of system start-up and testing, so CxA may be on site to witness.
8. Submit copies of all test results to the CxA.
9. Assist the Commissioning Authority in all Pre-Functional Checklist verifications and Functional Performance Tests.
10. Prepare preliminary schedule for life safety system orientation and inspections, O&M manual submission, training sessions, pipe and duct system testing, flushing and cleaning, equipment start up, TAB, and task completion for use by the GC and Commissioning Authority. Update schedule as appropriate throughout the construction period.
11. Conduct life safety system orientation and inspection when equipment is set in place.
12. Keep drawings updated as changes in the field are made, and review with the GC and Commissioning Authority.
13. Gather O&M data on all equipment, and assemble in binders as required by the Commissioning Specification. Submit to GC for review prior to the completion of construction.
14. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
15. Submit training syllabus for approval to Commissioning Authority.
16. Participate in, and schedule vendors and Contractors to participate in the training sessions as set up by the GC.
17. Provide a complete set of as-built records to the GC.

H. Equipment Manufacturers and Miscellaneous Contractors:

1. Include cost for commissioning requirements in the contract price.
2. Provide submittals, and appropriate O&M manual section(s).
3. Attend initial commissioning coordination meeting scheduled by the Commissioning Authority.
4. Participate in training sessions as scheduled by the GC.
5. Demonstrate performance of equipment as applicable.

I. Owner:

1. Manage the contract of the A/E and of the GC.
2. Arrange for facility operating and maintenance personnel to attend various field commissioning activities and field training sessions according to the Commissioning (Cx) Plan.
3. Provide final approval for the completion of the commissioning work.
4. Coordinate site visits and meetings with the Commissioning Authority (CxA).
5. Review and comment on commissioning documentation such as the Cx plan, field reports, and issue logs.
6. Provide interpretations and clarifications of the Owner's Project Requirements.
7. Provide input and direction on commissioning-related recommendations that arise from the commissioning process which may enhance the operation of the building but are not included in the project documents and may be an additional project cost. If the Owner is in agreement with commissioning recommendations, they are to direct the Design Team to review and issue the appropriate directive to add that scope and maintain the Design Team's responsibility for all construction documents.

J. Design Team (Architect/Engineer):

1. Perform normal submittal review, construction observation, as-built drawing preparation, O&M manual preparation, etc., as contracted with Owner.
2. Fulfill all obligations specified in the contract documents, including reviewing and approving submittals, conducting construction observation, issuing addenda and clarifications, responding to RFIs, issuing punchlists, and conducting substantial and final completion walkthroughs. Review and provide comments on all recommendations.
3. Provide any design narrative documentation requested by the CxA.
4. Prepare and submit final as-built design intent documentation for inclusion in the Systems Manual.
5. Review and approve the O&M manuals.
6. Coordinate resolution of design non-conformance and design deficiencies identified during the project.
7. Assist (along with the contractors) in clarifying the operation and control of commissioned equipment in areas where the specifications, control drawings or equipment documentation is not sufficient for writing detailed testing procedures.
8. Participate in the resolution of system deficiencies identified during commissioning.
9. Notify the CxA of substantive changes to the Contract Documents.
10. Provide clarifications to Contract Documents as required.
11. Review the Design Team Commissioning Issues Log and respond to all items in a timely manner. Update contract documents as required to address commissioning items identified.
12. Review commissioning suggestions identified on the Design Team Commissioning Issues Log for impact to the design intent. If the design team is in agreement with the suggestion, they are to assist in reviewing the suggestion with the owner for their review and decision if it should be added to the project.
13. The design team shall review all shop drawing and submittal comments from the CxA.

1.5 SCOPE OF COMMISSIONING

A. The systems listed below and any subsystems, components, or peripheral devices that form a complete functional system, including any associated controls and control equipment. The systems and equipment identified below will include their own specific pre-functional checklist and functional performance test procedures completed by the CxA. See the Cx Plan for a full list of equipment and sample rates within the current project scope.

B. Plumbing Systems:

1. Water heaters.
2. Booster pumps.
3. Laboratory gas systems.

C. HVAC System, including:

1. Major and minor equipment items.
2. Piping systems and equipment.
3. Ductwork and accessories.

4. Terminal units.
5. Control system.
6. Sound control devices.
7. Vibration control devices.
8. Variable frequency drives.

D. Special Ventilation:

1. Fume hoods.
2. Laboratory pressurization.

E. Integrated Automation.

F. Electrical Systems:

1. Power quality.
2. Emergency power systems.
3. Lighting controls other than manual switches.

G. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

1.6 RELATED REQUIREMENTS

A. Section 01 78 00 - Closeout Submittals: Scope and procedures for operation and maintenance manuals and project record documents.

1.7 COMMISSIONING DOCUMENTATION

A. General:

1. Timely and accurate documentation of commissioning activities is essential for the commissioning process to be effective. To this end, all commissioning activities conducted by the contractors shall be documented as outlined below and in Part 3 Execution of this specification.
2. Contractor commissioning responsibilities on WBCS include the following items:

a. Construction Issues
b. Functional Performance Tests

3. The Architect, Engineers, GC, subcontractors, and owner will be responsible for responding on the WBCS within five business days of an inquiry being assigned to them.

a. All of the aforementioned entities will be responsible for the same response time in the identified field punch software.
b. The punch list and open commissioning items will be tied to identify retention dollars that will not be paid until all open issues are resolved.

c. CxAlloy will be the designated web based commissioning software (WBCS) that will be used by all Cx agents and used for MEP items identified throughout the project.

4. The functional performance tests will be completed by the CxA as they witness the test conducted by the contractors.
5. All Contractor Commissioning Documents prepared by the contractors will be fully completed in a neat and workmanlike manner so as to be fully legible. Documentation which, at the CxA's discretion, is incomplete or less than fully legible shall be deemed unacceptable.
6. Commissioning procedures and tests, which are rejected by the CxA due to incomplete, or illegible contractor documentation shall be repeated by the contractor and new Contractor Commissioning Documents shall be prepared to the Commissioning Team's satisfaction at no additional cost to the Owner.
7. Procedures deemed unacceptable by the Commissioning Team after being repeated due to inadequate documentation may be subject to completion by the CxA, at a cost to the contactor as outlined in item Section 3.11 "Cost of Re-Evaluation" below.
8. All Contractor Commissioning Documents shall be completed on the job-site concurrent with the activities being documented. Remedial documentation of commissioning activities either off-site or after the procedures have been completed is unacceptable.
9. All Contractor Commissioning Documents will be submitted to the CxA for review and acceptance upon completion.

B. Contractor Commissioning Process Status Tracking:

1. Contractors shall be responsible for monitoring the progress of their commissioning activities. The contractor will update the status of issues, checklists and tests on WBCS.
2. The CxA will assist the contractor in using WBCS.
3. The contractors shall regularly update WBCS and upload drawings or pictures as commissioning activities are completed so as to provide a readily available report to CxA regarding current status of the contractors commissioning activities.
4. Example screenshots from the WBCS are included as Appendix A to this specification. These samples are provided for reference only to assist contractors in preparing their bids for this project. The actual forms used on this project will be similar in scope and format to the sample forms, but the specific content will differ somewhat from the sample forms to specifically reference the requirements of this project.

C. Record Drawings:

1. Contractors shall regularly update a 'redlined' set of record drawings showing commissioned systems as work is being installed so that the drawings remain current with the field work, and as required in Division 01, 21, 22, 23, 25, 26, 27, and 28 of the project specifications.
2. Redlining record drawings at the end of construction shall not be acceptable
3. The Contractors up-to-date, in-progress redlines shall be kept on-site in the Contractor's field office and available for review by the Cx Team.

D. Access to Contractor Documentation:

1. Contractors shall provide the CxA with access to shop drawings, coordination drawings, equipment cut-sheets, schematics, in-progress record drawings, manufacturers installation-operation-maintenance manuals, startup reports, etc. to assist the CxA in execution of the Cx process.

1.8 COORDINATION

A. The CxA shall receive a copy of all construction documents, addenda, change orders, and appropriate approved submittals and shop drawings directly from the GC.

B. The CxA shall disseminate written information and documents to all responsible parties relative to the nature and extent of the Cx communication.

C. The CxA is primarily responsible to the Owner and, as such, shall regularly apprise the GC and the Owner of progress, pending problems and/or disputes, and shall provide regular status reports on progress with each system. Any potential change in the contractual and/or financial obligations of the owner (credits, change orders, schedule changes, etc.) shall be identified and quantified as soon as possible.

D. The CxA shall coordinate the schedule of commissioning activities with the construction schedule. It is possible that some procedures will be completed before the entire system is completed.

1.9 SCHEDULE

A. Commissioning of systems shall proceed per the criteria established in the specific sections that follow, with activities to be performed on a timely basis. The CxA shall be available to respond promptly to avoid construction delays.

B. Start-up and testing of systems may proceed prior to final completion of systems to expedite progress. However, testing and checkout services that are the primary responsibility of the contractor / vendor will not proceed in advance of their testing and checkout.

C. Problems observed shall be addressed immediately, responsible parties notified, and actions to correct deficiencies coordinated in a timely manner.

D. Contractor schedules and scheduling is the responsibility of the GC. The CxA shall provide commissioning scheduling information to the GC for review and planning activities.

E. Functional performance testing will not be scheduled until equipment startups, acceptance testing, pre-functional checklists, system pre-testing, and test and balancing is complete for all commissioned systems. The contractor shall submit a certificate of readiness once each system is ready for functional testing.

1.10 REFERENCE STANDARDS

A. Industry standards and guidelines are a guide to the commissioning process and are hereby incorporated and will be applied as appropriate. Reference standards and guidelines include, but are not limited, to the following:

B. References:

1. ASHRAE Standard 202-2018: Commissioning Process for Buildings and Systems
2. ASHRAE Guideline 0-2019: The Commissioning Process
3. ASHRAE Guideline 1.1-2007: HVAC&R Technical Requirements for The Commissioning Process

2. PRODUCTS

2.1 TEST EQUIPMENT

A. All industry standard test equipment required for performing the specified tests shall be provided by the applicable Contractor (as specified) and shall be approved by the CxA.

B. Any portable or hand-held setup / calibration devices required to initialize the control system shall be made available by the control vendor (at no cost) to the CxA.

C. The instrumentation used in the commissioning process shall meet the following standards:

1. Be of sufficient quality and accuracy to test and/or measure system performance within the tolerances required.
2. Be calibrated at the manufacturer's recommended intervals with calibration tags permanently affixed to the instrument
3. Be maintained in good repair and operating condition throughout the duration of use on this project.
4. Be immediately re-calibrated or repaired if dropped and/or damaged in any way during use on this project.

2.2 TEST EQUIPMENT – PROPRIETARY

A. Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the Commissioning Process as needed. Proprietary test equipment (and software) shall become the property of the owner upon completion of the Commissioning Process.

2.3 BAS HARDWARE AND SOFTWARE

A. Field Panel Software and Hardware

1. The BAS Contractor shall furnish the CxA with three (3) copies of all hardware and software needed to connect to, communicate with and command the BAS field panels and controllers at no additional charge to the CxA. This hardware and software will be used by the CxA for execution of the commissioning process. Software and hardware provided to the CxA for this purpose, does not include any provisions for use by the Test & Balance Contractor.
2. Hardware and software covered under this requirement includes, but is not limited to:

    a. Latest versions of proprietary software such as Johnson Controls HVAC Pro, Siemens Building Technologies CIS, etc.
    b. Communication modules, software keys, and similar hardware needed for communication from a laptop computer, PDA or similar device to field panels or controllers
    c. Proprietary cables required for communication between laptop computers or PDAs to field panels or controllers
    d. Passwords, access levels and similar software permissions necessary for execution of the Cx Process.
    e. Software and hardware manuals for all control system hardware and software provided to the CxA.

3. This requirement is not meant to include provision of standard hardware such as laptop computers and PDAs nor provision of standard software such as Windows or MS Explorer.
4. At the conclusion of the Commissioning Process, this hardware and software will be turned over back to the contractor.

B. Front-End Software & Hardware

1. The BAS Contractor shall furnish the CxA with one (1) copy of their front-end software and associated hardware as needed to connect to, communicate with and command the BAS at no additional charge to the CxA.
2. Hardware and software covered under this requirement includes, but is not limited to:

    a. Proprietary software needed to communicate to field panels or controllers such as Johnson Controls Metasys, Siemens Building Technologies Apogee, etc. Revision levels for all software shall be identical with the revision level being provided to the project for the front-end operator workstation(s).
    b. Communication modules, software keys, and similar hardware needed for operation of the software or to communicate with the BAS.
    c. Proprietary cables required for communication between laptop computers and the BAS.
    d. Passwords, access levels and similar software permissions necessary for execution of the Cx Process.
    e. Software and hardware manuals for all control system hardware and software provided to the CxA.

3. This requirement is not meant to include provision of standard hardware such as laptop computers nor provision of standard software such as Windows or MS Explorer.

C. Operator Workstation Access

1. The BAS Contractor shall provide the CxA with software and hardware needed for accessing the BAS' front-end operator workstation(s). At a minimum, this shall include appropriate level user identification names and passwords. Access level shall allow the CxA to fully execute all commissioning procedures and will include the ability to:
2. View system operation:

    a. Override setpoints
    b. Command digital and analog output points
    c. View BAS programming source code (read-only)
    d. View and print graphics
    e. Create, view, modify, print and download trend logs, histories and reports

D. Technical Support:

1. The BAS Contractor shall also provide technical support to the CxA as reasonably requested by the CxA regarding setting up and operating BAS hardware and software to support successful execution of the Cx Process.

E. Duration of Support:

1. The BAS Contractor shall provide the CxA with technical support for the duration of the project and through the post occupancy phase commissioning activities and warranty period of the project to support the Cx process. The duration of this support is typically one year after turn over to the owner, to provide time to complete deferred and seasonal testing and the warranty phase activities.

3. EXECUTION

3.1 COMMISSIONING PLAN AND SCHEDULE

A. The CxA shall generate a Commissioning Plan which identifies Cx tasks, roles, and responsibilities for the Cx process. The CxA will submit Cx schedule tasks for the commissioning process which shall be integrated into the construction schedule by the General Contractor.

3.2 CONSTRUCTION OBSERVATION

A. Scope of Construction Phase Observation:

1. The Commissioning Authority will conduct periodic observations during the Construction Phase to monitor progress and compliance with the design intent and contract documents. It is the responsibility of the contractor to address the issues noted on the Issues Log and notify Commissioning Authority of completion.
2. Commissioning Authority observations will coincide with Design Team observations and are not intended to take the place of this work.

B. Documentation and Reporting:

1. Issues identified by the Commissioning Authority during Construction Phase will be documented on the WBCS and distributed to Commissioning Team members.
2. Progress during the Construction Phase will also be documented by the Commissioning Authority using Commissioning Process Reports.

3.3 COMMISSIONING ISSUES LOGS

A. As part of the commissioning process, all issues will be recorded on the WBCS. The WBCS will divide the issues as follows.

B. Design Commissioning Issues:

1. This log is part of the Web-Based Commissioning Software. This log is a formal and ongoing record of issues pertaining to the project construction documents which identifies areas of concern with the design regarding to coordination between divisions, constructability, maintenance clearances, operability or other commissioning concerns. This log specifically separates design issues from contractor issues. The contractor has no responsibility to track or comment on the design team Cx log.

C. Construction Commissioning Issues:

1. This log is part of the Web-Based Commissioning Software. It is a formal and ongoing record of problems or concerns pertaining to the installation of the commissioned systems and equipment which identifies where the contractors have deviated from the OPR, contract documents, applicable codes or normal industry construction practices. It is the GC's responsibility to regularly login and retrieve this log from the Web-Based Commissioning Software, follow up and review each item on the list with the appropriate trades, and respond to the CxA with feedback within 5 business days from the issuance of the log from the CxA.
2. Team members will be given access through the WBCS to comment on issues. This is where the GC should provide feedback which includes the following sections:
    a. Response/Action: This is the contractor’s response to the issue identified by the CxA.
    b. Trade: This identifies the specific contractor responsible for the correction of the issue. The issue will be assigned to that contractor or subcontractor.
    c. Expected Completion Date: This is the date which the GC and subcontractor agree the issue will be resolved by. This provides information back to the CxA as to when items should be corrected by for spot checking the correction of issues.
3. The GC shall provide feedback and updates to the construction Cx issues log to the CxA within 5 business days from its issuance from the CxA.
4. The CxA will maintain the master cx long on the WBCS.
5. A sample of the construction Cx issues log is included in Appendix B.

3.4 STARTUP PLANS AND REPORTS

A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.

B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.

C. Submit directly to the Commissioning Authority.

3.5 CONTRACTOR STARTUP TESTING

A. The contractors shall conduct all startup testing as required by the specifications, equipment manufacturer, the manufacturer's installation, operations and maintenance manual or as necessary to verify all equipment is properly installed.

B. Startup testing shall be documented. Appropriate documentation shall be by the contractor and/or the manufacturer's representative or entity specified in the construction documents.

C. The startup testing shall be documented using the contractors or manufacturer's standard forms and an electronic copy of the form shall be posted to the WBCS under the appropriate PFC.

3.6 TESTING AND BALANCING

A. Testing, Adjusting, and Balance Contractor (TAB) Requirements:

1. Air and water balance shall be accomplished by an independent test and balance firm. The test and balance firm shall come back after the final balancing report is approved to work with the CxA and spot check this work to verify accuracy of results. Refer to Division 23 for acceptance criteria.
2. Test and balance contractor to provide final balancing report to CxA.
3. The TAB contractor shall be responsible for successful completion and documentation of all TAB activities specified in the Division 23.
4. Prior to the start of TAB activities, the TAB contractor shall submit a proposed TAB plan, procedures and documentation to the CxA and A/E for review. TAB procedures shall be submitted to allow sufficient time for CxA review and approval prior to the start of TAB activities.
5. After this review, and prior to start of field work, the TAB contractor will attend one or more planning meetings as required with the Commissioning Team to review and discuss outstanding issues relating to TAB procedures and forms, discuss resolution of issues identified during the TAB contractor’s plan review and field inspections, and to coordinate field work.
6. Prior to the start of fieldwork, the TAB contractor shall issue a final set of TAB procedures and TAB forms which incorporate any comments received during the Commissioning Team review.

7. The TAB contractor shall have at least one certified field technician on site whenever TAB work is being performed.
8. The TAB contractor is responsible to notify the GC who in turn shall notify the Commissioning Team a minimum of two (2) weeks in advance of the time for start of TAB work to allow the CxA and A/E time to assess system readiness.
9. The TAB contractor will work cooperatively with the CxA.
10. The TAB contractor shall coordinate with the controls contractor to ensure that changes made to the control system during TAB (flow coefficients, duct areas, etc.) are archived and become the default or initial values for these parameters.
11. The TAB contractor shall provide daily lists of issues and/or problems identified during TAB work to the GC, CxA and A/E for follow-up & resolution with the appropriate contractors.
12. Participate in verification of the TAB report, which will consist of repeating any selected measurement contained in the TAB report where required by the CxA for verification or diagnostic purposes.
13. A TAB Final Acceptance Inspection shall be conducted by the A/E and CxA and will include a field verification of up to 5% of the TAB contractor's field readings.
14. The TAB contractor will provide technicians and instrumentation to support the field verification.
15. Instruments used for the field verification shall be the same instruments (by model and serial number) that were used for the original TAB work.
16. Failure of an item during the TAB field verification is defined as:

    a. For all readings other than sound, a deviation of more than 10 percent.
    b. For sound pressure readings, a deviation of 3 decibels. (Note: variations in background noise will be considered).

17. A failure of more than 10 percent or 10 (whichever is greater) of the readings tested during the field verification shall result in the rejection of the final TAB report and require re-balancing of the system(s) in question.

3.7 CONTROLS & INSTRUMENTATION TESTING

A. Prior to start of control system Functional Performance Procedures, the Building Automation System (BAS) Contractor shall verify and document that all control systems are installed and operating properly including the following:

1. Control Panels & Hardware Installation shall be fully verified and the appropriate Pre-Functional checklists completed prior to proceeding to subsequent installation/checkout steps.
2. Point-to-Point Checkout shall be completed and documented per the requirements of Integrated Automation and Controls section of Division 25 and item 3 below.
3. Control Sequence Checkout (Pre-Testing). Contractor shall verify that operation of control system programming matches the specified sequences of operation. For these checkouts, the Contractor shall, as much as possible, simulate actual operating conditions for the various operating modes being tested (heating, cooling, etc.) by false-loading systems, adjusting setpoints and similar techniques. The CxA will make the control sequence functional performance checklists available to the BAS Contractor for use in these checkouts.

4. Tune all Control Loops to obtain the fastest stable response without unreasonable hunting, offset or overshoot. Record tuning parameters and response test results for each control loop and provide trend reports to document results. Trend logs shall show both steady-state operation and response to setpoint changes.
5. Test All Alarms and Safeties Record all alarm parameters and alarm messages. Document all alarms and safeties have been tested and are functioning properly.

B. The BAS Contractor shall work with the TAB Contractor(s) to make sure that changes to the BAS made during TAB, such as flow coefficients, flow setpoints and duct areas are permanently archived in the BAS and become the initial or default values for their respective controllers. If BAS adjustments made by the TAB Contractor(s) get lost or overwritten prior to archiving, it shall be the BAS Contractor's responsibility to re-enter this data at no additional cost to the Owner.

C. Point-to-Point Checkout Requirements:

1. Items described in this section apply to and augment the requirements of the Integrated Automation section of the Division 25 specifications.

    a. These procedures will verify the following for each physical control point:
    b. Field device is installed per the manufacturer's recommendations and the project drawings and specifications
    c. Field verify calibration of all analog inputs and outputs
    d. Verify labeling of controllers, field devices, and wiring
    e. Physical points are correctly addressed and communicating properly between its controller and the field device.

2. Detailed written procedures for execution of Point-to-Point Checkouts shall be submitted to the CxA and Engineer by the Contractor for review and approval prior to the start of testing. Include proposed test forms as part of this submittal.
3. The Contractor shall provide all tools and instrumentation necessary for execution of this testing. All instrumentation must be in calibration and meet the requirements of Part 2 of this specification.
4. The CxA reserves the right to field verify up to 5% of the Contractor's Point-to-Point Checkout testing. The Contractor shall provide the technicians and instrumentation used for the original testing to assist the CxA with this field verification.

3.8 FUNCTIONAL PERFORMANCE TEST PROCEDURES

A. Scope

1. Functional Performance Test (FPT) procedures are executed after commissioned equipment and systems have been installed, started-up, and balanced. The goal of these procedures is to conclusively verify that commissioned equipment, sub-systems and major systems operate and perform per the design intent, the project specifications and OPR.
2. Equipment-level FPTs will be used to verify operation and capacity of selected equipment such as boilers, chillers cooling towers, pumps, exhaust fans, air handling units, etc.
3. System-level FPTs will verify the following aspects of system operation.

a. System operation under both normal and alternate operating conditions and modes
b. Interactions between equipment and sub-systems
c. Operation of safeties and interlocks
d. Control system operation, response time, stability and tuning
e. System response to abnormal and/or emergency conditions such as fire, equipment failure and power outages
f. All control sequence of operation strategies, alarm generation and reporting shall also be reviewed and proper operation verified by the CxA.

4. The central work station graphics, point assignments, alarm messages, and logging functions shall be verified.

B. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

C. Functional Performance Test Forms:

1. A sample FPT is included at the end of this specification as Appendix C. These sample forms are provided for reference only to assist contractors in preparing their bids for this project. The actual procedures and forms used for this project will be similar in scope and format to the samples, but the specific content will differ somewhat to specifically address the requirements of this project.
2. The FPTs used for this project will be finalized by the CxA after receipt of approved contractor submittals, including equipment Installation – Operations & Maintenance manuals.

D. Contractor Requirements:

1. The Cx team will, in a joint effort, coordinate and schedule FPT activities.
2. Scheduling of FPTs shall be contingent on notification from the affected contractor(s) to the GC and CxA that equipment and systems are ready for checkout.
3. Other prerequisites for execution of FPTs shall include the following:

a. TAB has been completed.
b. All Cx issues identified affecting equipment or system performance or operations have been resolved.

4. Prior to claiming readiness for FPT, the controls contractor shall ensure that the following items are completed and documented:

a. Point-to-point checkouts
b. Verify that network communication between all devices and systems is established
c. Sequence of Operation checkouts
d. Printed and annotated trend logs and alarm histories establishing acceptable operation including:

1) Stable control
2) Recovery from upset/changes (e.g., from setback)
3) Special and/or seasonal modes
4) Emergency and alarm modes including loss/restoration of power

5. Execution of the FPTs will be conducted by the contractors providing and installing the equipment and systems being commissioned and the BAS contractors and witnessed by the CxA.
6. Typical activities during FPT execution will include the following:

   a. Starting/stopping equipment
   b. Energizing/de-energizing electrical distribution gear
   c. Opening/closing valves and dampers
   d. Manipulating BAS inputs, outputs and setpoints
   e. Setup, collection and downloading of BAS trend data
   f. Test all modes of operation (normal, failure, backup, emergency, etc.)
   g. Confirmation of required alarms sent to BAS

7. The Contractor(s) shall maintain full responsibility for the facility, equipment and systems operated during the FPTs, maintain all guarantees and warranties, and shall repair any damage to the facility caused during the FPTs.
8. Contractors shall conduct seasonal FPTs as necessary. This includes performing FPTs on equipment during the season it is intended to operate (i.e. test cooling equipment during the peak cooling season and test heating equipment during the peak heating season, etc.). All seasonal FPT's shall be witnessed by the CxA.
9. Tools, test equipment and instrumentation required for completion of the FPTs shall be provided by the contractor except for special-purpose or proprietary tools, test equipment and instrumentation which will be provided by the contractors. All instruments shall meet the requirements of Part 2 of this specification.
10. FPT acceptance shall confirm the performance of systems to the extent of the design intent. When a system is accepted, the Owner shall be assured that the system is complete, works as intended, is correctly documented, and operator training has been performed.

3.9 INTEGRATED SYSTEMS TESTING (IST)

A. Blackout, or emergency power testing will be performed testing the functionality and reliability of building systems upon loss and restoration of normal power.

B. The objective of IST is to confirm that the systems, mechanical, electrical, life safety, and support systems, operate in concert to maintain power and critical environment conditions during a power loss failure scenario.

C. IST will test all operating modes, interlocks, and control sequence upon loss and restoration of normal power for all commissioned systems.

D. IST will begin once all functional performance testing has been completed and prior to building occupancy.

3.10 SEASONAL COMMISSIONING

A. Seasonal commissioning pertains to testing under full load conditions during peak heating and peak cooling seasons, as well as part load conditions during off-peak periods. Initial commissioning shall be done as soon as contract work is completed, regardless of season. Subsequent commissioning may be undertaken at any time thereafter to ascertain adequate performance during the different peak and off-peak conditions. Each contractor and manufacturer shall be responsible to participate in the initial and the alternate peak and off-peak tests of the systems as required to demonstrate performance.

3.11 COST OF RE-EVALUATION

A. The cost for Contractors to re-evaluate any Commissioning Procedure due to open issues shall be borne by the contractors.

B. The CxA will be available for two attempts of the Functional Performance Tests (one initial and one re-try) with minimal follow-up where necessary (due to deficiencies, systems not ready, incomplete work, etc.) to try to accomplish each test as part of the contract. When additional work is required because systems are not ready or because they do not successfully pass the FPT after they have been indicated as ready, the contractor will be charged for the CxA's additional retesting/reevaluation costs. Additional fees will be paid to the CxA by the Owner and shall be reimbursed by the Contractor.

C. Any required re-testing by any contractor shall not be allowed as a justified reason for a claim of delay or for a time extension by the contractor.

3.12 SOFTWARE DOCUMENATION REVIEW

A. Review detailed software documentation for all DDC control systems. This includes review of vendor documentation, their programming approach, and the specific software routines applied to this project. Discrepancies in programming approaches and/or sequences shall be reported and coordinated in order to provide the Owner with the most appropriate, simple, and straightforward approach to software routines.

3.13 OPERATION AND MAINTENANCE MANUALS

A. See Section 01 78 00 - Closeout Submittals for additional requirements.

B. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.

C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.

D. Commissioning Authority will add commissioning records to manuals after submission to Owner

E. The CxA shall review the draft form of the O&M manuals provided by the Division 21, 22, 23, 25, 26, 27, and 28 contractors. The review process shall verify that O&M instructions meet

specifications and are included for all equipment furnished by the contractor, and that the instructions and wiring diagrams are project specific (edited where necessary) to the actual equipment provided for this project.

1. Published literature shall be specifically oriented to the provided equipment indicating required operation and maintenance procedures, parts lists, assembly/disassembly diagrams, and related information.
2. The contractor shall incorporate the standard technical literature into system specific formats for this facility as designed and as actually installed. The resulting O&M information shall be project and system specific, concise, to the point, and tailored specifically to this facility. The Commissioning Authority shall review and edit these documents as necessary for final corrections by the contractor.

F. The O&M manual review, and coordination efforts MUST be completed prior to Owner training sessions, as these documents are to be utilized in the training sessions.

G. In addition to the O&M manual requirements within specification Division 21, 22, 23, 25, 26, 27, and 28 O&M manuals shall include at a minimum the following:

1. An equipment data sheet with the equipment name tag, model#, serial # and any other relevant information for the equipment for entry into the Owner's central maintenance management system (CMMS).

    a. The format of the data entry sheets will be provided by the owner and/or CxA.
    b. Data entry of the equipment information into the CMMS will be the responsibility of the owner.

2. A copy of the approved submittal, indicating the exact make and model of the equipment installed.
3. A copy of the manufacturer's IOM manual.
4. A copy of all warranties

    a. If not included on warranty. certificate, provide the start/end dates of warranty period, descriptions of what is and isn’t covered and contact information for warranty claims.

3.14 TRAINING

A. General

1. The Contractor shall train the Owner’s personnel in the operation and maintenance of systems and equipment listed in this Section and as mentioned in other sections.
2. The required training and demonstration required in the technical sections of the specifications is supplemental or in addition to the training required in this Section (where not a duplication).

B. Scope of Training:

1. Training must be conducted in two parts and include both classroom and on-the-job (hands- on) instruction by qualified manufacturer's representatives, vendors, installation/service technicians and operation personnel having the necessary knowledge, experience, and teaching skills.
2. The training shall provide comprehensive instruction on the operation and maintenance of building components, equipment, controls, and systems including procedures for startup, shutdown, normal operation, abnormal operation, preventive maintenance, troubleshooting, and corrective maintenance.
3. The classroom portion of each training session, shall be based on the information contained in the approved O&M Manuals and will use copies of these manuals for reference. This shall include the following items as applicable:

    a. Content and organization of appropriate O&M Manual materials
    b. Overall equipment / system layout and configuration
    c. Locations and tag numbers of major components
    d. Theory of Operation / Design Intent

        1) Startup and Shutdown Procedures
        2) Normal Operating Procedures
        3) Non-normal Operating Procedures (unoccupied, seasonal operation, etc.)
        4) Emergency procedures

    e. Health and Safety issues (both to O&M personnel and building occupants)
    f. Energy Efficiency Issues
    g. Occupant Comfort and IAQ Issues
    h. Control System Sequence of Operation
    i. Preventive Maintenance Procedures
    j. Diagnostic & Troubleshooting Procedures
    k. Corrective Maintenance & Repair Procedures
    l. Review of the BAS front end operators workstation. A temporary workstation and/or laptop shall be set up to review and train O&M staff on the actual BAS controls for this project.

4. The field portion of each training session shall at a minimum cover the following items as applicable:

    a. Walk-down of covered equipment and systems
    b. Demonstration of startup, shutdown and operating procedures
    c. Demonstration of diagnostic, service, maintenance and repair procedures
    d. Emergency shutdown procedures
    e. Locations of critical isolation valves

5. Follow-up or post-occupancy training, where specified, shall be planned, scheduled and conducted per the requirements of this specification. This training will focus on seasonal issues that could not be addressed during the initial training and on addressing operational and maintenance issues identified by the Owner since turnover.

C. Coordination and Scheduling:

1. Training shall not begin until the following items have been completed:

   a. Building systems and equipment are complete and operational.
   b. Functional Performance Testing for the equipment and systems being trained on have been successfully completed.
   c. The Owner has received and approved the final submittal copies of the Operation and Maintenance Manuals
   d. The contractor's proposed training plan and schedule have been approved by the owner.
   e. The Building Automation System (BAS) has been completed and tested.

2. The contractor shall work closely with the Owner's personnel and the CxA in the development and implementation of the training program. This may include preliminary meetings to map out the direction the training will take and development, with Owner approval, of the written training materials.
3. The minimum specific hours of training time provided for equipment and systems shall be in accordance with the requirements in the individual equipment spec sections.
4. All training shall include two identical training sessions. The first training session shall occur in the morning and shall cover the early morning and day shift staff and the second session shall occur in the late afternoon and cover the evening and night shift staff. Exact training plan and schedule shall be submitted to owner for approval prior to any training session.
5. OWNER retains the option of redistributing training time, subject to the total time specified. This may include repetition of selected training sessions or provision for follow-up training sessions after occupancy.
6. Specific schedules for all training sessions must be coordinated in advance with Owner.

D. Training Program and Materials:

1. The contractor will submit a written training program outlining the proposed scope of training, training materials and instruction schedule for review and approval by the Owner approximately 30 days before the scheduled completion of the work for which training is to occur.
2. Copies of training materials furnished by the Contractor as part of their training program shall become the property of the Owner. This includes but is not limited to:

   a. All lesson plans, teachers' guides or training aids used to instruct the students. One complete set shall be given to the Owner.
   b. All written materials. e.g., workbooks, manufacturers' instructions, brochures, student tests, charts or other printed or photographed visual aids. Three (3) sets with one complete reproducible master shall be given to the Owner.
   c. All audio-visual materials e.g., DVD's, CD's, video tapes, film and audio cassettes, overhead projector transparencies, software files of presentations, or other audio-visual medium. Three sets shall be given to the Owner.

3. The Contractor shall provide all equipment related to the conveyance of the training program e.g., DVD's, CD's, projectors, TV monitors, overhead projector, or other related

equipment. Non-permanent mounted white boards, cork board and projector screens. Equipment of this nature provided by the contractors for use during training sessions does NOT become the property of the Owner. Contractors shall promptly remove said equipment at the end of the training session(s).

E. Instructor Qualifications:

1. Credentials of training instructors are subject to review and approval by the Owner.
2. Instructors must have knowledge and experience with the equipment on which they are providing training
3. Instructors must be familiar with the organization and content of Operation and Maintenance Manuals for the equipment on which they are providing training.
4. Instructors for controls must be knowledgeable and familiar with the specific controls equipment, project applications, and specific sequences of operation for this project.

F. Classroom Training Facilities:

1. Locations for classroom training sessions shall be coordinated with the Owner. All training shall be conducted on-site except by prior arrangement and approval by the Owner.

3.15 EXCLUSIONS

A. Responsibility for construction means and methods: The CxA is not responsible for construction means, methods, job safety, or any construction management functions on the job site.

B. Hands-on work by the CxA: The contractors shall provide all services requiring tools or the use of tools to start-up, test, adjust, or otherwise bring equipment and systems into a fully operational state. The CxA shall coordinate and observe these procedures (and may make minor adjustments), but shall not perform construction or technician services other than verification of testing, adjusting, balancing, and control functions.

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SECTION 02 41 19 - 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 or recycled.

B. Related Requirements:

1. Section 01 10 00 "Summary" for restrictions on the use of the premises, Owner-occupancy requirements, and phasing requirements.
2. Section 01 73 00 "Execution" for cutting and patching procedures.
3. Section 31 10 00 "Site Clearing" for site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

B. Remove and Salvage: Carefully detach from existing construction, in a manner to prevent damage, and deliver to Owner.

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

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

1.4 MATERIALS OWNERSHIP

A. Unless otherwise indicated, demolition waste becomes property of Contractor.

B. Historic items, relics, antiques, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, and other items of interest or value to Owner that may be uncovered during demolition remain the property of Owner.

1. Carefully salvage in a manner to prevent damage and promptly return to Owner.

1.5 PREINSTALLATION MEETINGS

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 requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
5. Review areas where existing construction is to remain and requires protection.

1.6 INFORMATIONAL SUBMITTALS

A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed for protecting individuals and property, for environmental protection, for dust control and, for noise control. Indicate proposed locations and construction of barriers.

B. Schedule of Selective Demolition Activities: Indicate the following:

1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
2. Interruption of utility services. Indicate how long utility services will be interrupted.
3. Coordination for shutoff, capping, and continuation of utility services.
4. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

C. Pre-demolition Photographs or Video: Submit before Work begins.

1.7 FIELD CONDITIONS

A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.

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 not expected that hazardous materials will be encountered in the Work.

1. If suspected hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Hazardous materials will be removed by Owner under a separate contract.

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

F. 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.

1.8 WARRANTY

A. 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.

PART 2 - PRODUCTS

2.1 PEFORMANCE 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 ANSI/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. Review record documents of existing construction provided by Owner. Owner does not guarantee that existing conditions are same as those indicated in record documents.

C. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design 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.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated 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.
2. Arrange to shut off indicated utilities with utility companies.
3. 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.
4. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed.

    a. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
    b. Piping to Be Abandoned in Place: Drain piping and cap or plug piping with same or compatible piping material.
    c. Equipment to Be Removed: Disconnect and cap services and remove equipment.
    d. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
    e. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
    f. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
    g. Ducts to Be Abandoned in Place: Cap or plug ducts with same or compatible ductwork material.

B. Existing Services/Systems to Be Remain: Where services and systems that are to remain are impacted by the removal or demolition of other work (i.e. removal of ceiling grid that support lights and/or diffusers), the Contractor shall restore the services and systems back to original operation and/or location using materials, supports, and requirements outlined in the project specifications without additional compensation.

3.3 PREPARATION

A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

B. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.

1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
2. Provide temporary weather protection, during interval between selective demolition of existing construction on exterior surfaces and new construction, to prevent water leakage and damage to structure and interior areas.
3. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.

C. Temporary Shoring: 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.

3.4 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, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
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 fire watch and portable fire-suppression devices during flame-cutting operations.
5. Maintain adequate ventilation when using cutting torches.
6. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
7. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

8. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
9. Dispose of demolished items and materials promptly.

B. Removed and Salvaged Items:

1. Store items in a secure area until delivery to Owner.
2. Transport items to Owner's storage area designated by Owner.
3. Protect items from damage during transport and storage.

C. 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.

D. 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 cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in sections. Cut concrete full depth at junctures with construction to remain and at regular intervals using power-driven saw, then remove concrete between saw cuts.

B. Masonry: Demolish in small sections. Cut masonry at junctures with construction to remain, using power-driven saw, then remove masonry between saw cuts.

C. Concrete Slabs-on-Grade: Saw-cut perimeter of area to be demolished, then break up and remove.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

A. General: Except for items or materials indicated to be recycled, reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them.

B. Burning: Do not burn demolished materials.

C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 02 41 19

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SECTION 03 10 00 - CONCRETE FORMING 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. Form-facing material for cast-in-place concrete.

1.3 DEFINITIONS

A. Form-Facing Material: Temporary structure or mold for the support of concrete while the concrete is setting and gaining sufficient strength to be self-supporting.

B. Formwork: The total system of support of freshly placed concrete, including the mold or sheathing that contacts the concrete, as well as supporting members, hardware, and necessary bracing.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following:

1. Exposed surface form-facing material.
2. Concealed surface form-facing material.
3. Form ties.
4. Waterstops.
5. Form-release agent.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Concrete Formwork: Design, engineer, erect, shore, brace, and maintain formwork, shores, and reshores in accordance with ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads, so that resulting concrete conforms to the required shapes, lines, and dimensions.

1. Design wood panel forms in accordance with APA's "Concrete Forming Design/Construction Guide."
2. Design formwork to limit deflection of form-facing material to 1/240 of center-to-center spacing of supports.

2.2 FORM-FACING MATERIALS

A. As-Cast Surface Form-Facing Material:

1. Provide continuous, true, and smooth concrete surfaces.
2. Furnish in largest practicable sizes to minimize number of joints.
3. Acceptable Materials: As required to comply with Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete, and as follows:
   a. Plywood, metal, or other approved panel materials.

B. Concealed Surface Form-Facing Material: Lumber, plywood, metal, plastic, or another approved material.

1. Provide lumber dressed on at least two edges and one side for tight fit.

2.3 RELATED MATERIALS

A. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch, minimum.

B. Form-Release Agent: Commercially formulated form-release agent that does not bond with, stain, or adversely affect concrete surfaces and does not impair subsequent treatments of concrete surfaces.

1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
2. Form release agent for form liners shall be acceptable to form liner manufacturer.

C. Form Ties: Factory-fabricated, removable or snap-off, glass-fiber-reinforced plastic or metal form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.

PART 3 - EXECUTION

3.1 INSTALLATION OF FORMWORK

A. Comply with ACI 301.

B. Construct formwork, so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117 and to comply with the Surface Finish designations specified in Section 03 30 00 "Cast-In-Place Concrete" for as-cast finishes .

C. Limit concrete surface irregularities as follows:

1. Surface Finish-2.0: ACI 117 Class B, 1/4 inch.

D. Construct forms tight enough to prevent loss of concrete mortar.

1. Minimize joints.
2. Exposed Concrete: Symmetrically align joints in forms.

E. Construct removable forms for easy removal without hammering or prying against concrete surfaces.

1. Provide crush or wrecking plates where stripping may damage cast-concrete surfaces.
2. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
3. Install keyways, reglets, recesses, and other accessories, for easy removal.

F. Do not use rust-stained, steel, form-facing material.

G. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces.

1. Provide and secure units to support screed strips
2. Use strike-off templates or compacting-type screeds.

H. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible.

1. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar.
2. Locate temporary openings in forms at inconspicuous locations.

I. Do not chamfer exterior corners and edges of permanently exposed concrete.

J. At construction joints, overlap forms onto previously placed concrete not less than 12 inches.

K. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work.

1. Determine sizes and locations from trades providing such items.
2. Obtain written approval of Architect prior to forming openings not indicated on Drawings.

L. Construction and Movement Joints:

1. Construct joints true to line with faces perpendicular to surface plane of concrete.
2. Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
3. Place joints perpendicular to main reinforcement.
4. Locate joints for beams, slabs, joists, and girders in the middle third of spans.
   a. 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.

M. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection.

1. Locate ports and openings in bottom of vertical forms, in inconspicuous location, to allow flushing water to drain.
2. Close temporary ports and openings with tight-fitting panels, flush with inside face of form, and neatly fitted, so joints will not be apparent in exposed concrete surfaces.

N. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.

O. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

P. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 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 AISC 303.
3. Clean embedded items immediately prior to concrete placement.

3.3 REMOVING AND REUSING FORMS

A. Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations, and curing and protection operations need to be maintained.

1. Leave formwork for beam soffits, joists, slabs, and other structural elements that support weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.

B. Clean and repair surfaces of forms to be reused in the Work.

1. Split, frayed, delaminated, or otherwise damaged form-facing material are unacceptable for exposed surfaces.
2. Apply new form-release agent.

C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.

1. Align and secure joints to avoid offsets.
2. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

END OF SECTION 03 10 00

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SECTION 03 20 00 - CONCRETE REINFORCING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Steel reinforcement bars.
2. Welded-wire reinforcement.

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.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Type III Environmental Product Declaration (EPD): For each product.
3. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.
4. Manufacturer Inventory: For each product, provide manufacturer's manifest of ingredients.

C. 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.

D. 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. Qualification Statements: For testing and inspection agency.

B. Welding certificates.

1. Reinforcement To Be Welded: Welding procedure specification in accordance with AWS D1.4/D1.4M.

C. 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.

D. Field quality-control reports.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

B. Welding Qualifications: Qualify procedures and personnel in accordance with AWS D1.4/D 1.4M.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage and to avoid damaging coatings on steel reinforcement.

1. Store reinforcement to avoid contact with earth.

PART 2 - PRODUCTS

2.1 STEEL REINFORCEMENT

A. Recycled Content: Provide manufacturer documentation for recycled content, indicating postconsumer and preconsumer recycled content.

B. Reinforcing Bars: ASTM A615/A615M, Grade 60 , 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. Joint Dowel Bars: ASTM A615/A615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.

B. 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.

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. 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.

B. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length, to prevent concrete bonding to one side of joint.

3.4 INSTALLATION TOLERANCES

A. Comply with ACI 117.

3.5 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Testing Agency: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

C. Inspections:

1. Steel-reinforcement placement.
2. Steel-reinforcement welding.

D. Manufacturer's Inspections: Engage manufacturer of structural thermal break insulated connection system to inspect completed installations prior to placement of concrete, and to provide written report that installation complies with manufacturer's written instructions.

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SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cast-in-place concrete and vapor barrier, including concrete materials, mixture design, placement procedures, and finishes.

B. Related Requirements:

1. Section 03 10 00 "Concrete Forming and Accessories" for form-facing materials, form liners, insulating concrete forms, and waterstops.
2. Section 03 20 00 "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, other pozzolans, and silica fume; 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 .

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.
2. Review the following:
   a. Special inspection and testing and inspecting agency procedures for field quality control.
   b. Construction joints, control joints, isolation joints, and joint-filler strips.
   c. Semirigid joint fillers.
   d. Vapor-retarder installation.
   e. Anchor rod and anchorage device installation tolerances.

f. Cold and hot weather concreting procedures.
g. Concrete finishes and finishing.
h. Curing procedures.
i. Forms and form-removal limitations.
j. Methods for achieving specified floor and slab flatness and levelness.
k. Floor and slab flatness and levelness measurements.
l. Concrete repair procedures.
m. Concrete protection.

1.4 ACTION SUBMITTALS

A. Product Data: For each of the following.

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Aggregates.
6. 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.
7. Vapor retarders.
8. Curing materials.
9. Joint fillers.
10. Repair materials.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Laboratory Test Reports: For liquid floor treatments and curing and sealing compounds, indicating compliance with requirements for low-emitting materials.

C. 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. Calculated equilibrium unit weight, for lightweight concrete.
6. Slump limit.
7. Air content.
8. Nominal maximum aggregate size.
9. Indicate amounts of mixing water to be withheld for later addition at Project site if permitted.

10. Intended placement method.
11. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

D. Shop Drawings:

1. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
   a. Location of construction joints is subject to approval of the Architect.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For the following:

1. Installer: Include copies of applicable ACI certificates.
2. Ready-mixed concrete manufacturer.
3. Testing agency: Include copies of applicable ACI certificates.

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. Vapor retarders.
7. Semirigid joint filler.
8. Joint-filler strips.
9. Repair materials.

C. Material Test Reports: For the following, from a qualified testing agency:

1. Portland cement.
2. Fly ash.
3. Slag cement.
4. Silica fume.
5. Aggregates.

D. Floor surface flatness and levelness measurements report, indicating compliance with specified tolerances.

E. Field quality-control reports.

F. Minutes of preinstallation conference.

G. Submit photos of vapor barrier installation, including penetration detailing with time stamp taken 8 hours maximum prior to concrete placement.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs Project personnel qualified as an ACI-certified Flatwork Technician and Finisher and a supervisor who is a certified ACI Flatwork Concrete Finisher/Technician or an ACI Concrete Flatwork Technician .

1. Post-Installed Concrete Anchors Installers: ACI-certified Adhesive Anchor Installer.

B. 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. Manufacturer certified in accordance with NRMCA's "Certification of Ready Mixed Concrete Production Facilities."

C. Laboratory Testing Agency Qualifications: A testing agency qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated and employing an ACI-certified Concrete Quality Control Technical Manager.

1. Personnel performing laboratory tests to be an ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician, Grade I. Testing agency laboratory supervisor to be an ACI-certified Concrete Laboratory Testing Technician, Grade II.

D. Field Quality-Control Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified in accordance with ASTM C1077 and ASTM E329 for testing indicated.

1. Personnel conducting field tests to be qualified as an ACI Concrete Field Testing Technician, Grade 1, in accordance with ACI CPP 610.1 or an equivalent certification program.

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.

1.9 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to furnish replacement sheet vapor retarder/termite barrier material and accessories for sheet vapor retarder/ termite barrier and accessories that do not comply with requirements or that fail to resist penetration by termites within specified warranty period.

1. Warranty Period: 10 years from date of Substantial Completion.

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.

3. Slag Cement: ASTM C989/C989M, Grade 100 or 120.
4. Silica Fume: ASTM C1240 amorphous silica.

C. Normal-Weight Aggregates: ASTM C33/C33M, Class 3M coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
2. 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.

1. Water-Reducing Admixture: ASTM C494/C494M, Type A.

F. Water and Water Used to Make Ice: ASTM C94/C94M, potable

2.3 VAPOR RETARDERS

A. Sheet Vapor Retarder, Class A: ASTM E1745, Class A ; not less than 15 mils thick. Include manufacturer's recommended adhesive or pressure-sensitive tape.

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. Stego Industries, LLC.
   b. W. R. Meadows, Inc.

2.4 CURING MATERIALS

A. 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.

B. Water: Potable or complying with ASTM C1602/C1602M.

C. Clear, Waterborne, Membrane-Forming, Dissipating Curing Compound: ASTM C309, Type 1, Class B; to be used at locations denoted with floor finish other than sealed concrete per architectural documentation.

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. Dayton Superior Corporation.
   b. Euclid Chemical Company (The); an RPM company.
   c. SpecChem, LLC.

D. Clear, Waterborne, Membrane-Forming, Curing and Sealing Compound: ASTM C1315, Type 1, Class A; refer to architectural documentation for locations denoted to be sealed concrete finish or carpet tile for locations of use.

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. Dayton Superior Corporation.
   b. Euclid Chemical Company (The); an RPM company.
   c. SpecChem, LLC.
2. Verify products comply with the requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

2.5 RELATED MATERIALS

A. Expansion- and Isolation-Joint-Filler Strips: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork.

B. Bonding Agent: ASTM C1059/C1059M, Type II, nonredispersible, acrylic emulsion or styrene butadiene.

C. Floor Slab Protective Covering: 8-feet- wide cellulose fabric.

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. McTech Group, Inc.

2.6 REPAIR MATERIALS

A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.

2. Primer: Product of underlayment manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand, as recommended by underlayment manufacturer.
4. Compressive Strength: Not less than 4100 psi at 28 days when tested in accordance with ASTM C109/C109M.

B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to match adjacent floor elevations.

1. Cement Binder: ASTM C150/C150M portland cement or hydraulic or blended hydraulic cement, as defined in ASTM C219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi at 28 days when tested in accordance with ASTM C109/C109M.

2.7 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, in accordance with ACI 301.

1. Use a qualified testing agency for preparing and reporting proposed mixture designs, based on laboratory trial mixtures.

B. 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.
3. Silica Fume: 10 percent by mass.
4. Total of Fly Ash or Other Pozzolans, Slag Cement, and Silica Fume: 50 percent by mass, with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.
5. Total of Fly Ash or Other Pozzolans and Silica Fume: 35 percent by mass with fly ash or pozzolans not exceeding 25 percent by mass and silica fume not exceeding 10 percent by mass.

C. Admixtures: Use admixtures in accordance with manufacturer's written instructions.

1. Use water-reducing admixture in concrete, as required, for placement and workability.
2. Use water-reducing admixture in pumped concrete, and concrete with a w/cm below 0.50.

2.8 CONCRETE MIXTURES

A. Class A : Normal-weight concrete used for footings, grade beams, and tie beams.

1. Exposure Class: ACI 318 F2 .
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum Dry Shrinkage in Accordance with ASTM C157: 0.05%
4. Slump Limit: 8 inches , plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site .
5. Air Content:
   a. Exposure Classes F2 and F3: 6 percent, plus or minus 1.5 percent at point of delivery for concrete containing 3/4-inch nominal maximum aggregate size .
6. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

B. Class C : Normal-weight concrete used for interior slabs-on-ground.

1. Exposure Class: ACI 318 C0 .
2. Minimum Compressive Strength: 4000 psi at 28 days.
3. Maximum Dry Shrinkage in Accordance with ASTM C157: 0.05%
4. Minimum Cementitious Materials Content: 540 lb/cu. yd. .
5. Slump Limit: 8 inches , plus or minus 1 inch for concrete with verified slump of 3 inches plus or minus 1 inch before adding high-range water-reducing admixture or plasticizing admixture at Project site .
6. Air Content:
   a. Do not use an air-entraining admixture or allow total air content to exceed 3 percent for concrete used in trowel-finished floors.
7. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.

2.9 CONCRETE MIXING

A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete in accordance with ASTM C94/C94M, and furnish batch ticket information.

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.

3.4 INSTALLATION OF VAPOR RETARDER

A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder in accordance with ASTM E1643 and manufacturer's written instructions.

1. Install vapor retarder with longest dimension parallel with direction of concrete pour.
2. Face laps away from exposed direction of concrete pour.
3. Lap vapor retarder over footings and grade beams not less than 6 inches, sealing vapor retarder to concrete.
4. Lap joints 6 inches and seal with manufacturer's recommended tape.
5. Terminate vapor retarder at the top of floor slabs, grade beams, and pile caps, sealing entire perimeter to floor slabs, grade beams, foundation walls, or pile caps.
6. Seal penetrations in accordance with vapor retarder manufacturer's instructions.
7. Protect vapor retarder during placement of reinforcement and concrete.
   a. Repair damaged areas by patching with vapor retarder material, overlapping damages area by 6 inches on all sides, and sealing to vapor retarder.

B. Bituminous Vapor Retarders: Place, protect, and repair bituminous vapor retarder in accordance with manufacturer's written instructions.

3.5 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.
   b. Do not continue reinforcement through sides of strip placements of floors and slabs.
3. Space vertical joints in walls spaced at 20 feet maximum . Unless otherwise indicated on Drawings, locate vertical joints beside piers integral with walls, near corners, and in concealed locations where possible.
4. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

C. Control Joints in Slabs-on-Ground: Form weakened-plane control joints, sectioning concrete into areas as indicated. Construct control joints for a depth equal to at least one-fourth of concrete thickness as follows:

1. Grooved Joints: Form control joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of control joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.
2. Sawed Joints: Form control joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action does not tear, abrade, or otherwise damage surface and before concrete develops random cracks.

D. Isolation Joints in Slabs-on-Ground: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.

1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated on Drawings.
2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface, where joint sealants, specified in Section 07 92 00 "Joint Sealants," are indicated.
3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

E. Dowel Plates: Install dowel plates at joints where indicated on Drawings.

3.6 CONCRETE PLACEMENT

A. Before placing concrete, verify that installation of formwork, reinforcement, embedded items, and vapor retarder is complete and that required inspections are completed.

1. Immediately prior to concrete placement, inspect vapor retarder for damage and deficient installation, and repair defective areas.
2. Provide continuous inspection of vapor retarder during concrete placement and make necessary repairs to damaged areas as Work progresses.

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.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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.

1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

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.

F. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.

1. Do not place concrete floors and slabs in a checkerboard sequence.
2. Consolidate concrete during placement operations, so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
3. Maintain reinforcement in position on chairs during concrete placement.
4. Screed slab surfaces with a straightedge and strike off to correct elevations.
5. Level concrete, cut high areas, and fill low areas.
6. Slope surfaces uniformly to drains where required.
7. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface.
8. Do not further disturb slab surfaces before starting finishing operations.

3.7 FINISHING FORMED SURFACES

A. As-Cast Surface Finishes:

1. 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, .
2. ACI 301 Surface Finish SF-3.0:
   a. Patch voids larger than 3/4 inch wide or 1/2 inch deep.
   b. Remove projections larger than 1/8 inch.
   c. Patch tie holes.
   d. Surface Tolerance: ACI 117 Class A.
   e. Locations: Apply to concrete surfaces 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 .

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.

3.8 FINISHING FLOORS AND SLABS

A. Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Scratch Finish:

1. While still plastic, texture concrete surface that has been screeded and bull-floated or darbied.
2. Use stiff brushes, brooms, or rakes to produce a profile depth of 1/4 inch in one direction.
3. Apply scratch finish to surfaces to receive concrete floor toppings .

C. Float Finish:

1. When bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operation of specific float apparatus, consolidate concrete surface with power-driven floats or by hand floating if area is small or inaccessible to power-driven floats.
2. Repeat float passes and restraightening until surface is left with a uniform, smooth, granular texture and complies with ACI 117 tolerances for conventional concrete.
3. Apply float finish to surfaces to receive trowel finish and to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo .

D. Trowel Finish:

1. After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel.
2. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance.
3. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
4. Do not add water to concrete surface.
5. Do not apply hard-troweled finish to concrete, which has a total air content greater than 3 percent.
6. Apply a trowel finish to surfaces exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system .
7. Finish surfaces to the following tolerances, in accordance with ASTM E1155, for a randomly trafficked floor surface:
   a. Slabs on Ground:

1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch .

b. Suspended Slabs:

1) Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-ft.- long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/8 inch .

E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces . While concrete is still plastic, slightly scarify surface with a fine broom perpendicular to main traffic route.

1. Coordinate required final finish with Architect before application.
2. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

F. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and locations indicated on Drawings.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route.
2. Coordinate required final finish with Architect before application.

3.9 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. 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: 4000 psi at 28 days.
4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 12-inch centers around the full perimeter of concrete base.
5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete substrate.
6. 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.

3.10 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 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.
   d. Water-Retention Sheeting Materials: Cover exposed concrete surfaces with sheeting material, taping, or lapping seams.
   e. Membrane-Forming Curing Compound: Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
      1) Recoat areas subject to heavy rainfall within three hours after initial application.
      2) Maintain continuity of coating and repair damage during curing period.

C. Curing Unformed Surfaces: Comply with ACI 308.1 as follows:

1. Begin curing immediately after finishing concrete.
2. Interior Concrete Floors:
   a. Floors to Receive Floor Coverings Specified in Other Sections: Contractor has option of the following:
      1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
         a) Lap edges and ends of absorptive cover not less than 12 inches.

b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
   a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
   a) Water.
   b) Continuous water-fog spray.

b. Floors to Receive Penetrating Liquid Floor Treatments: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
   a) Lap edges and ends of absorptive cover not less than 12 inches.
   b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive.
   a) Immediately repair any holes or tears during curing period, using cover material and waterproof tape.
   b) Cure for not less than seven days.

3) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
   a) Water.
   b) Continuous water-fog spray.

c. Floors to Receive Polished Finish: Contractor has option of the following:

1) Absorptive Cover: As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
   a) Lap edges and ends of absorptive cover not less than 12 inches.
   b) Maintain absorptive cover water saturated, and in place, for duration of curing period, but not less than seven days.

2) Ponding or Continuous Sprinkling of Water: Maintain concrete surfaces continuously wet for not less than seven days, utilizing one, or a combination of, the following:
   a) Water.
   b) Continuous water-fog spray.

d. Floors to Receive Chemical Stain:

1) As soon as concrete has sufficient set to permit application without marring concrete surface, install curing paper over entire area of floor.
2) Install curing paper square to building lines, without wrinkles, and in a single length without end joints.
3) Butt sides of curing paper tight; do not overlap sides of curing paper.
4) Leave curing paper in place for duration of curing period, but not less than 28 days.

e. Floors to Receive Urethane Flooring:
1) As soon as concrete has sufficient set to permit application without marring concrete surface, install prewetted absorptive cover over entire area of floor.
2) Rewet absorptive cover, and cover immediately with polyethylene moisture-retaining cover with edges lapped 6 inches and sealed in place.
3) Secure polyethylene moisture-retaining cover in place to prohibit air from circulating under polyethylene moisture-retaining cover.
4) Leave absorptive cover and polyethylene moisture-retaining cover in place for duration of curing period, but not less than 28 days.

f. Floors to Receive Curing Compound:
1) Apply uniformly in continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Maintain continuity of coating, and repair damage during curing period.
4) Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound does not interfere with bonding of floor covering used on Project.

g. Floors to Receive Curing and Sealing Compound:
1) Apply uniformly to floors and slabs indicated in a continuous operation by power spray or roller in accordance with manufacturer's written instructions.
2) Recoat areas subjected to heavy rainfall within three hours after initial application.
3) Repeat process 24 hours later, and apply a second coat. Maintain continuity of coating, and repair damage during curing period.

3.11 TOLERANCES

A. Conform to ACI 117.

3.12 JOINT FILLING

A. Prepare, clean, and install joint filler in accordance with manufacturer's written instructions.

1. Defer joint filling until concrete has aged at least one month(s).
2. Do not fill joints until construction traffic has permanently ceased.

B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joints clean and dry.

C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints.

D. Overfill joint, and trim joint filler flush with top of joint after hardening.

3.13 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. Repairing Unformed Surfaces:

1. Test unformed surfaces, such as floors and slabs, for finish, and verify surface tolerances specified for each surface.
   a. Correct low and high areas.
   b. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.

2. Repair finished surfaces containing surface defects, including spalls, popouts, honeycombs, rock pockets, crazing, and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
3. After concrete has cured at least 14 days, correct high areas by grinding.
4. Correct localized low areas during, or immediately after, completing surface-finishing operations by cutting out low areas and replacing with patching mortar.
    a. Finish repaired areas to blend into adjacent concrete.
5. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
    a. Prepare, mix, and apply repair underlayment and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
    b. Feather edges to match adjacent floor elevations.
6. Correct other low areas scheduled to remain exposed with repair topping.
    a. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations.
    b. Prepare, mix, and apply repair topping and primer in accordance with manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
7. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete.
    a. Remove defective areas with clean, square cuts, and expose steel reinforcement with at least a 3/4-inch clearance all around.
    b. Dampen concrete surfaces in contact with patching concrete and apply bonding agent.
    c. Mix patching concrete of same materials and mixture as original concrete, except without coarse aggregate.
    d. Place, compact, and finish to blend with adjacent finished concrete.
    e. Cure in same manner as adjacent concrete.
8. Repair random cracks and single holes 1 inch or less in diameter with patching mortar.
    a. Groove top of cracks and cut out holes to sound concrete, and clean off dust, dirt, and loose particles.
    b. Dampen cleaned concrete surfaces and apply bonding agent.
    c. Place patching mortar before bonding agent has dried.
    d. Compact patching mortar and finish to match adjacent concrete.
    e. Keep patched area continuously moist for at least 72 hours.

E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.

F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.14 FIELD QUALITY CONTROL

A. Special Inspections: Owner will engage a special inspector to perform field tests and inspections and prepare testing and inspection reports.

B. Testing Agency: Owner will engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.

1. Testing agency to be responsible for providing curing container for composite samples on Site and verifying that field-cured composite samples are cured in accordance with ASTM C31/C31M.
2. Testing agency to immediately report to Architect, Contractor, and concrete manufacturer any failure of Work to comply with Contract Documents.
3. Testing agency to report results of tests and inspections, in writing, to Owner, Architect, Contractor, and concrete manufacturer within 48 hours of inspections and tests.
    a. Test reports to include reporting requirements of ASTM C31/C31M, ASTM C39/C39M, and ACI 301, including the following as applicable to each test and inspection:
        1) Project name.
        2) Name of testing agency.
        3) Names and certification numbers of field and laboratory technicians performing inspections and testing.
        4) Name of concrete manufacturer.
        5) Date and time of inspection, sampling, and field testing.
        6) Date and time of concrete placement.
        7) Location in Work of concrete represented by samples.
        8) Date and time sample was obtained.
        9) Truck and batch ticket numbers.
        10) Design compressive strength at 28 days.
        11) Concrete mixture designation, proportions, and materials.
        12) Field test results.
        13) Information on storage and curing of samples before testing, including curing method and maximum and minimum temperatures during initial curing period.
        14) Type of fracture and compressive break strengths at seven days and 28 days.

C. 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.

D. 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.

E. 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. Slump Flow: ASTM C1611/C1611M:
   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.
4. 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.
5. 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.
6. Compression Test Specimens: ASTM C31/C31M:
   a. Cast and laboratory cure five 4 4-inch by 8cylinders. cylinder specimens for each composite sample.
7. Compressive-Strength Tests: ASTM C39/C39M.
   a. Test one laboratory-cured specimens at seven days and one set of three specimens at 28 days.
   b. A compressive-strength test to be the average compressive strength from a set of three specimens obtained from same composite sample and tested at age indicated.
8. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor to evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
9. 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.
10. 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.
11. 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.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

3.15 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.
7. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.
8. Protect concrete surfaces scheduled to receive surface hardener or polished concrete finish using Floor Slab Protective Covering.

END OF SECTION 03 30 00

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SECTION 04 22 00 - CONCRETE UNIT MASONRY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Concrete masonry units.
2. Mortar and grout.
3. Steel reinforcing bars.
4. Masonry-joint reinforcement.
5. Miscellaneous masonry accessories.

B. Related Requirements:

1. Section 07 19 00 "Water Repellents" for water repellents applied to unit masonry assemblies.
2. Section 07 62 00 "Sheet Metal Flashing and Trim" for sheet metal flashing and for furnishing manufactured reglets installed in masonry joints.
3. Section 08 95 16 "Wall Vents" for wall vents (brick vents).

1.2 DEFINITIONS

A. CMU(s): Concrete masonry unit(s).

B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For the following:

1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending, lap lengths, and placement of unit masonry reinforcing bars. Comply with ACI 315. Show elevations of reinforced walls.
3. Fabricated Flashing: Detail corner units, end-dam units, and other special applications.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Material Certificates: For each type and size of the following:

1. Masonry units.
   a. Include data on material propertiesandmaterial test reports substantiating compliance with requirements.
   b. For masonry units used in structural masonry, include data and calculations establishing average net-area compressive strength of units.
2. Integral water repellant used in CMUs.
3. Cementitious materials. Include name of manufacturer, brand name, and type.
4. Mortar admixtures.
5. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
6. Grout mixes. Include description of type and proportions of ingredients.
7. Reinforcing bars.
8. Joint reinforcement.
9. Anchors, ties, and metal accessories.

C. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.

1. Include test reports for mortar mixes required to comply with property specification. Test in accordance with ASTM C109/C109M for compressive strength, ASTM C1506 for water retention, and ASTM C91/C91M for air content.
2. Include test reports, in accordance with ASTM C1019, for grout mixes required to comply with compressive strength requirement.

D. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined in accordance with TMS 602/ACI 530.1/ASCE 6.

E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.6 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified in accordance with ASTM C1093 for testing indicated.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.

B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.

C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.

D. Deliver preblended, dry mortar mix in moisture-resistant containers. Store preblended, dry mortar mix in delivery containers on elevated platforms in a dry location or in covered weatherproof dispensing silos.

E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 FIELD CONDITIONS

A. Protection of Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.

1. Extend cover a minimum of 24 inches down both sides of walls, and hold cover securely in place.

B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.

C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.

1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
2. Protect sills, ledges, and projections from mortar droppings.
3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.

D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost

or by freezing conditions. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than seven days after completing cleaning.

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

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from single source from single manufacturer for each product required.

B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.

2.2 UNIT MASONRY, GENERAL

A. Masonry Standard: Comply with TMS 602/ACI 530.1/ASCE 6 except as modified by requirements in the Contract Documents.

B. Defective Units: Referenced masonry unit standards may allow a certain percentage of units to contain chips, cracks, or other defects exceeding limits stated. Do not use units where such defects are exposed in the completed Work and will be within 20 feet vertically and horizontally of a walking surface.

C. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.

1. Where fire-resistance-rated construction is indicated, units are listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS

A. Regional Materials: Verify CMUs are manufactured within 100 miles of Project site from aggregates and cement that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.

1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
2. Provide square-edged units for outside corners unless otherwise indicated.

C. Integral Water Repellent: Provide units made with integral water repellent for exposed units and where indicated.

1. Integral Water Repellent: Liquid polymeric, integral water-repellent admixture that does not reduce flexural bond strength. Units made with integral water repellent, when tested in accordance with ASTM E514/E514M as a wall assembly made with mortar containing integral water-repellent manufacturer's mortar additive, with test period extended to 24 hours, show no visible water or leaks on the back of test specimen.
   a. 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:
      1) Acme Brick Company.
      2) Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
      3) GCP Applied Technologies Inc.

D. CMUs: ASTM C90.

1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi .
2. Density Classification: Normal weight .
3. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.4 MASONRY LINTELS

A. General: Provide one of the following:

B. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs matching adjacent CMUs in color, texture, and density classification, with reinforcing bars

placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.5 MORTAR AND GROUT MATERIALS

A. Regional Materials: Manufacture aggregate for mortar and grout , cement, and lime within 100 miles of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 100 miles of Project site.

B. Portland Cement: ASTM C150/C150M, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.

1. Alkali content is not more than 0.1 percent when tested in accordance with ASTM C114.

C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.

D. Masonry Cement: ASTM C91/C91M.

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. Cemex S.A.B. de C.V.
   b. Holcim (US) Inc.
   c. Lafarge North America Inc.

E. Mortar Cement: ASTM C1329/C1329M.

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. Lafarge North America Inc.

F. Aggregate for Mortar: ASTM C144.

1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
3. White-Mortar Aggregates: Natural white sand or crushed white stone.
4. Colored-Mortar Aggregates: Natural sand or crushed stone of color necessary to produce required mortar color.

G. Aggregate for Grout: ASTM C404.

H. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs containing integral water repellent from same manufacturer.

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. ACM Chemistries.
   b. Euclid Chemical Company (The); a subsidiary of RPM International, Inc.
   c. GCP Applied Technologies Inc.

I. Water: Potable.

2.6 REINFORCEMENT

A. Uncoated Steel Reinforcing Bars: ASTM A615/A615M or ASTM A996/A996M, Grade 60.

B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and to hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

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. Heckmann Building Products, Inc.
   b. Hohmann & Barnard, Inc.
   c. Wire-Bond.

C. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A951/A951M.

1. Interior Walls: Hot-dip galvanized carbon steel.
2. Wire Size for Side Rods: 0.187-inch diameter.
3. Wire Size for Cross Rods: 0.187-inch diameter.
4. Spacing of Cross Rods: Not more than 16 inches o.c.
5. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.

2.7 MISCELLANEOUS MASONRY ACCESSORIES

A. Compressible Filler: Premolded filler strips complying with ASTM D1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene urethane or PVC.

B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D2000, Designation M2AA-805 or PVC, complying with ASTM D2287, Type PVC-

65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.

C. Bond-Breaker Strips: Asphalt-saturated felt complying with ASTM D226/D226M, Type I (No. 15 asphalt felt).

2.8 MORTAR AND GROUT MIXES

A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures unless otherwise indicated.

1. Do not use calcium chloride in mortar or grout.
2. Use portland cement-lime masonry cement or mortar cement mortar unless otherwise indicated.
3. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.

B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C270, Property Specification. Provide the following types of mortar for applications stated unless another type is indicated or needed to provide required compressive strength of masonry.

1. For masonry below grade or in contact with earth, use Type S.
2. For reinforced masonry, use Type S .
3. For mortar parge coats, use Type S or Type N.
4. For exterior, above-grade, load-bearing and nonload-bearing walls and parapet walls; for interior load-bearing walls; for interior nonload-bearing partitions; and for other applications where another type is not indicated, use Type N.
5. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C476.

1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
2. Proportion grout in accordance with ASTM C476, paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 3000 psi.
3. Provide grout with a slump of 8 to 11 inches as measured in accordance with ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

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

1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
2. Verify that foundations are within tolerances specified.
3. Verify that reinforcing dowels are properly placed.
4. Verify that substrates are free of substances that would impair mortar bond.

B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping.

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

3.2 INSTALLATION, GENERAL

A. Build chases and recesses to accommodate items specified in this and other Sections.

B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match construction immediately adjacent to opening.

C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

A. Dimensions and Locations of Elements:

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

B. Lines and Levels:

1. For bed joints and top surfaces of bearing walls, do not vary from level by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet, 1/4 inch in 20 feet, or 1/2-inch maximum.
5. For lines and surfaces, do not vary from straight by more than 1/4 inch in 10 feet, 3/8 inch in 20 feet, or 1/2-inch maximum.
6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet, or 1/2-inch maximum.
7. For faces of adjacent exposed masonry units, do not vary from flush alignment by more than 1/16 inch.

C. Joints:

1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch, with a maximum thickness limited to 1/2 inch.
2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch.
3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch.
4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch.

3.4 LAYING MASONRY WALLS

A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond ; do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4 inches. Bond and interlock each course of each wythe at corners. Do not use units with less-than-nominal 4-inch horizontal face dimensions at corners or jambs.

D. Stopping and Resuming Work: Stop work by stepping back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive

mortar, remove loose masonry units and mortar, and wet brick if required before laying fresh masonry.

E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.

F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.

G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below, and rod mortar or grout into core.

H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.

I. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.

1. Install compressible filler in joint between top of partition and underside of structure above.
2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 07 84 43 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

A. Lay hollow CMUs as follows:

1. Bed face shells in mortar and make head joints of depth equal to bed joints.
2. Bed webs in mortar in all courses of piers, columns, and pilasters.
3. Bed webs in mortar in grouted masonry, including starting course on footings.
4. Fully bed entire units, including areas under cells, at starting course on footings where cells are not grouted.

B. Lay solid CMUs with completely filled bed and head joints; butter ends with sufficient mortar to fill head joints and shove into place. Do not deeply furrow bed joints or slush head joints.

C. Rake out mortar joints at pre-faced CMUs to a uniform depth of 1/4 inch and point with epoxy mortar to comply with epoxy-mortar manufacturer's written instructions.

D. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches.

1. Space reinforcement not more than 16 inches o.c.
2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.

B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.

C. Provide continuity at wall intersections by using prefabricated T-shaped units.

D. Provide continuity at corners by using prefabricated L-shaped units.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

A. Anchor masonry to structural steel and concrete, where masonry abuts or faces structural steel or concrete, to comply with the following:

1. Provide an open space not less than 1 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

A. General: Install control- and expansion-joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.

B. Form control joints in concrete masonry using one of the following methods:

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

3.9 LINTELS

A. Provide masonry lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.

B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY

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

1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support forms to maintain position and shape during construction and curing of reinforced masonry.
2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other loads that may be placed on them during construction.

B. Placing Reinforcement: Comply with requirements in TMS 602/ACI 530.1/ASCE 6.

C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.

1. Comply with requirements in TMS 602/ACI 530.1/ASCE 6 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
2. Limit height of vertical grout pours to not more than 60 inches .

3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas as needed to perform tests and inspections. Retesting of materials that fail to comply with specified requirements is done at Contractor's expense.

B. Inspections: Special inspections in accordance with Level B in TMS 402/ACI 530/ASCE 5.

1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
3. Place grout only after inspectors have verified proportions of site-prepared grout.

C. Testing Prior to Construction: One set of tests.

D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.

E. Prism Test: For each type of construction provided, in accordance with ASTM C1314 at 28 days.

3.12 PARGING

A. Parge exterior faces of below-grade masonry walls, where indicated, in two uniform coats to a total thickness of 3/4 inch. Dampen wall before applying first coat, and scarify first coat to ensure full bond to subsequent coat.

B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot. Form a wash at top of parging and a cove at bottom.

C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, pointed to eliminate evidence of replacement.

B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for sealant application, where indicated.

C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before tooling joints.

D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:

1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
3. Protect adjacent stone and nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.

5. Clean concrete masonry by applicable cleaning methods indicated in NCMA TEK 8-4A.

3.14 MASONRY WASTE DISPOSAL

A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.

1. Crush masonry waste to less than 4 inches in each dimension.
2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Section 31 20 00 "Earth Moving."
3. Do not dispose of masonry waste as fill within 18 inches of finished grade.

C. Masonry Waste Recycling: Return broken CMUs not used as fill to manufacturer for recycling.

D. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above or recycled, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00

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SECTION 05 40 00 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Load-bearing wall framing.
2. Floor joist framing.
3. Ceiling joist framing.

B. Related Requirements:

1. Section 09 22 16 "Non-Structural Metal Framing" for standard, interior non-load-bearing, metal-stud framing, with height limitations and ceiling-suspension assemblies.

1.2 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site .

1.3 ACTION SUBMITTALS

A. Product Data: For the following:

1. Cold-formed steel framing materials.
2. Load-bearing wall framing.
3. Floor joist framing.
4. Ceiling joist framing.
5. Power-actuated anchors.

B. Sustainable Design Submittals:

1. Product Data: For recycled content, indicating postconsumer and preconsumer recycled content and cost.
2. Environmental Product Declaration: For each product.
3. Health Product Declaration: For each product.
4. Sourcing of Raw Materials: Corporate sustainability report for each manufacturer.

C. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.

D. Delegated Design Submittal: For cold-formed steel framing.

1.4 INFORMATIONAL SUBMITTALS

A. Welding certificates.

B. Product Certificates: For each type of code-compliance certification for studs and tracks.

C. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency .

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Horizontal drift deflection clips
7. Miscellaneous structural clips and accessories.

D. Research Reports:

1. For nonstandard cold-formed steel framing post-installed anchors and power-actuated fasteners, from ICC-ES or other qualified testing agency acceptable to authorities having jurisdiction.
2. For sill sealer gasket/termite barrier, showing compliance with ICC-ES AC380.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: Qualified according to ASTM E329 for testing indicated.

B. Product Tests: Mill certificates or data from a qualified independent testing agency , or in-house testing with calibrated test equipment, indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

C. 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 the Steel Stud Manufacturers Association or the Supreme Steel Framing System Association.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

E. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.6 DELIVERY, STORAGE, AND HANDLING

A. Protect and store cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling as required in AISI S202.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. 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:

1. ClarkDietrich.
2. Steel Network, Inc. (The).

2.2 PERFORMANCE REQUIREMENTS

A. Delegated Design: Engage a qualified professional engineer, as defined in Section 01 40 00 "Quality Requirements," to design cold-formed steel framing.

B. Cold-Formed Steel Framing Standards: Unless more stringent requirements are indicated, framing complies with AISI S100 and AISI S240.

2.3 COLD-FORMED STEEL FRAMING MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with AISI S240 for conditions indicated.

C. Steel Sheet: ASTM A1003/A1003M, Structural Grade, Type H, metallic coated, of grade and coating designation as follows:

1. Grade: ST33HandST50Has indicated on drawings .
2. Coating: G60 , A60 , AZ50 , or GF30 .

D. Steel Sheet for Clips: ASTM A653/A653M, structural steel, zinc coated, of grade and coating as follows:

1. Grade: 50 , Class 1 .
2. Coating: G60 .

2.4 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch .
2. Flange Width: 2 inches .

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel studs .
2. Flange Width: 1-1/4 inches .

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch .
2. Flange Width: 2 inches .

2.5 FLOOR JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch .
2. Flange Width: 2 inches , minimum.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel joists .
2. Flange Width: 2 inches , minimum.

2.6 CEILING JOIST FRAMING

A. Steel Ceiling Joists: Manufacturer's standard C-shaped steel sections, of web depths indicated, unpunched, with stiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: 0.0428 inch .
2. Flange Width: 2 inches , minimum.

2.7 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from ASTM A1003/A1003M, Structural Grade, Type H, metallic coated steel sheet, of same grade and coating designation used for framing members.

B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:

1. Bracing, bridging, and solid blocking.
2. Web stiffeners.
3. Joist hangers and end closures.

2.8 ANCHORS, CLIPS, AND FASTENERS

A. Steel Shapes and Clips: ASTM A36/A36M, zinc coated by hot-dip process according to ASTM A123/A123M.

B. Power-Actuated Anchors: Fastener systems with working capacity greater than or equal to the design load, according to an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.

C. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.

1. Head Type: Low-profile head beneath sheathing; manufacturer's standard elsewhere.

D. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

A. Shims: Load-bearing, high-density, multimonomer, nonleaching plastic; or cold-formed steel of same grade and metallic coating as framing members supported by shims.

2.10 FABRICATION

A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.

1. Fabricate framing assemblies using jigs or templates.
2. Cut framing members by sawing or shearing; do not torch cut.

3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners and install according to Shop Drawings, with screws penetrating joined members by no fewer than three exposed screw threads.
4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies by means that prevent damage or permanent distortion.

C. Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable variation of 1/8 inch in 10 feet and as follows:

1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.
2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, conditions, and abutting structural framing 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. Install load-bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch to ensure a uniform bearing surface on supporting concrete or masonry construction.

3.3 INSTALLATION, GENERAL

A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

B. Install cold-formed steel framing according to AISI S200, AISI S202, and manufacturer's written instructions unless more stringent requirements are indicated.

C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.

1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch.

D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.

1. Cut framing members by sawing or shearing; do not torch cut.
2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
   a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
   b. Locate mechanical fasteners, install according to Shop Drawings, and comply with requirements for spacing, edge distances, and screw penetration.

E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

F. Install temporary bracing and supports to secure framing and support loads equal to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.

H. Fasten hole-reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.

3.4 INSTALLATION OF LOAD-BEARING WALL FRAMING

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As shown on Shop Drawings .

B. Squarely seat studs against top and bottom tracks, with gap not exceeding 1/8 inch between the end of wall-framing member and the web of track.

1. Fasten both flanges of studs to top and bottom tracks.
2. Space studs as follows:

a. Stud Spacing: As indicated on Drawings .

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame. Fasten jamb members together to uniformly distribute loads.
2. Install tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically as indicated on Shop Drawings . Fasten at each stud intersection.

1. Channel Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bar Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 INSTALLATION OF JOIST FRAMING

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated on Drawings .

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated on Shop Drawings. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 INSTALLATION TOLERANCES

A. Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error are not to exceed minimum fastening requirements of sheathing or other finishing materials.

3.7 REPAIR

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A780/A780M and manufacturer's written instructions.

3.8 PROTECTION

A. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 05 50 00 - 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.

1.2 SUMMARY

A. Section Includes:

1. Steel framing and supports for mechanical and electrical equipment.
2. Metal ladders.

B. Related Requirements:

1. Section 03 30 00 "Cast-in-Place Concrete" for installing anchor bolts and other items cast into concrete.
2. ASTM B 209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
3. OSHA 1910.27 – Fixed Ladders.

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 metal fabrications that are anchored to or that receive other work. 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.

1.4 ACTION SUBMITTALS

A. Shop Drawings and Product Data: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide reaction loads for each hanger and bracket.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For professional engineer qualified for designing stair in state and municipal codes and design standards.

B. Welding certificates.

1.6 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

B. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Manufacturer Qualifications: A firm experienced in producing aluminum metal ladders similar to those indicated for this Project and capable of engaging a professional engineering competent in design and structural analysis to fabricate ladders in compliance with industry standards and local codes.

D. Product Qualification: Product design shall comply with OSHA 1910.27 minimum standards for ladders.

1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis of Design: Provide O'Keeffe's 520A 60 degree or one of the following:

1. Erect A Step
2. ALACO
3. FS Industries
4. Approved equal submitted during bid process.

2.2 METALS

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.

B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

D. Steel Hollow Structural Section: ASTM A500 Gr. B

E. Abrasive-Surface Floor Plate: Aluminum plate with abrasive surface.

F. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

G. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

2.3 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 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.

F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

G. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

H. 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.

2.4 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.

2.5 METAL SHIPS' LADDERS

A. Provide metal ships' ladders where indicated. Fabricate of open-type construction with channel or plate stringers and pipe and tube railings unless otherwise indicated. Provide brackets and fittings for installation.

1. Treads shall be not less than 4 inches , and riser height shall be 6 ½” minimum to 12” maximum, width of 24”.
2. Fabricate ships' ladders, including railings from aluminum 1 ½” round, 12” above stringer, 42” height at top step.
3. Slope of stair stringer to be 60 degrees.

2.6 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. Prime exterior miscellaneous steel trim with primer specified in Section 09 96 00 "High-Performance Coatings."

2.7 FINISHES, GENERAL

A. Finish metal fabrications after assembly.

B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.8 STEEL AND IRON FINISHES

A. Galvanizing: Hot-dip galvanize items exposed to the exterior to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.

1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.

2.9 ALUMINUM FINISHES

A. As-Fabricated Finish: AA-M12.

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 screws, wood screws, and other connectors.

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 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 nonshrink grout. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING

A. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

END OF SECTION 05 50 00

SECTION 06 10 00 - 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.
2. Plywood Flooring at Above-ceiling Services Access Over Metal Joist Framing.

1.3 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2.

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.

1.4 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.

B. For items of dimension lumber size, provide Construction or No. 2 grade lumber of any species.

C. For blocking not used for attachment of other construction, Utility, Stud, or No. 3 grade lumber of any species may be used provided that it is cut and selected to eliminate defects that will interfere with its attachment and purpose.

1.5 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, Exposure 1, C-D Plugged, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.

1.6 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 of Type 304 stainless steel.

B. Nails, Brads, and Staples: ASTM F 1667.

C. Power-Driven Fasteners: NES NER-272.

D. Wood Screws: ASME B18.6.1.

END OF SECTION 06 10 00

SECTION 07 21 00 - THERMAL INSULATION

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. Foam-plastic board insulation.
2. Foam-plastic board insulation with concrete facing.

1.3 ACTION SUBMITTALS

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

B. Samples: For concrete-faced insulation board – 6”x6” minimum sample.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each product.

B. Research/Evaluation Reports: For foam-plastic insulation, from ICC-ES.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect insulation materials from physical damage and from deterioration due to moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

B. Protect foam-plastic board insulation as follows:

1. Do not expose to sunlight except to necessary extent for period of installation and concealment.

2. Protect against ignition at all times. Do not deliver foam-plastic board materials to Project site before installation time.
3. Quickly complete installation and concealment of exposed foam-plastic board insulation in each area of construction.

PART 2 - PRODUCTS

2.1 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and minimum compressive strength indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

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

   a. DiversiFoam Products.
   b. Dow Chemical Company (The).
   c. Owens Corning.
   d. Kingspan Insulation LLC.
   e. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2. Type VI, 1.8 pcf min. density at installations below grade, and/or supporting backfill.

2.2 CONCRETE-FACED INSULATED PERIMETER WALL PANELS

A. Extruded polystyrene insulation with 5/8” latex modified concrete face; tongue and groove edges. Foam R value of 5 per inch; compressive strength 40 pounds per square inch. Secure to perimeter concrete with manufacturer mechanical attachment system.

1. Products: Provide from basis of design manufacturer or approved equal:

   a. Wallguard, T Clear Corporation
   b. CFI – Tech-Creet Processors LTD.
   c. Sopra XPS Protect Artic C – Soprema.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean substrates of substances that are harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders, or that interfere with insulation attachment.

3.2 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.

C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.3 INSTALLATION OF BELOW-GRADE INSULATION

A. On vertical surfaces, set insulation units using manufacturer's recommended adhesive according to manufacturer's written instructions.

1. If not otherwise indicated, extend insulation a minimum of 36 inches (915 mm) below exterior grade line.

3.4 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07 21 00

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SECTION 07 62 00 - 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.

B. Division 13 34 19 “Metal Buildings Systems” for coordination at expansion joint; wall flashings, roof penetrations, and trims.

1.2 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, joints, and seams to provide leakproof, secure, and noncorrosive installation.

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 for each manufactured product and accessory.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Detail fabrication and installation layouts, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work.
3. Include identification of material, thickness, weight, and finish for each item and location in Project.
4. Include details for forming, including profiles, shapes, seams, and dimensions.
5. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
6. Include details of termination points and assemblies.
7. Include details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction from fixed points.
8. Include details of roof-penetration flashing.

9. Include details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
10. Include details of special conditions.
11. Include details of connections to adjoining work.

C. Samples for Verification: For each type of exposed finish.

1. Sheet Metal Flashing and Trims: Refer to requirements in Section 13 34 19.

1.4 WARRANTY

A. Special Warranty on Finishes: 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. Same requirements listed in Section 13 34 19.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies 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. Sheet Metal Standard for Flashing and Trim: Comply with NRCA's "The NRCA Roofing Manual" and SMACNA's "Architectural Sheet Metal Manual" requirements for dimensions and profiles shown unless more stringent requirements are indicated.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

2.3 FABRICATION, GENERAL

A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry,

metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.

1. 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.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.

B. Fabrication Tolerances: 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 indicated on Drawings and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. Fabrication Tolerances: Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

E. Sealant Joints: Where movable, non-expansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by cited sheet metal standard for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances, substrate, 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 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. Use fasteners**,** solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. 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.
3. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
4. Torch cutting of sheet metal flashing and trim is not permitted.
5. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
1. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of 10 feet with no joints within 24 inches (600 mm) of corner or intersection.

1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.

D. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.

E. Seal joints as required for watertight construction.

1. Use sealant-filled joints unless otherwise indicated. Embed hooked flanges of joint members not less than 1 inch (25 mm) into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F (4 and 21 deg C), 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 (4 deg C).
2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

3.3 ROOF-DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.

3.4 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet (6 mm in 6 m) on slope and location lines indicated on Drawings and within 1/8-inch (3-mm) 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."

3.5 CLEANING AND PROTECTION

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.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of sheet metal flashing and trim installation, remove unused materials and clean finished surfaces as recommended by sheet metal flashing and trim manufacturer. Maintain sheet metal flashing and trim in clean condition during construction.

E. 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

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SECTION 07 72 53 - SNOW GUARDS

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 ACTION SUBMITTALS

A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for snow guards.

B. Shop Drawings: Include roof plans showing layouts and attachment details of snow guards.

1. Include calculation of number and location of snow guards based on snow load, roof slope, roof type, components, spacings, and finish.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Performance Requirements: Provide snow guards that withstand exposure to weather and resist thermally induced movement without failure, rattling, or fastener disengagement due to defective manufacture, fabrication, installation, or other defects in construction.

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

B. Structural Performance:

1. Snow Loads: As indicated on Structural Drawings.

2.2 SNOW GUARDS – CLAMP AND RAIL

A. Provide system with bar rail, pressure clamped to standing seam with no penetrating fasteners and intermediate snow/ice stops between standing seams:

1. Material: Manufacturer's standard noncorrosive metal.

2. Product: Metal Roof Snowguards, SnoBar or equal approved by Metal Building System Manufacturer to not void finish or weathertightness warranties.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, snow guard attachment, and other conditions affecting performance of the Work.

1. Verify compatibility with and suitability of substrates including compatibility with existing finishes or primers.

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

3.2 PREPARATION

A. Clean and prepare substrates for bonding snow guards.

B. Prime substrates according to snow guard manufacturer's written instructions.

3.3 INSTALLATION

A. Install snow guards according to manufacturer's written instructions.

B. Attachment for Standing-Seam Metal Roofing:

1. Do not use fasteners that will penetrate metal roofing, or fastening methods that void metal roofing finish or weathertightness warranty.

END OF SECTION 07 72 53

SECTION 07 92 00 - 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. Nonstaining silicone joint sealants.
2. Urethane joint sealants.
3. Latex joint sealants.

B. Related Requirements:

1. Section 32 13 73 "Concrete Paving Joint Sealants" for sealing joints in paved roads, parking lots, walkways, and curbing.

1.3 ACTION SUBMITTALS

A. Product Data: For each joint-sealant product.

B. Provide color selection samples from manufacturer’s standard range.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each kind of joint sealant, for tests performed by manufacturer and witnessed by a qualified testing agency.

B. Sample Warranties: For special warranties.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

1.6 FIELD 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.
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 Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Two years from date of Substantial Completion.

B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

C. Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:

1. Movement of the structure caused by stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from 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 JOINT SEALANTS, 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:

1. Architectural sealants shall have a VOC content of 250 g/L or less.
2. Sealants and sealant primers for nonporous substrates shall have a VOC content of 250 g/L or less.
3. Sealants and sealant primers for nonporous substrates shall have a VOC content of 775 g/L or less.

C. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 URETHANE JOINT SEALANTS

A. Urethane, M, NS, 50, T, NT: Multicomponent, nonsag, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920.

2.3 NONSTAINING SILICONE JOINT SEALANTS

A. Nonstaining Joint Sealants: No staining of substrates when tested according to ASTM C 1248.

B. Silicone, Nonstaining, S, NS, 100/50 NT: Nonstaining, single-component, nonsag, plus 100 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

1. Products: Subject to compliance with requirements, provide the following or approved equal:

a. Pecora Corporation; 890FTS/TXTR.

2.4 MILDEW-RESISTANT JOINT SEALANTS

A. Mildew-Resistant Joint Sealants: Formulated for prolonged exposure to humidity with fungicide to prevent mold and mildew growth.

B. Silicone, Mildew Resistant, Acid Curing, S, NS, 25, NT: Mildew-resistant, single-component, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, acid-curing silicone joint sealant; ASTM C920,.

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. Adfast.
b. GE Construction Sealants; Momentive Performance Materials Inc.

c. May National Associates, Inc.; a subsidiary of Sika Corporation.
d. Pecora Corporation.
e. Soudal USA.
f. The Dow Chemical Company.
g. Tremco Incorporated.

2.5 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

2.6 JOINT-SEALANT BACKING

A. Sealant Backing Material, General: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330. As approved in writing by joint-sealant manufacturer for joint application indicated, 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 nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent 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 performance of the Work.

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.

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. Porcelain enamel.
    c. Glazed surfaces of ceramic tile.

B. Joint Priming: Prime joint substrates as 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 Nonsag 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. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

G. Location of joint sealant shall include all areas noted on the drawings and shall also include the following specific areas.

1. At perimeter and bottom of all hollow metal door frames in gypsum, and concrete masonry unit walls.
2. At connection of all dissimilar materials including but not limited to; gypsum drywall to concrete, gypsum drywall to masonry, concrete to masonry, steel to gypsum drywall, steel to masonry, steel to concrete, etc.

3. At perimeter of all accessory items mounted in concrete, gypsum drywall and masonry surfaces including, but not limited to; toilet accessories, fire extinguisher cabinets, etc.
4. At perimeter of all millwork as it abuts any wall surface unless directed by the Architect.

3.4 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.

3.5 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, remove, and repair damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.6 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces.

1. Joint Sealant: Urethane T.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Exterior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

    a. Construction joints in cast-in-place concrete.
    b. Control and expansion joints in unit masonry.
    c. Joints between metal panels.
    d. Joints between different materials listed above.
    e. Perimeter joints between materials listed above and frames of doors and storefront.

2. Joint Sealant: Urethane 50 NT.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

3.7 Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement.

1. Joint Locations:

   a. All interior joints not otherwise indicated.

2. Joint Sealant: Acrylic latex.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.

1. Joint Locations:

   a. Joints between adjoining walls and plumbing fixture, floors, door frames, wall penetrations, fixed casework,
   b. Tile joints.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

END OF SECTION 07 92 00

SECTION 07 95 00 - EXPANSION CONTROL

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 wall expansion control systems.

B. Related Requirements:

1. Section 07 92 00 "Joint Sealants" for liquid-applied joint sealants and elastomeric sealants without metal frames.

1.3 ACTION SUBMITTALS

A. Shop Drawings: For each expansion control system specified. Include plans, elevations, sections, details, splices, attachments to other work, and line diagrams showing entire route of each expansion control system. Where expansion control systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

B. Samples: For each exposed expansion control system and for each color and texture specified, full width by 6 inches long in size.

C. Color Selection: For each exposed joint finish face provide manufacturer's standard colors for selection approval.

1.4 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each fire barrier provided as part of an expansion control system, for tests performed by a qualified testing agency.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

A. General: Provide expansion control systems of design, basic profile, materials, and operation indicated. Provide units with capability to accommodate variations in adjacent surfaces.

1. Furnish units in longest practicable lengths to minimize field splicing. Install with hairline mitered corners where expansion control systems change direction or abut other materials.
2. Include factory-fabricated closure materials and transition pieces, T-joints, corners, curbs, cross-connections, and other accessories as required to provide continuous expansion control systems.

B. Coordination: Coordinate installation of exterior wall expansion control systems with roof expansion control systems to ensure that wall transitions are watertight. Roof expansion joint assemblies are specified elsewhere.

2.2 EXTERIOR WALL EXPANSION CONTROL SYSTEMS

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

1. Emseal Corporation.
2. InPro Products
3. Tremco
4. Construction Specialties
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Basis-of-Design Product: Emseal Colorseal – silicone-coated, pre-compressed primary seal with 100% joint movement (50% each way).

C. Source Limitations: Obtain expansion control systems from single source from single manufacturer.

2.3 MATERIALS

A. Compression Seals: ASTM E 1612; preformed elastomeric extrusions having an internal baffle system and designed to function under compression.

B. Cellular Foam Seals: Extruded, compressible foam designed to function under 50% compression and 50% tension.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical 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 not acceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces where expansion control systems will be installed for installation tolerances and other conditions affecting performance of work.

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

3.2 PREPARATION

A. Prepare substrates according to expansion control system manufacturer's written instructions.

3.3 INSTALLATION

A. Comply with manufacturer's written instructions for storing, handling, and installing expansion control systems and materials unless more stringent requirements are indicated.

B. Foam Seals: Install with adhesive recommended by manufacturer.

C. Terminate exposed ends of expansion control systems with field- or factory-fabricated termination devices.

3.4 PROTECTION

A. Do not remove protective covering until finish work in adjacent areas is complete. When protective covering is removed, clean exposed metal surfaces to comply with manufacturer's written instructions.

B. Protect the installation from damage by work of other Sections. Where necessary due to heavy construction traffic, remove and properly store cover plates or seals and install temporary protection over expansion control systems. Reinstall cover plates or seals prior to Substantial Completion of the Work.

END OF SECTION 07 95 00

SECTION 08 11 13 - HOLLOW METAL DOORS AND FRAMES

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 hollow metal work.

B. Related Requirements:

1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.
2. Section 09 91 13 “Exterior Painting” for coordination and compatibility of shop prime coating with field-applied top coatings.
3. Section 09 96 00 “High-Performance Coatings” for coordination and compatibility of shop prime coating with field-applied top coatings.
4. Section 08 16 13 “Fiberglass Reinforced Plastic (FRP) Doors” for non-hollow metal doors in hollow metal frames.
5. Section 08 71 00 “Door Hardware” for door hardware.

1.3 COORDINATION

A. Coordinate anchorage installation for hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

1. Elevations of each door type.
2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.

3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
4. Locations of reinforcement and preparations for hardware.
5. Details of each different wall opening condition.
6. Details of anchorages, joints, field splices, and connections.
7. Details of accessories.
8. Details of moldings, removable stops, and glazing.
9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use non-vented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- high wood blocking. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Republic Doors and Frames.
4. Steelcraft; an Ingersoll-Rand company.

5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Source Limitations: Obtain hollow-metal work from single source from single manufacturer.

2.2 INTERIOR DOORS AND FRAMES

A. Construct interior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Heavy-Duty Doors and Frames: SDI A250.8, Level 3. All interior locations.

1. Physical Performance: Level B according to SDI A250.4.

2. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches .
   c. Face: Uncoated, cold-rolled steel sheet, minimum thickness of 0.053 inch .
   d. Edge Construction: Model 2, Seamless.
   e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, core at manufacturer's discretion.

3. Frames:

   a. Materials: Uncoated steel sheet, minimum thickness of 0.053 inch .
   b. Construction: Full profile welded.

4. Exposed Finish: Prime paint at ferrous metal, #4 brushed satin at stainless steel.

2.3 EXTERIOR HOLLOW-METAL DOORS AND FRAMES

A. Construct exterior doors and frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.

B. Extra-Heavy-Duty Doors and Frames: SDI A250.8, Level 3. All exterior locations.

1. Physical Performance: Level A according to SDI A250.4.
2. Doors:

   a. Type: As indicated in the Door and Frame Schedule.
   b. Thickness: 1-3/4 inches

c. Face: Metallic-coated steel sheet, minimum thickness of 0.053 inch , with minimum A40 coating.
d. Edge Construction: Model 2, Seamless.
e. Core: Manufacturer's standard kraft-paper honeycomb, polystyrene, polyurethane, polyisocyanurate, mineral-board, or vertical steel-stiffener core at manufacturer's discretion.
f. Core: Polyurethane.

1) Thermal-Rated Doors: Provide doors fabricated with thermal-resistance value (R-value) of not less than 2.1 deg F x h x sq. ft./Btu when tested according to ASTM C 1363.

3. Frames:

a. Materials: Metallic-coated steel sheet, minimum thickness of 0.067 inch , with minimum A40 coating.
b. Construction: Full profile welded.

4. Exposed Finish: Factory.

2.4 HOLLOW-METAL PANELS

A. Provide hollow-metal panels of same materials, construction, and finish as adjacent door assemblies.

2.5 FRAME ANCHORS

A. Jamb Anchors:

1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
3. Compression Type for Drywall Slip-on Frames: Adjustable compression anchors.
4. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch-bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch and as follows:

1. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.
2. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch height adjustment. Terminate bottom of frames at finish floor surface.

2.6 MATERIALS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.

B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.

E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.

1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

G. Power-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow-metal frames of type indicated.

H. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

2.7 FABRICATION

A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

B. Hollow-Metal Doors:

1. Vertical Edges for Single-Acting Doors: Bevel edges 1/8 inch in 2 inches .
2. Top Edge Closures: Close top edges of doors with inverted closures, except provide flush closures at exterior doors of same material as face sheets.
3. Bottom Edge Closures: Close bottom edges of doors with end closures or channels of same material as face sheets.
4. Exterior Doors: Provide weep-hole openings in bottoms of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

C. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
2. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
3. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
4. Jamb Anchors: Provide number and spacing of anchors as follows:

    a. Masonry Type: Locate anchors not more than 16 inches from top and bottom of frame. Space anchors not more than 32 inches o.c., to match coursing, and as follows:

        1) Three anchors per jamb from 60 to 90 inches high, four from 90 to 120 inches.

    b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

        1) Four anchors per jamb from 60 to 90 inches high, five from 90 to 120 inches.

    c. Compression Type: Not less than two anchors in each frame.
    d. Post-installed Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.

5. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Keep holes clear during construction.

    a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
    b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

D. Fabricate concealed stiffeners and edge channels from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.

1. Reinforce doors and frames to receive non-templated, mortised, and surface-mounted door hardware.
2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.

F. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.
3. Provide loose stops and moldings on inside of hollow-metal work.
4. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.8 STEEL FINISHES

A. Prime Finish: Clean, pretreat, and apply primer compatible with top-coatings to be field-painted and coordinated with painting and coating sections withing this project manual.

1. Shop Primer: Prime coating coordinated with intended field-applied top coatings, lead- and chromate-free primer complying with SDI A250.10; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure. Primer to be compatible with finish coat; refer to finish schedule and related paint and coating specification sections.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Drill and tap doors and frames to receive non-templated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.

1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

    a. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    b. Install frames with removable stops located on secure side of opening.
    c. Install door silencers in frames before grouting.
    d. Remove temporary braces necessary for installation only after frames have been properly set and secured.
    e. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.

    a. Floor anchors may be set with power-actuated fasteners instead of post-installed expansion anchors if so indicated and approved on Shop Drawings.

3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

    a. Squareness: Plus or minus 1/16 inch , measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
    b. Alignment: Plus or minus 1/16 inch , measured at jambs on a horizontal line parallel to plane of wall.
    c. Twist: Plus or minus 1/16 inch , measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
    d. Plumbness: Plus or minus 1/16 inch , measured at jambs at floor.

C. Hollow-Metal Doors: Fit hollow-metal doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

    a. Between Door and Frame Jambs and Head: 1/8 inch plus or minus 1/32 inch .
    b. Between Edges of Pairs of Doors: 1/8 inch to 1/4 inch plus or minus 1/32 inch.
    c. At Bottom of Door: 3/4 inch plus or minus 1/32 inch

d. Between Door Face and Stop: 1/16 inch to 1/8 inch plus or minus 1/32 inch

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

E. Factory-Finish Touchup: Clean abraded areas and repair with same material used for factory finish according to manufacturer's written instructions.

F. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 08 11 13

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SECTION 08 11 19 - STAINLESS STEEL HOLLOW METAL DOORS AND FRAMES

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 include:
   1. Stainless-steel, hollow metal doors.
   2. Stainless-steel, hollow metal frames.

B. Related Requirements:

   1. Section 08 71 00 "Door Hardware" for door hardware for hollow-metal doors.

1.3 COORDINATION

A. Coordinate anchorage installation for stainless steel hollow-metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

   1. Include construction details, material descriptions, core descriptions, fire-resistance ratings, and finishes.

B. Shop Drawings: Include the following:

   1. Elevations of each door type.
   2. Details of doors, including vertical- and horizontal-edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.

9. Details of conduit and preparations for power, signal, and control systems.

C. Schedule: Provide a schedule of hollow-metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with final Door Hardware Schedule.

1.5 INFORMATIONAL SUBMITTALS

A. Product Test Reports: For each type of stainless steel hollow-metal door and frame assembly, for tests performed by a qualified testing agency.

B. Oversize Construction Certification: For assemblies required to be fire rated and exceeding limitations of labeled assemblies.

1.6 QUALITY ASSURANCE

A. Source Limitations: Obtain stainless-steel, hollow-metal work from single source from single manufacturer.

B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

2. Temperature-Rise Limit: At vertical exit enclosures and exit passageways, provide doors that have a maximum transmitted temperature end point of not more than 450 deg F (250 deg C) above ambient after 30 minutes of standard fire-test exposure.

C. Smoke- and Draft-Control Door Assemblies: At corridors, smoke barriers, and smoke partitions, provide assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.

D. Fire-Rated, Borrowed-Light Frame Assemblies: Assemblies that are listed and labeled, by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9. Label each individual glazed lite. Install in compliance with NFPA 80.

E. Pre-installation Conference: Conduct conference at Project site.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow-metal work palletized, packaged, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store stainless steel hollow-metal work vertically under cover at Project site with head up. Place on minimum 4-inch- (102-mm-) high wood blocking. Provide minimum 1/4-inch (6-mm) space between each stacked door to permit air circulation.

1.8 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.9 COORDINATION

A. Coordinate installation of anchorages for stainless-steel frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 STAINLESS STEEL DOORS AND FRAMES

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

1. Ceco Door Products; an Assa Abloy Group company.
2. Curries Company; an Assa Abloy Group company.
3. Steelcraft; an Ingersoll-Rand company.
4. West Central Manufacturing
5. Stainless Doors
6. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Source Limitations: Obtain stainless steel work from single source from single manufacturer.

2.2 REGULATORY REQUIREMENTS

A. Fire-Rated Assemblies: Complying with NFPA 80 and listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C.

B. Fire-Rated, Borrowed-Light Assemblies: Complying with NFPA 80 and listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction for fire-protection ratings indicated, based on testing according to NFPA 257 or UL 9.

2.3 INTERIOR DOORS AND FRAMES

A. Description: Stainless-steel doors, not less than 1-3/4 inches (44 mm) thick, of seamless, hollow-metal construction. Construct doors with smooth, flush surfaces without visible joints or seams on faces.
   1. Face Sheets: Fabricate from 0.078-inch- (1.98-mm-) thick, stainless-steel sheet.
   2. Core Construction: Fabricate doors with core indicated.
      a. Welded Steel-Stiffened Core: vertical stiffeners extending full-door height, spaced not more than 6 inches (152 mm) apart, spot welded to face sheets a maximum of 5 inches (127 mm) o.c. Fill spaces between stiffeners with mineral-fiber insulation.
      b. Fire-Rated Door Core: As required to provide fire-protection and temperature-rise ratings indicated.
   3. Vertical Edges for Single-Acting Doors: Beveled 1/8 inch in 2 inches (3 mm in 50 mm).
   4. Vertical Edges for Double-Acting Doors: Round vertical edges with 2-1/8-inch (54-mm) radius.
   5. Moldings for Glazed Lites in Doors: 0.038-inch- (0.95-mm-) thick stainless steel.
   6. Loose Stops for Glazed Lites in Doors: 0.038-inch- (0.95-mm-) thick stainless steel.
   7. Top and Bottom Channels: Closed with continuous channels, 0.062-inch- (1.59-mm-) thick stainless steel.
      a. Securely fastened using adhesive.
   8. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
   9. Electrical Hardware Enclosures: Provide enclosures and junction boxes within doors for electrically operated door hardware, interconnected with UL-approved, 1/2-inch- (12.7mm-) diameter conduit and connectors.
      a. Where indicated for installation of wiring, provide access plates to junction boxes, fabricate from same material and thickness as face sheet and fasten with at least four security fasteners spaced not more than 6 inches (152 mm) o.c.

B. Performance: Level A, ANSI A250.4.

C. Materials:
   1. Stainless-Steel Sheet: ASTM A240/A240M, austenitic stainless steel, Type 316 as indicated.
   2. Steel Sheet: ASTM A1008/A1008M or ASTM A1011/A1011M, Commercial Steel (CS), Type B.
   3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

4. Foam-Plastic Insulation: Manufacturer's standard polystyrene board insulation with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, according to ASTM E84. Enclose insulation completely within door.
5. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

D. Stainless-Steel Finishes:
1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.
2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.
   a. Run grain of directional finishes with long dimension of each piece.
   b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
   c. Directional Satin Finish: No. 4.

2.4 STAINLESS-STEEL PANELS

A. Provide stainless-steel panels of same construction, materials, and finish as specified for adjoining stainless-steel doors.

2.5 STAINLESS-STEEL FRAMES

A. Description: Fabricate stainless-steel frames of construction indicated, with faces of corners mitered and contact edges closed tight.
1. Door Frames: Saw mitered and full (continuously) welded.
   a. Weld frames according to HMMA 820.
2. Sidelight Transom and Borrowed-Light Frames: Saw mitered and full (continuously) welded.
3. Door Frames for Openings 48 Inches (1219 mm) Wide or Less: Fabricate from 0.078inch- (1.98-mm-) 0.109-inch- (2.78-mm-) thick, stainless-steel sheet.
4. Door Frames for Openings More Than 48 Inches (1219 mm) Wide: Fabricate from 0.109-inch- (2.78-mm-) thick, stainless-steel sheet.
5. Borrowed-Light Frames: Fabricate from 0.078-inch- (1.98-mm-) thick, stainless-steel sheet.
6. Sidelight and Transom Frames: Fabricate from stainless-steel sheet of same thickness as adjacent door frame.
7. Glazing and Panel Stops: Formed integral with stainless-steel frames, minimum 5/8 inch (16 mm) high, unless otherwise indicated.
8. Loose Stops for Glazed Lites and Panels: 0.038-inch- (0.95-mm-) thick stainless steel.
9. Hardware Reinforcement: Fabricate according to ANSI/NAAMM-HMMA 866 with reinforcing plates from stainless steel.
10. Head Reinforcement: 0.109-inch- (2.78-mm-) thick, stainless-steel channel or angle stiffener for openings widths more than 48 inches (1219 mm).
11. Jamb Anchors:

a. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.062-inch- (1.59-mm-) thick stainless steel with corrugated or perforated straps not less than 2 inches (50 mm) wide by 10 inches (250 mm) long; or wire anchors not less than 0.156 inch (4.0 mm) thick.

b. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.050-inch- (1.27-mm-) thick stainless steel.

c. Compression Type for Slip-on Frames: Fabricate adjustable compression anchors from stainless steel.

d. Post-installed Expansion Type for In-Place Concrete or Masonry: Minimum 3/8inch- (9.5-mm-) diameter, stainless-steel bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.

12. Floor Anchors: Not less than 0.078-inch- (1.98-mm-) thick stainless steel, and as follows:

a. Monolithic Concrete Slabs: Clip-type anchors, with two holes to receive fasteners.

b. Separate Topping Concrete Slabs: Adjustable-type anchors with extension clips, allowing not less than 2-inch (50-mm) height adjustment. Terminate bottom of frames at finish floor surface.

13. Ceiling Struts: Minimum 3/8-inch-thick by 2-inch- (9.5-mm-thick by 50-mm-) wide from stainless steel.

14. Plaster Guards: Not less than 0.019-inch- (0.48-mm-) thick stainless steel. B.

Performance: Level A, ANSI A250.4.

C. Materials:

1. Stainless-Steel Sheet: ASTM A240/A240M, austenitic stainless steel, Type 304 or 316 as indicated.

2. Steel Sheet: ASTM A1008/A1008M or ASTM A1011/A1011M, Commercial Steel (CS), Type B.

3. Metallic-Coated Steel Sheet: ASTM A653/A653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

4. Frame Anchors: Stainless-steel sheet. Same type as door face.

5. Frame Anchors: Steel sheet, hot-dip galvanized according to ASTM A153/A153M, Class B.

6. Inserts, Bolts, and Anchor Fasteners: Stainless-steel components complying with ASTM F593 and ASTM F594, Alloy Group 1 or 2 (ASTM F738M and ASTM F836M, Alloy Group 1 or 4) for bolts and nuts.

7. Inserts, Bolts, and Anchor Fasteners: Hot-dip galvanized steel according to ASTM A153/A153M or ASTM F2329. D. Finishes:

1. Surface Preparation: Remove tool and die marks and stretch lines, or blend into finish.

2. Polished Finishes: Grind and polish surfaces to produce uniform finish, free of cross scratches.

   a. Run grain of directional finishes with long dimension of each piece.

   b. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.

   c. Directional Satin Finish: No. 4.

2.6 ACCESSORIES

A. Glazing: Comply with requirements in Section 08 80 00 "Glazing."

B. Grout: Comply with ASTM C476, with a slump of not more than 4 inches (102 mm) as measured according to ASTM C143/C143M.

C. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil (0.4-mm) dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

D. Mineral Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers.

2.7 FABRICATION

A. Stainless-Steel Door Fabrication: Stainless-steel doors to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal.
   1. Seamed Edge Construction: Both vertical door edges joined by visible, continuous interlocking seam (lock seam) full height of door.
   2. Seamed Edge Construction: Both vertical door edges joined by visible seam that is projection, spot, or tack welded on inside edges of door at minimum 6 inches (152 mm) o.c.
   3. Seamless Edge Construction: Door face sheets joined at vertical edges by continuous weld extending full height of door; with edges ground and polished, providing smooth, flush surfaces with no visible seams.
   4. Exterior Doors: Close top edges flush and seal joints against water penetration. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape.
   5. Stops and Moldings: Factory cut openings in doors. Provide stops and moldings around glazed lites. Form corners of stops and moldings with butted or mitered hairline joints.
      a. Glazed Lites: Provide fixed stops and moldings welded on secure side of door.
      b. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.
   6. Hardware Preparation: Factory prepare stainless-steel doors to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping,

according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."

a. Reinforce doors to receive non-templated mortised and surface-mounted door hardware.

7. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
8. Tolerances: Fabricate doors to tolerances indicated in ANSI/NAAMM-HMMA 866.

B. Stainless-Steel Frame Fabrication: Fabricate stainless-steel frames to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

1. Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible. Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated from same thickness metal as frames.
2. Mullions Rails and Transom Bars: Provide closed tubular members with no visible face seams or joints. Fasten members at crossings and to jambs by butt welding according to joint designs in HMMA 820.
   a. Provide false head member to receive lower ceiling where frames extend to finish ceilings of different heights.
3. Provide countersunk, flat-, or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
4. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
5. Jamb Anchors: Provide number and spacing of anchors as follows:
   a. Masonry Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      1) Two anchors per jamb up to 60 inches (1524 mm) in height.
      2) Three anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
      3) Four anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
      4) Four anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof more than 96 inches (2438 mm) in height.
   b. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c. and as follows:
      1) Three anchors per jamb up to 60 inches (1524 mm) in height.
      2) Four anchors per jamb from 60 to 90 inches (1524 to 2286 mm) in height.
      3) Five anchors per jamb from 90 to 96 inches (2286 to 2438 mm) in height.
      4) Five anchors per jamb plus one additional anchor per jamb for each 24 inches (610 mm) or fraction thereof more than 96 inches (2438 mm) in height.
      5) Two anchors per head for frames more than 42 inches (1066 mm) wide and mounted in metal-stud partitions.
   c. Compression Type: Not less than two anchors in each jamb.

d. Post-installed Expansion Type: Locate anchors not more than 6 inches (152 mm) from top and bottom of frame. Space anchors not more than 26 inches (660 mm) o.c.

6. Head Reinforcement: For frames more than 48 inches (1219 mm) wide, provide continuous head reinforcement for full width of opening, welded to back of frame at head.
7. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers as follows. Provide plastic plugs to keep holes clear during construction.
   a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.
   b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.
8. Stops and Moldings: Provide stops and moldings around glazed lites and solid panels where indicated. Form corners of stops and moldings with butted or mitered hairline joints.
   a. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of door or frame.
   b. Multiple Glazed Lites: Provide fixed and removable stops and moldings such that each lite is capable of being removed independently.
   c. Coordinate rabbet width between fixed and removable stops with type of glazing or panel and type of installation indicated.
9. Hardware Preparation: Factory prepare stainless-steel frames to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping, according to the Door Hardware Schedule and templates furnished as specified in Section 087100 "Door Hardware."
   a. Reinforce frames to receive non-templated mortised and surface-mounted door hardware.
   b. Locate hardware as indicated, or if not indicated, according to HMMA 831, "Recommended Hardware Locations for Custom Hollow Metal Doors and Frames."
10. Plaster Guards: Weld guards to frame at back of hardware mortises and mounting holes in frames to be grouted.
11. Tolerances: Fabricate frames to tolerances indicated in ANSI/NAAMM-HMMA 866.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

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

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation and with installation spreaders in place, adjust and securely brace stainlesssteel door frames for squareness, alignment, twist, and plumb to the following tolerances:
   1. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   2. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
   3. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   4. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install stainless steel hollow-metal work plumb, rigid, properly aligned, and securely fastened in place. Comply with Drawings and manufacturer's written instructions.

B. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with NAAMM-HMMA 866 as required by standards specified.

   1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

      a. At fire-rated openings, install frames according to NFPA 80.
      b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
      c. Install frames with removable stops located on secure side of opening.
      d. Install door silencers in frames before grouting.
      e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
      f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
      g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.

   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.

a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Grout jamb members full.
4. In-Place Concrete or Masonry Construction: Secure frames in place with postinstalled expansion anchors. Countersink anchors, and fill and make smooth, flush, and invisible on exposed faces.
5. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
6. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:

a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.

C. Stainless-Steel Doors: Fit stainless-steel doors accurately in frames, within clearances specified below. Shim as necessary.

1. Non-Fire-Rated Steel Doors:

a. Between Door and Frame Jambs and Head: 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).
b. Between Edges of Pairs of Doors: 1/8 inch (3.2 mm) to 1/4 inch (6.3 mm) plus or minus 1/32 inch (0.8 mm).
c. At Bottom of Door: 3/4 inch (19.1 mm) plus or minus 1/32 inch (0.8 mm).
d. Between Door Face and Stop: 1/16 inch (1.6 mm) to 1/8 inch (3.2 mm) plus or minus 1/32 inch (0.8 mm).

2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.
3. Smoke-Control Doors: Install doors and gaskets according to NFPA 105.

D. Glazing: Comply with installation requirements in Section 08 80 00 "Glazing" and with hollow-metal manufacturer's written instructions.

1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow-metal work immediately after installation.

C. Stainless-Steel Touchup: Immediately after erection, smooth any abraded areas of stainless steel and polish to match undamaged finish.

END OF SECTION 08 11 13

SECTION 08 16 13 – FIBERGLASS-REINFORCED POLYMER (FRP) DOORS

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 08 11 13 "Hollow Metal Doors and Frames".

C. Section 08 71 00 "Door Hardware".

1.2 QUALITY ASSURANCE

A. Construction: Verify that FRP doors and frames are manufactured utilizing pultruded fiberglass components.

B. Resins: Resins shall comply with USDA and FDA standards for incidental food contact

C. Flame Spread Rating: Flame retardant structural shapes meet the minimum flame spread rating less than or equal to 25 when tested according to ASTM E84.

D. Physical Endurance: FRP Doors and frames to successfully complete 1,000,000 cycles Grade A swing test in compliance with ANSI/SDI A250.4-2011**.**

E. Impact Strength: FRP doors 10.32 foot-pounds per inch, ASTM D-256**.**

F. Tensile Strength:

1. FRP doors 12,000 psi, ASTM D-638.
2. FRP frames 30,000 psi, ASTM D-638.

G. Flexural Strength: FRP doors and frames 25,000 psi, ASTM D-790.

H. Compressive Strength:

1. FRP doors 18,000 psi, ASTM D-695.
2. FRP frames 30,000 psi, ASTM D-695.

I. Water Absorption: FRP doors and frames .27%, ASTM D-570.

J. Hardware Reinforcements: FRP doors and frames fabricated with a minimum screw holding strength of 1,000 lbs. Tested with a #12 x 1-1/4" hinge screw.

K. Warranty: Life of the initial installation against failure due to corrosion. Additionally, lifetime warranty against failure due to materials and workmanship from date of substantial completion.

1.3 SUBMITTALS

A. Product Data: For each type of door and frame indicated, include door designation, type, level and model, material description, core description, construction details and finishes.

1.4 DELIVERY, STORAGE AND HANDLING

A. Deliver doors and frames crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.

B. Inspect doors and frames on delivery for damage and notify shipper and supplier if damage exists. Minor damages may be repaired provided refinished items match new work and are acceptable to the Architect. Remove and replace damaged items that cannot be repaired as directed.

C. Store doors and frames at building site under cover. Avoid using non-vented plastic or canvas covers that could create a humidity chamber.

PART 2 – PRODUCTS

2.1 MANUFACTURERS

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

1. FRP Architectural Doors Inc.
2. Weiland
3. Special-Lite, Inc.
4. Others submitted and approved by Architect prior to bid submittal.

B. Interior Doors: Provide doors complying with requirements indicated below:

1. CF34 (Heavy Duty).
2. Doors to have at least two internal full height vertical FRP stiffeners for warp resistance.
3. Polystyrene foam core standard.

C. Vision Lite Systems: Lite cutout shall be built-in during door assembly, utilizing FRP tubing.

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2.2 FABRICATION

A. General: Fabricate fiberglass door and frame units to be rigid and free from defects including warp and buckle.

B. Core Construction: Manufacturer's standard core construction that complies with the following:

1. Expanded polystyrene or polyurethane foam core.
2. Fire resistant mineral core.

C. Stiles and Rails: Fabricate doors using FRP pultrusions.

D. Door Faces: Fiberglass face skins shall be fused to the stile and rail assembly, including the vertical stiffeners and core material, utilizing polyurethane adhesive.

E. Clearances: Not more than 1/8" at jambs and heads. Not more than 1/4" between pairs of doors. Not more than 3/4" at bottom unless indicated otherwise.

F. Door Edges: Lock stile to be factory beveled 3 degrees, standard.

G. Tolerances: Maximum diagonal distortion 1/8" measured with straight edge, corner-to-corner.

H. Hardware Reinforcement: Fabricate all hardware reinforcements using FRP pultrusions.

I. Exposed Fasteners: Unless otherwise indicated, provide stainless steel, countersunk flat or oval heads for exposed screws and bolts.

J. Hardware Preparations: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier.

K. Hardware Locations: Locate hardware as indicated on shop drawings or, if not indicated, according to manufacturer's standard locations.

L. Glazing Stops: Two-piece PVC lite kits.

1. Provide screw-applied, removable, glazing stops on inside of opening, louvers, and other panels in doors.
2. Glass to be supplied and installed under section 08800, unless stated otherwise.

2.3 FINISHES

A. Two-component acrylic urethane topcoat custom color, factory-finished.

PART 3 – EXECUTION

3.1 INSTALLATION

A. General: Install FRP doors, frames, and accessories according to shop drawings, manufacturer's data, and as specified.
B. Placing Frames: Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set.

1. Except for frames located in existing walls, place frames before construction of enclosing walls and ceilings.
2. In masonry construction, provide at least three wall anchors per jamb; install adjacent to hinge locations on hinge jamb and at corresponding heights on strike jamb**, u**tilizing masonry wire anchors.
3. In existing concrete or masonry construction, provide at least three completed opening anchors per jamb; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with stainless steel expansion bolts.
4. For openings 90" or more in height, install an additional anchor at hinge and strike jambs.

C. Factory Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
D. Door Installation: Fit fiberglass doors accurately in frames. Shim as necessary.

END OF SECTI`ON 08 16 13

SECTION 08 31 13 - ACCESS DOORS AND FRAMES

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. Access doors and frames for walls and ceilings.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, fire ratings, materials, individual components and profiles, and finishes.

B. Shop Drawings:

1. Include plans, elevations, sections, details, and attachments to other work.
2. Detail fabrication and installation of access doors and frames for each type of substrate.

C. Product Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

PART 2 - PRODUCTS

2.1 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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

1. J. L. Industries, Inc.; Div. of Activar Construction Products Group.
2. Larsen's Manufacturing Company.
3. Milcor Inc.

4. Acudor
5. Cendrex
6. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Source Limitations: Obtain each type of access door and frame from single source from single manufacturer.

C. Flush Access Doors with Concealed Flanges :

1. Assembly Description: Fabricate door to fit flush to frame. Provide frame with gypsum boardbeads for concealed flange installation.
2. Locations: Ceiling
3. Door Size: 24x24".

a. Finish: Factory finish.

D. Hardware:

1. Latch: Cam latch operated by screwdriver.

2.2 MATERIALS

A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

B. Steel Sheet: Uncoated or electrolytic zinc coated, ASTM A 879/A 879M, with cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

C. Frame Anchors: Same type as door face.

2.3 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access doors to types of supports indicated.

1. For concealed flanges with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.

2. For concealed flanges with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
3. Provide mounting holes in frames for attachment of units to metal or wood framing.
4. Provide mounting holes in frame for attachment of masonry anchors.

D. Recessed Access Doors: Form face of panel to provide recess for application of applied finish. Reinforce panel as required to prevent buckling.

1. For recessed doors with plaster infill, provide self-furring expanded metal lath attached to door panel.

E. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

1. For cylinder locks, furnish two keys per lock and key all locks alike.
2. For recessed panel doors, provide access sleeves for each locking device. Furnish plastic grommets and install in holes cut through finish.

F. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

2.4 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Protect mechanical 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 not acceptable. 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.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates 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 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

A. Adjust doors and hardware, after installation, for proper operation.

B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 08 31 13

SECTION 08 41 13 – ALUMINUM-FRAMED 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 and storefront framing.

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 aluminum-framed entrances and storefronts. Include plans, elevations, sections, full-size details, and attachments to other work.

1. Include details of provisions for assembly expansion and contraction and for draining moisture occurring within the assembly to the exterior.
2. Include full-size isometric details of each vertical-to-horizontal intersection of aluminum-framed entrances and storefronts, showing the following:

a. Joinery, including concealed welds.
b. Anchorage.
c. Expansion provisions.
d. Glazing.
e. Flashing and drainage.

3. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

1.4 INFORMATIONAL SUBMITTALS

A. Energy Performance Certificates: For aluminum-framed entrances and storefronts, accessories, and components, from manufacturer.

1. Basis for Certification: NFRC-certified energy performance values for each aluminum-framed entrance and storefront.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For aluminum-framed entrances and storefronts to include in maintenance manuals.

1.6 QUALITY ASSURANCE

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

1.7 WARRANTY

A. Special Warranty: Installer agrees to repair or replace components of aluminum-framed entrances and storefronts 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 created by wind and thermal and structural movements.
c. Deterioration of metals, metal finishes, and other materials beyond normal weathering.
d. Water penetration through fixed glazing and framing areas.
e. Failure of operating components.

2. Warranty Period: Ten (10) years from date of Substantial Completion.

PART 2. PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.

1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
2. Failure also includes the following:

a. Thermal stresses transferring to building structure.
b. Glass breakage.
c. Noise or vibration created by wind and thermal and structural movements.
d. Loosening or weakening of fasteners, attachments, and other components.
e. Failure of operating units.

B. Structural Loads:

1. Wind Loads: As indicated on Drawings.

C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:

a. Maximum air leakage of 0.06 cfm/sq. ft. at a static air-pressure differential of 1.57 lbf/sq. ft.

D. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:

1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than 6.24 lbf/sq. ft.

E. Energy Performance: Certify and label energy performance according to NFRC as follows:

1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than 0.45 Btu/sq. ft. x h x deg F as determined according to NFRC 100.
2. Condensation Resistance: Fixed glazing and framing areas shall have an NFRC-certified condensation resistance rating of no less than 45 as determined according to NFRC 500.

F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:

1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Kawneer 451T Storefront System or comparable product by one of the following:

1. EFCO Corporation.
2. Manko Window Systems.
3. Tubelite.

4. Or approved equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Source Limitations: Obtain all components of aluminum-framed entrance and storefront system, including framing and accessories, from single manufacturer.

2.3 FRAMING

A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.

1. Construction: Thermally broken.
2. Glazing System: Retained mechanically with gaskets on four sides.
3. Glazing Plane: Front.
4. Finish: Clear anodic finish
5. Fabrication Method: Field-fabricated stick system.

B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.

C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with non-staining, nonferrous shims for aligning system components.

D. Materials:

1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.

a. Sheet and Plate: ASTM B 209.
b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 .
c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
d. Structural Profiles: ASTM B 308/B 308M.

2.4 GLAZING

A. Glazing Comply with Section 08 80 00 "Glazing".

B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.

C. Sealants used inside the weatherproofing system shall have a VOC content of 250 g/L.

2.5 ACCESSORIES

A. Fasteners and Accessories: Manufacturer's standard corrosion-resistant, non-staining, 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.
3. Use exposed fasteners with countersunk Phillips screw heads, finished to match framing system.

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.

C. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, 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.

2.6 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. 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. Physical and thermal isolation of glazing from framing members.
4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
5. Provisions for field replacement of glazing from exterior.
6. Fasteners, anchors, and connection devices that are concealed form view to greatest extent possible.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.

PART 3. EXECUTION

3.1 EXAMINATION

A. Examine areas, 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

A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

C. Set continuous sill members and flashing in full sealant bed to produce weathertight installation.

D. Install components plumb and true in alignment with established lines and grades.

E. Install glazing as specified in Section 08 80 00 "Glazing."

F. specified in Section 08 80 00 "Glazing."

G. Install weather seal sealant according to sealant manufacturer's written instructions to produce weatherproof joints. Install joint filler behind sealant as recommended by sealant manufacturer.

H. Provide end dams at all window systems.

END OF SECTION 08 41 13

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SECTION 08 71 11 – DOOR HARDWARE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes finish hardware for the proper operation and control of all doors in the Project. Prior to bidding, notify Architect of any doors that do not have hardware meeting this intention.

B. Hardware supplier will be responsible to furnish and install hardware on labeled doors to satisfy State and Local Building Codes.

C. Related Sections include the following:

1. Division 8 Section "Hollow Metal Doors and Frames."
2. Division 8 Section "Fiberglass-reinforced Polymer Doors."

1.3 SUBMITTALS

A. Product Data: For each product and material indicated, submit manufacturer's technical product data. Include information necessary to show compliance with requirements, installation instructions and maintenance instructions.

B. Hardware Schedule: Submit a hardware schedule organized into sets, including the information below. Designations for door numbers and hardware sets shall match those used in the construction documents.

1. Opening Number
2. Door Type and Size
3. Frame Type and Size
4. Frame Anchoring Method
5. Hardware Set
6. Assembly Rating

C. Hardware Schedule shall be coordinated with the doors, frames and related work to ensure proper size, thickness, hand function and finish of door hardware

1.4 QUALITY ASSURANCE

A. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehous-

ing facilities, who has been furnishing hardware in the Project's vicinity for a period of not less than two (2) years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about Project's hardware requirements, to Owner, Architect and Contractor.

B. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80, No. 101 and local building code requirements. Provide only hardware, which has been tested and listed, by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.

C. Standards: Comply with the requirements of the latest edition of the following standards unless indicated otherwise:

1. American National Standards Institute Publications:
   a. A115 Series – Door and Frame Preparation
   b. A156 Series – Hardware
2. Builders Hardware Manufacturer's Association Publications:
   a. 1201 – Auxiliary Hardware
   b. 1301 – Materials and Finishes
3. Door and Hardware Institute Publications:
   a. Keying – Procedures, Systems and Nomenclature
   b. Abbreviations and Symbols
   c. Hardware for Labeled Fire Doors
   d. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames
   e. Wood Door Standards W1, W2, WDHS-2, WDHS-3
4. National Fire Protection Association Publications
   a. NFPA 80 – Standards for Fire Doors and Windows
   b. NFPA 101 – Life Safety Code
5. International Building Code – 2015 Edition
6. American with Disabilities Act.

D. 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. Inspect and discuss preparatory work performed by other trades.
3. Inspect and discuss electrical roughing-in for electrified door hardware.
4. Review sequence of operation for each type of electrified door hardware.
5. Review required testing, inspecting, and certifying procedures.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark each box with hardware heading and door number according to approved hardware schedule.

B. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation: Provide a complete packing list showing items, door numbers and hardware headings with each shipment.

C. Store hardware in shipping cartons above ground and under cover to prevent damage. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable -so that completion of the Work will not be delayed by hardware losses both before and after installation.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with delivery and/or installation when ambient and substrate temperature conditions are outside limits permitted by material manufacturers.

1.7 COORDINATION

A. Installation Templates: Distribute for doors, frames, and other work specified to be factory 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.

PART 2 - PRODUCTS

2.1 HARDWARE GENERAL

A. Provide the materials of products indicated by trade names, manufacturer’s name, or catalog number. Substitutions will not be permitted except as described in Division 1.

B. Provide manufacturer’s standard products meeting the design intent of this Specification, free of imperfections affecting appearance or serviceability.

1. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.
2. Hand of Door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
3. Furnish screws for installation with each hardware item. Provide Phillips flat head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish, or, if exposed in surface of other work, to match finish of such other work as closely as possible. Use machine screws for metal con-

nections and wood screws for connections to wood. Use manufacturer's screws to secure hardware.

4. Provide concealed fasteners for hardware unit with care exposed when door is closed, except to extent no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt, head or nut on opposite face is exposed in other work, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex screw fasteners.
5. Special Tools: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance and removal and replacement of finish hardware.

C. Hardware is specified in the hardware schedule by set, type and functions, which have been selected as best meeting the application requirements. Acceptable products for each category are specified in Paragraph 2.5 "Hardware Products".

2.2 SPECIAL REQUIREMENTS

A. General:
1. Where new doors and hardware are scheduled to be installed in existing frames, contractor to coordinate hinge sizes and locations, lockset backsets, strikes, hardware mounting heights, etc with existing frames to ensure new door and hardware fits and functions properly in existing frame.

B. Hinges:
1. Use heavy weight hinges for all doors.
2. Provide non-removable pins for all exterior doors and out-swinging corridor doors. Use nonrising pins for all other doors.
3. Pre-drill pilot holes for hinge fasteners at factory to suit hinge type.

C. Locksets:
1. Locksets to be grade 1 heavy duty cylindrical or as specified.

D. Exit Devices:
1. All latchbolts to be deadlatching type.
2. All touchbars to be stainless steel.
3. Devices are to incorporate a flush and tapered end cap.
4. Devices incorporating plastic dogging components will not be allowed.
5. Provide electrical options as specified.

E. Closers:
1. Comply with manufacturer's recommendations for unit size based on door size and usage.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.
3. All closers UL Listed Certified to be in compliance with UBC 7.2 and UL 10C.
4. Closers with Pressure Relief Valves will not be acceptable.
5. Provide any brackets or plates required for proper installation of door closers.

F. Stops
1. Provide heavy duty and concealed or surface mounted overhead stop or holder for interior doors as specified. Provide overhead stop for interior doors that swing more than opens against equipment, casework, sidelights, and where conditions do not allow wall stop.

G. Thresholds and Gasketing
1. Provide thresholds, weatherstripping (including door sweeps, seals, astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
2. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.
3. Gasketing and astragals on aluminum frames by door manufacturer.

2.3 KEYING

A. Contractor to turn all cylinders over to MU key shop for keying.

2.4 FINISHES

A. Standard: Comply with BHMA A156.18
1. All door hardware to be US26D/630 throughout project.

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 application units of hardware.

C. Protect finishes on exposed surfaces from any damage by applying a strippable temporary protective covering before shipping.

D. BHMA Designations: Comply with base material and finish requirements indicated by BHMA standards.

2.5 HARDARE PRODUCTS

ITEM	SPECIFIED	APPROVED EQUAL
Hinges	Ives	Stanley
Locksets	Best	Schlage, Sargent
Cylinders	Best	No Substitutions
Closers	LCN	No Substitutions
Panic Devices	Von Duprin	Sargent, Precision
Flatgoods	Ives	Burns, Rockwood
Stops	Ives	Burns, Rockwood
Overhead Stops	Glynn Johnson	Rixson

Gasket	Zero	NGP, Reese

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and frames with installer present for compliance with the requirements, for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance.

B. Examine rough-in for electrical source power to verify actual locations of wiring connections before electrified door hardware installation.

C. Notify Architect of any discrepancies or conflicts between the door schedule, door types, frame types, drawings, scheduled hardware and built condition.

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

3.2 PREPARATION

A. Steel Frames: Comply with ANSI/DHI A115 Series

B. Wood Doors: Comply with ANSI/DHI A115-W Series.

3.3 INSTALLATION

A. Mounting Heights: Mount door hardware units at heights indicated in the following applicable publications, or as 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. Custom Steel Doors and Frames: DHI's "Recommended Locations for Builder's Hardware for Custom Steel Doors and Frames."
3. Wood Doors: DHI WDHS.2 "Recommended Locations for Architectural Hardware for Wood Flush Doors."

B. Install each door hardware item to complete with manufacturer's 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 to with finishing work. Do not install surface mounted items until finishes have been completed on substrates involved.

3.4 FIELD QUALITY CONTROL

A. Field Inspection: Supplier will perform a final inspection of installed door hardware and state in written report whether work complies with or deviates from requirements, including whether

door hardware is properly installed, operating and adjusted.

3.5 ADJUSTING

A. Initial Adjustment: Adjust and check each operating items of door hardware and each door to ensure proper operation of function of every unit. Replace units that cannot be adjusted to operate as intended and/or required. Adjust door control devices to compensation for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.6 CLEANING AND PROTECTION

A. Clean adjacent surfaces soiled by door hardware installation.

B. Clean operating items as necessary to restore proper finish, and provide final protection and maintain condition that ensure door hardware is without damage or deterioration at time of owner occupancy.

3.7 DEMOSTRATION AND TRAINING

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate and maintain door hardware and door hardware finishes.

3.8 DOOR HARDWARE SETS

HARDWARE SET: 01

DOOR NUMBER:
218

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
2	EA	POWER TRANSFER	EPT10 CON	689	VON
1	EA	PANIC HARDWARE	9949-EO	626	VON
1	EA	ELEC PANIC HARDWARE	QEL-9949-L-NL-17-CON 24 VDC	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	WEATHERSTRIPPING	8217SBK PSA	BK	ZER
2	EA	DOOR BOTTOM	365AA	AA	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
2	EA	MEETING STILE	873AA	AA	ZER
1	EA	THRESHOLD	566A-223	A	ZER
4	EA	WIRE HARNESS	CON (VERIFY LENGTH REQUIRED)		SCH
2	EA	DOOR CONTACT	7764	628	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE
1			CARD READER - WORK OF DIVISION 28		

OPERATION: DOORS PROGRAMMED TO BE LOCKED/UNLOCKED DURING SCHEDULED HOURS. ENTRY BY VALID CARD READ WHEN LOCKED. FREE FOR IMMEDIATE EGRESS. DOOR CONTACT MONITORS OPEN/CLOSE POSITION OF DOORS. KEY SWITCH TO TURN OFF AUTO OPERATORS WITH KEY.

HARDWARE SET: 02

DOOR NUMBER:
208

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	9849-EO	626	VON
1	EA	PANIC HARDWARE	9849-NL	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	OH STOP & HOLDER	90H	630	GLY
2	EA	SURFACE CLOSER	4040XP LONG (TOP JAMB MOUNT)	689	LCN
2	EA	FLUSH CEILNG MTG PLT	4040XP-18G	689	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	WEATHERSTRIPPING	8217SBK PSA	BK	ZER
2	EA	DOOR BOTTOM	365AA	AA	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
2	EA	MEETING STILE	873AA	AA	ZER
1	EA	THRESHOLD	566A-223	A	ZER
2	EA	DOOR CONTACT	7764	628	SCE
1	EA	POWER SUPPLY	PS902 900-2RS 120/240 VAC	LGR	SCE

HARDWARE SET: 03

DOOR NUMBER:
218.1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	9949-L-BE-06-LBL	626	VON
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
2	EA	DOOR BOTTOM	355AA	AA	ZER
2	EA	MEETING STILE	873AA	AA	ZER

HARDWARE SET: 04

DOOR NUMBER:
217 219.1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	REMOVABLE MULLION	KR4954	689	VON
2	EA	PANIC HARDWARE	98-EO	626	VON
1	EA	CYLINDER	1E74	626	BES
2	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
2	EA	KICK PLATE	8400 10" X 1" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	SET	ASTRAGAL	8878AA-S	AA	ZER
2	EA	DOOR BOTTOM	365AA	AA	ZER
1	EA	MEETING STILE	383AA	AA	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	566A-223	A	ZER
2	EA	DOOR CONTACT	7764	628	SCE

HARDWARE SET: 05

DOOR NUMBER:
214

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	98-NL	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
1	EA	DOOR BOTTOM	365AA	AA	ZER
1	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	566A-223	A	ZER
1	EA	DOOR CONTACT	7764	628	SCE

HARDWARE SET: 06

DOOR NUMBER:
211

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	CONST LATCHING BOLT	FB51P	630	IVE
1	EA	STOREROOM LOCK	9K37D 14D	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	OH STOP & HOLDER	90H	630	GLY
2	EA	SURFACE CLOSER	4040XP LONG (TOP JAMB MOUNT)	689	LCN
2	EA	FLUSH CEILNG MTG PLT	4040XP-18G	689	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	SET	GASKETING	429AA-S	AA	ZER
2	EA	DOOR BOTTOM	361AA	AA	ZER
1	EA	MEETING STILE	383AA	AA	ZER
2	EA	DOOR SWEEP	8197AA	AA	ZER
1	EA	THRESHOLD	566A-223	A	ZER
2	EA	DOOR CONTACT	7764	628	SCE

HARDWARE SET: 07

DOOR NUMBER:
219.2 219

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	98-EO	626	VON
1	EA	SURFACE CLOSER	4040XP LONG (TOP JAMB MOUNT)	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 08

DOOR NUMBER:
207

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	98-NL	626	VON
1	EA	RIM CYLINDER	1E72	626	BES
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 09

DOOR NUMBER:
207.1 208.1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5 NRP	630	IVE
1	EA	PANIC HARDWARE	98-EO	626	VON
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 10

DOOR NUMBER:

201	201A	202	202A	203	203A
204	204A	205	205A	206	206A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	STOREROOM LOCK	9K37D 14D	626	BES
1	EA	ELECTRIC STRIKE	6211 FSE CON 12/16/24/28 VAC/VDC	630	VON
1	EA	MAGNETIC LOCK	M450P 12/24 VDC	628	SCE
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	EA	DOOR CONTACT	679-05	WHT	SCE
1	EA	PUSH BUTTON	CB401-AU (ONE PER ROOM)	630	SDC
1	EA	EMER RELEASE BUTTON	CB401-B	630	SDC
2	EA	OCC INDICATOR LIGHT	CM-AF550	630	CAM
1	EA	POWER SUPPLY	631RF UR2-4 (ONE PER ROOM)		SDC
1			CARD READER - WORK OF DIVISION 28		
3	EA	SILENCER	SR64	GRY	IVE

OPERATION: DOOR NORMALLY CLOSED AND LOCKED. VALID CARD READ UNLOCKS DOOR, UNLESS OPPOSING INTERLOCK DOOR IS OPEN. OPENING OPPOSING DOORS LOCKS MAG LOCK ON THIS DOOR FROM BOTH SIDES UNTIL OPPOSING DOOR CLOSES. OPENING THIS DOOR LOCKS MAG LOCK AT OPPOSING INTERLOCK DOOR FROM BOTH SIDES UNTIL DOOR CLOSES. WHEN DOOR IS CLOSED PRESSING LOCK BUTTON LOCKS OUT CARD READER FOR PRIVACY AND ILLUMINATES INDICATOR LIGHT. LEAVING EITHER DOOR RESETS SYSTEM. EMERGENCY PUSH BUTTON UNLOCKS BOTH DOORS FOR EMERGENCY ACCESS. FREE EGRESS UNLESS OPPOSING INTERLOCK DOOR IS OPEN.
*COORDINATE INSTALLATION WITH SYSTEM INTEGRATOR. SYSTEM INTEGRATOR TO VERIFY OPERATION AND CONFIRM ALL COMPONENTS REQUIRED.

HARDWARE SET: 11

DOOR NUMBER:

201A.1	201B	202A.1	202B	203A.1	203B
204A.1	204B	205A.1	205B	206A.1	206B
216					

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	CONST LATCHING BOLT	FB51T	630	IVE
1	EA	PASSAGE SET	9K30N 14D	626	BES
1	EA	COORDINATOR	COR X FL	628	IVE
2	EA	MOUNTING BRACKET	MB	689	IVE
2	EA	SURFACE CLOSER	4040XP HEDA	689	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
2	EA	WALL STOP	WS406/407CVX	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
2	SET	ASTRAGAL	8878AA-S	AA	ZER
2	EA	DOOR BOTTOM	355AA (CONFIRM COMPATIBILITY WITH FRP DOOR)	AA	ZER
2	EA	DOOR CONTACT	679-05	WHT	SCE

HARDWARE SET: 12

DOOR NUMBER:

217.2	220

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
2	EA	PUSH PLATE	8200 4" X 16"	630	IVE
2	EA	PULL PLATE	8302 10" 4" X 16"	630AM	IVE
1	EA	SURF. AUTO OPERATOR	9563 REG/STD HL/D MS AS REQ (120/240 VAC)	ANCLR	LCN
1	EA	SWITCH	8310-806R		LCN
2	EA	ACTUATOR, TOUCHLESS	8310-810S	630	LCN
2	EA	ARMOR PLATE	8400 48" X 1" LDW B-CS (PREP/NOTCH FOR HARDWARE AS REQUIRED)	630	IVE
1	EA	GASKETING	188SBK PSA	BK	ZER
2	SET	ASTRAGAL	8878AA-S	AA	ZER
2	EA	DOOR BOTTOM	355AA	AA	ZER

HARDWARE SET: 13

DOOR NUMBER:
209 212 214.1

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
8	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	9K30N 14D	626	BES
1	EA	SURFACE CLOSER	4040XP H SRI	689	LCN
1	EA	ARMOR PLATE	8400 48" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE
3	EA	SILENCER	SR64	GRY	IVE

HARDWARE SET: 14

DOOR NUMBER:
210 213

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	PASSAGE SET	9K30N 14D	626	BES
1	EA	SURFACE CLOSER	4040XP SHCUSH	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CVX	630	IVE

HARDWARE SET: 15

DOOR NUMBER:
215

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
4	EA	HINGE	5BB1HW 4.5 X 4.5	630	IVE
1	EA	PRIVACY LOCK	L9040 17B 09-544 L283-722	626	SCH
1	EA	SURFACE CLOSER	4040XP REG OR PA AS REQ	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	626	IVE
3	EA	SILENCER	SR64	GRY	IVE

END OF SECTION
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SECTION 08 80 00 - GLAZING

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes glazing for the following products:
   1. Storefront construction.
   2. Hollow metal door lites.

B. Related Sections: The following Sections contain requirements that relate to this Section:

   1. Section 08 41 13 "Aluminum-Framed Storefronts" for insulated glass in aluminum frames.
   2. Section 08 11 13 “Hollow Metal Doors and Frames” for insulated and non-insulated glass in hollow metal doors.

1.3 SUBMITTALS

A. Product data for each glass product and glazing material indicated.

B. Samples of manufacturer's standard sealant colors for selection by Architect.

C. Samples of glass to include tinted glass.

1.4 QUALITY ASSURANCE

A. Glazing Publications: Comply with "FGMA Glazing Manual" and "LSGA Design Guide," except where more stringent requirements are indicated.

B. Glazier Qualifications: Engage an experienced glazier who has completed glazing similar to that indicated for Project.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials to comply with manufacturer's directions and as needed to prevent damage to glass and glazing materials.

1.6 WARRANTY

A. Manufacturer's Warranty on Insulating Glass: Submit written warranty signed by manufacturer of insulating glass agreeing to furnish replacements for insulating glass units that deteriorate as defined in "Definitions" article, f.o.b. point of manufacture, freight allowed Project site, within specified warranty period indicated below. Warranty covers only deterioration due to normal conditions of use and not to handling, installing, protecting, and maintaining practices contrary to glass manufacturer's published instructions.

1. Warranty Period: Manufacturer's standard but not less than 10 years after date of Substantial Completion.

2. PRODUCTS

2.1 MANUFACTURERS

A. Available Products: Subject to compliance with requirements, provide products of the following:

1. Ford Glass Division
2. Libby-Owens-Ford Co.
3. P.P.G. Industries, Inc.
4. Vitro

B. See Glass Schedule at the end of this section for specific glass types.

2.2 ELASTOMERIC GLAZING SEALANTS

A. General: Comply with glass manufacturer's recommendations.

B. Colors: As selected by Architect from manufacturer's standards.

C. Elastomeric Glazing Sealant Standard: ASTM C 920.

2.3 GLAZING TAPES

A. Back-Bedding Mastic Glazing Tape: Preformed, butyl-based elastomeric tape with 100% solids content, nonstaining and nonmigrating, with or without spacer rod as recommended by tape and glass manufacturers, and complying with AAMA 800.

2.4 GLAZING GASKETS

A. Glazing Gaskets: Resilient polyvinylchloride or other material as required.

2.5 MISCELLANEOUS GLAZING MATERIALS

A. Cleaners, Primers and Sealers: As recommended by sealant or gasket manufacturer.

B. Setting Blocks: Shore A durometer hardness of 85 plus or minus 5.

C. Spacers: Blocks or extrusions with a Shore A durometer hardness as required.

D. Edge Blocks: As needed to limit glass lateral movement (side-walking).

3. EXECUTION

3.1 EXAMINATION

A. Examine glass framing, with glazier present, for compliance with installation tolerances; minimum required face or edge clearances; and effective sealing between joints of glass-framing members.

3.2 PREPARATION

A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove coatings that are not firmly bonded to substrates.

3.3 GLAZING

A. Comply with combined recommendations of manufacturers of glass, sealants, gaskets, and other glazing materials, except where more stringent requirements are indicated, including those in referenced glazing publications.

B. Protect glass from edge damage during handling and installation. Use a rolling block in rotating glass to prevent damage to corners. Use suction cups to shift glass within openings; do not raise or drift glass with a pry bar. Rotate glass lites with flares or bevels on bottom horizontal edges.

C. Apply primers to joint surfaces where required for adhesion of sealants.

D. Install elastomeric setting blocks, sized and located to comply with glazing standard. Set blocks in thin course of sealant suitable for heel bead.

E. Provide spacers for glass sizes larger than 50 united inches. Provide 1/8 inch minimum bite and use thickness equal to sealant width. With glazing tape, use thickness slightly less than final compressed thickness of tape.

F. Provide edge blocking to comply with requirements of referenced publications.

3.4 PROTECTION AND CLEANING

A. Protect glass from breakage immediately after installation by attaching crossed streamers to framing held away from glass. Do not apply markers to glass surface. Remove nonpermanent labels, and clean surfaces.

B. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction for build-up of alkali deposits or stains and remove as recommended by glass manufacturer.

C. Remove and replace glass that is broken, chipped, cracked, abraded, or damaged in any way, including natural causes, accidents and vandalism, during construction period.

D. Wash glass on both faces in each area of Project not more than 4 days prior to Substantial Completion. Wash glass as recommended by glass manufacturer.

3.5 GLASS SCHEDULE

A. CLEAR INSULATING FLOAT GLASS (EXTERIOR DOORS AND STOREFRONT)

1. Description: Type I, Class 1, Quality q3; Basis of Design – Vitro Optigray (#1); 90% Argon, 10% Air; Solarban 60 (#3). BOD to be provided or equal submitted and approved prior to bid submission.
2. Visible light 80%.
3. Low Emissivity Coating: Magnetically sputtered on third surface.
4. Thickness: 1/4" glass, 1/2" air space, 1" overall.
5. Tempered interior, heat-strengthened exterior.
6. U-value .29 winter / .27 summer
7. SHG .29 max.

B. CLEAR TEMPERED FLOAT GLASS (INTERIOR DOORS)

1. Type 1, Class 1 tempered.

END OF SECTION 08 80 00

SECTION 09 22 16 - NON-STRUCTURAL METAL FRAMING

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. Non-load-bearing steel framing systems for interior gypsum board assemblies.
2. Suspension systems for interior gypsum ceilings, soffits, and grid systems.

B. Related Requirements:

1. Section 05 40 00 "Cold-Formed Metal Framing".
2. Section 09 29 00 “Gypsum Board”.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 FRAMING SYSTEMS

A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

B. Framing Members, General: Comply with ASTM C 754 for conditions indicated.

1. Steel Sheet Components: Comply with ASTM C 645 requirements for metal unless otherwise indicated.
2. Protective Coating: ASTM A 653/A 653M, G40 (Z120), hot-dip galvanized unless otherwise indicated.

C. Studs and Runners: ASTM C 645.

1. Steel Studs and Runners:

    a. Minimum Base-Metal Thickness, unless otherwise indicated:
        1) Framing behind standard panels: 0.0329" inches
        2) Framing behind impact resistant panels: 0.0329" inches
        3) Framing behind tile backer panels: 0.0329 inches
    b. Depth: 3-5/8 inches (92 mm) unless otherwise indicated.

D. Flat Strap and Backing Plate: Steel sheet for blocking.

1. Minimum Base Metal Thickness: 0.027 inches

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 of the Work.

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

3.2 INSTALLATION, GENERAL

A. Installation Standard: ASTM C 754.

1. Gypsum Board Assemblies: Also comply with requirements in ASTM C 840 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.

3.3 INSTALLING FRAMED ASSEMBLIES

A. Install framing system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.

1. Single-Layer Application: 16 inches o.c. unless otherwise indicated.

2. Multilayer Application: 16 inches o.c. unless otherwise indicated.
3. Tile Backing Panels: 16 inches o.c. unless otherwise indicated.

B. Where studs are installed directly against exterior masonry walls or dissimilar metals at exterior walls, install isolation strip between studs and exterior wall.

C. Install studs so flanges within framing system point in same direction.

D. 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 (13-mm) 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.

END OF SECTION 09 22 16

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SECTION 09 29 00 - GYPSUM BOARD

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.
2. Tile backing panels.

B. Related Requirements:

1. Section 05 40 00 “Cold-formed Metal Framing”
2. Section 09 22 16 "Non-Structural Metal Framing"

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.4 DELIVERY, STORAGE AND HANDLING

A. Store materials inside under cover and keep them dry and protected against weather, condensation, direct sunlight, construction traffic, and other potential causes of damage. Stack panels flat and supported on risers on a flat platform to prevent sagging.

1.5 FIELD CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install paper-faced gypsum panels 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 INTERIOR GYPSUM BOARD

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. American Gypsum.
2. CertainTeed Corp.
3. Georgia-Pacific Gypsum LLC.
4. National Gypsum Company.
5. USG Corporation.
6. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Gypsum Board, Type X: ASTM C 1396/C 1396M.

1. Thickness: 5/8 inch .
2. Long Edges: Tapered.
3. Provide moisture-resistive panels 4’ minimum horizontal and vertical at floor basin sink locations.
4. Type: manufacturer’s recommended type capable of spanning 24” between framing, single layer.

2.2 TILE BACKING PANELS

A. Glass Mat Faced Board: Coated glass mat water-resistant gypsum backing panel as defined in ASTM C 1178, Type X, in maximum lengths available to minimize end-to-end butt joints, with manufacturer's standard square edges.

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

   a. CertainTeed Corporation; GlasRoc® 5/8" Type X Tile Backer.
   b. Georgia-Pacific Gypsum LLC—DensShield® Fireguard Tile Backer.
   c. USG—Durock™ Glass-Mat Tile Backerboard.
   d. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2. Thickness: 5/8 inch .
3. Mold Resistance: ASTM C 1178, score of 10.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
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. Expansion (control) joint – v-shape.

B. Aluminum Trim: Extruded accessories of profiles and dimensions indicated.

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

    a. Fry Reglet Corp.
    b. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2. Aluminum: Alloy and temper with not less than the strength and durability properties of ASTM B 221 Alloy 6063-T5.
3. Finish: Class I Clear Anodic Finish: AA-C12C22A3.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Board: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Board: 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.

    a. Use setting-type compound for installing paper-faced metal trim accessories.

3. Fill Coat: For second coat, use setting-type, sandable topping compound.

4. Finish Coat: For third coat, use setting-type, sandable topping compound.
5. Skim Coat: For final coat of Level 5 finish, use setting-type, sandable topping compound or high-build interior coating product designed for application by airless sprayer and to be used instead of skim coat to produce Level 5 finish.

D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates including welded hollow-metal frames and framing, with Installer present, 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 C 840.

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. (0.7 sq. m) 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- (6.4- to 9.5-mm-) 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- (6.4- to 12.7-mm-) 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.

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. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

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 C 840 and in specific locations approved by Architect for visual effect.

1. If control joints are not shown on the drawings they shall be located at a maximum of 30 feet on center.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use where indicated.

D. Aluminum Trim: Install in locations indicated on Drawings.

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 for trim products specifically indicated as not intended to receive tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840 and Gypsum Association GA-214-10.

1. Level 1: Mechanical and electrical rooms, concealed areas, and where indicated.

2. Level 5: All other locations.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect adjacent surfaces from drywall compound and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.

B. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

C. 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 09 29 00

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SECTION 09 30 00 - TILE

1. GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Porcelain Ceramic Tile

B. Module Size: Actual tile size plus joint width indicated.

C. Face Size: Actual tile size, excluding spacer lugs.

1.3 ACTION SUBMITTALS

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

B. Samples for Selection: For tile, grout, and accessories involving color selection.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

PRODUCTS

1.5 MANUFACTURERS

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.

   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

1.6 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements.

1.7 TILE BACKING PANELS

Basis-of-Design Product—Fiberglass-Mat Faced Gypsum Backing Board: USG—Durock™ Glass-Mat Tile Backerboard. ASTM C 1178, Type X, in maximum lengths available to minimize end-to-end butt joints

1.8 ACCESSORIES

A. Metal Edge Accessories: For porcelain ceramic tile walls provide Schluter-Systems L.P. metal accessories (edge finishes) as noted below. Note that model numbers listed on drawings shall override if listed differently.

1.9 SETTING MATERIALS

1. Interior Tile—Typical (Thinset):

a. Bostik Findley—Big Tile and Stone™ (polymer modified large and heavy tile mortar).
b. LATICRETE International Inc—4-XLT.
c. MAPEI Corporation—Ultraflex™ LFT™ System.
d. MAPEI Corporation—Ultraflex RS.
e. TEC Specialty Products (H.B. Fuller)—Medium Bed mortar, #3N1® Performance Mortar.
f. Other equivalent products may be accepted if and as specifically approved by Architect by Addendum during bidding period.

1.10 GROUTING MATERIALS

A. Epoxy Grout: ANSI A118.3 .

1. Interior Walls & Floors:

a. Bostik Findley—Hydroment EzPoxy™ Grout and Mortar 100% Solids Epoxy.
b. CUSTOM Building Products—CEG-Lite 100% Solids Commercial Epoxy Grout.
c. Latiicrete—Latapoxy® 2000 IG Industrial 100% Solids Epoxy Grout
d. Latiicrete—SpectraLOCK® PRO Premium Sanded Grout.
e. MAPEI Corporation—Kerapoxy water cleanable 100% Solids Epoxy Grout.
f. TEC Specialty Products (H.B. Fuller)—AccuColor® EFX 100% Solids Epoxy Grout, #TA-440.

g. Color—As selected by Architect from manufacturer's standards or as listed in subparagraphs above.
h. Other equivalent products may be accepted if and as specifically approved by Architect by Addendum during bidding period.

1.11 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other procedures to produce mortars and grouts of uniform quality with optimum performance characteristics for installations indicated.

2. EXECUTION

2.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

1. Verify that substrates for setting tile are firm; dry; clean; free of coatings that are incompatible with tile-setting materials, including curing compounds and other substances that contain soap, wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for installations indicated.
2. Verify that concrete substrates for tile floors installed thinset mortar comply with surface finish requirements in ANSI A108.01 for installations indicated.

    a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
    b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.
4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

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

2.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thinset mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

2.3 INSTALLATION, GENERAL

A. Comply with TCNA's "Handbook for Ceramic, Glass, and Stone Tile Installation" for TCNA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 series "Specifications for Installation of Ceramic Tile" that are referenced in TCNA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

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B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Provide manufacturer's standard trim shapes where necessary to eliminate exposed tile edges.

E. Where accent tile differs in thickness from field tile, vary setting-bed thickness so that tiles are flush.
   1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
   2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
   3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.

F. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:
   1. Porcelain Tile: 1/4 inch (6.4 mm).

2.4 CRACK ISOLATION MEMBRANE INSTALLATION

A. Install crack isolation membrane to comply with ANSI A108.17 and manufacturer's written instructions to produce membrane of uniform thickness that is bonded securely to substrate.

B. Allow crack isolation membrane to cure before installing tile or setting materials over it.

2.5 ADJUSTING AND CLEANING

A. Remove and replace tile that is damaged or that does not match adjoining tile. Provide new matching units, installed as specified and in a manner to eliminate evidence of replacement.

B. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter:

1. Remove grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.

END OF SECTION 09 30 00

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SECTION 09 67 33 – TROWEL-APPLIED RESINOUS FLOORING AND WALL COATING

1. PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:

1. Resinous flooring systems with high-build double-broadcast applied flooring system consisting of 100% solids epoxy binder, that consists of epoxy resin ad colored quartz aggregate with a high-solids, two-component 100% aliphatic urethane topcoat providing a slip-resistant surface on interior concrete floors.
2. Installer pre-approval required.

B. Related Requirements:

1. Section 03 30 00 “Cast-In-Place Concrete”.

1.3 PRE-INSTALLATION MEETINGS

A. Pre-Installation Conference: Conduct conferenced at Project Site.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include manufacturer’s technical data, material test reports, application instructions, chemical resistance, surface preparation, and application instructions.

B. Samples for Initial Selection: For each type of exposed finish and texture required.

C. Samples for Verification: For each resinous flooring system required, 12 inches (300-mm) square, applied to rigid backing by Installer for this Project.

1. Samples for review of color and texture.

D. Test Data: Provide a letter confirming that the concrete substrate meets all specified requirements including, not limited to product manufacturer specific requirements prior to commencing with floor finish installation. Include in letter, documentation of test results showing passing results.

1.5 INFORMATIONAL SUBMITTALS

A. Installer Qualifications:

1. Provide documentation of the requirements listed under Quality Assurance.
2. Applicator personnel shall be trained for application of specified materials.

a. Provide a list of employees trained for application of specified materials with product manufacturer's statement of qualification training for installation.

3. Provide a list of completed projects including project name and location, name of Architect, name of material manufacturer, and approximate quantity of materials applied.

1.6 MOCKUP

A. Provide 6"x18" mockups of three levels of texture for selection by Owner regarding finish and slip resistance. Levels of additive for mockup to be discussed with Owner and Architect and agreed to prior to mockup installation. Mockup location to occur in agreed location in pre-application meeting within space to receive sealed concrete per finish schedule (mechanical or electrical room).

1.7 CLOSEOUT SUBMITTALS

A. Maintenance data: For resinous flooring to include in maintenance manuals.

1.8 QUALITY ASSURANCE

A. Installer Qualifications: An authorized representative who employs only persons trained and approved by resinous flooring manufacturer for applying resinous flooring systems indicated.

1. Qualifications of installers for resinous flooring system shall not be less than seven (7) years of experience installing resinous flooring systems indicated. Resinous flooring installer shall be manufacturer approved and have performed at least ten similar installations. Resinous flooring installer shall have a minimum of 1,000,000 square feet of successful applications.
2. **Special Coatings System Installers must be pre-approved by the Architect**. Subject to the requirements of the specifications and approval of the manufacturer.

B. Pre-Application Meeting: Convene a pre-application meeting two (2) weeks before the start of application of floor coating system. Require attendance of parties directly affecting work of this section, including the Contractor, Architect, Applicator, Manufacturer's Representative, and Owner's Representative. Review the surface preparation, application, cleaning, protection, and coordination with other work.

C. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, through one source from a single manufacturer. Provide secondary materials, including patching and fill material, joint sealant, and repair materials, of type and from source recommended by manufacturer of primary materials.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Deliver materials in original packages and containers, with seals unbroken, bearing manufacturer's labels indicating brand name and directions for storage and mixing with other components.

1.10 PROJECT CONDITIONS

A. Environmental Limitations: Comply with resinous flooring manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting resinous flooring application.

B. Lighting: Provide permanent lighting or, if permanent lighting is not in place, simulate permanent lighting conditions during resinous flooring application.

C. Close spaces to traffic during resinous flooring application and for not less than 24 hours after application, unless manufacturer recommends a longer period.

1.11 WARRANTY

A. Manufacturer's written warranty against defects and wear for a period of five (5) years, including:

1. Delamination from substrate.
2. Loss of aggregate.
3. Degradation of finish.
4. Cracking and spalling
5. Water penetration.

2. PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Flammability: Self-extinguishing according to ASTM D 635.

2.2 MANUFACTURERS

A. Source Limitations:

1. Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer.
2. Obtain secondary materials, including patching and fill material, joint sealant, and repair materials of type and from manufacturer recommended in writing by manufacturer of primary materials.

B. Requests for manufacturer substitutions prior to bidding will be reviewed and responded to in conformance with Division 1 requirements.

2.3 RESINOUS FLOORING

A. Resinous Flooring System: Abrasion-resistant, impact-resistant, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor.

1. Basis-of-Design: Res-Tek—EPO-CF Double Broadcast colored Flake Resinous Flooring System.
2. Acceptable pre-approved Manufacturers—Towel-Applied Epoxy Resinous Flooring subject to compliance w/ Basis of Design product requirements include:

a. Tnemec Company - DecoTrowel
b. Desco Coatings, Inc—Cremona TG.
c. Stonhard®, Inc—StontecHRI with Stonseal SK6 Sealer/Top Coat.
d.

B. Dur-A-Flex-Hybri-Flex ACSika – Sikafloor DecoDur Flake FXColor(s):

1. RES-1 - Res-Tek—Pattern and Color: Full Flake per finish legend –Verify Color with Owner.
2. RES-2 - Res-Tek—Pattern and Color: Full Flake per finish legend —Verify Color with Owner.

C. System Characteristics:

1. Colored Flake with 100 percent solids according to ASTM D2369. Completely light stable over the normal life of the coating.

2. Wearing Surface: Medium Textured for slip resistance, match Architect's sample. Integral.
3. Cove Base: 6 inches high or as noted on drawings.
4. Overall System Thickness: 1/4-inch (6.4-mm) finish over sloped patching and fill material.

D. System Components: Manufacturer's standard components that are compatible with each other and as follows:

1. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

   a. Basis of Design Product: Res-Tek EPO-203 High-Solids, Two-Component Moisture-Tolerant Modified Polyamine Epoxy.
   b. Formulation Description: 100 percent solids.

2. Floor Slope Build:

   a. Basis of Design Product: Modified Polyamine Epoxy. Mix with Portland cement, aggregate and dry silica as recommended by manufacturer.
   b. Formulation Description: 100 percent solids.

3. Body Coat—1st coat:

   a. Basis of Design Product: Res-Tek EPO-203 Pigmented — Modified Polyamine Epoxy.
   b. Formulation Description: 100 percent solids.

4. Broadcast—2 coats to refusal:

   a. Broadcast Colored Flake per manufacturer's written instructions.

5. Body Coat—2nd coat:

   a. Basis of Design Product: Res-Tek EPO-204—Modified Polyamine Epoxy.
   b. Formulation Description: 100 percent solids.

6. Grout Coat:

   a. Basis of Design Product: Res-Tek EPO-204—Epoxy. A Two-Component Modified Polyamine Epoxy.
   b. Dry Film Thickness: 14 - 18 DFT.

7. Topcoats: Sealing or finish coats.

a. Basis of Design Product: Res-Tek ISO-103—Epoxy. High Traffic Urethane Finish Coat.
b. Formulation Description: High Solids.
c. Type: Clear.
d. Finish: Satin/Low Sheen
e. Finish Texture: Manufacturer's standard
f. Dry Film Thickness: 2.0 – 3.0 DFT.

E. System Physical Properties: Provide resinous flooring system with the following minimum physical property requirements when tested according to test methods indicated

1. Compressive Strength: 15,567 psi per ASTM C 579.
2. Tensile Strength: 2,200 psi per ASTM C 307.
3. Flexural Modulus of Elasticity: 4,550 psi per ASTM C 580.
4. Indentation: 2,000 psi according to MIL-D-3134.
5. Impact Resistance: No chipping, cracking, or delamination and not more than 1/16-inch (1.6-mm) permanent indentation per MIL-D-3134J.
6. Resistance to Elevated Temperature: No slip or flow of more than 1/16 inch (1.6 mm) per MIL-D-3134J.
7. Abrasion Resistance: 0.18gm maximum weight loss per ASTM D 4060.
8. Coefficient of Friction: 0.5 minimum according to STM D-2047.
9. Hardness: 85 - 90, Shore D per ASTM D 2240.

F. System Chemical Resistance: Test specimens of cured resinous flooring system are unaffected by the following:

1. 20% Hydrochloric Acid.
2. Mercurochrome.
3. Betadyne.
4. Urine.
5. Coffee.
6. Ethyl Alcohol.
7. Iodine.
8. 10% Lactic Acid.
9. Tea.
10. Mustard.

2.4 RESINOUS WALL COATING

A. Resinous Wall System:

1. Acceptable pre-approved Manufacturers—Resinous wall coating include:

a. Desco Coatings, Inc—Wallglass FX.
b. Stonhard®, Inc—Stoneglaze VSD.
c. Dur-A-Flex-Dur-A-Wall VC

d. Res-Tek-EPO 205 system

2.5 ACCESSORIES

A. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

B. Metal Edge Strips: Metal strips are to be provided by Resinous Flooring Installer and used at transitions between epoxy and adjacent floor finishes and two differing resinous flooring finishes as noted within and located on the finish plan.

3. PART 3 - EXECUTION

3.1 PREPARATION

A. General: Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry, and neutral Ph substrate for resinous flooring application.

B. Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with resinous flooring.

1. Roughen concrete substrates as follows:

   a. Shot-blast surfaces with an apparatus that abrades the concrete surface, contains the dispensed shot within the apparatus, and recirculates the shot by vacuum pickup.
   b. Comply with ASTM C 811 requirements, unless manufacturer's written instructions are more stringent.
   c. Create a surface profile similar to ICRI-CSP5.

2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.
3. Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer’s written instructions.

   a. Anhydrous Calcium Chloride Test: ASTM F 1869. Proceed with application of resinous flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1,000 sq. ft. (1.36 kg of water/92.9 sq m) of slab area in 24 hours.
   b. Plastic Sheet Test: ASTM D 4263. Proceed with application only after testing indicates absence of moisture in substrates.

c. Relative Humidity Test: Use in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level measurement.

4. Alkalinity and Adhesion Testing: Verify that concrete substrates have neutral pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

C. Patching and Filling: Use patching and fill and build material to fill holes and depressions in substrates and to provide floor slopes where indicated according to manufacturer's written instructions to build floor surface to the specified slopes. Fill, sand or grind cured floor build to eliminate surface imperfections and trowel marks.

1. Control Joint Treatment: Treat control joints and other nonmoving substrate cracks to prevent cracks from reflecting through resinous flooring according to manufacturer's written recommendations.

D. Resinous Materials: Mix components and prepare according to resinous flooring manufacturer’s written instructions.

3.2 APPLICATION

A. General: Apply components of resinous flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated**.**

1. Coordinate application of components to provide optimum adhesion of resinous flooring system to substrate, and optimum intercoat adhesion.
2. Cure resinous flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.
3. Expansion and Isolation Joint Treatment: At substrate expansion and isolation joints, provide joint in resinous flooring to comply with resinous flooring manufacturer's written recommendations.

a. Apply joint sealant to comply with manufacturer's written recommendations.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Floor Slope Build: Apply floor slope build product, where indicated, over primed substrate per manufacturer's recommendations.

D. Integral Cove Base: Apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top coating of cove base. Round internal and external corners.

E. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.

F. Double Broadcast Body Coats: Apply double broadcast body coats to refusal in thickness indicated for flooring system.

G. Topcoats: Apply topcoat(s) in number of coats indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

H. Add glass beads and/or top coats to achieve desired surface texture and uniformity.

3.3 PROTECTION

A. Protect resinous flooring from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.

END OF SECTION 09 67 33

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SECTION 09 68 13 - TILE CARPETING

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. Modular carpet tile.

B. Product Data: For each type of product.

1. Include manufacturer's written data on physical characteristics, durability, and fade resistance.
2. Include manufacturer's written installation recommendations for each type of substrate.

C. Samples: For each of the following products and for each color and texture required. Label each Sample with manufacturer's name, material description, color, pattern, and designation indicated on Drawings and in schedules.

D. Samples for Verification: For each of the following products and for each color and texture required.

1. Carpet Tile.

1.3 INFORMATIONAL SUBMITTALS

A. Sample Warranty: For special warranty.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For carpet tiles to include in maintenance manuals. Include the following:

1. Methods for maintaining carpet tile, including cleaning and stain-removal products and procedures and manufacturer's recommended maintenance schedule.
2. Precautions for cleaning materials and methods that could be detrimental to carpet tile.

1.5 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Carpet Tile: Full-size units equal to 5 percent of amount installed for each type indicated.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Comply with the Carpet and Rug Institute's CRI 104.

1.7 FIELD CONDITIONS

A. Comply with the Carpet and Rug Institute's CRI 104 for temperature, humidity, and ventilation limitations.

B. Do not install carpet tiles over concrete slabs until slabs have cured and are sufficiently dry to bond with adhesive and concrete slabs have pH range recommended by carpet tile manufacturer.

1.8 WARRANTY

A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.

1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
2. Failures include, but are not limited to, the following:

a. More than 10 percent edge raveling, snags, and runs.
b. Dimensional instability.
c. Excess static discharge.
d. Loss of tuft-bind strength.
e. Loss of face fiber.
f. Delamination.

3. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 CARPET TILE

A. Basis of Design: Shaw Industries, Welcome II 5T031, Charcoal 31549

B. Products to be considered as equal and alternate to Basis of Design if submitted and specifically approved by Architect by Addendum during the bidding period.

2.2 INSTALLATION ACCESSORIES

A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.

B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that comply with flammability requirements for installed carpet tile, and are recommended by carpet tile manufacturer for releasable installation.

C. Metal Edge/Transition Strips: Extruded aluminum with mill finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance.

B. Examine carpet tile for type, color, pattern, and potential defects.

C. Concrete Slabs: Verify that finishes comply with requirements specified in Section 033000 "Cast-in-Place Concrete" and that surfaces are free of cracks, ridges, depressions, scale, and foreign deposits.

1. Moisture Testing: Perform tests per manufacturer recommendation prior to installation.

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

3.2 PREPARATION

A. General: Comply with the Carpet and Rug Institute's CRI 104 and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile.

B. Use trowelable leveling and patching compounds, according to manufacturer's written instructions, to fill cracks, holes, depressions, and protrusions in substrates. Fill or level cracks, holes and depressions 1/8 inch (3 mm) wide or wider, and protrusions more than 1/32 inch (0.8 mm) unless more stringent requirements are required by manufacturer's written instructions.

C. Concrete Substrates: Remove coatings, including curing compounds, and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, without using solvents. Use mechanical methods recommended in writing by adhesive and carpet tile manufacturers.

D. Broom and vacuum clean substrates to be covered immediately before installing carpet tile.

3.3 INSTALLATION

A. General: Comply with the Carpet and Rug Institute's CRI 104, Section 10, "Carpet Tile," and with carpet tile manufacturer's written installation instructions.

3.4 CLEANING AND PROTECTION

A. Perform the following operations immediately after installing carpet tile:

1. Remove excess adhesive and other surface blemishes using cleaner recommended by carpet tile manufacturer.
2. Remove yarns that protrude from carpet tile surface.
3. Vacuum carpet tile using commercial machine with face-beater element.

B. Protect installed carpet tile to comply with the Carpet and Rug Institute's CRI 104, Section 13.7.

C. Protect carpet tile against damage from construction operations and placement of equipment and fixtures during the remainder of construction period. Use protection methods indicated or recommended in writing by carpet tile manufacturer.

END OF SECTION 09 68 13

SECTION 09 91 13 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on exterior substrates.

1. Steel and iron (including factory-primed).

B. Related Requirements:

1. Division 03 Section “Cast-In-Place” for concrete sealing requirements.
2. Division 05 Sections for shop priming of metal substrates with primers specified in this Section.
3. Section 05 12 00 "Structural Steel Framing" for shop priming of metal substrates.

4. 08 11 13 “Hollow Metal Doors and Frames” for factory-primed finishes.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and each color and gloss of topcoat.

1. Submit Samples on rigid backing, 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.

D. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials from the same product run that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Paint: Not less than 1 gal. of each material and color applied.

1.5 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.

B. 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 (7 deg C).

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 paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints in snow, rain, fog, or mist; when 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.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

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.

B. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.

C. Colors: Match existing Phase 1 building.

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 and recommendations applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

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 paints according to manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual."

1. Use applicators and techniques suited for paint and substrate indicated.

2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
3. Paint both sides and edges of exterior doors and entire exposed surface of exterior door frames.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

B. Tint undercoats same color as topcoat, but tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance. Ensure that edges, corners, crevices, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces. Recoat primed and sealed surfaces where evidence of unsealed areas in first coat appears.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Allow sufficient time betweens successive coats to permit proper drying.

F. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not in compliance with specified requirements.

G. Painting includes field painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.

H. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces, operating parts and labels. Painting is required on all new items included in the work.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.5 EXTERIOR PAINT SCHEDULE

LOCATION	SHEEN	PAINT SYSTEM
Exterior Pre-Painted Steel	Semi-Gloss	EPS-1X
Exterior Painted Steel	Semi-Gloss	EPS-2X

3.6 EXTERIOR PAINTING SYSTEMS

A. System EPS-2X for application on Exterior Painted Steel Ferrous Metal:

1. Semi-Gloss Latex Finish: Apply two (2) coats over primer with total dry film thickness not less than 2.5 mils.
2. Acrylic, Rust-Inhibiting Primer: Quick-drying, rust-inhibiting primer for priming ferrous metal on the interior under waterborne semi-gloss enamels**:**

   a. DV: Diamond Prime Universal Primer.
   b. Moore: SuperSpec HP Acrylic Metal Primer #P04/KP04.
   c. P & L: Acrylic Waterborne Bonding Primer Z6650.
   d. PPG Paints: Breakthrough, #V70.
   e. SW: Pro-Cryl Universal Metal Primer, B66 W 310.

3. Exterior Acrylic Semi-Gloss Paint for use over a primer on exterior ferrous surfaces:

   a. DV: Vers-Acryl 222 Acrylic Maintenance Semi-Gloss.
   b. Moore: SuperSpec DTM Acrylic Semi-Gloss #P29/KP29.
   c. P & L: Acrylic Waterborne DTM Semi-Gloss Z6761 .
   d. PPG Paints: PittTech Plus Semi-Gloss DTM Industrial Enamel #90-1210.
   e. SW: DTM Acrylic Semi-Gloss, #B66-200 Series.

END OF SECTION 09 91 13

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SECTION 09 91 23 - INTERIOR PAINTING

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 surface preparation and the application of paint systems on interior substrates.

1. Gypsum board.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.

B. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.

1. Submit Samples on rigid backing, 8 inches (200 mm) square.
2. Step coats on Samples to show each coat required for system.
3. Label each coat of each Sample.
4. Label each Sample for location and application area.

1.4 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.

B. 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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.5 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when 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.

PART 2 - PRODUCTS

2.1 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

1. Nonflat Paints and Coatings: 150 g/L.
2. Primers, Sealers, and Undercoaters: 200 g/L.

C. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing one or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

a. Acrolein.
b. Acrylonitrile.
c. Antimony.
d. Benzene.
e. Butyl benzyl phthalate.
f. Cadmium.
g. Di (2-ethylhexyl) phthalate.
h. Di-n-butyl phthalate.
i. Di-n-octyl phthalate.
j. 1,2-dichlorobenzene.
k. Diethyl phthalate.

l. Dimethyl phthalate.
m. Ethylbenzene.
n. Formaldehyde.
o. Hexavalent chromium.
p. Isophorone.
q. Lead.
r. Mercury.
s. Methyl ethyl ketone.
t. Methyl isobutyl ketone.
u. Methylene chloride.
v. Naphthalene.
w. Toluene (methylbenzene)
x. 1,1,1-trichloroethane.
y. Vinyl chloride.

D. Low-Emitting Materials: Interior 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."

E. Colors: To be selected from manufacturer's standard range.

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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Plaster Substrates: Verify that plaster is fully cured.

E. Spray-Textured Ceiling Substrates: Verify that surfaces are dry.

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

G. 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. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.

1. Remove incompatible primers and re-prime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

C. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.

1. Use applicators and techniques suited for paint and substrate indicated.
2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable in writing to topcoat manufacturers.

B. Allow sufficient time between successive coats to permit proper drying.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

E. Provide “wet paint” signs to protect newly painted finishes.

3.5 INTERIOR PAINT SCHEDULE

LOCATION	SHEEN	PAINT SYSTEM
Interior Gypsum Drywall	Semi-Gloss	GDW-4I

3.6 INTERIOR PAINTING SYSTEMS

A. System GDW-4I for application on Interior Gypsum Drywall:

1. Semi-Gloss Latex Finish: 2 finish coats over primer.
2. Latex-Based Interior White Primer: Latex-based primer coating used on interior gypsum drywall under a flat latex paint.

a. Devoe: “WonderPure” Primer recommended for substrate listed.
b. DV: “Health-Kote” Low Odor Primer/Flat Finish, DF-1591.
c. Kwal: “Envirokote” Primer, 08300.
d. Moore: “Pristine ECO-Spec” Primer, 231.
e. P & L: Pro-Hide Gold Interior Low Odor Latex Primer, Z9165.
f. PPG Paints: “Pure Performance” Interior Latex Primer, 9-900 Series.
g. S-W: ProMar 200 Zero VOC Interior Latex Primer, B28 Series.
h. S-W: “Harmony” Interior Latex Primer, B11W900.

3. Semi-Gloss Latex Finish:

a. Devoe: “WonderPure” Low Odor Interior Latex Semi-Gloss recommended for

substrate listed.

b. DV: "Health-Kote" Low Odor Interior Latex Semi-Gloss, DS-1591.
c. Kwal: Envirokote Semi Gloss, 3310.
d. Moore: Super Hide Zero Latex Semi-Gloss, 358.
e. P & L: Pro-Hide Gold Interior Low Odor Latex Semi-gloss, Z9300 Series.
f. PPG Paints: "Pure Performance" Latex Semi-Gloss Enamel, 9-500 Series.
g. S-W: ProMar 200 Zero VOC Semi-Gloss, B31 Series.
h. S-W: "Harmony" Interior Latex Semi-Gloss, B10 Series.

END OF SECTION 09 91 23

SECTION 09 96 00 – HIGH-PERFORMANCE COATINGS

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 surface preparation and the application of high-performance coating systems on the following substrates:

1. Interior Substrates:

a. Concrete Masonry Units
b. Gypsum board.
c. Metal Doors and Frames.

1.3 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 rigid backing, 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.

D. Product List: Cross-reference to coating system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.4 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, which match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Coatings: Not less than 1 gal. of each material and color applied.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: An experienced installer who employs only persons trained and approved by special coatings manufacturer for applying special coatings systems indicated.

1. Qualifications of installers for special coatings system shall not be less than five years of experience installing specified items. Special coatings installer shall be manufacturer approved and have performed at least ten similar installations.
2. Special Coatings System Installers must be pre-approved by the Architect. Subject to the requirements of the specifications and approval of the manufacturer, pre-approved installers are listed in paragraph 2.1 of this Section.

B. Single-Source Responsibility: Provide primers and undercoat material produced by the same manufacturer as the finish coats for each type of coating. Use only thinners recommended by the manufacturer and only within recommended limits.

C. Mock-ups: Apply mock-ups of each coating system indicated to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect or Owner 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. (9 sq. m).

2. Apply mock-ups after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on mock-ups.

a. If preliminary color selections are not approved, apply additional mock-ups of additional colors selected by Architect at no added cost to Owner.

4. Approval of mock-ups does not constitute approval of deviations from the Contract Documents contained in mock-ups unless Architect or Owner specifically approves such deviations in writing.
5. Subject to compliance with requirements, approved mock-ups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.6 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 (7 deg C).

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.7 FIELD CONDITIONS

A. Apply coatings only when temperature of surfaces to be coated and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply coatings when 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.

C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 HIGH-PERFORMANCE COATINGS, GENERAL

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.

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. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

1. Masonry (Clay and CMUs): 12 percent.

2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

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

E. Proceed with coating application only after unsatisfactory conditions have been corrected.

1. Application of coating indicates acceptance of surfaces and conditions.

F. Notify the Architect of problems anticipated using the coatings specified over substrates primed by others.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations applicable to substrates and coating systems indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.

1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.

C. 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 re-prime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.

3.3 APPLICATION

A. Provide finish coats compatible with the primers used.

B. Apply high-performance coatings according to manufacturer's written instructions and recommendations:

1. Use applicators and techniques suited for coating and substrate indicated.
2. Coat surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, coat surfaces behind permanently fixed equipment or furniture with prime coat only.

3. Coat backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

    a. 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.

4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. 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.

D. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.

E. 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.

F. 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. Where sanding is required, according to the manufacturer’s directions, sand between applications to produce a smooth, even surface.

3.4 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing coating application, clean spattered surfaces. Remove spattered coatings by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. 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.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

E. Provide “Wet Paint” signs to protect newly coated finishes.

F. Refer to the drawings, room finish schedules and notes for paint requirements. Architect shall approve all “match adjacent surfaces” colors before painting begins.

3.5 HIGH-PERFORMANCE COATINGS, GENERAL

A. Material Compatibility.

1. Provide materials for use within each coating system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. Provide products of same manufacturer for each coat in a coating system.

B. Chemical Components of Field-Applied Interior Paints and Coatings: Provide topcoat paints and anti-corrosive and anti-rust paints applied to ferrous metals that comply with the following chemical restrictions; these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Aromatic Compounds: Paints and coatings shall not contain more than 1.0 percent by weight of total aromatic compounds (hydrocarbon compounds containing 1 or more benzene rings).
2. Restricted Components: Paints and coatings shall not contain any of the following:

    a. Acrolein.
    b. Acrylonitrile.
    c. Antimony.
    d. Benzene.
    e. Butyl benzyl phthalate.
    f. Cadmium.
    g. Di (2-ethylhexyl) phthalate.
    h. Di-n-butyl phthalate.
    i. Di-n-octyl phthalate.
    j. 1,2-dichlorobenzene.
    k. Diethyl phthalate.
    l. Dimethyl phthalate.
    m. Ethylbenzene.
    n. Formaldehyde.
    o. Hexavalent chromium.
    p. Isophorone.
    q. Lead.
    r. Mercury.
    s. Methyl ethyl ketone.
    t. Methyl isobutyl ketone.
    u. Methylene chloride.
    v. Naphthalene.
    w. Toluene (methylbenzene).
    x. 1,1,1-trichloroethane.
    y. Vinyl chloride.

C. Colors: As selected by Architect from manufacturer's full range

D. HIGH-PERFORMANCE COATINGS SCHEDULE

LOCATION	SHEEN	COATINGS SYSTEM
Interior Ferrous Metal	Semi-Gloss	IFM-1X
Interior Ferrous Metal	Semi-Gloss	IFM-6X
Interior Gypsum Drywall (Epoxy)	Semi-Gloss	GDW-51
Interior CMU/Concrete (Epoxy)	Gloss Epoxy	CMU-31 (PTE)

3.6 INTERIOR HIGH-PERFORMANCE COATING SYSTEMS

A. System IFM-1X for application on Interior Ferrous Metal:

1. Semi-Gloss Acrylic Polymer: Two (2) finish coats over an epoxy primer. (Primer to be applied by metal fabricator in shop.) / Two (2) finish coats over an epoxy primer used on interior ferrous metal surfaces shall be full-prime coated, Typical and applied per manufacturer's written specifications.
2. Touch-Up Metal Primer: Epoxy primer used on interior ferrous metal surfaces shall be touch-up primed as required if pre-primed steel is used, Typical and applied per manufacturer's written specifications.

    a. Thickness: 2.5 – 3.5 mils.
    a. PPG Paints: Amerlock, 2/400.
    b. SW: Macropoxy 646 Fast Cure Epoxy.
    c. Tnemec: Epoxoline, Series 66.
    d. Or equal, if and as specifically approved by Architect by Addendum during bidding period.

3. Metal Primer: Epoxy primer used on interior ferrous metal surfaces shall be full-prime coated, Typical and applied per manufacturer's written specifications.

    a. Thickness: 2.5 – 3.5 mils.
    b. PPG Paints: TBD.
    c. SW: TBD.
    d. Tnemec: TBD.
    e. Or equal, if and as specifically approved by Architect by Addendum during bidding period.

4. Thermoset Semi-Gloss Fluoro-Polymer: Opaque coat for use over primed, ferrous metal surfaces: Custom color to match existing Phase 1 building.

    a. Thickness: 3 – 4 mils.
    b. PPG Paints: Coraflon ADS (solid color).
    c. SW: Shercryl HPA.
    d. Tnemec: HDP Acrylic Polymer, Series 1029.

e. Or equal, if and as specifically approved by Architect by Addendum during bidding period.

B. System GDW-51 for application on Interior Gypsum Drywall:

1. Eggshell / Semi-Gloss Latex Epoxy Finish: Two (2) finish coats over primer.
2. Latex-Based Interior White Primer: Latex-based primer coating used on interior gypsum drywall under an epoxy finish**:**

a. PPG Paints: "Pure Performance" Interior Latex Primer, 9-900 Series.
b. SW: "Harmony" Interior Latex Primer, B11W900, applied at 4 mils wet, 1.3 mils dry per coat.
c. Or equal, if and as specifically approved by Architect by Addendum during bidding period.

3. Semi-Gloss Latex Epoxy Finish: Custom colors toto match exiting Phase 1 building:

a. PPG Paints: Pitt-Glaze WB1 Water Based Pre-Catalyzed epoxy. (Eggshell finish) 16-310. Applied at 1.5 DFT.
b. PPG Paints: Pitt-Glaze WB 1 Water Based Pre-Catalyzed Epoxy. (Semi-Gloss finish) 16-510. Applied at 1.5 DFT.
c. SW: Pro Industrial™ Water-Based Pre-Catalyzed Epoxy (Eggshell finish), K45 Series, applied at 1.5 mils dry per coat.
d. SW: Pro Industrial™ Water-Based Catalyzed Epoxy (Semi-Gloss finish), B70W211 / B60V25, applied at 2.5 – 3 mils dry per coat.
e. Or equal, if and as specifically approved by Architect by Addendum during bidding period.

E. System CMU-31 for application on Interior CMU:

1. Low Odor Water-based Semi-Gloss Pre-Catalyzed Epoxy Finish: Two (2) coats over filled surface with total dry film thickness not less than 3.5 mils excluding filler coat.
2. High Performance Latex Block Filler: Heavy Duty latex block filler used for filling open textured interior concrete masonry block before application of top coats:

a. DV: DiaPro Acrylic Block Filler.
b. P & L: Krylon Industrial Heavy Duty Block Filler K-Z8465.
c. PPG Paints: SPEEDHIDE® Hi-Fill Interior/Exterior Latex Block Filler. Apply at a DFT of not less than @ 8.0 mils DFT.
d. S-W: Pro Industrial™ Heavy Duty Block Filler, B42W46. Apply at a DFT of not less than @ 8.0 mils DFT.

3. Water-based Semi-Gloss Pre-Catalyzed Epoxy: Two (2) coats of semi-gloss pre-catalyzed epoxy for use over a primer on concrete and masonry.

   a. DV: Eas-E-Poxy Pre-Catalyzed Waterborne Semi-Gloss Epoxy, ME-0574 / ME-1575 / ME-1573, applied at 2- 3 mils dry per coat.
   b. P & L: Krylon Industrial Precat Epoxy Acrylic Semi-Gloss K-Z7200 Series applied at 1.5 mils dry per coat.
   c. PPG Paints: PITT-GLAZE® WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy, applied at 1.5 mils dry per coat.
   d. S-W: Pro Industrial™ Water-Based Pre-Catalyzed Epoxy, K46 Series, applied at 1.5 mils dry per coat.

END OF SECTION 09 96 00

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SECTION 10 26 00 - WALL PROTECTION

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. Wall guards.
2. Corner guards.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product.

1. Include construction details, material descriptions, impact strength, dimensions of individual components and profiles, and finishes.

B. Shop Drawings: For each type of wall protection showing locations and extent.

1. Include plans, elevations, sections, and attachment details.

C. Samples for Verification: For each type of exposed finish on the following products, prepared on Samples of size indicated below:

1. Wall Guards: 6 inches long. Include examples of corners.

2. Corner Guard: 6 inches.

1.4 WARRANTY

A. Special Warranty: Manufacturer agrees to repair or replace components of wall protection units that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Structural failures including detachment of components from each other or from the substrates, delamination, and permanent deformation beyond normal use.
b. Deterioration of metals, metal finishes, plastics, and other materials beyond normal use.

2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain wall- and door-protection products of each type from single source from single manufacturer.

2.2 WALL GUARDS

A. Crash Rail: Heavy-duty assembly consisting of continuous stainless-steel bar designed to withstand impacts.

1. Inpro 52SS 2” 304 stainless steel satin finish wall guard with rounded corners (match guard in exiting facility).

2. Products to be considered as equal and alternate to Basis of Design if submitted and specifically approved by Architect by Addendum during the bidding period.

2.3 CORNER GUARDS

A. Surface-Mounted, Stainless Steel Corner Guards

1. Size: 2” legs, 42” length.

2. Installed with double-sided adhesive tape or adhesive sealant per manufacturer recommendation. Provide clear silicone sealant at gaps between walls.

2.4 CLEANING

A. Immediately after completion of installation, clean plastic covers and accessories using a standard ammonia-based household cleaning agent.

B. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 10 26 00

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SECTION 10 28 00 – TOILET ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
1. Surface-Mounted Paper Towel Dispenser.
2. Surface-Mounted Soap Dispenser.
3. Surface-Mounted Toilet Tissue Dispenser.
4. Framed Mirror.
5. Grab Bar: Satin-Finish Stainless Steel, 1-1/2” (38 mm) diameter.
6. Stainless Steel Shower Curtain Rod.
7. Folding Shower Seat.
8. Towel Hook.
9. Underlavatory Guards.
10. Mop and Broom Holder (Custodial Accessories).

B. Related Requirements:

1.3 COORDINATION

A. Coordinate accessory locations with other work to prevent interference with clearances required for access by people with disabilities, and for proper installation, adjustment, operation, cleaning, and servicing of accessories.

B. Deliver inserts and anchoring devices set into concrete or masonry as required to prevent delaying the Work.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include the following.

1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes.

2. Include anchoring and mounting requirements, including requirements for cutouts in other work and substrate preparation.
3. Include electrical characteristics.
4. Features that will be included for Project.
5. Manufacturer's warranty.

B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.

1. Identify locations using room designations indicated.
2. Identify accessories using designations indicated.

1.5 CLOSEOUT SUBMITTALS

A. Maintenance Data: For accessories to include in maintenance manuals.

1.6 WARRANTY

B. Manufacturer’s Standard Warranty: Manufacturer’s standard form in which manufacturer agrees to repair, restore, or replace defective automated hand dryer components and labor within specified warranty period.

1. Warranty Period: One (1) year limited for labor and five (5) years for parts.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Stainless Steel: ASTM A 666, Type 304, 0.031-inch minimum nominal thickness unless otherwise indicated.

B. Steel Sheet: ASTM A 1008/A 1008M, Designation CS (cold rolled, commercial steel), 0.036-inch minimum nominal thickness.

C. Galvanized-Steel Sheet: ASTM A 653/A 653M, with G60 hot-dip zinc coating.

D. Galvanized-Steel Mounting Devices: ASTM A 153/A 153M, hot-dip galvanized after fabrication.

E. Fasteners: Screws, bolts, and other devices of same material as accessory unit and tamper-and-theft resistant where exposed, and of galvanized steel where concealed.

F. Chrome Plating: ASTM B 456, Service Condition Number SC 2 (moderate service).

G. Mirrors: ASTM C 1503, Mirror Glazing Quality, clear-glass mirrors, nominal 6.0 mm thick.

H. ABS Plastic: Acrylonitrile-butadiene-styrene resin formulation.

2.2 PERFORMANCE REQUIREMENTS

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.

2.3 STAINLESS STEEL SURFACE-MOUNTED TOILET TISSUE DISPENSER

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2.4 WALL-MOUNTED SOAP DISPENSER

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

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2.5 FRAMED MIRROR

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

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation

3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Stainless Steel 304 framed mirror installed with concealed hanging brackets; 18” x 36”.

2.6 GRAB BARS

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

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Stainless Steel, 1-1/2” (38 mm) diameter Grab Bar with 2” Snap End Flange..

1. 18-gauge, 1-1/2” (38 mm) diameter grab bar. Clearance between the grab bar and wall shall be 1-1/2” (38 mm). Concealed mounting flanges shall be 1/8” (3 mm) thick stainless steel plate, 2” x 3-1/8” (50 x 80 mm), and equipped with two screw holes for attachment to wall. Flange covers shall be 22 gauge (0.8 mm), 3-1/4” (85 mm) diameter x 1/2” (13 mm) deep, and shall snap over mounting flange to conceal mounting screws and/or WingIt fasteners. Ends of grab bar shall pass through concealed mounting flanges and be heliarc welded to form one structural unit. Grab bar shall comply with barrier-free accessibility guidelines (including ADAAG in the U.S.A.) for structural strength. Finish: Satin-Finish Type #304 Stainless Steel.

2.7 STAINLESS STEEL SHOWER CURTAIN ROD

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

C. Shower Curtain Rod: Satin-Finish Stainless Steel, 1” diameter rod.

2.8 FOLDING SHOWER SEAT

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

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Folding Shower Seat - 20-gauge, 1” (25 mm) diameter rod. ADA Barrier-Free, 1/2” thick, durable, water-resistant phenolic seat, reversible for left or right-hand installation. Dimensions: 33” W, extends 22-15/16” D from wall. Finish: Ivory-colored, 1/2” thick phenolic.

2.9 TOWEL HOOK

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Bobrick Washroom Equipment, Inc.
2. Bradley Corporation
3. Foundations Worldwide, Inc.
4. ASI
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2.10 UNDERLAVATORY GUARDS

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

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Plumberex Specialty Products, Inc.
2. Truebro by IPS Corporation.

3. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

C. Underlavatory Guard:

1. Description: Insulating pipe covering for supply and drain piping assemblies that prevent direct contact with and burns from piping; allow service access without removing coverings.
2. Material and Finish: Antimicrobial, molded plastic, white.

2.11 MOP AND BROOM HOLDER (CUSTODIAL ACCESSORIES)

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

B. Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. A & J Washroom Accessories, Inc.
2. American Specialties, Inc.
3. Bobrick Washroom Equipment, Inc.
4. Bradley Corporation.
5. ASI
6. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

C. Mop and Broom Holder:

1. Description: Unit with shelf, hooks, holders, and rod suspended beneath shelf.
2. Length: 36 inches (914 mm).
3. Hooks: Three.
4. Mop/Broom Holders
5. Material and Finish: Stainless steel, No. 4 finish (satin).

2.12 FABRICATION

A. General: Fabricate units with tight seams and joints, and exposed edges rolled. Hang doors and access panels with full-length, continuous hinges. Equip units for concealed anchorage and with corrosion-resistant backing plates.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install accessories according to manufacturers' written instructions, using fasteners appropriate to substrate indicated and recommended by unit manufacturer. Install units level, plumb, and firmly anchored in locations and at heights indicated.

B. Grab Bars: Install to withstand a downward load of at least 250 lbf , when tested according to ASTM F 446.

3.2 ADJUSTING AND CLEANING

A. Adjust accessories for unencumbered, smooth operation. Replace damaged or defective items.

B. Remove temporary labels and protective coatings.

C. Clean and polish exposed surfaces according to manufacturer's written instructions.

END OF SECTION 10 28 00

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SECTION 10 44 13 - FIRE PROTECTION CABINETS

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. Fire-protection cabinets for the following:

a. Portable fire extinguishers.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product. Show door hardware, cabinet type, trim style, and panel style. Include roughing-in dimensions and details showing recessed-, semirecessed-, or surface-mounting method and relationships of box and trim to surrounding construction.

B. Product Schedule: For fire-protection cabinets. Indicate whether recessed, semirecessed, or surface mounted. Coordinate final fire-protection cabinet schedule with fire-extinguisher schedule to ensure proper fit and function.

1.4 CLOSEOUT SUBMITTALS

A. Maintenance Data: For fire-protection cabinets to include in maintenance manuals.

1.5 COORDINATION

A. Coordinate sizes and locations of fire-protection cabinets with wall depths.

1.6 SEQUENCING

A. Apply decals on field-painted fire-protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

2.2 FIRE-PROTECTION CABINET

A. Cabinet Type: Suitable for standard 10 lb fire extinguisher.

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

a. JL Industries, Inc.; a division of the Activar Construction Products Group.
b. Larsens Manufacturing Company.
c. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Cabinet Material: Cold-rolled steel sheet.

C. Recessed Cabinet:

1. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
a. Coordinate with all wall types where cabinets are to be installed and note on Shop Drawings for Architects review.

D. Cabinet Trim Material: Same material and finish as door.

E. Door Material: Steel sheet.

F. Door Style: Vertical duo panel with frame.

G. Door Glazing: Tempered float glass (clear).

H. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

I. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire-protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.

2.3 FABRICATION

A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

1. Weld joints and grind smooth.
2. Provide factory-drilled mounting holes.
3. Prepare doors and frames to receive locks.
4. Install door locks at factory.

B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles.

1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch (13 mm) thick.
2. Fabricate door frames of one-piece construction with edges flanged.
3. Miter and weld perimeter door frames.

C. Cabinet Trim: Fabricate cabinet trim in one piece with corners mitered, welded, and ground smooth.

2.4 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's AMP 500, "Metal Finishes Manual for Architectural and Metal Products," for recommendations for applying and designating finishes.

B. Protect mechanical finishes on exposed surfaces of fire-protection cabinets from damage by applying a strippable, temporary protective covering before shipping.

C. Finish fire-protection cabinets after assembly.

D. Appearance of Finished Work: Noticeable variations in same piece are not acceptable. 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.

2.5 INSTALLATION

A. General: Install fire-protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

B. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.

END OF SECTION 10 44 13

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aSECTION 11 53 19 – DRY HEAT STERILIZER

1.0 GENERAL

1.1 RELATED DOCUMENTS
Drawings and general provisions of the Contract, including General and Supplementary Conditions and Divisions 01 specifications Sections, apply to this section.

1.2 ACTION SUBMITTALS
Product data with manufacturer's qualified data for the unit including required utility services.
Shop drawings with specifics including but not limited to plans, elevations, sections, details that will assist with verification of chamber size, chamber access size, overall unit size with required rough openings and clearances, utility input locations.

2.0 EQUIPMENT DESCRIPTION / SUMMARY

Unit shall be a truck-in style, dry heat sterilizer to be used in the sterilization of poultry cages, various items designed to be sterilized at 285°F/140°C or better.
Proposed sterilizer shall be rated as a NFPA 86 Class "B" dry heat sterilizer.
Unit shall be a truck-in style, dry heat sterilizer to be used in the sterilization of poultry cages, various items designed to be sterilized at 285°F/140°C or better.
Proposed sterilizer shall be rated as a NFPA 86 Class "B" dry heat sterilizer.
The dry heat sterilizer shall be designed to accommodate cages/racks which are 38"W x 64"L x 74"H and 47"W* x 84.5"L x 86"H.
At a minimum, the interior chamber of the sterilizer shall be a minimum of 52"W x 86"L x 88X"H.
The exterior dimensions of the dry heat sterilizer shall not exceed 115"W x 95"L x 106"H.

3.0 DRY HEAT STERILIZER CONSTRUCTION

3.1 CHAMBER CONSTRUCTION
The dry heat sterilizer shall be constructed in modules, sized for ease of rigging and assembly without modification of the existing facility, from a welded heavy-duty steel frame that supports the interior stainless steel chamber. The exterior shall be constructed from stainless steel sheet metal. All interconnecting struts shall be non-continuous from inner to outer walls, thus keeping the exterior as cool as possible. A full 4" of insulation shall surround the work chamber on all sides, with the exception of the floor, which shall be 3/16" stainless plate. Locating pins integral to the frame must be used to align the modules during assembly and have interior flanges to bolt them together for perfectly aligned seams.

3.1.1 CHAMBER SIDE RAILS
Internal side rails shall be supplied and located down the length of the work chamber. These side rails shall be located at a height of 36" up from the chamber floor. The internal side rails shall

prevent the trucks from coming in contact with the side air duct walls in each work chamber. Chamber rail construction shall be designed for ease of cleaning and toolless removal.

3.1.2 FULLY WELDED LINER (BACK SIDE, SQUARE CORNERS)
The interior of the sterilizer shall be fabricated with 304L stainless steel with a 2B finish. All welds shall be ground and polished to match this finish. The dry heat sterilizer's stainless steel liner shall be continuously welded thus creating an impervious barrier between the process chamber and the insulation material and preventing any contamination from entering the chamber from that source.

3.1.3 FLOOR
The dry heat sterilizer shall contain a 3/16" thick plate floor. The front edges of the plate shall be beveled to give a loading truck a smooth transition into and out of the dry heat sterilizer.
The facility floor will be rated withstand to the operating temperature.

3.1.4 EXTERIOR FINISH
The exterior of the sterilizer shall be fabricated with 304 stainless steel with a #4 finish. All welds shall be ground and polished to match this finish. The following components shall be a 2B finish with welds chemically passivated: filter boxes, junction boxes, motor/blower mounts and pneumatic boxes.
The following components shall be a mill finish with welds mechanically passivated:
Exterior tubular stands and interior tubular guide rails.

3.2 DOOR
One individual door, one, right hand hinged for loading and unloading, shall be fitted to the unit. The door close against the sterilizer cabinet over a silicone "P" gasket. Door shall be held closed by a dual cam-action bar latch and hung with a pair of stainless steel machined hinges. Each bar latch shall be supplied with an inside release handle. The bottom bar latch shall be side latching so no truck obstructions are located on the plate floor.

3.2.1 DOOR SWITCHES
Door switches shall be installed on the dry heat sterilizer to de-energize the heating and circulation systems when the dry heat sterilizer door is opened. This is to minimize hot air from being expelled from the dry heat sterilizer should the doors be opened during the heating cycle.

3.2.2 DOOR LOCK OPERATION
Each end door will be equipped with an automatic lock that will function in accordance with operational modes. Pneumatic interlocks will control the door lock sequence in this manner:
When the unload door is open, the load side door is locked;
When the load side door is open, the unload side door is locked
When the cycle is engaged, all doors are locked;

3.2.3 INTERIOR DOOR LOCK OVERRIDE
Inside the sterilizer, located along a duct wall in the work chamber, shall be door lock over-ride cables. When pulled, the cable shall activate the interior door override. This shall shut down the sterilizer and unlock the doors. The Safety Reset Button must be pushed to reset the PLC logic. Junction boxes to be mounted on the top of the unit.

3.2.4 WINDOW, DOOR
A viewing window shall be mounted in the face of the door. The viewing area shall be approximately 10" wide x 15.50" high with a 6-pane glass window. Each window shall be supplied with a window guard located above and below to protect the windows from accidental contact.

3.3 STAINLESS STEEL TRIM PANELS SEAL
Trim panels of 18 ga stainless steel matched to the exterior of the sterilizer shall be fitted to cover the area between the wall opening and the unit so that a flush appearance is achieved. The trim panels are held in place by magnets on the back of the panel to simplify the installation.

3.4 MODULAR/SPLIT CONSTRUCTION
The unit shall be built in sections to accommodate move in restrictions such as elevators, hallways, doorways and the like. The joining flanges shall be interior flange design. No joining hardware is to be mounted on the outside of the unit. Sections shall contain tapered alignment pins for ease of reassembly where possible.

4.0 PROCESS AIR CIRCULATION (HORIZONTAL)

To ensure uniform heat distribution throughout the oven chamber and optimize efficiency, a high volume, horizontal airflow system is installed in the unit. A large fan located in a plenum chamber on the r side of the sterilizer, directs air to a circulation duct up across a top mounted duct running to the opposite side of the unit. The air enters the work space through a semi-pierced wall, flows horizontally across the product, from the one side to the other side, and exits the work space through a semi-pierced wall on the other side, and is directed back to the fan for reheating and recirculation.

Note: Output of each circulation motor will be controlled by Variable Frequency Drives to allow for correct tuning of the oven system. Circulation systems are mounted on the right side of the unit.

5.0 AIR HEATING SYSTEM

Seamless-tubular incoloy type heaters shall be used as the heat source. The heaters are suspended in the plenum, adjacent to, but separate from the process chamber, so that work in progress and operators are protected. Terminal ends are inserted through the walls of the dry heat sterilizer and use sufficient dead zones so that heat is not generated beyond the plenum. All heaters are wired with double nut connections. The heaters shall be positioned between the circ. return duct and the circ. fan to ensure the maximum utilization of the electric heaters and the re-circulation of conditioned air.

5.1 FILTRATION

1. Intake Air Pre-filter
   Air shall be pre-filtered through 25-40% roughing filter, 24” x 24” x 2” thick

2. Exhaust Air Pre-filter
   Air shall be pre-filtered through a 25-40% roughing filter, 24” x 24” x 2” thick

3. Air Intake HEPA Filter

A 24" x 24" x 5-7/8" HEPA filter, rated at 99.97% efficient at particles 0.3 microns or larger, shall be installed in a stainless steel housing on the incoming airflow side of the conditioning path. Challenge ports are provided for the verification of filter integrity. Access panels in the filter housing are secured with acorn nuts on 3" centers.

4. Air Exhaust HEPA Filter

A 24" x 24" x 5-7/8" HEPA filter, rated at 99.97% efficient at particles 0.3 microns or larger, shall be fitted to the exhaust path to protect the chamber from particulate backflow. Challenge ports are provided for the verification of filter integrity. Access panels in the filter housing are secured with acorn nuts on 3" centers.

5. Forced Exhaust

A 1100 SCFM exhaust blower that shall operate at minimum SCFM during the cycle or 1100 SCFM during cooling shall be installed to the dry heat sterilizer's air exhaust system and be initiated by an output from the programmable temperature controller to provide for moisture removal during the sterilization period, and a cooling capacity at the end of the temperature soak cycle. The blower shall be 2-speed, with a lower rpm during the ramp and soak period and a higher speed during the cooling period. A 10" O.D. exhaust collar shall be supplied for attaching customer's exhaust connection.

6.0 CONTROLS AND INSTRUMENTATION

6.1 CONTROL CONSOLE

The main operating electrical components for the sterilizer are housed in a single free-standing remote control console and shall house the Micro850 PLC and other electrical components. Circuit wiring is complete, including a step-down transformer to provide the control circuits with 110-volt power. Wiring in the control console terminates in a suitable block for connection to the customer's power supply. The control console and control boxes shall be labelled as NEMA 1 but designed and built to NEMA 12 standards in order to comply with UL508A regulations.

1. U.L. Label

The control console and the control box shall be designed and built to comply with all current and pertinent UL508A directives and labelled. All control boxes shall be rated at NEMA 1, built to NEMA 12 design.

2. E-Stop

The control console shall include an E-Stop. When pressed, the sterilizer heat, circulation and exhaust fans shall stop and the load end doors shall unlock.

3. Controls Protection Rail

Stand-off rails shall be included on the face of the control console and HMI box to protect the face of the electrical controls from accidental damage from being hit by carts and operators. The bumper rails shall be a round design without sharp edges for easy cleaning and located above and below the controls on the face of the console.

6.2 DISCONNECT SWITCH
A fused power disconnect switch shall be installed on the main control console for safe maintenance of the sterilizer. The disconnect switch assures that the panel power is de-energized before the access door can be opened.

6.3 OPERATOR INTERFACE TERMINALS, 10" Display
One Operator interface terminal shall be supplied with this unit and located in the load end main control console. At a minimum, it shall feature:

10 inch diagonal (800 x 480) color TFT LCD and an analog-resistive touchscreen
Serial, Ethernet communications, and USB
Expandable memory for recipe and data log storage
Support monitoring from a personal computer (PC) with free VNC Client software
Data logging in Excel®-compatible comma separated value (.csv) files
Recipe management
128MB Memory
Provides audible alarms and key chirp
Flexible 4 level password security
UL®, NEMA 4, CE, RoHS rated

6.4 PLC
An Allen Bradley Micro850 PLC with on board Ethernet communications must be supplied to provide all control and functional logic of the sterilizer.

6.5 HIGH LIMIT THERMOSTAT
A separate, independent high limit thermostat shall be provided to de-energize the heating system should the process temperature reach the customer's preset limit. The high limit control must be manually reset to reactivate heating.

6.6 AIRFLOW SWITCHES
Pressure differential switches shall be installed and located in the air stream of the circulation and forced exhaust systems. Upon failure of either system, the airflow switch shall de-energize the heater circuit.

6.7 SEPARATE MAIN POWER RELAY
This relay is in addition to the normal relays serving the heater circuits. It shall be wired into the control circuit so that the high limit thermostat activates it. Should the main relays become mechanically frozen, as a result of extended use, this "back up" relay is deactivated, and the heat system shall be de-energized.

6.8 SCR
The sterilizer shall use SCR power controls installed to proportion power to the heaters only as necessary to maintain set-point temperature. This minimizes swings in set-point temperature, provides good temperature uniformity within the chamber, conserves energy and provides longer heater life.

6.9 PANEL MOUNT THERMAL PRINTER, EVENT LOGGER
A thermal panel mount 2" printer shall be included. It shall feature easy paper loading, incorporated paper cutter, end of roll signal, USB and RS232 connections. A NEMA 4 rated enclosure shall be supplied, mounted to the face of the control console.

6.10 COMMUNICATIONS INTERFACE MODULE
A Communications Interface module may be provided on the control panel. It shall include an Ethernet Port and a 120 VAC outlet for the connection of an external PC to perform software maintenance. A USB port shall also be provided.

6.11 AUDIBLE ALARM
An audible alarm with manual silencer shall be provided. Alarms, at a minimum, shall indicate over-temperature alarm, circ. and exhaust low airflow alarm, temperature deviation alarm, and filter alarm.

6.12 DRY CONTACTS FOR BMS INTEGRATION
The sterilizer shall be provided with two dry contacts. One shall signal the building management system (BMS) when the sterilizer is in cycle at low exhaust flow. The second dry contact shall signal the BMS when the sterilizer is in cooling at high exhaust flow.

6.13 HMI CONTROL BOXES (Locations at load/unload end, remote in wall panel)
Control boxes shall house an Operator Interface touchscreen terminal.

7.0 LOADING TRUCKS/TROLLEYS

Not used.

8.0 TESTING AND ACCEPTANCE

The factory testing shall include at least two tests: one empty chamber uniformity mapping, and one full chamber uniformity mapping and sterilization test. (Customer may supply a full complement of trucks and cages or the seller shall include these items for testing).
Factory standard testing and standard operating procedure documents shall be provided for review along with the approval drawings. SOP's to be included are, at a minimum, sterilizer functional testing SOP, chamber uniformity testing and calibration SOP, HEPA filter testing SOP, temperature controller and high limit calibration SOP and full load testing SOP.
Testing shall be performed using calibrated NIST traceable data recording equipment. The documentation of calibration shall be submitted to the client along with the test data.

8.1 TEMPERATURE UNIFORMITY
The sterilizer shall be equipped to maintain a temperature uniformity of ± 5ºF, at a test temperature of 300ºF. Test temperature readings are taken within a volume of space not exceeding 80% of each empty work chamber or closer than 3" from any of the six interior surfaces of each work chamber. At a minimum, a 12-point uniformity test shall be performed with a soak length of 60 minutes.

9.0 PRE-SHIPMENT EVALUATION WITNESS TEST

All equipment shall be built to the referenced specification and subject to the standard seller's test protocols pertinent to the specific equipment design. Additional test protocols maybe completed if agreed to prior to the equipment purchase. Clients shall be welcome to visit the factory *by arrangement* prior to shipment of their equipment in order to carry out a Pre-Shipment Evaluation Witness Test. As a minimum, this evaluation shall consist of the following.

- Dimensional review and quality check of system.
- Review of completed test data.
- Controls overview and interface.
- Functional review: Cycle operated either through the equipment design extremes or through the clients agreed to cycle parameters. Cycle operation is performed with a loaded chamber, including temperature mapping of the customer's load.

10.0 INSTALLATION

Seller shall send a factory trained technician(s) to manage and supervise the rigging and installation of the dry heat sterilizer. The installation shall be performed using a local rigger, at the direction and supervision of the seller's technician. The cost of the rigger shall be included in seller's proposal.

10.1 START-UP and TRAINING
Seller shall send a factory trained test technician to perform the start-up of the sterilizer. Training on the control system, maintenance, and overall features of the unit shall be provided. The startup shall follow manufacturer's standard SOP for startup and standard agenda for the user training.

10.2 POST INSTALLATION VALIDATION
Seller shall send a trained test technician to perform a Post Installation Validation on this unit. The scope of work shall consist of commissioning the sterilizer and the execution of the system's validation protocols as they were when the unit was tested at our facility before being shipped. A minimum of 3 different cycle types shall be developed and validated as part of the proposal. The installation shall follow manufacturer's SOP for cycle validation and be available for review prior to bid award. A written validation report showing the efficacy as challenged with a minimum of (20) 10-6 biological indicators for each cycle shall be provided to users at the end of testing.

10.3 INSTALLATION, START UP, TRAINING AND VALIDATION DOCUMENTATION
As part of the approval drawing process, seller shall provide copies of their standard operating procedures for the installation, start up, user training and post installation validation for review.

11.0 WARRANTY

At a minimum, a comprehensive two-year parts and labor warranty shall be included. The date of the warranty shall start at the date of substantial completion of the project.

12.0 MAINTENANCE AND OPERATING DOCUMENTS

Seller shall supply 1 set of operational and maintenance manuals on thumb-drive. It shall be complete with lubrication specifications, routine maintenance, parts lists, wiring, and mechanical drawings.

13.0 UTILITIES

1. V: 480V/240 or 208V / 3Ø / 60Hz / 176 FLA
2. CA: 2-5 CFM, 80-120psig
3. EXH: 10" OD, minimal SCFM during the cycle, 1100 SCFM during cooling. Up to 285°F

14.0 QUALIFICATIONS

14.1 MANUFACTURER'S QUALIFICATIONS
Vendor shall have been in the business of providing NFPA 86 rated dry heat sterilizers, dry heat sterilizers and related equipment for at least 10 years. In addition, vendor shall have direct laboratory animal industry experience with more than 7 years' experience and more than one dozen successful dry heat sterilizer installations specifically in cage sterilization applications in vivariums. All bidders must provide a list of at least 5 successful installations completed in the last five years. Manufacturers shall have established organizations and production facilities including all tools, equipment and special machinery necessary for specializing in the fabrication and installation of dry heat sterilizers, with skilled personnel, factory trained workmen and an experienced engineering department.

14.2: INSTALLER QUALIFICATIONS
Installer of dry heat sterilizers shall have an established organization including all tools, equipment and special machinery necessary for specializing in the installation, start up and validation of this equipment. Personnel shall have the demonstrated knowledge, ability and the capability to install the specified equipment of the required quality and capacity to complete an installation of this size and type within the required time limits. The firm specializing in installation of products specified shall have a minimum five years' experience and authorized by manufacturer to install product.
Manufacturer to provide installation standard operating procedure (SOP) documents for review along with the approval drawings. SOP's for the installation and validation to be included are, at a minimum, sterilizer field commissioning testing SOP, chamber uniformity testing SOP and cycle validation SOP.
Upon request, installer shall provide five references of similar installations.

15.0 MANUFACTURER

Products, which comply with this specification section as judged and approved by the Owner or Owner's Architect, may be provided by the following manufacturers. All dry heat sterilizers specified in this section shall be provided by a single manufacturer.

SECTION 11 53 20 – STEAM HEAT STERILIZER

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Laboratory sterilization (autoclaves) equipment.

1.2 REFERENCES

A. All engineering, manufacturing, rating, and testing shall conform, when applicable, to the latest edition of the following codes, standards, and specifications in effect at the time of order placement:

1. ASME American Society of Mechanical Engineer.
2. AAMI Association for the Advancement of Medical
3. CGMP Current Good Manufacturing Practices
4. ANSI American National Standards Institute
5. OSHA Occupational Safety and Health Administration
6. NEMA National Electrical Manufacturers Association
7. NEC National Electric Code
8. MSS Manufacturer's Standardization society (SP-6)
9. FPA National Fire Protection Association
10. NPC National Plumbing Code
11. UL Underwriter's Laboratories
12. ETL Intertek
13. ISO Internal Standards Organization 9002 Certified
14. FDA Food & Drug Administration Approval
15. MS Federal Specification GG-SS-1340A

1.3 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct virtual or live conference at Project site

1.4 SUBMITTALS

A. Product Data: For each type of product. Include the following:

1. Manufacturer's model number.
2. Accessories and components that will be included in the project.
3. Clearance requirements for access and maintenance.
4. Utility service connections for water, drainage, power.

B. Shop Drawings: Show overall dimensions, utility locations and consumptions, wall opening sizes, and relationships to adjoining structures.

C. Operation & Maintenance Manuals: Includes operating procedures, maintenance schedules, parts list, control and wiring diagrams.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: For laboratory sterilization facilities.

1. Indicate locations of laboratory sterilization equipment and connections to utilities.
2. Key equipment using same designations as indicated on drawings.
3. Include plans and elevations; clearance requirements for equipment access and maintenance; details of equipment support; and utility service characteristics.
4. Include details of seismic bracing for equipment, if required for location.

B. Warranty: 1-Year Parts and Labor, 15-Years on Chamber/Pressure Vessel

1.6 QUALITY ASSURANCE

A. Sterilizer manufacturer must have ISO9001 facility with the latest tools and machinery needed for proper assembly of equipment. The manufacturer must have a minimum 25 years experience and over 1,000 installations of equipment specified herein, within the contiguous US.

B. Installation and maintenance services must be provided by an authorized, factory-trained representative located within 130 miles of the destination facility.

PART 2 - PRODUCTS

2.1 SYSTEM REQUIREMENTS

A. Design Requirements:

1. Sterilizing Equipment:

Laboratory Sterilizer (Autoclave): 26W x 26H x 49D Chamber Size, Double, Vertical Sliding Automatic Doors.

2.2 MANUFACTURERS

A. Manufacturer/Model: Products must meet or exceed the specifications of the listed manufacturer below and be approved by the Owner and Design Team, prior to bid submission.

1. Tuttnauer USA Co. Ltd.,

a. Model 66D-EPD2-V-CS

2. Proposed substitutions are to be submitted during bidding including full qualifications for review and assessment of allowance; only pre-approved substitutions to be allowed to bid.

2.3 DESCRIPTION

A. Description: Microprocessor controlled laboratory steam sterilizer, gravity, and pre/post vacuum means of air removal. Equipped with dual, 7" full color touch screens and minimum 20 user customizable cycles, capable of providing suitable sterile processing of glassware, hard goods, animal food/bedding, lightly wrapped porous loads and liquid loads in vented containers. General temperature range shall be from 105°C (221°F) to 137°C (278°F).

B. Internal Chamber Dimensions:

1. 26W x 26H x 49D

C. Door Type:

1. Double: Automatic Vertical Sliding. Smooth Hydraulic operation, no cables, pulleys or motors.

D. Mounting:

1. Double Door: Recessed Through Two Walls.
2. Integral air differential seal with stainless steel mounting frame (mounted and sealed to wall and floor), silicone rubber gasket and all stainless steel mounting hardware.

    a. Air differential seal shall be mounted on load side of autoclave.

E. Construction:

1. Chamber: Minimum 316L Type Stainless Steel. Polished to high luster.
2. Jacket: Minimum 304L Type Stainless Steel. Fully enclosed, dimpled welded design. Sectional U" channels, which only provide a partial jacket, are not acceptable.
3. Vessel Identification: Autoclave shall have one permanently fixed plate stamped in accordance with ASME codes with the following information:

    a. Name & Address of Manufacturer.
    b. Serial Number.
    c. Chamber Pressure Rating.
    d. Jacket Pressure Rating.
    e. Stamp of Inspection Authority.

4. Chamber Penetrations: Sterilizer chamber shall come equipped with (2) TWO 1-inch capped chamber penetration ports for validation, temperature distribution and heat mapping.
5. Baffles: Sterilizer chamber shall be fitted with steam inlet baffles constructed of 316L stainless steel. Baffle design is configured to direct condensate toward the chamber floor and prevent wetting of the load. Baffling also helps to assure proper steam and temperature distribution.
6. Insulation: Chamber and Door are completely insulated with 2-inch rigid insulation and enclosed in stainless steel cladding.
7. Piping Materials: Chamber and Jacket shall be provided with stainless steel piping. All piping shall be threaded, modular in design, with unions placed before and after components to facilitate servicing. All straight piping of 12 inch or more will be insulated.
8. Components:

    a. Stainless steel components in the primary steam supply to chamber. Non-critical components can be stainless steel, brass and copper.

9. Valves: Except where otherwise stated, steam, water, and exhaust valves are solenoid activated, pneumatically operated normally closed valves. All valves shall be of material

compatible with the utility service. All valves shall be provided with tags for identification. All pneumatic and hydraulic components shall be standard off the shelf, non-proprietary items. Utility shut-off valves on all supply lines shall be high quality ball type, unless prohibited by local code. (Provided by others)

10. Air Inlet Filter: The air inlet filter, used for vacuum break, shall be a hydrophobic type bacterial retentive absolute air filter 0.2 micron. The air filter shall be mounted external to the chamber with a replaceable element appropriately supported and connected.
11. Sensors and Gauges: All appropriate sensors shall be installed to be easily removed for calibration.

F. Control System:

1. General: The sterilizer control system shall be equipped with a minimum 7-inch full color touch screen on both the clean and dirty side, including a printer and dual emergency shut off switches.
2. Cycles: Pre-Vacuum, Gravity, Liquid.
3. Test Cycles: Vacuum Leak Test, Bowie-Dick Test (Daily Air Removal).
4. Printer: Alphanumeric, thermal printer.
5. USB and Ethernet ports for downloading cycle data and system backup.
6. Multiple access levels and passwords for added security.
7. Minimum 20 cycle capacity.

G. Safety Features:

1. The autoclave door shall be designed with several redundant/independent mechanical and control features that provide safety.

    a. A cycle cannot be started until the door(s) are fully closed and locked.
    b. The door cannot be opened while a cycle is in progress.
    c. The door shall not be unsealed or unlocked until chamber pressure is 2 psi or less.
    d. Clean and dirty side doors cannot be opened at the same time.
    e. After the dirty-side door is opened a successful sterilization cycle must be completed before the clean-side door can be opened.

H. Additional Required Options:

1. Automatic Utility Start-Up/Shutdown: The autoclave's required utilities are set to automatically shut down and start up at a pre-determined time. Operator selected; each timed set point is independent of each other.
2. Water Conserving Effluent Cool Down System: An automatic condenser exhaust system utilizing a drain RTD shall be provided to condense and cool effluent flowing to the external drain. Water temperature shall be below 140°F, in accordance with U.S. National Plumbing Code.

3. Loading Equipment: Loading Cart (with two shelves) and two transfer carriages (all stainless steel)
4. Air Removal: Liquid Ring Vacuum Pump (3-phase, 208V or 480V)
5. Warranty: 1 Year Parts & Labor, 15 Years on Chamber/Pressure Vessel.

2.4 UTILITIES

A. Autoclave requirement:

a. Domestic Cold Water: ¾" NPT, 45 PSI Dynamic Minimum, 13 GPM Peak, <70 Degrees.
b. RO/DI Treated Water for Integral Stainless Steel Electric Steam Generator (1-3 Mohm)
c. Compressed Air: 1/2" NPT, 90 PSI Minimum, 3.5 SCFM
d. Floor Drain: 2" ODT, Floor Sink Recommended
e. Electric: 1-Phase, 120V, 20 AMP Dedicated Circuit
f. Electric: 3-Phase, 208V/100Amps or 480V/44Amps for Integral Stainless Steel Electric Steam Generator (36Kw)

2.3 INSTALLATION

A. The vendor shall provide start-up, testing and user-training for personnel as required to operate equipment.

B. Delivery and installation shall be coordinated so that equipment can be positioned in-place, within the sequence of construction: Contractor shall verify the delivery route through building is adequate for equipment.

C. Equipment to be securely crated and/or packaged to prevent damage during shipment. Loose parts shipped inside of the unit shall be secured.

D. The vendor shall be responsible for delivery of the unit(s) to the job site, unpacking, transport to final location, setting the equipment in place and reassembly, if required.

E. The vendor shall be responsible for the full air differential seal installation, including installation of the air differential seal wall frame.

F. The vendor shall verify that required utilities are available, in proper locations, and ready for use.

G. The vendor will not be responsible for the final utility connections. This scope of work shall be performed by others.

H. Beginning of installation means acceptance of existing conditions by the vendor.

END OF SECTION 115320

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SECTION 115353 - BIOLOGICAL SAFETY CABINETS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Biological Safety Cabinets

1. Class II, Type B2 Biological Safety Cabinets. Note that all Type II B2 biological safety cabinets are to be furnished by owner and installed by Contractor.

B. See drawings for locations, types, sizes and infrastructure requirements.

C. Connection to utilities.

1.2 RELATED REQUIREMENTS

A. Division 23 for ductwork connections.

B. Division 26 for electrical connections.

1.3 REFERENCE STANDARDS

A. NEMA MG 1 - Motors and Generators 2018.

B. NSF 49 - Biosafety Cabinetry: Design, Construction, Performance, and Field Certification 2016.

1.4 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate installation of biological safety cabinets with laboratory casework and other laboratory equipment.

1.5 SUBMITTALS

A. Shop Drawings: Show complete construction details, fittings, electrical connection, filters and other information necessary to fully describe each unit and its installation. Include plans and elevations. Include CFM and static pressure requirements. Indicate required installation, operational, and maintenance clearances to wall and ceilings.

B. Product Data: Show test results and performance charts.

C. Manufacturer's Qualification Statement.

D. Installer's Qualification Statement.

E. Operation Data: Include description of equipment operation and required adjusting and testing.

F. Maintenance Data: Identify maintenance requirements, servicing cycles, recertification requirements, and local spare part sources.

G. Warranty Documentation: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

H. Field Reports: Start-up report(s) prepared by independent qualified certifier, accredited by NSF to test and balance biological safety cabinets.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum three years of documented experience.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Package each piece of equipment to ensure protection from damage during shipment and delivery.

B. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.

1.8 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install biological safety cabinets until building is enclosed, wet work and utility roughing-in is complete, gypsum board, spackling, painting, flooring installation is completed, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

1.9 WARRANTY

A. Provide manufacture’s standard warranty

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Biological Safety Cabinets basis of design manufacturer - Esco Lifesciences Labculture LB2-5B-E or provide approved equal from one of the following:

1. The Baker Company: www.bakerco.com/#sle.
2. Labconco Corp: www.labconco.com/#sle.
3. NuAire Inc: www.nuaire.com/#sle.

2.2 PERFORMANCE/DESIGN CRITERIA

A. Design meeting requirements of the particular class and type of cabinet.

1. Class II Type B2: Suitable for testing and experimentation with low to moderate risk biological agents may be used for work with volatile toxic chemicals and radionuclide required as part of microbiological research.

2.3 BIOLOGICAL SAFETY CABINETS - CLASS II, TYPE B2

A. General: Enclosed, ventilated cabinet designed to offer personnel, product and environmental protection, while limiting cross-contamination between biological agents inside the cabinet and in surrounding environment. May be used for work with volatile toxic chemicals and radionuclide required as adjunct to microbiological studies.

1. 100 percent exhausted from cabinet to building exterior.

B. Class II B2 Biological Safety Cabinets. Note that all Type II B2 biological safety cabinets are to be furnished Contractor and installed by Contractor.

C. See drawings for locations, types, sizes and infrastructure requirements.

D. Nominal Size: 60”.

E. Work Zone: Nominal dimensions complying with performance specifications for unit specified.

1. Internal Dimensions: 61.8x24.5x28.1H”.

F. Front View Window Opening Height: Fully-closed to 21 inches.

G. Cabinet Style: Benchtop/Console with base stand.

H. Controls: Microprocessor based control system with cleanable membrane touch-screen control panel mounted on the front of the cabinet and facing down towards operator while seated.

1. Audible alarm and flashing LED to indicate unsafe condition.
2. Alarm mute switch on the front of the cabinet to allow a brief time for equipment loading in the work zone. Automatic reactivation of audible alarm after five minutes if the viewscreen sash remains at the improper height. The visible alarm to stay on until safe conditions are reestablished.
3. Delay-Off Timer: For lights, outlets and optional ultraviolet lights. Capable of 15-minute interval settings.

I. Illumination: Externally-mounted fluorescent lighting fixture with solid state ballasts producing an average of 100 footcandles (1076 lux) at work surface, with a minimum of 90 footcandles (968 lux).

J. Electrical Requirements - Dedicated 110-120V, 20 amp, 60 Hz single phase circuit required. Pre-wired cabinet with a 14 foot (4.27 m) power cord terminated with a NEMA 5-20P plug. Two GFCI outlets minimum in the work area protected by an independent self-resetting breaker.

K. Optional Accessories:

1. Channel Stand: Telescoping type, adjustable, with leg levelers, designed to position work surface from 30 inches (762 mm) to 37 inches (940 mm).
2. Footrest: Manufacturer's standard.

2.4 FABRICATION

A. General: Assemble each biological safety cabinet in factory to greatest extent possible.

B. Cabinet Construction: Double-wall construction, with negative pressure airflow between the walls from drain pan to top surrounding sides and back of work area. High-velocity return air slots in side walls and top adjacent to front access opening for enhanced containment and reduction of air turbulence.

C. Cabinet Assembly: Welded, gasketed and/or hermetically sealed joints for cabinet components, capable of achieving a soap-bubble-tested seal when completely assembled.

D. Cabinet Exterior: 16 gauge, 0.063 inches (1.52 mm), cold rolled steel, with baked enamel white finish.

E. Cabinet Interior: One piece, fully-welded 16 gauge, 0.063 inches (1.59 mm) stainless-steel sheet, type 304, no.4 finish, side walls and rear walls with radiused rounded corners. Perforated metal diffuser top of work zone, protecting supply filter.

F. Front View Window: Vertical sliding, frameless, with 1/4 inch (6 mm) thick laminated safety glass at a 10 degree angle from the vertical.

G. Airfoil: Aerodynamic design at bottom of access opening, directing airflow into front grille.

H. Gaskets: Manufacturer's standard closed cell Neoprene, forming airtight and soap-bubble-tight seals to suit installation conditions and cabinet function.

I. Work Surface: Removable dished work surface tray with integral supports.

J. Drain Pan: Unitized pan with radiused corners on every side to facilitate cleaning, with a minimum liquid holding capacity of 1 gal (3.79 L). Stainless ball valve at pan drain outlet.

K. Motor-Blower: Complying with NEMA MG 1; Variable speed, constant airflow 3/4 horsepower ECM motor with VFD controller. Position within BSC unit to promote even filter loading.

L. Supply Air Plenum: Telescoping design air plenum of steel construction with acid-resistant finish. HEPA filters to be front loading, directly clamped, uniformly loaded, and sealed by closed-cell neoprene gaskets.

M. Air Diffuser and Filter Protector: Stainless steel assembly on top of the cabinet.

N. Filters: One supply and one exhaust, scan-tested, zero-probe HEPA Filters, 99.99 percent efficient on 0.3 micron particles by DOP test, serviceable and removable from front of unit.

1. Type B2 Cabinets: Exhaust filter located below.

O. Exhaust Plenum: All steel construction, with acid-resistant finish. Size for adequate volume to provide unidirectional airflow from cabinet.

1. Type B2 Cabinets:
   a. Exhaust Transition Collar: 12 inch (305 mm) diameter. Type 304 stainless steel, with manufacturer's standard finish.

P. Sashes: Front view window guides incorporating a counterweighted pulley system allowing up and down movement, with one-hand low-effort operation.

1. Glass edges covered with metal extruded channel.
2. Glaze with laminated safety glass.
3. Guide rails capable of holding the sash in place regardless of position.
4. Rubber bumpers to cushion sash when fully opened or closed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of biological safety cabinets.

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

3.2 INSTALLATION

A. Install biological safety cabinets in compliance with shop drawings and manufacturer's written instructions.

B. Connect to facility utilities.

3.3 FIELD QUALITY CONTROL

A. Employ a qualified, independent testing agency to test and/or inspect installed biological safety cabinets; provide access and assistance as required to accommodate timely completion of testing.

B. Field certify biological safety cabinets, using procedures described in Annex F of NSF 49, current edition.

1. Perform the following tests directly related to containment (i.e., personnel and environmental protection), and product protection:
    a. Downflow velocity profile test.
    b. Inflow velocity test.
    c. Airflow smoke patterns test.
    d. HEPA filter leak test.
    e. Site installation assessment tests, including:
        1) Alarm functions as required by the referenced standard.

C. Make the necessary corrections and retest units that do not meet specified standards.

D. Affix to the cabinet a certificate of satisfactory performance when the cabinet meets all field test criteria.

3.4 ADJUSTING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Verify that counterbalances operate without interference.

3.5 CLEANING

A. Clean finished surfaces, including both sides of glass; touch up as required; and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Clean adjacent construction and surfaces that may have been soiled or damaged in the course of installation of work in this section.

C. Provide all necessary protective measures to prevent exposure of equipment and surfaces to other construction activity.

END OF SECTION 115353

SECTION 12 35 53 – STAINLESS STEEL LABORATORY CASEWORK

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. Stainless steel laboratory casework
2. Stainless steel filler and closure panels.
3. Stainless steel countertops.

1.3 COORDINATION

A. Coordinate layout and installation of framing and reinforcements for support of laboratory casework.

B. Coordinate installation of laboratory casework with installation of fume hoods and other laboratory equipment.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For laboratory casework. Include plans, elevations, sections, and attachment details.

1. Indicate types and sizes of cabinets.
2. Indicate locations of hardware.
3. Indicate locations and types of service fittings.
4. Indicate locations of blocking and reinforcements required for installing laboratory casework.
5. Include details of support framing system.
6. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
7. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Samples for Verification: For each type of cabinet finish and each type of countertop material, in manufacturer's standard sizes.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

B. Product Test Reports for Casework: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory casework with requirements of specified product standard.

C. Product Test Reports for Countertop Surface Material: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating compliance of laboratory countertop surface materials with requirements specified for chemical and physical resistance.

1.6 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Cabinet Mounting Clips and Related Hardware: Quantity equal to 5 percent of amount installed, but no fewer than 6 of each type.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 M.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.9 FIELD CONDITIONS

A. Environmental Limitations: Do not deliver or install laboratory casework until building is enclosed, utility roughing-in and wet work are complete and dry, and temporary HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Locate concealed framing, blocking, and reinforcements that support casework by field measurements before being enclosed, and indicate measurements on Shop Drawings.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

1. Kewaunee Scientific Corporation; Laboratory Products Group.
2. Jamestown Metal Products Inc.
3. Mott Manufacturing Ltd.
4. H2I Group
5. Or equal if and as specifically approved by Architect by Addendum during the bidding period.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.

C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's catalog numbers. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered.

2.2 CASEWORK, GENERAL

A. Casework Product Standard: Comply with SEFA 8 M, "Laboratory Grade Metal Casework."

2.3 METAL CABINET AND TABLE MATERIALS

A. Metal: Mild. cold-rolled and leveled #304 stainless steel. (#4 polished sheen on all exposed surfaces).

B. Nominal Metal Thickness:

1. Sides, Ends, Fixed Backs, Bottoms, Tops, Soffits, and Items Not Otherwise Indicated: 0.048 inch (1.21 mm). Except for flammable liquid storage cabinets, bottoms may be 0.036 inch (0.91 mm) if reinforced.
2. Back Panels, Doors, Drawer Fronts and Bodies, and Shelves: 0.036 inch (0.91 mm) except 0.048 inch (1.21 mm) for back panels and doors of flammable liquid storage cabinets and for unreinforced shelves more than 36 inches (900 mm) long.
3. Intermediate Horizontal Rails, Table Aprons and Cross Rails, Center Posts, and Top Gussets: 0.060 inch (1.52 mm).
4. Drawer Runners, Sink Supports, and Hinge Reinforcements: 0.075 inch (1.90 mm).
5. Leveling and Corner Gussets: 0.105 inch (2.66 mm).

2.4 AUXILIARY CABINET MATERIALS

A. Glass for Glazed Doors: Clear tempered glass complying with ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality-Q3; not less than 5.0 mm thick.

2.5 METAL CABINETS AND TABLES

A. Fabrication: Assemble and finish units at point of manufacture. Use precision dies for interchangeability of like-size drawers, doors, and similar parts. Perform assembly on precision jigs to provide units that are square. Reinforce units with angles, gussets, and channels. Except where otherwise specified, integrally frame and weld cabinet bodies to form dirt- and vermin-resistant enclosures. Where applicable, reinforce base cabinets for sink support. Maintain uniform clearance around door and drawer fronts of 1/16 to 3/32 inch (1.5 to 2.4 mm).

B. Flush Doors: Outer and inner pans that nest into box formation, with full-height channel reinforcements at center of door. Fill doors with noncombustible, sound-deadening material.

C. Glazed Doors: Hollow-metal stiles and rails of similar construction as flush doors, with glass held in resilient channels or gasket material.

D. Hinged Doors: Mortise for hinges and reinforce with angles welded inside inner pans at hinge edge.

E. Drawers: Fronts made from outer and inner pans that nest into box formation, with no raw metal edges at top. Sides, back, and bottom fabricated in one piece with rolled or formed top of sides for stiffening and comfortable grasp for drawer removal. Provide drawers with rubber bumpers, polymer roller slides, and positive stops to prevent metal-to-metal contact or accidental removal.

F. Adjustable Shelves: Front, back, and ends formed down, with edges returned horizontally at front and back to form reinforcing channels.

G. Upper Cabinets: Provide sloped tops in same cabinet material at all upper cabinets.

H. Toe Space: Fully enclosed, 4 inches (100 mm) high by 3 inches (75 mm) deep, with no open gaps or pockets.

I. Filler and Closure Panels: Provide where indicated and as needed to close spaces between cabinets and walls, ceilings, and indicated equipment. Fabricate from same material and with same finish as cabinets and with hemmed or flanged edges unless otherwise indicated.

1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where indicated. Fabricate from back-to-back panels or of hollow construction to eliminate exposed hemmed or flanged edges.
2. Provide utility-space closure panels at spaces between base cabinets where utility space would otherwise be exposed, including spaces below countertops.

3. Provide closure panels at ends of utility spaces where utility space would otherwise be exposed.

2.6 HARDWARE

A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.

B. Hinges: Stainless-steel, five-knuckle hinges complying with BHMA A156.9, Grade 1, with antifriction bearings and rounded tips. Provide two for doors 48 inches (1200 mm) high or less and three for doors more than 48 inches (1200 mm) high.

C. Hinged Door and Drawer Pulls: Stainless-steel back-mounted pulls. Provide two pulls for drawers more than 24 inches (600 mm) wide.

1. Design: Wire pulls.
2. Overall Size: 1-1/4 by 4-1/2 inches (32 by 114 mm).

D. Door Catches: Nylon-roller spring catches. Provide two catches on doors more than 48 inches (1200 mm) high.

E. Ball Bearing Drawer Slides:

1. Acceptable Manufacturers:

a. Base:

1) Accuride.

b. Optional:

1) Waterloo Furniture Components Inc.
2) Fulterer USA
3) Or equal if and as specifically approved by Architect by Addendum during the bidding period.

2. Typical Drawers:

a. Satisfy ANSI/BHMA Grade 1 HD requirements.
b. Basis of Design:

1) For drawer widths up to 460mm 18 IN: Accuride 4033 (light-duty polymer ball bearings).
2) For drawer widths greater than 460mm 18 IN and up to 685mm 27 IN: Accuride 4032 (medium duty stainless steel ball bearings).

3) For drawer widths greater than 685mm 27 IN and up to 1065mm 42 IN: Accuride 930.

c. Full extension.
d. Dynamic Load Rating: 45 kg/pair 100 LB/PAIR capacity, minimum.

3. Base Metal:
a. Sheet metal to match cabinet construction.

2.7 COUNTERTOPS, AND SHELVES ,

A. Stainless-Steel Countertops: Made from stainless-steel sheet, not less than 0.062-inch (1.59-mm) nominal thickness, with No. 4 satin finish.

1. Extend top down 1 inch (25 mm) at edges with a 1/2-inch (13-mm) return flange under frame. Apply heavy coating of heat-resistant, sound-deadening mastic to undersurface.
2. Form backsplash coved to and integral with top surface.
3. Provide raised (marine) edge where indicated.
4. Factory punch holes for service fittings.
5. Reinforce underside of countertop with channels, or use thicker metal sheet where necessary to ensure rigidity without deflection.
6. Weld shop-made joints.
7. Where field-made joints are required, provide hairline butt joints mechanically bolted through continuous channels welded to underside at edges of joined ends. Keep field jointing to a minimum.
8. Where stainless-steel sinks or cup sinks occur in stainless-steel countertops, factory weld into one integral unit.
9. After fabricating and welding, grind surfaces smooth, and polish as needed to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

B. Stainless-Steel Shelves: Made from stainless-steel sheet, not less than 0.050-inch (1.27-mm) nominal thickness, with No. 4 satin finish. Weld shop-made joints. Fold up front edge 3/4 inch (19 mm); fold up back edge 3 inches (75 mm). Provide integral stiffening brackets, formed by folding up ends 3/4 inch (19 mm) and welding to upturned front and back edges. After fabricating, grind welds smooth, and polish as needed to produce uniform, directionally textured finish with no cross scratches or evidence of welds. Passivate and rinse surfaces; remove embedded foreign matter and leave surfaces clean.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas, with Installer present, for compliance with requirements for installation tolerances, location of reinforcements, and other conditions affecting performance of the Work.

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

3.2 INSTALLATION OF CABINETS

A. Comply with installation requirements in SEFA 2.3. Install level, plumb, and true; shim as required, using concealed shims. Where laboratory casework abuts other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical. Do not exceed the following tolerances:

1. Variation of Tops of Base Cabinets from Level: 1/16 inch in 10 feet (1.5 mm in 3 m).
2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet (3 mm in 3 m).
3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet (3 mm in 3 m).
4. Variation of Adjacent Surfaces from a True Plane (Lippage): 1/32 inch (0.8 mm).
5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch (1.5 mm).

B. Wall Cabinets: Fasten to hanging strips, masonry, partition framing, blocking, or reinforcements in partitions. Fasten each cabinet through back, near top, at not less than 16 inches (400 mm) o.c.

C. Install hardware uniformly and precisely. Set hinges snug and flat in mortises.

D. Adjust laboratory casework and hardware so doors and drawers align and operate smoothly without warp or bind and contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.

3.3 INSTALLATION OF COUNTERTOPS

A. Comply with installation requirements in SEFA 2.3. Abut top and edge surfaces in one true plane with flush hairline joints and with internal supports placed to prevent deflection. Locate joints only where indicated on Shop Drawings.

B. Field Jointing: Where possible, make in same manner as shop-made joints, using dowels, splines, fasteners, adhesives, and sealants recommended by manufacturer. Shop prepare edges for field-made joints.

1. Use concealed clamping devices for field-made joints in plastic-laminate countertops. Locate clamping devices within 6 inches (150 mm) of front and back edges and at

intervals not exceeding 24 inches (600 mm). Tighten according to manufacturer's written instructions to exert a uniform heavy pressure at joints.

C. Provide required holes and cutouts for service fittings.

D. Provide scribe moldings for closures at junctures of countertop, curb, and splash with walls as recommended by manufacturer for materials involved. Match materials and finish to adjacent laboratory casework. Use chemical-resistant, permanently elastic sealing compound where recommended by manufacturer.

E. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

3.4 INSTALLATION OF SINKS

A. Comply with installation requirements in SEFA 2.3.

B. Semiflush Installation of Stainless-Steel Sinks: Before setting, apply sink and countertop manufacturers' recommended sealant under rim lip and along top. Remove excess sealant while still wet and finish joint for neat appearance.

3.5 INSTALLATION OF LABORATORY ACCESSORIES

A. Install accessories according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions.

B. Securely fasten adjustable shelving supports, stainless-steel shelves, and pegboards to partition framing, wood blocking, or reinforcements in partitions.

C. Install shelf standards plumb and at heights to align shelf brackets for level shelves. Install shelving level and straight, closely fitted to other work where indicated.

D. Securely fasten pegboards to partition framing, wood blocking, or reinforcements in partitions.

3.6 CLEANING AND PROTECTING

A. Clean finished surfaces, touch up as required, and remove or refinish damaged or soiled areas to match original factory finish, as approved by Architect.

B. Protect countertop surfaces during construction with 6-mil (0.15-mm) plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches (1200 mm) o.c.

END OF SECTION 12 35 53

SECTION 13 34 19 - METAL BUILDING 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. Section Includes:

1. Structural-steel framing.
2. Metal roof panels.
3. Sheet metals/flashings.
4. Foam-insulation-core metal wall panels.
5. Metal soffit panels.
6. Thermal insulation.
7. Accessories.

1.3 DEFINITIONS

A. Terminology Standard: See MBMA's "Metal Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of metal building system component. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for the following:

1. Structural-steel-framing system.
2. Metal roof panels.
3. Metal wall panels.
4. Insulation and vapor retarder facings.
5. Flashing and trim.
6. Accessories.

B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other work.

1. Anchor-Bolt Plans: Submit anchor-bolt plans and templates before foundation work begins. Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location.
2. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing; include provisions for openings. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
3. Metal Roof and Wall Panel Layout Drawings: Show layouts of metal panels including methods of support. Include details of edge conditions, joints, panel profiles, corners, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work; show locations of exposed fasteners.

    a. Show wall-mounted items including doors, windows, louvers, and lighting fixtures.

4. Accessory Drawings: Include details of the following items, at a scale of not less than 1-1/2 inches per 12 inches:

    a. Flashing and trim.
    b. Gutters.
    c. Downspouts.

C. Samples for Initial Selection: For units with factory-applied color finish.

D. Samples for Verification: For each type of exposed finish required, prepared on Samples of sizes indicated below:

1. Metal Panels: Nominal 12 inches long by actual panel width. Include fasteners, closures, and other exposed panel accessories.

E. Delegated-Design Submittal: For metal building systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer licensed to practice in the State of Missouri responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified erector, manufacturer, professional engineer and land surveyor.

B. Manufacturer Accreditation: Statement that metal building system and components were designed and produced by a manufacturer accredited according to the International Accreditation Service's AC472.

C. Metal Building System Certificates: For each type of metal building system, from manufacturer.

1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:

    a. Name and location of Project.
    b. Order number.
    c. Name of manufacturer.
    d. Name of Contractor.
    e. Building dimensions including width, length, height, and roof slope.
    f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
    g. Governing building code and year of edition.
    h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic design category or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads (cranes).
    i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
    j. Building-Use Category: Indicate category of building use and its effect on load importance factors.

D. Erector Certificates: For each product, from manufacturer.

E. Manufacturer Certificates: For each product, from manufacturer.

F. Material Test Reports: For each of the following products:

1. Structural steel including chemical and physical properties.
2. Bolts, nuts, and washers including mechanical properties and chemical analysis.
3. Tension-control, high-strength, bolt-nut-washer assemblies.
4. Shop primers.
5. Nonshrink grout.

G. Product Test Reports: Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for insulation and vapor-retarder facings. Include reports for thermal resistance, fire-test-response characteristics, water-vapor transmission, and water absorption.

H. Source quality-control reports.

I. Field quality-control reports.

J. Warranties: Sample of special warranties.

1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For metal panel finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer and member of MBMA.

1. Accreditation: According to the International Accreditation Service's AC472.
2. Engineering Responsibility: Preparation of comprehensive engineering analysis and Shop Drawings by a professional engineer who is legally qualified to practice in jurisdiction where Project is located.

B. Erector Qualifications: An experienced erector who specializes in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.

C. Source Limitations: Obtain metal building system components, including primary and secondary framing and metal panel assemblies, from single source from single manufacturer.

D. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
2. AWS D1.3, "Structural Welding Code - Sheet Steel."

E. Structural Steel: Comply with AISC 360, "Specification for Structural Steel Buildings," for design requirements and allowable stresses.

F. Cold-Formed Steel: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" for design requirements and allowable stresses.

G. Preinstallation Conference: Conduct conference at Project site.

1. Review methods and procedures related to metal building systems including, but not limited to, the following:

a. Condition of foundations and other preparatory work performed by other trades.
b. Structural load limitations.
c. Construction schedule. Verify availability of materials and erector's personnel, equipment, and facilities needed to make progress and avoid delays.
d. Required tests, inspections, and certifications.
e. Unfavorable weather and forecasted weather conditions.

2. Review methods and procedures related to metal roof panel assemblies including, but not limited to, the following:

a. Compliance with requirements for purlin and rafter conditions, including flatness and attachment to structural members.
b. Structural limitations of purlins and rafters during and after roofing.
c. Flashings, special roof details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect metal roof panels.

d. Temporary protection requirements for metal roof panel assembly during and after installation.
e. Roof observation and repair after metal roof panel installation.

3. Review methods and procedures related to metal wall panel assemblies including, but not limited to, the following:

a. Compliance with requirements for support conditions, including alignment between and attachment to structural members.
b. Structural limitations of girts and columns during and after wall panel installation.
c. Flashings, special siding details, wall penetrations, openings, and condition of other construction that will affect metal wall panels.
d. Temporary protection requirements for metal wall panel assembly during and after installation.
e. Wall observation and repair after metal wall panel installation.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Deliver components, sheets, 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.

1.9 PROJECT CONDITIONS

A. Weather Limitations: Proceed with installation only when weather conditions permit metal panels to be installed according to manufacturers' written instructions and warranty requirements.

B. Field Measurements:

1. Established Dimensions for Foundations: Comply with established dimensions on approved anchor-bolt plans, establishing foundation dimensions and proceeding with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
2. Established Dimensions for Metal Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating metal panels without field measurements, or allow for field trimming metal

panels. Coordinate construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.10 COORDINATION

A. Coordinate sizes and locations of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Section 03 30 00 "Cast-in-Place Concrete."

B. Coordinate metal panel assemblies with rain drainage work, flashing, trim, and construction of supports and other adjoining work to provide a leakproof, secure, and noncorrosive installation.

1.11 WARRANTY

A. Special Warranty on Metal 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 Hunter units when tested according to ASTM D 2244.
b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.
c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 25 years from date of Substantial Completion.

B. Special Weathertightness Warranty for Standing-Seam Metal Roofing, sheet metal, and flashings: Manufacturer's standard form in which manufacturer agrees to repair or replace standing-seam metal roof panel assemblies, sheet metal, flashings that leak or otherwise fail to remain weathertight within specified warranty period.

1. Warranty Period: 5 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include the following:

1. Butler Manufacturing Company.
2. Varco Pruden.
3. Nucor Building Systems.

4. Ceco Metal Building Systems.
5. Approval of other manufacturers subject to acceptance prior to bidding.

2.2 METAL BUILDING SYSTEMS

A. Description: Provide a complete, integrated set of metal building system manufacturer's standard mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior.

1. Provide metal building system of size and with bay spacings, roof slopes, and spans indicated.

B. Primary-Frame Type:
1. Rigid Modular: Solid-member, structural-framing system with interior columns.

C. End-Wall Framing: Manufacturer's standard, for buildings not required to be expandable, consisting of primary frame, capable of supporting one-half of a bay design load, and end-wall columns.

D. Secondary-Frame Type: Manufacturer's standard purlins and joists and exterior-framed (bypass) girts.

E. Eave Height: As indicated.

F. Bay Spacing: As indicated

G. Roof Slope: As indicated.

H. Roof System: Metal roof panels to match panel profile and color of in-place Phase 1 building adjacent to proposed addition; basis – Ceco Building System, Battonlok.

I. Exterior Wall and Roof Soffit Panel System: Foam-insulation core metal wall panels to match panel profile and color of in-place Phase 1 building adjacent to proposed addition; basis - Ceco Building Systems, Striated IMP:

1. 26 gage interior, 24 gage exterior stucco-embossed metal skins.
2. PVDF coating over Galvalume substrate – basis Signature 300.
3. 2 ½” non-CFC polyurethane foamed-in-place core, minimum R-19 panel value.
4. 42” wide panel.
5. Concealed clip and fastener system.

J. Canopy Soffit Panels: 26 gauge (minimum) corrugated. Perforated metal panels, finish to match adjacent wall panels.

2.3 METAL BUILDING SYSTEM PERFORMANCE

A. Delegated Design: Design metal building system, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

B. Structural Performance: Metal building systems shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated according to procedures in MBMA's "Metal Building Systems Manual."

1. Design Loads: As indicated on Drawings.

2. Design Loads: As required by ASCE/SEI 7.
3. Deflection Limits: Design metal building system assemblies to withstand design loads with deflections no greater than the following:

    a. Main framing members: Vertical deflection of 1/240.
    b. Purlins and Rafters: Vertical deflection of 1/180 of the span.
    c. Girts: Horizontal deflection of 1/180 of the span.
    d. Metal Roof Panels: Vertical deflection of 1/180 of the span.
    e. Metal Wall Panels: Horizontal deflection of 1/180 of the span.
    f. Design secondary-framing system to accommodate deflection of primary framing and construction tolerances, and to maintain clearances at openings.

4. Drift Limits: Engineer building structure to withstand design loads with drift limits no greater than the following:

    a. Lateral Drift: Maximum of 1/160 of the building height.

5. Metal panel assemblies shall withstand the effects of gravity loads and loads and stresses within limits and under conditions indicated according to ASTM E 1592.

C. Seismic Performance: Metal building systems shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

D. Thermal Movements: 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 joint sealants, failure of connections, and other detrimental effects. Base engineering 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.

E. Air Infiltration for Metal Roof Panels: Air leakage through assembly of not more than 0.008 cfm/sq. ft. of roof area when tested according to ASTM E 1680 at negative test-pressure difference of 6.24 lbf/sq. ft.

F. Air Infiltration for Metal Wall Panels: Air leakage through assembly of not more than 0.006 cfm/sq. ft. of wall area when tested according to ASTM E 283 at static-air-pressure difference of 6.24 lbf/sq. ft.

G. Water Penetration for Metal Roof Panels: No water penetration when tested according to ASTM E 1646 at test-pressure difference of 12.0 lbf/sq. ft.

H. Water Penetration for Metal Wall Panels: No water penetration when tested according to ASTM E 331 at a wind-load design pressure of not less than 12.0 lbf/sq. ft.

I. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for Class 90.

J. Thermal Performance: Provide insulated metal panel assemblies with the following maximum U-factors and minimum R-values for opaque elements when tested according to ASTM C 1363 or ASTM C 518:

1. Metal Roof Assemblies:
   a. R-Value: 30 min.

2. Metal Wall Panel Assemblies:
   a. R-Value: 19 min.

2.4 STRUCTURAL-STEEL FRAMING

A. Primary Framing: Manufacturer's standard primary-framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.

1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.

   a. Slight variations in span and spacing may be acceptable if necessary to comply with manufacturer's standard, as approved by Architect.
   b. by Architect.
2. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipes or tubes, or shop-welded, built-up steel plates.
3. Frame Configuration: Single gable.
4. Exterior Column Type: Strait.
5. Rafter Type: Tapered.

B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:

1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet.
2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; or I-shaped sections fabricated from shop-welded, built-up steel plates or structural-steel shapes.

C. Secondary Framing: Manufacturer's standard secondary framing, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers, jambs, and other miscellaneous structural members. Unless otherwise indicated, fabricate framing from either cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes.

    a. Depth: As needed to comply with system performance requirements.
2. Eave Struts: Unequal-flange, C-shaped sections; fabricated from built-up steel plates, steel sheet, or structural-steel shapes; to provide adequate backup for metal panels.
3. Flange Bracing: Minimum 2-by-2-by-1/8-inch structural-steel angles or 1-inch- diameter, cold-formed structural tubing to stiffen primary-frame flanges.
4. Sag Bracing: Minimum 1-by-1-by-1/8-inch structural-steel angles.
5. Base or Sill Angles: Minimum 3-by-2-inch zinc-coated (galvanized) steel sheet.
6. Purlin and Girt Clips: Manufacturer's standard clips fabricated from steel sheet. Provide galvanized clips where clips are connected to galvanized framing members.
7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from zinc-coated (galvanized) steel sheet.
8. Framing for Openings: Channel shapes; fabricated from cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings and head, jamb, and sill of other openings.
9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. Canopy Framing: Manufacturer's standard structural-framing system, designed to withstand required loads; fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide frames with attachment plates and splice members, factory drilled for field-bolted assembly.

E. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50; or ASTM A 529/A 529M, Grade 50; minimum 1/2-inch- diameter steel; threaded full length or threaded a minimum of 6 inches at each end.
2. Cable: ASTM A 475, 1/4-inch- diameter, extra-high-strength grade, Class B, zinc-coated, seven-strand steel; with threaded end anchors.

F. Bolts: Provide plain-finish bolts for structural-framing components that are primed or finish painted. Provide hot-dip galvanized bolts for structural-framing components that are galvanized.

G. Materials:

1. W-Shapes: ASTM A 992/A 992M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
2. Channels, Angles, M-Shapes, and S-Shapes: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
3. Plate and Bar: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade 50 or 55; or ASTM A 529/A 529M, Grade 50 or 55.
4. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
5. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B or C, structural tubing.
6. Structural-Steel Sheet: Hot-rolled, ASTM A 1011/A 1011M, Structural Steel (SS), Grades 30 through 55, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70; or cold-rolled, ASTM A 1008/A 1008M, Structural Steel (SS), Grades 25 through 80, or High-Strength Low-Alloy Steel (HSLAS), Grades 45 through 70.
7. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G60 coating designation; mill phosphatized.
8. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet, metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

    a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grades 33 through 80 or High-Strength Low-Alloy Steel (HSLAS), Grades 50 through 80; with G90 coating designation.
    b. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Structural Steel (SS), Grade 50 or 80; with Class AZ50 coating.

9. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A, carbon-steel, hex-head bolts; ASTM A 563 carbon-steel hex nuts; and ASTM F 844 plain (flat) steel washers.

    a. Finish: Plain.

10. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy-hex steel structural bolts; ASTM A 563 heavy-hex carbon-steel nuts; and ASTM F 436 hardened carbon-steel washers.

    a. Finish: Plain.

11. Unheaded Anchor Rods: ASTM F 1554, Grade 36.

    a. Configuration: Straight.
    b. Nuts: ASTM A 563 heavy-hex carbon steel.
    c. Plate Washers: ASTM A 36/A 36M carbon steel.
    d. Washers: ASTM F 436 hardened carbon steel.

e. Finish: [Plain] [Hot-dip zinc coating, ASTM A 153/A 153M, Class C].

12. Headed Anchor Rods: ASTM F 1554, Grade 36.

a. Configuration: Straight.
b. Nuts: ASTM A 563 heavy-hex carbon steel.
c. Plate Washers: ASTM A 36/A 36M carbon steel.
d. Washers: ASTM F 436 hardened carbon steel.
e. Finish: [Plain] [Hot-dip zinc coating, ASTM A 153/A 153M, Class C].

13. Threaded Rods: ASTM A 36/A 36M.

a. Nuts: ASTM A 563 heavy-hex carbon steel.
b. Washers: ASTM F 436 hardened carbon steel.
c. Finish: Plain.

2.5 METAL ROOF PANELS

A. Tapered-Rib-Profile, Lap-Seam Metal Roof Panels : Formed with raised, trapezoidal major ribs and intermediate stiffening ribs symmetrically spaced between major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps. Match profile of existing Phase 1 building.

1. Material: Zinc alloy-coated steel sheet, 0.018-inch nominal thickness.

a. Exterior Finish: Fluoropolymer.
b. Color: Custom to match existing building.

2. Major-Rib Spacing: Match existing.

B. Materials:

1. 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.

a. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating designation, Grade 50; structural quality.
b. Surface: Smooth, flat finish.

C. Finishes:

1. Exposed Coil-Coated Finish:
a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent 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. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.6 FOAM-INSULATION-CORE METAL WALL PANELS

A. Description: Provide factory-formed and -assembled, metal wall panels fabricated from two metal facing sheets and an insulation core foamed in place during fabrication, with joints between panels designed to form weathertight seals. Include accessories required for weathertight installation.

1. Concealed-Fastener, Foam-Insulation-Core Metal Wall Panels : Formed with tongue-and-groove panel edges; designed for sequential installation by interlocking panel edges and mechanically attaching panels to supports using concealed clips or fasteners.

   a. Facings: Fabricate panel with exterior and interior facings of same material and thickness.
   b. Exterior Surface: Striatedstucco-embossed.
   c. Panel Coverage: 42 inchesnominal.
   d. Panel Thickness: 2.5 inches.
   e. Thermal-Resistance Value (R-Value): 19 min.

B. Panel Performance:

1. Flatwise Tensile Strength: 30 psi when tested according to ASTM C 297/C 297M.
2. Humid Aging: Volume increase not greater than 6.0 percent and no delamination or metal corrosion when tested for seven days at 140 deg F and 100 percent relative humidity according to ASTM D 2126.
3. Heat Aging: Volume increase not greater than 2.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at 200 deg F according to ASTM D 2126.
4. Cold Aging: Volume decrease not more than 1.0 percent and no delamination, surface blistering, or permanent bowing when tested for seven days at minus 20 deg F according to ASTM D 2126.
5. Fatigue: No evidence of delamination, core cracking, or permanent bowing when tested to a 20-lbf/sq. ft. positive and negative wind load and with deflection of L/180 for two million cycles.
6. Autoclave: No delamination when exposed to 2-psi pressure at a temperature of 212 deg F for 2-1/2 hours.
7. Fire-Test-Response Characteristics: Class A according to ASTM E 108.

C. Polyisocyanurate Insulation-Core Performance:

1. Density: 2.0 to 2.6 lb/cu. ft. when tested according to ASTM D 1622.
2. Compressive Strength: Minimum 20 psi when tested according to ASTM D 1621.
3. Shear Strength: 26 psi when tested according to ASTM C 273/C 273M.

D. Materials:

1. Polyisocyanurate Insulation: Modified polyisocyanurate foam using a non-CFC blowing agent, foamed-in-place or board type as indicated, with maximum flame-spread and smoke-developed indexes of 25 and 450, respectively.

   a. Closed-Cell Content: 90 percent when tested according to ASTM D 6226.

2. 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.

   a. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 coating designation; structural quality.
   b. Surface: Embossed finish.

E. Finishes:

1. Exposed Coil-Coated Finish:
   a. Three-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent 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. Concealed Finish: Apply pretreatment and manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

2.7 METAL SOFFIT PANELS

A. General: Provide factory-formed metal soffit panels designed to be installed by lapping and interconnecting side edges of adjacent panels and mechanically attaching through panel to supports using concealed fasteners in side laps. Include accessories required for weathertight installation.

B. Metal Roof Soffit Panels: Match profile and material of metal wall panels.

C. Finish: Match finish and color of metal roof panels.Canopy Soffit Panels: tapered-rib-profile at canopies: Exposed-Fastener Perforated Metal Soffit Panels : Formed with raised, trapezoidal

major ribs; designed to be installed by lapping side edges of adjacent panels and mechanically attaching panels to supports using exposed fasteners in side laps.

a. Exterior Finish: Fluoropolymer.
b. Color: Custom to match existing building.

2.8 THERMAL INSULATION

A. Unfaced Metal Building Roof Insulation: ASTM C 991, Type I, or NAIMA 202, glass-fiber-blanket insulation; 0.5-lb/cu. ft. density; 2-inch- wide, continuous, vapor-tight edge tabs; with a flame-spread index of 25 or less.

1. Vapor-Retarder Facing: ASTM C 1136, with permeance not greater than 0.02 perm when tested according to ASTM E 96/E 96M, Desiccant Method.
   a. Composition: White polypropylene film facing and fiberglass-polyester-blend fabric backing.

2.9 ACCESSORIES

A. General: Provide accessories as standard with metal building system manufacturer and as specified. Fabricate and finish accessories at the factory to greatest extent possible, by manufacturer's standard procedures and processes. Comply with indicated profiles and with dimensional and structural requirements.

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.

B. Roof Panel Accessories: Provide components required for a complete metal roof panel assembly including copings, fasciae, corner units, ridge closures, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal roof panels unless otherwise indicated.

1. Closures: Provide closures at eaves and ridges, fabricated of same material as metal roof panels.
2. Clips: Manufacturer's standard, formed from steel sheet, designed to withstand negative-load requirements.
3. Cleats: Manufacturer's standard, mechanically seamed cleats formed from steel sheet.
4. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
5. 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 roof panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
6. Thermal Spacer Blocks: Where metal panels attach directly to purlins, provide thermal spacer blocks of thickness required to provide 1-inch standoff; fabricated from extruded polystyrene.

C. Wall Panel Accessories: Provide components required for a complete metal wall panel assembly including copings, fasciae, mullions, sills, corner units, clips, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal wall panels unless otherwise indicated.

1. Closures: Provide closures at eaves and rakes, fabricated of same material as metal wall panels.
2. 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 wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

D. Flashing and Trim: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match adjacent metal panels.

1. Provide flashing and trim 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, fasciae, and fillers.
2. Opening Trim: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Trim head and jamb of door openings, and head, jamb, and sill of other openings.

E. Gutters: Formed from 0.022-inch nominal-thickness, metallic-coated steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match roof fascia and rake trim. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch- long sections, sized according to SMACNA's "Architectural Sheet Metal Manual."

1. Gutter Supports: Fabricated from same material and finish as gutters.
2. Strainers: Bronze, copper, or aluminum wire ball type at outlets.

F. Downspouts: Formed from 0.022-inch nominal-thickness, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating; finished to match metal wall panels. Fabricate in minimum 10-foot- long sections, complete with formed elbows and offsets.

1. Mounting Straps: Fabricated from same material and finish as gutters.

G. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

H. Materials:

1. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners

with heads matching color of materials being fastened by means of plastic caps or factory-applied coating.

a. Fasteners for Metal Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM sealing washer.
b. Fasteners for Metal Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws.
c. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
d. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

2. Corrosion-Resistant Coating: Cold-applied asphalt mastic, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
3. Metal Panel Sealants:

a. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene-compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape of manufacturer's standard size.
b. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane or polysulfide; of type, grade, class, and use classifications required to seal joints in metal panels and remain weathertight; and as recommended by metal building system manufacturer.

2.10 FABRICATION

A. General: Design components and field connections required for erection to permit easy assembly.

1. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
2. Fabricate structural framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Members shall be free of cracks, tears, and ruptures.

B. Tolerances: Comply with MBMA's "Metal Building Systems Manual" for fabrication and erection tolerances.

C. Primary Framing: Shop fabricate framing components to indicated size and section, with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.

1. Make shop connections by welding or by using high-strength bolts.
2. Join flanges to webs of built-up members by a continuous, submerged arc-welding process.

3. Brace compression flange of primary framing with steel angles or cold-formed structural tubing between frame web and purlin web or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
4. Weld clips to frames for attaching secondary framing.
5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary framing with specified primer after fabrication.

D. Secondary Framing: Shop fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.

1. Make shop connections by welding or by using non-high-strength bolts.
2. Shop Priming: Prepare uncoated surfaces for shop priming according to SSPC-SP 2. Shop prime uncoated secondary framing with specified primer after fabrication.

E. Metal Panels: Fabricate and finish metal panels at the factory to greatest extent possible, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements. Comply with indicated profiles and with dimensional and structural requirements.

1. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of metal panel.

PART 3 - EXECUTION

3.1 EXAMINATION

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

B. Before erection proceeds, survey elevations and locations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments to receive structural framing, with erector present, for compliance with requirements and metal building system manufacturer's tolerances.

1. Engage land surveyor to perform surveying.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural framing, connections, and bracing are in place unless otherwise indicated.

3.3 ERECTION OF STRUCTURAL FRAMING

A. Erect metal building system according to manufacturer's written erection instructions and erection drawings.

B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.

C. Set structural framing accurately in locations and to elevations indicated, according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.

D. Base 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. 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.
3. Promptly pack 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 shrinkage-resistant grouts.

E. Align and adjust structural framing before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with framing. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.

1. Level and plumb individual members of structure.
2. Make allowances for difference between temperature at time of erection and mean temperature when structure will be completed and in service.

F. Primary Framing and End Walls: Erect framing level, plumb, rigid, secure, and true to line. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist-cure grout for not less than seven days after placement.

1. Make field connections using high-strength bolts installed according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for bolt type and joint type specified.

a. Joint Type: Snug tightened or pretensioned.

G. Secondary Framing: Erect framing level, plumb, rigid, secure, and true to line. Field bolt secondary framing to clips attached to primary framing.

1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
2. Locate and space wall girts to suit openings such as doors and windows.
3. Locate canopy framing as indicated.
4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.

1. Tighten rod to avoid sag.
2. Locate interior end-bay bracing only where indicated.

I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to structural framing.

J. Erection Tolerances: Maintain erection tolerances of structural framing within AISC 303.

3.4 METAL PANEL INSTALLATION, GENERAL

A. Examination: Examine primary and secondary framing to verify that structural-panel support members and anchorages have been installed within alignment tolerances required by manufacturer.

1. Examine roughing-in for components and systems penetrating metal panels, to verify actual locations of penetrations relative to seams before metal panel installation.

B. General: Anchor metal panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Field cut metal panels as required for doors, windows, and other openings. Cut openings as small as possible, neatly to size required, and without damage to adjacent metal panel finishes.

a. Field cutting of metal panels by torch is not permitted unless approved in writing by manufacturer.

2. Install metal panels perpendicular to structural supports unless otherwise indicated.
3. Flash and seal metal panels with weather closures at perimeter of openings and similar elements. Fasten with self-tapping screws.
4. Locate and space fastenings in uniform vertical and horizontal alignment.
5. Locate metal panel splices over, but not attached to, structural supports with end laps in alignment.
6. Lap metal flashing over metal panels to allow moisture to run over and off the material.

C. Metal Protection: Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by metal roof panel manufacturer.

D. Joint Sealers: Install gaskets, joint fillers, and sealants where indicated and where required for weatherproof performance of metal panel assemblies. Provide types of gaskets, fillers, and sealants indicated; or, if not indicated, provide types recommended by metal panel manufacturer.

1. Seal metal panel end laps with double beads of tape or sealant the full width of panel. Seal side joints where recommended by metal panel manufacturer.

3.5 METAL ROOF PANEL INSTALLATION

A. General: Provide metal roof panels of full length from eave to ridge unless otherwise indicated or restricted by shipping limitations.

1. Install ridge caps as metal roof panel work proceeds.
2. Flash and seal metal roof panels with weather closures at eaves and rakes. Fasten with self-tapping screws.

B. Lap-Seam Metal Roof Panels: Fasten metal roof panels to supports with exposed fasteners at each lapped joint, at location and spacing recommended by manufacturer.

1. Provide metal-backed sealing washers under heads of exposed fasteners bearing on weather side of metal roof panels.
2. Provide sealant tape at lapped joints of metal roof panels and between panels and protruding equipment, vents, and accessories.
3. Apply a continuous ribbon of sealant tape to weather-side surface of fastenings on end laps and on side laps of nesting-type metal panels, on side laps of ribbed or fluted metal panels, and elsewhere as needed to make metal panels weatherproof to driving rains.
4. At metal panel splices, nest panels with minimum 6-inch end lap, sealed with butyl-rubber sealant and fastened together by interlocking clamping plates.

C. Metal Fascia Panels: Align bottom of metal panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws. Flash and seal metal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.

D. Metal Roof Panel Installation Tolerances: Shim and align metal roof panels 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 METAL WALL PANEL INSTALLATION

A. General: Install metal wall panels in orientation, sizes, and locations indicated on Drawings. Install panels perpendicular to girts, extending full height of building, unless otherwise indicated. Anchor metal wall panels and other components of the Work securely in place, with provisions for thermal and structural movement.

1. Unless otherwise indicated, begin metal panel installation at corners with center of rib lined up with line of framing.
2. Shim or otherwise plumb substrates receiving metal wall panels.
3. Rigidly fasten base end of metal wall panels and allow eave end free movement due to thermal expansion and contraction.
4. Flash and seal metal wall panels with weather closures at eaves, rakes, duct penetrations, and at perimeter of all openings. Fasten with self-tapping screws.
5.
6. Install flashing and trim as metal wall panel work proceeds.
7. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as indicated; or, if not indicated, as necessary for waterproofing.
8. Align bottom of metal wall panels and fasten with blind rivets, bolts, or self-drilling or self-tapping screws.
9. Provide weatherproof escutcheons for pipe and conduit penetrating exterior walls.

B. Metal Wall Panels: Install metal wall panels on exterior side of girts. Attach metal wall panels to supports with fasteners as recommended by manufacturer.

C. Insulated Metal Wall Panels: Install insulated metal wall panels on exterior side of girts. Attach panels to supports at each panel joint using concealed clip and fasteners at maximum 42 inches o.c., spaced not more than manufacturer's recommendation. Fully engage tongue and groove of adjacent insulated metal wall panels.

1. Install clips to supports with self-tapping fasteners.
2. Apply continuous ribbon of sealant to panel joint on concealed side of insulated metal wall panels as vapor seal; apply sealant to panel joint on exposed side of panels as weather seal.

D. Installation Tolerances: Shim and align metal wall panels within installed tolerance of 1/4 inch in 20 feet, nonaccumulative, on level, plumb, and on location lines as indicated, and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

3.7 METAL SOFFIT PANEL INSTALLATION

A. Provide metal soffit panels the full width of soffits. Install panels perpendicular to support framing.

B. Flash and seal metal soffit panels with weather closures where panels meet walls and at perimeter of all openings.

3.8 THERMAL INSULATION INSTALLATION

A. General: Install insulation concurrently with metal panel installation, in thickness indicated to cover entire surface, according to manufacturer's written instructions.

1. Set vapor-retarder-faced units with vapor retarder toward warm side of construction unless otherwise indicated. Do not obstruct ventilation spaces except for firestopping.
2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to the surrounding construction to ensure airtight installation.

3. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder-facing tabs up and over purlin, overlapping adjoining facing of next insulation course and maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and crossbands below insulation.

    a. Thermal Spacer Blocks: Where metal roof panels attach directly to purlins, install thermal spacer blocks.

4. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.9 ACCESSORY INSTALLATION

A. General: 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 roof panel assembly, including trim, copings, ridge closures, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
2. Install components for a complete metal wall panel assembly, including trim, copings, corners, seam covers, flashings, sealants, gaskets, fillers, closure strips, and similar items.
3. Where dissimilar metals contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with corrosion-resistant coating, by applying rubberized-asphalt underlayment to each contact surface, or by other permanent separation as recommended by manufacturer.

B. 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 excessive oil-canning, 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 to result in 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 or bayonet-type 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).

C. Gutters: Join sections with riveted-and-soldered or lapped-and-sealed joints. Attach gutters to eave with gutter hangers spaced as required for gutter size, but not more than 36 inches o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.

D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Tie downspouts to underground drainage system indicated.

E. Pipe Flashing: Form flashing around pipe penetration and metal roof panels. Fasten and seal to panel as recommended by manufacturer.

3.10 CLEANING AND PROTECTION

A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Metal Panels: Remove temporary protective coverings and strippable films, if any, as metal panels are installed. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

1. Replace metal panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 13 34 19