PROJECT MANUAL FOR:
MEDICAL SCIENCE BUILDING
FIRST FLOOR RESEARCH LABORATORY RENOVATION
PROJECT NUMBER: # CP171091

AT:
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI

FOR:
THE CURATORS OF THE UNIVERSITY OF MISSOURI

PREPARED BY:
PGAV Architects
Architect of Record
1900 W 47th Place, Suite 300
Westwood, KS 66205
913.362.6500

Ross & Baruzzini
Mechanical, Plumbing and FP Engineer
6 South Old Orchard
St. Louis, MO 63119
314.918.8383

Antella Consulting Engineering
Electrical Engineer
1600 Genessee, Suite 260
Kansas City, MO 64102
816.421.0950

BID DOCUMENTS
November 6, 2017

VOLUME 1 OF 2
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ADVERTISEMENT FOR BIDS

Sealed bids for:

MEDICAL SCIENCE BUILDING –
FIRST FLOOR RESEARCH LAB RENOVATION
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI
PROJECT NUMBER: CP171091  CONSTRUCTION ESTIMATE $2,300,000 - $2,575,000

will be received by the Curators of the University of Missouri, Owner, at Campus Facilities, Planning, Design & Construction, Room L100 (Front Reception Desk), General Services Building, University of Missouri, Columbia, Missouri 65211, until 1:30 p.m., C.T., November 30, 2017 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 should be directed to the office of Planning, Design & Construction at (573) 882-0455.

Questions regarding the scope of work should be directed to Jason Tippie with PGAV Architects at 913.362.6500 or jason.tippie@pgav.com. Questions regarding commercial conditions should be directed to Jude Wawrzyniak at (573) 882-9340 or wawrzyniakj@missouri.edu.

Information regarding bid results will be available the day following the bid opening by calling (573) 882-6894.

A prebid meeting will be held at 1:30 p.m., C.T., November 9, 2017 in the General Services Bldg., Rm 194A, University of Missouri, Columbia, Missouri, followed by a walk-through at the site. All interested bidders are invited to attend this meeting. A walk-through of the project may be scheduled by contacting the Prebid Inspection Guide at (573) 882-2228.

A Diversity Participation goal of 10% MBE / 3% SDVE / 10% Combined WBE, DBE and Veteran Owned Business 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) 882-1133.

Advertisement Date: November 6, 2017

Gary Ward
Associate Vice Chancellor – Facilities
University of Missouri
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<td>PANELBOARDS</td>
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<td>262726</td>
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<td>262813</td>
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<td>ENCLOSED SWITCHES AND CIRCUIT BREAKERS</td>
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<td>265119</td>
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<td>EMERGENCY AND EXIT LIGHTING</td>
<td>4</td>
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**DIVISION 27 – COMMUNICATIONS**

<table>
<thead>
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<td>270544</td>
<td>SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING</td>
<td>2</td>
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**DIVISION 28 – FIRE ALARM SYSTEMS**

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
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<tbody>
<tr>
<td>283111</td>
<td>DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM</td>
<td>6</td>
</tr>
</tbody>
</table>

**DIVISION 31 – EARTHWORK**

NOT APPLICABLE

**DIVISION 32 – EXTERIOR IMPROVEMENTS**

NOT APPLICABLE

END OF SECTION
This page is intentionally left blank.
SECTION 000002 - ARCHITECTURAL CERTIFICATION

I, Michael A. Schaadt, hereby specify that pursuant to RSMO.327.411 the documents intended to be authenticated by my seal are limited to:

**SPECIFICATIONS:**

**DIVISION 02** EXISTING CONDITIONS
- 024119 SELECTIVE DEMOLITION

**DIVISION 03** CONCRETE
- 035416 HYDRAULIC CEMENT UNDERLAYMENT

**DIVISION 04** MASONRY
- 042200 CONCRETE UNIT MASONRY

**DIVISION 05** METALS
- 055000 METAL FABRICATIONS

**DIVISION 06** WOOD, PLASTICS, AND COMPOSITES
- 061053 MISCELLANEOUS ROUGH CARPENTRY

**DIVISION 07** THERMAL AND MOISTURE PROTECTION
- 070150 PREPARATION FOR ROOFING REPAIR
- 072100 INSULATION
- 075216 STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING
- 076200 SHEET METAL FLASHING AND TRIM
- 078413 PENETRATION FIRESTOPPING
- 079200 JOINT SEALANTS

**DIVISION 08** OPENINGS
- 081213 HOLLOW METAL FRAMES
- 081416 FLUSH WOOD DOORS
- 083113 ACCESS DOORS AND FRAMES
- 085113 ALUMINUM WINDOWS
- 087100 DOOR HARDWARE
- 088000 GLAZING

**DIVISION 09** FINISHES
- 090561 COMMON WORK RESULTS FOR FLOORING PREPARATION
- 092216 NON-STRUCTURAL METAL FRAMING
- 092900 GYPSUM BOARD
- 095113 ACOUSTICAL PANEL CEILINGS
- 096513 RESILIENT BASE AND ACCESSORIES
- 096519 RESILIENT TILE FLOORING
- 096723 RESINOUS FLOORING
- 097713 STRETCHED FABRIC SYSTEMS
- 099123 INTERIOR PAINTING
- 099600 HIGH-PERFORMANCE COATINGS

**DIVISION 10** SPECIALTIES
- 101100 VISUAL DISPLAY UNITS
- 101200 DISPLAY CASES
- 101400 SIGNAGE
- 102600 WALL AND DOOR PROTECTION
ARCHITECTURAL CERTIFICATION

I hereby certify that these drawings and/or specifications 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.

And I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part or parts for the **MEDICAL SCIENCE BUILDING FIRST FLOOR RESEARCH LABORATORY RENOVATION**, PROJECT NO. CP171091.

SIGNATURE: _______________________________________________________

DATE: November 6, 2017

END OF CERTIFICATION
SECTION 000003 - FIRE PROTECTION, PLUMBING, MECHANICAL CERTIFICATION

I, Randy Diemer, hereby specify that pursuant to RSMO.327.411 the documents intended to be authenticated by my seal are limited to:

SPECIFICATIONS:

DIVISION 21  FIRE SUPPRESSION
  210500  COMMON WORK RESULTS FOR FIRE SUPPRESSION
  211313  WET-PIPE SPRINKLER SYSTEMS

DIVISION 22  PLUMBING
  220500  COMMON WORK RESULTS FOR PLUMBING
  220519  METERS AND GAGES
  220523  GENERAL DUTY VALVES
  220529  HANGERS AND SUPPORTS
  220553  IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
  220719  PLUMBING PIPING INSULATION
  221113  NATURAL GAS PIPING
  221116  DOMESTIC WATER PIPING
  221117  LABORATORY WATER PIPING
  221119  DOMESTIC WATER PIPING SPECIALTIES
  221316  STORM, SANITARY WASTE AND VENT PIPING
  221319  SANITARY WASTE PIPING SPECIALTIES
  224000  PLUMBING FIXTURES
  226113  COMPRESSED AIR PIPING FOR LABORATORY FACILITIES
  226213  VACUUM PIPING FOR LABORATORY FACILITIES
  226700  PROCESSED WATER SYSTEMS FOR LABORATORY FACILITIES

DIVISION 23  HEATING, VENTILATING, AND AIR-CONDITIONING (HVAC)
  230100  BASIC MECHANICAL REQUIREMENTS
  230500  BASIC MECHANICAL MATERIALS AND METHODS
  230513  MOTORS
  230519  METERS AND GAGES
  230523  VALVES
  230529  HANGERS AND SUPPORTS
  230540  MECHANICAL VIBRATION ISOLATION
  230700  MECHANICAL INSULATION
  230900  CONTROL SYSTEMS
  230990  TESTING, ADJUSTING, AND BALANCING
  232113  HYDRONIC PIPING
  232123  HYDRONIC PUMPS
  232213  STEAM AND CONDENSATE PIPING
  233113  METAL DUCTS
  233300  DUCT ACCESSORIES
  233419  LABORATORY MECHANICAL SYSTEMS
  233423  FANS & VENTILATORS
  233600  AIR TERMINAL UNITS
  233713  DIFFUSERS, REGISTERS, AND GRILLES
I hereby certify that these drawings and/or specifications 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.

And I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part or parts for the MEDICAL SCIENCE BUILDING FIRST FLOOR RESEARCH LABORATORY RENOVATION, PROJECT NO. CP171091.

SIGNATURE: [Signature]

DATE: November 6, 2017

END OF CERTIFICATION

[Stamp]
SECTION 000004 - ELECTRICAL CERTIFICATION

I, Monica Santos, hereby specify that pursuant to RSMO.327.411 the documents intended to be authenticated by my seal are limited to:

SPECIFICATIONS:

DIVISION 26  ELECTRICAL

  260500  COMMON WORK RESULTS FOR ELECTRICAL
  260519  LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES
  260526  GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS
  260529  HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS
  260533  RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS
  260536  CABLE TRAYS FOR COMMUNICATIONS SYSTEMS
  260544  SLEEVES AND SLEEVE SEALS FOR ELECTRICAL SYSTEMS
  260553  IDENTIFICATION FOR ELECTRICAL SYSTEMS
  260572  OVERCURRENT PROTECTIVE DEVICE SHORT-CIRCUIT STUDY
  260573  OVERCURRENT PROTECTIVE DEVICE COORDINATION STUDY
  260574  OVERCURRENT PROTECTIVE DEVICE ARC FLASH STUDY
  260923  LIGHTING CONTROL DEVICES
  262200  LOW VOLTAGE TRANSFORMERS
  262416  PANELBOARDS
  262726  WIRING DEVICES
  262813  FUSES
  262816  ENCLOSED SWITCHES AND CIRCUIT BREAKERS
  262913  ENCLOSED CONTROLLERS
  262923  VARIABLE FREQUENCY MOTOR CONTROLLERS
  265119  LED INTERIOR LIGHTING
  265219  EMERGENCY AND EXIT LIGHTING

DIVISION 27  COMMUNICATIONS

  270500  COMMON WORK RESULTS FOR COMMUNICATIONS
  270544  SLEEVES AND SLEEVE SEALS FOR COMMUNICATIONS PATHWAYS AND CABLING

DIVISION 28  FIRE ALARM SYSTEMS

  283111  DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM
I hereby certify that these drawings and/or specifications 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.

And I hereby disclaim any responsibility for all other plans, specifications, estimates, reports or other documents or instruments relating to or intended to be used for any part or parts for the MEDICAL SCIENCE BUILDING FIRST FLOOR RESEARCH LABORATORY RENOVATION, PROJECT NO. CP171091.

SIGNATURE: ________________________________
Monica Santos, P.E. 2000174546

DATE: November 6, 2017

END OF CERTIFICATION
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
c/o Director, Campus Facilities- Planning Design and Construction
Room L100 General Services Building
Columbia, Missouri 65211

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by PGAV Architects and their sub-consultants, entitled "MU MEDICAL SCIENCE BUILDING FIRST FLOOR RESEARCH LABORATORY RENOVATION", project number CP171091, November 6, 2017 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 to renovate portions of the Medical Science Building first floor as shown on the documents; 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: M148 Flooring
Base Bid: Patch and repair existing resinous floor and integral cove as indicated.
Add Alternate: Demolish existing resinous floor throughout, patch and repair existing slab to receive new finishes, mitigate moisture in slab as required (alternate pricing to include moisture mitigation throughout affected area), and install new LVT floor and resilient base as specified.
All for sum of:

______________________________________________
DOLLARS ($__________).  

(2) Additive Alternate No. 2: M123 Sprinklers
Base Bid: Existing to remain.
Add Alternate: Extend sprinkler coverage throughout M123 and surrounding spaces as indicated.
All for sum of:

______________________________________________
DOLLARS ($__________).  

(3) Additive Alternate No. 3: M124 & M145 Finishes
Base Bid: Patch and repair existing VCT floor and rubber base as indicated. Paint new construction walls in corridor to match existing.
Add Alternate: Demolish existing VCT floor and rubber base throughout as indicated, patch and repair existing slab to receive new finishes, mitigate moisture as required (alternate pricing to include moisture mitigation throughout affected area), and install new VCT floor and rubber base as specified. Paint new and existing walls per schedule.
All for sum of:

______________________________________________
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) Note that the term “Base Bid Quantity” may not necessarily be directly related to the actual base bid scope of work. Certain items may also apply in part or in whole to additive alternate scopes of work.

(7) Floor Preparation as defined in Divisions 3 & 9:

A2
(a) Hydraulic Cement Underlayment as described in Sections 035416 & 090561.
Base Bid Quantity = 6,000 s.f.
$_________/s.f.

(b) Floor slab moisture mitigation for use beneath LVT and/or VCT as described in Sections 090561 and 096519.
Base Bid Quantity = 6,000 s.f.
$_________/s.f.

(c) Floor slab moisture mitigation for use beneath resinous flooring as described in Sections 090561 and 096723.
Base Bid Quantity = 400 s.f.
$_________/s.f.

(8) Hazardous Material Abatement as defined in Division 2:
(a) Removal of ACM pipe insulation (up to 6” pipe,)
Base Bid Quantity = 630 l.f.
$_____/l.f.
(b) Removal of ACM Pipe fitting insulation
Base Bid Quantity = 100 each
$_____/each
(d) Removal of ACM floor leveling material greater than ½” thick
Base Bid Quantity = 100 s.f.
$_____/s.f.
(e) Removal of ACM Exterior Window Caulk
Base Bid Quantity = 20 windows each
$_____/each
(f) Removal of ACM transite ductwork
Base Bid Quantity = 340 l.f.
$_____/l.f.

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 Two Hundred and Seventy (270) 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. Special Scheduling Requirements – Refer to Special Conditions for specific scheduling requirements for this project.

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

Electrical

Plumbing

Laboratory Casework

FM and/or UL Certified Fire Stopping 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 an irrevocable letter of credit, 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.

<table>
<thead>
<tr>
<th>Authorized Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Printed Name</td>
<td>Title</td>
</tr>
<tr>
<td>Company Name</td>
<td></td>
</tr>
<tr>
<td>Mailing Address</td>
<td></td>
</tr>
<tr>
<td>City, State, Zip</td>
<td></td>
</tr>
<tr>
<td>Phone No.</td>
<td>Federal Employer ID No.</td>
</tr>
<tr>
<td>Fax No.</td>
<td>E-Mail Address</td>
</tr>
<tr>
<td>Circle one: Individual Partnership Corporation Joint Venture</td>
<td></td>
</tr>
<tr>
<td>If a corporation, incorporated under the laws of the State of_______</td>
<td></td>
</tr>
<tr>
<td>Licensed to do business in the State of Missouri? _____yes _____no</td>
<td></td>
</tr>
</tbody>
</table>

(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
This page is intentionally left blank.
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).

<table>
<thead>
<tr>
<th>Project &amp; Address</th>
<th>Owner/Owner's Representative</th>
<th>Phone Number</th>
<th>Architect</th>
<th>Amount of your Contract</th>
<th>Percent Completed</th>
</tr>
</thead>
</table>

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.

<table>
<thead>
<tr>
<th>Project &amp; Address</th>
<th>Owner/Owner's Representative</th>
<th>Phone Number</th>
<th>Architect</th>
<th>Amount of your Contract</th>
<th>Percent Completed</th>
</tr>
</thead>
</table>

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

1. Company Name__________________________Phone# ______________________
   Address ________________________________________________________________

2. State of Missouri Registration number______________________________

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

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

<table>
<thead>
<tr>
<th>Project &amp; Address</th>
<th>Owner/Owner's Representative</th>
<th>Phone Number</th>
<th>Architect</th>
<th>Amount of your Contract</th>
<th>Percent Completed</th>
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5. General character of work performed by your company personnel.

6. 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.

<table>
<thead>
<tr>
<th>Project &amp; Address</th>
<th>Owner/Owner's Representative</th>
<th>Phone Number</th>
<th>Architect</th>
<th>Amount of your Contract</th>
<th>Percent Completed</th>
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7. Other experience qualifying you for the work now bid.

8. 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

9. (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

10. 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.)

11. 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.)

12. Workers Compensation Experience Modification Rates (last 3 yrs): / / 
    Incidence Rates (last 3 years): / / 

13. List banking references.

14. (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?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>If yes, please provide details and attach a copy of the certification.</th>
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</table>

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?

<table>
<thead>
<tr>
<th>Yes</th>
<th>No</th>
<th>If yes, please attach letter.</th>
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</table>

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

SD/5
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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 DIVERSITY AGENCIES

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
1015 Locust
St. Louis, MO 63101
314/622-3400; 314/622-3413 (Fax)
CONTACT: Minority Business Development Manager

Metro
707 North First Street
St. Louis, MO 63102-2595
314/982-1400; 314/982-1558 (Fax)
CONTACT: Disadvantaged Business Enterprise Coordinator

St. Louis Minority Business Council
308 North 21st St., 7th Floor
St. Louis, MO 63101
314/241-1143; 314/241-1073 (Fax)
CONTACT: Executive Director

U.S. Small Business Administration - St. Louis, MO
8(a) Contractors, Minority Small Business
1222 Spruce Street, Suite 10.103
St. Louis, MO 63101
314/539-6600; 202/481-6565 (Fax)
CONTACT: Business Opportunity Specialist

Lambert St. Louis International Airport
11495 Navaid
Bridgeton, MO 63044
314/551-5000; 314/551-5013 (Fax)
CONTACT: Program Specialist

City of Kansas City, Missouri
Human Relations Department, MBE/WBE Division
4th Floor, City Hall
414 E. 12th Street
Kansas City, MO 64106
816/513-1836; 816/513-1805 (Fax)
CONTACT: Minority Business Specialist

Mid America Minority Development Council
7777 Admiral Boulevard
Kansas City, MO 64106
816/221-4200; 816/221-4212 (Fax)
CONTACT: President

U.S. Small Business Administration - Kansas City, MO
8(a) Contractors, Minority Small Business
1000 Walnut, Suite 500
Kansas City, MO 64106
816/426-4900; 816/426-4939 (Fax)
CONTACT: Business Opportunity Specialist

Missouri Department of Transportation
Division of Construction
P.O. Box 270
Jefferson City, MO 65102
573/515-6801; 573/526-5640-6555 (Fax)
CONTACT: Disadvantaged Business Enterprise Coordinator

Illinois Department of Transportation
MBE/WBE Certification Section
2300 Dirksen Parkway
Springfield, IL 62764
217/782-5490; 217/785-1524 (Fax)
CONTACT: Certification Manager

State of Missouri-Office of Administration
Office of Supplier & Workforce Diversity
P.O. Box 809
Jefferson City, MO 65102
573/515-8130; 573/522-8078 (Fax)
CONTACT: MBE/WBE Certification Coordinator
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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:

<table>
<thead>
<tr>
<th>Scope of Work</th>
<th>Bid/Contract Amount</th>
<th>Final Dollar Amount</th>
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<tbody>
<tr>
<td>Base Bid</td>
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<tr>
<td>Alternate #1</td>
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<td>Alternate #2</td>
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<td>Alternate #3</td>
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<td>Alternate #4</td>
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<td>Alternate #5</td>
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<td>Alternate #6</td>
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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: __________________________
THIS PAGE LEFT BLANK INTENTIONALLY
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 any thing 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 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 work days) 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 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 Statute 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 and manufactured in marketable quantity and quality in the State of 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.

The University will grant a three (3) point bonus preference to a Missouri based, certified Service Disabled Veteran Enterprise (SDVE) bidder as defined in Article 1 – (Supplier Diversity Definitions) of the General Conditions of the Contract for Construction included in the contract documents.

15.2 List of Supplier Diversity Firms

A list of suppliers may be required as part of the bid 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.

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

15.2.2 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 firms as contractors, subcontractors, and suppliers. The percent of contract price stated in the Supplier Diversity goal paragraph of the Bid for Lump Sum Contract Form.

15.4 Supplier Diversity Percent Goal Computation

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.

15.4.1 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
expected to obtain the required SDVE, and WBE/Veteran/DBE goals, a MBE 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 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.

15.4.3.1 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.

15.4.3.2 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.

15.4.3.3 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.

15.4.4 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.

15.4.5 On projects with separate MBE and WBE/Veteran/DBE goals, the Owner may allow MBE participation provided in excess of the MBE goal to be counted towards the WBE/Veteran/DBE goal.

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 list of 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. Bidder’s 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 work day) 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

September 2016 Edition
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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 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.

1.1.6 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.

1.1.7 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 person must have a personal net worth that does not exceed $22.41 million. To be regarded as economically disadvantaged, an individual must have a personal net worth that does not exceed $1.32 million. To be regarded 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, incidental 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", "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.
1.17 Day
The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

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.

1.19 Punch List
“Punch List” means the list of items, prepared in connection with the inspection 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.

1.2 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 be 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 the 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 breach 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 breach 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, Permits, Regulations and Inspections

3.2.1 The Contractor shall, without additional expense to the Owner, comply with all applicable laws, ordinances, rules, 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 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 bench mark 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 work day 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 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 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 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 reinsurers of any of the foregoing (hereafter collectively referred to as the “Indemnities”) 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 Indemnities 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 includes 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 Materials, Labor, and Workmanship

3.11.1 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.

3.11.2 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.

3.11.3 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.

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

3.11.5 Materials and workmanship shall be subject to inspection, examination, and test 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.

3.11.6 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.

3.11.7 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.

3.11.8 Substitutions

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

3.11.8.2 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 Documents, 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.

3.11.8.3 Substitutions may be rejected without explanation in 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.

3.11.8.4 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 substitute.

3.12 Approved Equal

3.12.1 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.

3.12.2 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.

3.12.3 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.

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

3.13.1 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.

3.13.2 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.

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

3.13.4 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.

3.13.5 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.
3.13.6 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 transmitted, 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.

3.13.7 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, Contractor shall be responsible for the correctness of dimensions, details and the design of adequate connections and details contained in the Shop Drawings.

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.

3.13.8 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.

3.13.9 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.

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

3.13.11 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.

3.13.12 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.

3.13.13 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.

3.13.14 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.

3.14 Record Drawings

3.14.1 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,
3.15 Operating Instructions and Service Manuals

3.15.1 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.

3.15.2 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.

3.16 Taxes

3.16.1 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.

3.16.2 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.

3.16.3 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 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.

3.16.4 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.

3.16.5 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
Prior to submittal to the Owner's Representative, the schedule shall be prepared using Primavera. Contractor shall comply with the following requirements of the Special Conditions to this contract. At a minimum, contractor shall monitor the progress of the Work for conformance with the 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.

3.17 Contractor’s Construction Schedules

3.17.1 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.

3.17.2 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.

3.17.3 As time is of the essence to this contract, the University expects that the Contractor will take all necessary steps to insure 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).

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.

3.17.4 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 and the Owner's Representative 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 rescission. 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 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 If any other Force Majeure event results in the delay to the critical path of the project, the Owner will consider a time extension request from the Contractor that is submitted in accordance with the contract requirements.

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 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
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**

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

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.

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.

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**

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, by strikes, lockouts, abnormal weather conditions, jurisdictional disputes, 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) 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 in 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. Written notices hereunder shall be in accordance with the applicable provisions of Section 4.7.

8.2.3 The Contractor further acknowledges and agrees that adjustments to 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 similar claims due to or caused by any events beyond the control of both the Owner and Contractor. 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 promptly provide written notice to the Owner. 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. 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:

GC/23
09/16
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 of 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 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 time 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 the appropriate UCC filing, 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.

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 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 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
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 1.1.9 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. 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, 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 it's employees and it’s 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 by telephone or messenger to the Owner.

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.

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**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 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 Requirements
11.5.1 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 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 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 or entity acceptable to the Owner, and shall bear related costs of tests, inspections, and approvals. The Contractor shall give the Architect and the Owner's Representative timely notice of when and where tests and inspections are to be made so the Architect and/or the Owner's Representative may observe procedures.

13.3.2 If the Architect or the Owner's Representative 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, and the Owner's Representative, of when and where tests and inspections are to be made so the Architect and/or the Owner's Representative may observe such procedures. 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 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
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.

The Contractor may pay workers a rate of pay less than required by the wage rates made a part of the Contract, provided the worker is a bona fide Apprentice or Trainee and also meets the other criteria as set forth in MDLIR 8 CSR 30-3.030.

**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 The Contractor may pay workers a reduced rate of pay, provided the worker is a bona fide Apprentice or Trainee and also meets the other criteria as set forth in MDLIR 8 CSR 30-3.030.

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.

13.7 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 NFPA 70 National Electric Code (NEC)
.5 Americans with Disabilities Act – Standards for Accessible Design.
.6 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
.7 NFPA 101 Life Safety Code (as noted above)
.8 American Concrete Institute (ACI)
.9 American National Standards Institute (ANSI)
.10 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.11 American Refrigeration Institute (ARI)
.12 American Society for Testing and Materials (ASTM)
.13 Missouri Standard Specification for Highway Construction, Missouri State Highway Commission
.14 National Electrical Manufacturers Association (NEMA)
.15 Underwriter's Laboratories, Inc. (UL), Federal Specifications
.16 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 responsibilities or obligations of the Contractor also apply to any third parties, and Contractor shall nevertheless remain legally responsible for all obligations under the Contract. The contractor certifies to the best of its knowledge and belief that it and its principals are not presently debarred, suspended, or proposed for debarment, declared ineligible, or voluntarily 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 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, only such provision or portion thereof shall be ineffective, without invalidating or affecting 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.

13.9.9 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 Debarment and Suspension Certification
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).

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, or regulations or orders of a public authority having jurisdiction;
.5 disregards the authority of the Owner's Representative or Architect;
.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 as referred to in and accompanying Project Manual consist of Drawings prepared by and bearing name of below defined Architect and consultants, bearing the title "MU Medical Science Building First Floor Research Laboratory Renovation", and project number CP171091, and dated November 6, 2017. Requirements for materials and products identified on Drawings are described in the Project Manual.

B. Project Manual:

Specifications prepared by and bearing name of below defined Architect and consultants, bearing the title "MU Medical Science Building First Floor Research Laboratory Renovation", and project number CP171091, and dated November 6, 2017. Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

1. Imperative mood and streamlined language are generally used in the Specifications. The words “shall,” “shall be,” or “shall comply with,” depending on the context, are implied where a colon (:) is used within a sentence or phrase.
2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.

C. Owner: The Curators of the University of Missouri, a public corporation of the state of Missouri.

D. Architect:

PGAV Architects
1900 W 47th Pl Suite 300
Westwood, KS 66205
913-362-6500

E. Mechanical, Plumbing and Fire Protection Engineer:

Ross & Baruzzini
6 South Old Orchard
St. Louis, MO 63119
314-918-8333

F. Electrical Engineer:

Antella Consulting Engineering
1600 Genessee, Suite 260
Kansas City, MO 64102
816-421-0950

G. Disruptive Activity:

Disruptive Activity shall be defined as any work generating excessive noise, vibration, or offensive odors impacting the use of occupied spaces; or any work impacting the life safety of building occupants. Examples of disruptive activity include, but are not limited to the following:

1. Any demolition or construction activity performed within the existing building outside of construction barriers, excluding transportation of waste, materials, tools and equipment as described under Non-disruptive work activity below.
2. Any demolition, saw cutting, shooting of fasteners or anchors, drilling into, or core drilling of concrete or masonry.
3. Installation of any product or use of any tool that introduces noxious fumes or odors to occupied spaces. This does not include the application of low VOC finishes.
4. The use of any tools or equipment requiring an air compressor inside the building.

H. Non-disruptive Activity:

Non-disruptive Activity shall be defined as any work capable of being performed adjacent to occupied space without impacting building use or life safety. Examples of non-disruptive activity include:

1. Demolition of flooring, suspended ceilings, interior stud partitions, fixtures, and ductwork within construction barriers. Includes the use of handheld tools and equipment such as reciprocating saws.
2. Careful transportation of construction waste from the work area to dumpsters. All construction waste transported through the building shall be via covered bins.
3. Careful transportation of construction materials, tools or equipment to and from the work area through the existing building.
4. Stud framing and drywall installation, including the use of screw guns and chop saws. This does not include the use of powder activated fasteners to install runner track.
5. Installation of ductwork and mechanical equipment within construction barriers.
6. Installation of electrical systems and fixtures within construction barriers.
7. Installation of plumbing and sprinkler systems and fixtures within construction barriers.
Installation of floor, wall, and ceiling finishes within construction barriers.

I. Dirty Activity: Dirty activity shall be defined as any activity generating air borne dust, such as demolition, drywall sanding, etc.

J. Thorough Clean: Contractor shall retain an outside bonafide cleaning company to perform final thorough cleaning of project area upon completion of each phase.

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

2. SPECIAL SCHEDULING REQUIREMENTS

A. Contractor shall complete project within (270) calendar days from receipt of aforementioned documents. Fifteen (15) calendar days have been allocated in the construction schedule for receiving aforementioned documents from Bidder. Work shall be completed in two phases:

1. Contractor shall complete Phase 1 within (210) calendar days from receipt of aforementioned documents. Contractor will not have access to the renovation area prior to December 15th, 2017 to perform any demolition or construction activities, unless otherwise noted in writing by Owner.

2. Owner will vacate Phase 2 work area by June 22nd, 2018, and Contractor may begin Phase 2 work immediately once Owner vacates the premises. Contractor may begin Phase 2 work prior to substantial completion of Phase 1, with Phase 1 and Phase 2 activities proceeding concurrently. Contractor shall complete Phase 2 within the remainder of the contract duration.

3. Bid Alternate #1, if accepted, will be completed concurrently with Phase 2.

4. Bid Alternate #2, if accepted, will be completed between December 18th, 2017 and January 10th, 2018. This room is scheduled for Owner’s use prior to and following this period, so construction activities will be limited to the timeframe specified.

5. Bid Alternate #3, if accepted, will be completed concurrently with Phases 1 & 2 as appropriate for completion of the work. Provisions for temporary egress will be required.

B. Outages requiring in excess of 48-hours shall be scheduled to occur during one of the following timeframes when scheduled classes are in recess:

1. Winter Recess: December 18th, 2017 through January 12th, 2018

2. Spring Break: March 24th, 2018 through March 31st, 2018

3. Summer Recess: May 21st, 2018 through August 3rd, 2018

C. Owner will occupy the premises during the entire construction period, with the exception of areas under construction as indicated on drawings. Cooperate fully with Owner during construction operations to minimize conflicts and facilitate Owner operations.

1. Maintain existing building in a secure, weather tight condition throughout construction. Temporary protection shall be provided by the Contractor as needed to maintain indoor environment and adequately protect and maintain public use of, and access to occupied portions of the building for the duration of the Project. Temporary protection shall include zipwall or similar dust barrier system to minimize disruption to building occupants, and HEPA filtered dedicated exhaust system to exterior (negative air) to maintain dust control during project. Provide walk-off tacky matts at all project locations that cross into occupied building areas. All provisions for temporary protection of occupied areas and existing construction to remain shall be installed prior to beginning demolition or construction activities for each phase.

2. Maintain access to existing stairs, walkways, corridors, and other adjacent occupied or used facilities at all times. Do not close or obstruct walkways, corridors, or other occupied or used facilities without written permission from Owner and authorities having jurisdiction.

3. Provide not less than 72 hours’ notice to Owner of activities that will affect Owner’s operations.

4. Owner will be responsible for moving and installing all existing and/or Owner furnished laboratory equipment. Contractor shall not move or install existing and/or Owner furnished laboratory equipment unless specifically directed to do so in writing. If existing furniture or equipment is found to be in conflict with, or preventing required Contractor access for construction or demolition activity, Contractor shall notify the Owner’s Representative a minimum of 72 hours prior to the scheduled start of that activity so that Owner can arrange for removal.

5. Construction activities inside the existing building and adjacent to occupied spaces shall be kept free of construction debris, materials and equipment to the greatest extent possible. Contractor shall periodically survey the condition of occupied areas to ensure that they are free of construction debris, construction dust, materials, and equipment. Contractor shall clean areas affected by construction activities at the end of each construction day at a minimum.

6. Contractor shall protect existing casework and laboratory equipment to remain in renovation areas from dust and debris as required.

7. Contractor shall be responsible for cleaning laboratory countertops and floors before returning work areas to Owner operations.

D. The existing dual temperature system serving 2nd floor east wing must be maintained until new systems
are installed, with outages for switch-over limited to 48 hours or less.

E. On-Site Work Hours: Contractor shall have access to project area 24 hours a day, 7 days a week.

(1) The project may be completed during normal working hours, with the exception of Disruptive Activities. Contractor shall perform all disruptive activities Before 7:00am and after 5:00pm. The Contractor shall plan for the labor rates needed to complete Disruptive Activities before 7:00am and after 5:00pm.

(2) Any work that requires eliminating the building occupants’ access to the building egress or accessible route will also need to occur outside of normal operating hours, unless alternative means of egress are provided. Proposed alternative means of egress must be approved in writing by Owner.

(3) Coordinate large deliveries with Owner to limit interruption to daily activities.

F. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions, and then only after providing temporary utility services according to requirements indicated:

(1) Notify Owner not less than (5) days in advance of proposed utility interruptions.

(2) Contractor will be responsible for coordinating all utility shutdowns with Owner. Contractor shall not shut down utilities without Owner present.

(3) The following utility shut downs will be allowed during normal business hours:
   a. Lab Air
   b. Control Air
   c. Natural Gas
   d. Vacuum

(4) Domestic Water requires shut down of the entire building. A maximum of two occurrences for water shutdown will be allowed through the duration of the project. These shutdowns must occur on a weekend or after hours on a weekday, with Owner present.

(5) HHW, CHW, Steam, Condensate: Shutdowns will occur outside of normal business hours.

(6) Electricity: Power outages will occur outside of normal business hours. Contractor to coordinate with Owner to minimize power outages with other work occurring in the building. Maximum outage time is three hours.

G. Project sequence and inter-project dependencies must be maintained in the Contractor’s schedule. Schedule development shall include, but not be limited to MU work activities of Controls, TAB, IT, Engineering Support, and Inspections and Testing.

H. Phase 1 Construction Requirement: Prior to AHU start-up and 2nd pass (see Controls spec 230900) by Owner, all Dirty Activities will be complete. Contractor shall in all instances be responsible for “Thorough Clean” requirements. The Owner requires AHU start-up / air movement a minimum of 30 days prior to substantial completion to perform TAB and 2nd pass controls. Pre-punch inspection will take place 45 days prior to substantial completion to allow 15 days to complete Dirty Activities.

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 the partial renovation of the first floor of the Medical Sciences Building, with the strategic goal of creating new laboratory, and laboratory support space for the School of Medicine. Bid alternates include expanded new finish and fire suppression extents.

(2) Demolition consists of selective removal of existing construction as shown on plans and as required to complete the work.

(3) Hazardous material abatement as described in the Owner-provided field survey includes pipe wrap, flooring, and transite ducts. Abatement work to be completed outside of normal working hours.

(4) Architectural work consists of new partitions, doors, lab casework, ceilings, finishes, and equipment, as well as selective modification of existing construction as indicated.

(5) Mechanical work consists of new mechanical equipment, ductwork, and plumbing systems as indicated. Work will include modifications to existing ductwork, steam, condensate, domestic water, chilled water, heating hot water, DI water, natural gas, lab vacuum, and sanitary sewer. Systems installed to include all required joints, guides, anchors, thermal insulation, etc. Direct digital controls will be provided for all temperature control functions in the building, with reporting to a central building energy management control system. The central building energy management control system shall be Johnson Controls.

(6) Electrical work consists of new power and lighting throughout the renovation areas as
indicated. Existing Fire alarm system is modified as required for new space configuration. New panelboards are provided for the renovated area. Existing panel P5 is replaced with new. There is a panel on second floor and on penthouse that are backed up due to removal of panels.

(7) Fire protection work consists of new wet-pipe sprinkler system throughout the areas indicated.

4. LOCATION

A. Work shall be performed under this Contract on the campus of the University of Missouri, on the first floor of the Medical Sciences Building, Columbia, Missouri 65212.

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.

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 digital versions of all required Shop Drawings, material and equipment lists in PDF format. 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. Refer to: http://projex4.cf.missouri.edu/projex/ for protocols for the use of this website. Each submittal shall have the General Contractor’s 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 as hard copies with a manual seal affixed, in addition to the digital PDF copy described above.

  (1) The Contractor shall include the following information on each submittal item:
    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. Samples: The Contractor shall submit four (3) sets of all required physical samples. This number will allow for one (1) set of samples to be returned to the Contractor for record. Samples should be addressed and sent directly to the Architect for review.

E. The Contractor shall submit to the Architect one (1) bound copy plus one PDF copy 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. Hard copy and pdf shall be the same. 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).

F. 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

A. 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, steam, sewer, and nitrogen. 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) The Owner will issue Contractor two (2) service vehicle parking permits for use in University Tiger Ave. Parking Garage top level. The permits will be issued at no cost to the contractor up to the contract completion date. After the contract completion date, the permits will be re-issued on an as available basis at the contractor’s expense. These permits are to be used for general contractor or subcontractor owned and labeled vehicles only. Personal vehicles are prohibited from use of these permits. Violation of this requirement may result in ticketing and/or towing at the vehicle owner’s expense and suspension of progress payments.

   (2) North Construction Staging Area (North of Lottes Library): Parking for service vehicles will be permitted in this area beginning March 26th, 2018, for Contractor’s use.

   (3) Parking of personal vehicles within project access/lay down/staging areas is prohibited. Violation of this requirement may result in ticketing and/or towing at the vehicle owner’s expense and suspension of progress payments.

   (4) 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.

   (5) Free parking for contractor employees is available in the Ashland Road Contractor lot on an as available basis. This space is for use by contractor employees for parking their personal vehicles only and is not to be used for staging or storage.

   (6) Vendor Permits may be purchased by contractor management personnel on an as available basis by contacting the Parking and Transportation office in the Turner Avenue Parking Structure. These permits will allow contractor management personnel to park in various University lots while conducting business on University construction projects.

   (7) Temporary University parking permits may be purchased by contractor employees for use with their personal vehicles on an as available basis by contacting the Parking and Transportation office in the Turner Avenue Parking Structure.

   (8) Conley Avenue between Missouri Avenue and University Avenue and Hitt Street between University Avenue and the Memorial Union are designated for pedestrian use only during the work week between the hours of 8:15 AM and 3:45 PM. Unless otherwise indicated in the contract documents, this area is strictly off limits to vehicular traffic without authorization from the Owner’s Representative.

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.

D. Utilities: Drinking water, water required to carry on work, and 120 volt electrical power required for small tool operation may be obtained without cost to the Contractor from existing utilities at locations designated by the Owner's Representative. Provisions for obtaining power, including temporary extensions, shall be furnished and maintained by the Contractor. Upon completion of work such extensions shall be removed and any damage caused by use of such extensions shall be repaired to satisfaction of the Owner's Representative, at no cost to the Owner.

E. Restroom: Existing toilet facilities within Project Limits or Restrooms designated by the Owner’s Representative for use by the Contractor will be available. Failure of the Contractor to maintain restrooms in a clean condition will be cause for the Contractor’s discontinued use of the restroom.
F. Use of tobacco products 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 use of any tobacco products or e-cigarettes.

G. 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.

H. 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.

I. 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 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 through the following link: 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”)

There are no known “permit required confined spaces” within the project limits. Each contractor shall conduct a survey to confirm whether or not any confined spaces exist within the project limits. It is incumbent upon each contractor to list all “permit required spaces”.

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.

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. Finishes: Existing finishes not specifically noted to be removed shall remain in place and be protected from damage resulting directly or indirectly from any and all construction and/or demolition activity. Existing construction to remain which is damaged by the Contractor and/or his Subcontractors shall be repaired or replaced with similar and/or superior material to the satisfaction of the Owner at no additional cost to the Owner. If the Owner elects to make repairs, Contractor shall reimburse Owner for the cost of the repairs.

C. Construction Project Fencing: 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.

D. Preserving and Protecting Existing Vegetation and Electrical Gear/Utility Manholes:
   1. Trees and shrubs within work area designated to remain shall be protected from damage during construction by fixed chain link fencing or armoring as 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.
   2. 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.
   3. 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.
   4. Pruning of limbs necessary to repair damage or provide clearance for work shall be done by the MU Landscape Services Department. Limbs shall be cut off cleanly and cut surfaces treated according to established horticultural standards.
   5. Any lawn areas damaged by Contractor during construction shall be regraded by Contractor. MU Landscape Services will reseed lawn areas once final grading by Contractor is complete.
   6. Protect existing transformer located within project staging area with fencing. Protect utility manholes from damage.

10. SUBSTITUTIONS AND EQUALS

A. Substitutions are defined in General Conditions article 3.11.8 for and Equals are defined General Conditions Article 3.12.

B. Substitutions and/or Equals of the item(s) listed below will be allowed only prior to receipt of bids provided that a written request for approval has been received by both the Architect and the Owner at least ten calendar days prior to the date for receipt of Bids. All other substitution and/or Equals items shall follow the procedures set forth in the General Conditions.

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum Windows</td>
<td>085113</td>
</tr>
<tr>
<td>Acoustical Ceiling Tile</td>
<td>095113</td>
</tr>
<tr>
<td>Laboratory Fume Hoods</td>
<td>115313</td>
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<tr>
<td>Biological Safety Cabinets</td>
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<td>Wood Laboratory Casework</td>
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<td>Laboratory Worksurfaces</td>
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<tr>
<td>Chilled Water &amp; Heating Hot Water Control Valves</td>
<td>230900</td>
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<tr>
<td>Laboratory Air Volume Control Products</td>
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<td>Heat Exchangers</td>
<td>235700</td>
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<tr>
<td>Modular Air Handling Units</td>
<td>237313</td>
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<tr>
<td>Lighting Controls</td>
<td>260923</td>
</tr>
<tr>
<td>LED Interior Lighting</td>
<td>265119</td>
</tr>
</tbody>
</table>

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.
D. No substitutions and/or equal will be allowed for the following items:

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lock Cylinders [Best]</td>
<td>087100</td>
</tr>
<tr>
<td>Fire Alarm [FCI 7200]</td>
<td>283111</td>
</tr>
</tbody>
</table>

11. CODES AND STANDARDS

A. The Contractor shall comply with applicable codes and standards as listed in General Conditions. The following codes and standards shall also apply:

(1) 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. SPECIALTIES

A. Owner furnished topsoil: The Owner will place the topsoil and provide final grade.

(1) Final plantings will be by the Owner. The Owner will water and maintain all seed, sod and landscaping.

13. PRE-BID INSPECTION

A. Pre-bid inspections of work areas shall be scheduled with pre-bid inspection guide, telephone: (573) 882-2228.

14. ROOF WARRANTY REQUIREMENT

A. Owner has an existing roof warranty on roof of the Medical Science Building which is included at the end of this section. The Contractor shall use a licensed applicator of the existing roofing system to make and repair roof penetrations in order for the Owner’s existing warranty to remain in full force and effect.

- Roof System Manufacturer: Soprema, Inc.
- Roof Type: BUR-Modified SBS System
- Installer: Kirberg Roofing – St. Louis
- Manufacturer’s Warranty: 20 years
- Substantial Completion: August 28th, 2000
- Expiration Date: August 28th, 2020

B. Proper protection of all existing facilities is required (see section 07150, part 3.1.C) Repairs done as part of this contract will be covered under the ‘Contractors Roofing/Flashing/Sheet Metal Guarantee’ (See CRFSMG - 1/2)

15. MODIFICATIONS TO GENERAL CONDITIONS

A. General Conditions:

(1) Add to the Insurance Requirements in General Conditions Article 11, Asbestos Liability Coverage, for specified asbestos abatement in the contract documents, in a limit no less than $1,000,000 combined single limit, per occurrence and aggregate, for both bodily injury and property damage combined. The Owner will accept coverage from the Asbestos Removal Subcontractor in lieu of the General Contractor subject to all requirements set forth in article 11.

(2) Add to the Insurance Requirements in General Conditions Article 11, Pollution Liability Coverage, for specified hazardous waste disposal in the contract documents, in a limit no less than $1,000,000 combined single limit, per occurrence and aggregate, for both bodily injury and property damage combined. The Owner will accept coverage from the Hazardous Waste Disposal Subcontractor and/or Hauler in lieu of the General Contractor subject to all requirements set forth in article 11.
16. PROJECT SCHEDULING

A. The project scheduling specification for the project are included immediately after the Special Conditions. For this project the Contractor shall meet the following scheduling requirements:

(1) 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.

17. 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 thirty (30) 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 any dimensional or detail information needed to complete the coordination drawings.

18. BUILDING SYSTEM COMMISSIONING

A. Contractor shall provide all personnel and equipment required to complete the commissioning activities referenced in the Commissioning Plan. The requirements of the commissioning 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 commissioning coordinator. The commissioning coordinator is responsible for planning, scheduling, coordinating, conducting and verifying all commissioning activities required by the commissioning 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.

19. MECHANICAL, ELECTRICAL, PLUMBING (MEP) PRE-INSTALLATION MEETING(S)

A. Before the start of MEP installation, the Contractor shall 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.

20. COST BREAKOUT FOR OWNER’S ACCOUNTING PURPOSES

A. Contractor will be required to submit the following cost breakouts on company letterhead prior to the end of the next business day following the bid opening.

(1) Cost Break Out #1: Costs for all work in rooms M144, M144A, M144B, and M144C. Provide a single cost for all work in these rooms, with a schedule of values breakdown by trade.
21. 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.

22. WARRANTY WALKTHROUGH

A. 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
Limited Warranty For Roofing System

Type of Roof: 02-2042/2043
Type of Roof Deck: Concrete
Area of Roof in Square: 20
Type of Insulation: Iso/Woodfiber

SOPREMA Approved Applicator’s Name and Address: Kirberg Roofing, 3951 Duncan Avenue, St. Louis, MO 63110

Date of Completion: 08/28/00
Date of Final Inspection: 08/28/00

Name and Address of Inspector: Kevin Athmer, 11369 Williamson Road Unit A, Cincinnati, OH 45241

SOPREMA, INC., an Ohio Corporation ("Soprema"), warrants, subject to the following terms and conditions, that the roofing membrane and flashing materials ("Roofing System") sold by Soprema in the above-described Roofing System will remain in a watertight condition for 20 years from the date of construction specified above and that the Roofing System is free from defects in material and installation at the time of application and that the materials in the Roofing System conform to Soprema’s specifications. This Limited Warranty extends only to the original owner and is not transferable or assignable to subsequent owners without the prior written consent of Soprema.

Under this Limited Warranty, Soprema will make any repairs necessary to correct leaks in the roof membrane and/or flashing if it is proven to the satisfaction of Soprema that the leak is caused by defects in the materials or the workmanship of the roofing system, or by the use of materials not specified for use in the Roofing System. The warranty does not cover any product, components, or parts not manufactured by Soprema, Inc. (Soprema), or by Soprema SA, (France). ANY PRODUCT SOLD "AS IS" AND WITHOUT ANY WARRANTY BY SOPREMA, EXPRESS OR IMPLIED. Soprema disclaims all warranties, either written or implied, design, or construction of any portion of the building, including the Roofing System, except as expressly stated and understood in the contract documents.

Soprema shall have no obligation under this Limited Warranty to make any repairs unless each of the following events shall have first occurred:

a. Soprema shall have been paid in full for the roofing materials;

b. The Roofing System and all alterations, installations, and modifications to the Roofing System shall have been installed in accordance with Soprema’s specifications and procedures by a roofing contractor approved or agreed upon in advance by Soprema;

c. All repairs and modifications to the Roofing System shall have been installed after installation shall have been approved by Soprema;

d. Owner shall have given Soprema written notice within thirty days after any defect or leak is discovered or in the exercise of ordinary care should have been discovered;

e. The completed installation of the Roofing System shall have been inspected and accepted by an inspector approved by Soprema and shall have been certified by him to be in conformity with Soprema’s specifications; and

f. Any roof shall have maintained the Roofing System in substantially the same condition or with any repairs or alterations necessary to keep the Roofing System in substantially the same condition.

This LIMITED WARRANTY DOES NOT COVER SOPREMA SHALL NOT BE LIABLE FOR ANY LEAKS OR DEFECTS THAT RESULT FROM ANY OF THE FOLLOWING CONDITIONS OR EVENTS:

1. Natural disasters and Acts of God, including, but not limited to, floods, lightning, hurricanes, hail, tornados, windstorms in excess of Beaufort Scale Number 8 of the Beaufort Scale, earthquakes, tornadoes, fires, storms, hurricanes, wind, ice, ice storms, or other acts of nature.
2. Structural failures or damages, including, but not limited to, any defects, failure, or malfunction of any material or product included in the roofing system, such as shingles, tiles, siding, or any other component of the building, if such defect or failure is caused by movements of the structure or by changes in the structure.
3. Damage resulting from any installation of the roof on the roof or through the roof membranes.
4. Damage resulting from any installation caused by movement of metal work and in no connection with the roof membranes.
5. Repairs, modifications, or alterations to the roof membrane after completion unless done in a manner approved in writing by Soprema.

Some states do not allow the exclusion or limitation of incidental or consequential damages, or limitations on how long an implied warranty lasts, so the above limitations or exclusions may not apply to you. This Limited Warranty gives you specific legal rights, and you may also have other rights which vary from state to state.

ALL OTHER WARRANTIES HEREBY EXCLUDED. THIS LIMITED WARRANTY IS EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES, WHETHER ORAL OR WRITTEN, EXPRESS OR IMPLIED. NO WARRANTY OR MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE IS MADE OR SHALL APPLY.

SOPREMA, INC.

By: Gilbert Lorenzo

Name: Gilbert Lorenzo

Title: General Manager

Date: 08/28/00

Owner:

No payment shall be made hereunder by Soprema to the extent that any cause one paid by any corporation affiliated with Soprema on account of a claim against such affiliated company arising out of the same facts.
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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 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.

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2. SCHEDULING PROCESS
   a) The intent of this section is to insure 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
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 sheetmetal 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: ________________

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## 1-E.2 OPERATING INSTRUCTIONS AND SERVICE MANUAL LOG

Project: MU Medical Science Building First Floor Research Laboratory Renovation  
Project Number: CP171091

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<td>Welder Qualifications</td>
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<tr>
<td><strong>72100 Insulation</strong></td>
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</tr>
<tr>
<td>Verify insulation is undamaged prior to its concealment.</td>
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<tr>
<td>Commissioning Items by CSI Division</td>
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<tr>
<td><strong>SBS-Modified Bituminous Membrane Rooing</strong></td>
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<tr>
<td>Conduct a preinstallation conference at project site per specifications</td>
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<tr>
<td>Perform Final Roof Inspection (Manufacturer's Rep)</td>
<td></td>
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<tr>
<td><strong>Sheet Metal Flashing and Trim</strong></td>
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</tr>
<tr>
<td>Hold Preinstallation meeting as specified</td>
<td></td>
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<tr>
<td><strong>Penetration Firestopping</strong></td>
<td></td>
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</tr>
<tr>
<td>Do not enclose firestopping with other construction until inspection has been completed.</td>
<td></td>
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<tr>
<td><strong>Joint Sealants</strong></td>
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<tr>
<td>Perform Adhesion Tests per specifications</td>
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<tr>
<td><strong>Flush Wood Doors</strong></td>
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<tr>
<td>Inspect Frames and Doors for Fire labels</td>
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<tr>
<td><strong>Aluminum Windows</strong></td>
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<tr>
<td>Hold Preinstallation meeting as specified</td>
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<tr>
<th>Commissioning Items by CSI Division</th>
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<th>Owner Witness Required</th>
</tr>
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<tbody>
<tr>
<td>Notify Owner's Representative once window installation is complete so that specified field testing can be set up. Test Per Field Quality Control section of specifications</td>
<td></td>
<td></td>
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<td>Test Reports</td>
<td>✓</td>
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<tr>
<td><strong>87100</strong></td>
<td>Door Hardware</td>
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<td>Perform Field Quality Control section of specifications</td>
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<td>Test Report</td>
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<tr>
<td><strong>90561</strong></td>
<td>Common Work Results for Flooring Preparation</td>
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<tr>
<td>Conduct moisture and PH test as specified in PH Testing Section.</td>
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<tr>
<td><strong>92117</strong></td>
<td>Gypsum Board</td>
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<tr>
<td>Verify fire rating compliance is maintained, including all wall penetrations And Stencil of Wall if applicable.</td>
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<td><strong>95113</strong></td>
<td>Acoustical Panel Ceilings</td>
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<tr>
<td>Hold Preinstallation meeting as specified.</td>
<td></td>
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<td>Meeting Minutes</td>
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<tr>
<td><strong>96513</strong></td>
<td>Resilient Base and Accessories</td>
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<tr>
<td>Provide Extra Material as specified</td>
<td></td>
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</tr>
<tr>
<td><strong>96519</strong></td>
<td>Resilient Tile Flooring</td>
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<tr>
<td>Perform pH, Chloride (moisture) and bond tests per manufacturer. Do not proceed until all manufacturing requirements are met.</td>
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<td>Test reports</td>
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<tr>
<td>Provide Extra Material as specified</td>
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<td>Transmittal</td>
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<tr>
<td>Verify product and room temperature are kept within prescribed temp ranges (typically 65F or higher) for 24 hours before and after installation.</td>
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<td><strong>99123</strong></td>
<td>Interior Painting</td>
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<td>Periodically Check Wet Film Thickness To Assure Conformance With Manufacturer's Requirements To Achieve Dry Film Thickness</td>
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<td>field report</td>
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<td>Provide Extra Material as specified</td>
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<td><strong>99600</strong></td>
<td>High-Performance Coatings</td>
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<tr>
<td>Periodically Check Wet Film Thickness To Assure Conformance With Manufacturer’s Requirements To Achieve Dry Film Thickness</td>
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<td>Test Report</td>
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<td><strong>115313</strong></td>
<td>Fume Hoods</td>
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<td>Perform Field Quality Control section of specifications</td>
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<td>Test Report</td>
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<tr>
<td>Provide factory training</td>
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<td>Signup sheet</td>
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<tr>
<td><strong>115353</strong></td>
<td>Biological Safety Cabinets</td>
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<td>Perform Field Quality Control section of specifications</td>
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<td><strong>122413</strong> Roller Window Shades</td>
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<td><strong>123553</strong> Wood Laboratory Casework</td>
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<td>Meeting Minutes</td>
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<td>Hold Preinstallation meeting as specified</td>
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<td>Provide Extra Material as specified</td>
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<td><strong>211313</strong> Wet-Pipe Sprinkler System</td>
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<td>Provide extra material as specified</td>
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<tr>
<td><strong>220500</strong> Common Work Results for Plumbing</td>
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<td>Meeting Minutes and Sign-up Sheet</td>
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<tr>
<td>Hold MEP pre-installation meeting(s.)</td>
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<tr>
<td>Instruct Owner's personnel in the proper maintenance and operation of the new system</td>
<td></td>
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<td>Schedule On-site training</td>
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<tr>
<td><strong>220553</strong> Identification for Plumbing Piping and Equipment</td>
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<td>Valve Schedule framed/posted</td>
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<td>Install valve tags on valves and control devices per specifications</td>
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<tr>
<td>221113 Natural Gas Piping</td>
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<tr>
<td>Perform Tests per Field Quality Control section of specification at 60 PSI</td>
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<tr>
<td>221116 Domestic Water Piping</td>
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<td>Test Report</td>
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<tr>
<td>Flush, chlorinate, and reflush the potable water system. Take water sample at farthest point in system and perform test by approved lab.</td>
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<td>Perform Field Quality Control section of specifications. 100 PSI hydrostatic</td>
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<tr>
<td>221117 Laboratory Water Piping</td>
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<td>Test Report</td>
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<tr>
<td>Perform Field Quality Control section of specifications.</td>
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<tr>
<td>221119 Domestic Water Piping Specialties</td>
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<td>Test Report</td>
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<td>Perform Field Quality Control section of specifications.</td>
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<tr>
<td>Proved Extra material as specified</td>
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<tr>
<td>221316 Storm, Sanitary Waste and Vent Piping</td>
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<td>Test Reports</td>
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<tr>
<td>Test per specifications for 1 hour not 15 minutes. Air test is 4 hours. DO NOT air test PVC/ Plastic Pipe.</td>
<td></td>
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<tr>
<td>224000 Plumbing Fixtures</td>
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<td>test report</td>
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<tr>
<td>Adjust and Test All Fixtures Per &quot;Field Quality Control&quot; section of spec. Clean and flush all floor drains and verify positive drainage, free of blockage</td>
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<tr>
<td><strong>226113</strong> Compressed-Air Piping for Laboratory Facilities</td>
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<tr>
<td>Perform &quot;Field Quality Control for Compressed-Air Piping in Non-Medical Laboratory&quot; section of spec.</td>
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<td>written test reports</td>
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<td><strong>226213</strong> Vacuum Piping for Laboratory</td>
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<tr>
<td>Perform &quot;Field Quality Control for Laboratory Facility Nonmedical Vacuum Piping&quot; section of spec.</td>
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<td><strong>226700</strong> Processed Qater systems for Laboratory Facilities</td>
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<td>Perform &quot;Field Quality Control&quot; section of spec.</td>
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<td>Test Report</td>
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<tr>
<td><strong>230500</strong> Basic Mechanical Materials and Methods</td>
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<td>Hold MEP pre-installation meeting(s).</td>
<td></td>
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<td></td>
<td>Meeting Minutes</td>
<td>✔</td>
</tr>
<tr>
<td>Perform Mechanical walkthrough for Owners maintenance Personnel</td>
<td></td>
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<td>Sign Up Sheet</td>
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<td><strong>230513</strong> Common Motor Requirements for HVAC Equipment</td>
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<td>Verify basic motor requirements are in accordance with documents including efficiency.</td>
<td></td>
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<td>Inspection Report</td>
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<tr>
<td><strong>230900</strong> Control Systems</td>
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| Ensure shipping material has been removed from thermostats and other control devices | | | | | ❌

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<thead>
<tr>
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<tr>
<td>Post laminated control diagram in mechanical room</td>
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<td>Verify all field devices provided by contractor are terminated</td>
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<tr>
<td>Verify all panel covers are installed</td>
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<tr>
<td>Verify method of labeling used for identification has been defined to</td>
<td></td>
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<tr>
<td>the Owners Representative</td>
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<tr>
<td>Verify power to all EMCS panels and equipment is complete</td>
<td></td>
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<tr>
<td>Verify safety alarms hard wired to control panels</td>
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<tr>
<td><strong>230990</strong></td>
<td></td>
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<tr>
<td><strong>Testing, Adjusting, and Balancing</strong></td>
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<td>Confirm approved shop drawings, as-builts, O&amp;Ms and change orders</td>
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<tr>
<td>and change orders have been submitted to the TAB engineer prior to</td>
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<td>testing and balancing</td>
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<tr>
<td>Ensure pre-test requirements as specified in paragraph 1.2 have</td>
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<td>been completed</td>
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<tr>
<td>Hold Prebalance conference as specified</td>
<td></td>
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<tr>
<td>Mark equipment settings including central positions, value indicators,</td>
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<td>fan speed control levers, etc.</td>
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<td>Notify Owner's Representative 14 days prior to the scheduled date for</td>
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<td>balancing the system</td>
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<td>Supply control diagram</td>
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<tbody>
<tr>
<td>Verify TAB Engineer notified of differences between design and installed equipment</td>
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<td><strong>232113</strong> Hydronic Piping</td>
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<td>Remove and clean all strainers after flushing system</td>
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<td><strong>232123</strong> Hydronic Pumps</td>
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<td>Align pumps to conform with manufacturer’s published tolerances</td>
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<td>Flush system and replace strainers</td>
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<td>Perform Startup Service Section of specifications</td>
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<td><strong>232213</strong> Steam and Condensate Piping</td>
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<td>Verify proper operation of all traps</td>
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<td><strong>233113</strong> Metal Ducts</td>
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<td><strong>233300</strong> Duct Accessories</td>
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<td>Pull pressure vessel permit if vessel meets state requirements</td>
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<td>Verify underground splices are performed per NEC article 110-14(b) ensuring connections and insulation are rated for underground use</td>
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<td>Perform independent tests per &quot;Field Quality Control&quot; section of spec, including megohm/high pot tests</td>
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<td>Perform resistance test as described in &quot;Field Quality Control&quot; section of spec</td>
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<td>Verify all equipment, panels, conduits and conductors are correctly labeled.</td>
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<td><strong>260572</strong> Overcurrent Protective Device Short Circuit Study</td>
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<td>Factory certified technician to set electronic overcurrent devices to approved coordination study setpoints</td>
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<td>Inspection Report</td>
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<td>Train owners representatives in setting of overcurrent devices</td>
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<td>Overcurrent Protective Device Arcflash Study</td>
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<td>Perform 'Testing' section of specifications</td>
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<td>Place arcflash labels on equipment as specified</td>
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<td>Factory rep shall provide start-up</td>
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<td>Provide factory training</td>
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<td>Factory rep shall provide pretesting and adjustment per &quot;Field Quality Control&quot; section of spec</td>
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<td>Test Emergency Lighting fixtures for proper operation</td>
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<td><strong>283111</strong> Digital, Addressable Fire-Alarm System</td>
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<td>Perform pretest and fill in pretest checklist</td>
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<td>Pre test checklist</td>
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<td>Test system operation of pull stations horns/strobes by factory trained representative</td>
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<td>Written certification of fire alarm system per NFP</td>
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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 properly installed, working, 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 in piping being turned on.
- Contractor has method to communicate “Services On” to other contractor personnel and Owner’s personnel.

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.
- Insulation must be installed.
- All hangers and bolts have been installed.
- Meter installed, working and in readable location. (Don't need metasys to turn on.)
- 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.

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.
- Insulation installed (preferred but not required)
- Pressure test completed in piping being turned on.
- Contractor has method to communicate “Services On” to other contractor personnel and Owner’s personnel.

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
- GFCI set and tested.
- Breakers set and tested.
- All needed permanent grounds are installed.
- Meter installed, working and in readable location.
- Main switchgear protected from the weather.
- Contractor has method to communicate “Services On” to other contractor personnel and Owner’s personnel.

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.
- Insulation must be installed.
- Meter installed, working and connected to Metasys.
- Building pump and automatic isolation/control valve must be installed and under control.
- 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.
Please see following website for suggested commissioning forms:

http://www.cf.missouri.edu/pdc/commissioning-forms.html
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SECTION 1.F
LIST OF DRAWINGS

Drawings referred to in and accompanying Project Manual consist of the following sheets dated November 6, 2017

ARCHITECTURAL
A000 COVER
A100 GENERAL INFORMATION
A110 CODE PLAN – LEVEL 1 OVERALL
A111 CODE PLAN ENLARGED – LEVEL 1 PROJECT AREA
A150 TYPICAL PARTITIONS, SIGNAGE & INTERIOR DETAILS
A151 UL-RATED ASSEMBLIES
A201 LEVEL 1 DEMOLITION PLAN
A202 LEVEL 1 DEMOLITION RCP PLAN
A301 LEVEL 1 FLOOR PLAN
A401 EXTERIOR ELEVATIONS – DEMO / NEW WORK
A501 SECTIONS
A601 LEVEL 1 RCP PLAN
A701 DOOR SCHEDULE & LEGEND
A710 CASEWORK LEGEND, SCHEDULES & DETAILS
A801 M134 EAST RESEARCH LAB INTERIOR ELEVATIONS
A802 M148 WEST RESEARCH LAB INTERIOR ELEVATIONS
A803 M112, M114, M128, M132 SUPPORT INTERIOR ELEVATIONS
A900 FINISH FLOOR PLAN
A901 FINISH SCHEDULE & MATERIAL LEGEND & ALT 03

FIRE PROTECTION
FP000 FIRE PROTECTION SYMBOLS AND ABBREVIATIONS
FPD101 LEVEL 1 – EAST ZONE FIRE PROTECTION - DEMOLITION
FPD102 LEVEL 1 – WEST ZONE FIRE PROTECTION – DEMOLITION
FPD103 LEVEL 1 – EAST ZONE TEACHING LAB – ALTERNATE BID #2 DEMOLITION
FP101 LEVEL 1 – EAST ZONE FIRE PROTECTION – NEW WORK
FP102 LEVEL 1 – WEST ZONE FIRE PROTECTION – NEW WORK
FP103 LEVEL 1 – EAST ZONE TEACHING LAB – ALTERNATE BID #2 NEW WORK
FP601 FIRE PROTECTION DETAILS AND SCHEDULES

PLUMBING
P000 PLUMBING SYMBOLS AND ABBREVIATIONS
PD101 LEVEL 1 PLUMBING PLAN - DEMOLITION
P100 FOUNDATION PLUMBING PLAN
P101 LEVEL 1 PLUMBING PLAN - NEW WORK
P201 LEVEL 1 PLUMBING CASEWORK PLAN – NEW WORK
P401 PLUMBING RISERS AND DETAILS
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Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

ERIC R. GREITENS, Governor

Annual Wage Order No. 24
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
Tammy Cavender
Acting Department Director
Division of Labor Standards

This Is A True And Accurate Copy Which Was Filed With The Secretary of State: **March 10, 2017**

Last Date Objections May Be Filed: **April 10, 2017**

Prepared by Missouri Department of Labor and Industrial Relations
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<th>OCCUPATIONAL TITLE</th>
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Fringe Benefit Percentage is of the Basic Hourly Rate

**Annual Incremental Increase
**Occupational Title** | **Date of Increase** | **Basic Hourly Rates** | **Over-Time Schedule** | **Holiday Schedule** | **Total Fringe Benefits**
--- | --- | --- | --- | --- | ---

*Welders receive rate prescribed for the occupational title performing operation to which welding is incidental.*

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

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).

- **Vacation:** Employees over 5 years - 8%; Employees under 5 years - 6%
- **All work over $7 Mil. Total Mech. Contract - $38.00, Fringes - $26.93**
  - All work under $7 Mil. Total Mech. Contract - $36.66, Fringes - $21.49
- **Vacation:** Employees after 1 year - 2%; Employees after 2 years - 4%; Employees after 10 years - 6%
REPLACEMENT PAGE
BOONE COUNTY
BUILDING CONSTRUCTION - OVERTIME SCHEDULE

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 1/2) shall be paid for all work in excess of forty (40) hours per work week.

NO. 9: Means the regular workday starting time of 8:00 a.m. (and resulting quitting time of 4:30 p.m.) may be moved forward to 6:00 a.m. or delayed one hour to 9:00 a.m. All work performed in excess of the regular work day and on Saturday shall be compensated at one and one-half (1½) times the regular pay. In the event time is lost during the work week due to weather conditions, the Employer may schedule work on the following Saturday at straight time. All work accomplished on Sunday and holidays shall be compensated for at double the regular rate of wages. The work week shall be Monday through Friday, except for midweek holidays.

NO. 11: Means eight (8) hours shall constitute a day's work, with the starting time to be established between 6:00 a.m. and 8:00 a.m. from Monday to Friday. Time and one-half (1½) shall be paid for first two (2) hours of overtime Monday through Friday and the first eight (8) hours on Saturday. All other overtime hours Monday through Saturday shall be paid at double (2) time rate. Double (2) time shall be paid for all time on Sunday and recognized holidays or the days observed in lieu of these holidays.

NO. 12: Means the work week shall commence on Monday at 12:01 a.m. and shall continue through the following Friday, inclusive of each week. All work performed by employees anywhere in excess of forty (40) hours in one (1) work week, shall be paid for at the rate of one and one-half (1½) times the regular hourly wage scale. All work performed within the regular working hours which shall consist of a ten (10) hour work day except in emergency situations. Overtime work and Saturday work shall be paid at one and one-half (1½) times the regular hourly rate. Work on recognized holidays and Sundays shall be paid at two (2) times the regular hourly rate.

NO. 18: Means the regular work day shall be eight (8) hours. Working hours are from six (6) hours before Noon (12:00) to six (6) hours after Noon (12:00). The regular work week shall be forty (40) hours, beginning between 6:00 a.m. and 12:00 Noon on Monday and ending between 1:00 p.m. and 6:00 p.m. on Friday. Saturday will be paid at time and one-half (1½). Sunday and Holidays shall be paid at double (2) time. Saturday can be a make-up day if the weather has forced a day off, but only in the week of the day being lost. Any time before six (6) hours before Noon or six (6) hours after Noon will be paid at time and one-half (1½).

NO. 22: Means a regular work week of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A workday is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interest parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.
REPLACEMENT PAGE
BOONE COUNTY
BUILDING CONSTRUCTION - OVERTIME SCHEDULE

NO. 26: Means that the regular working day shall consist of eight (8) hours worked between 6:00 a.m., and 5:00 p.m., five (5) days per week, Monday to Friday, inclusive. Hours of work at each jobsite shall be those established by the general contractor and worked by the majority of trades. (The above working hours may be changed by mutual agreement). Work performed on Construction Work on Saturdays, Sundays and before and after the regular working day on Monday to Friday, inclusive, shall be classified as overtime, and paid for at double (2) the rate of single time. The employer may establish hours worked on a jobsite for a four (4) ten (10) hour day work week at straight time pay for construction work; the regular working day shall consist of ten (10) hours worked consecutively, between 6:00 a.m. and 6:00 p.m., four (4) days per week, Monday to Thursday, inclusive. Any work performed on Friday, Saturday, Sunday and holidays, and before and after the regular working day on Monday to Thursday where a four (4) ten (10) hour day workweek has been established, will be paid at two times (2) the single time rate of pay. The rate of pay for all work performed on holidays shall be at two times (2) the single time rate of pay.

NO. 28: Means a regular workday shall consist of eight (8) hours between 7:00 a.m. and 5:30 p.m., with at least a thirty (30) minute period to be taken for lunch. Five (5) days a week, Monday through Friday inclusive, shall constitute a work week. The Employer has the option for a workday/workweek of four (4) ten (10) hour days (4-10’s) provided:

- The project must be for a minimum of four (4) consecutive days.
- Starting time may be within one (1) hour either side of 8:00 a.m.
- Work week must begin on either a Monday or Tuesday. If a holiday falls within that week it shall be a consecutive work day. (Alternate: If a holiday falls in the middle of a week, then the regular eight (8) hour schedule may be implemented).
- Any time worked in excess of any ten (10) hour work day (in a 4-10 hour work week) shall be at the appropriate overtime rate.

All work outside of the regular working hours as provided, Monday through Saturday, shall be paid at one & one-half (1½) times the employee's regular rate of pay. All work performed from 12:00 a.m. Sunday through 8:00 a.m. Monday and recognized holidays shall be paid at double (2) the straight time hourly rate of pay. Should employees work in excess of twelve (12) consecutive hours they shall be paid double time (2X) for all time after twelve (12) hours. Shift work performed between the hours of 4:30 p.m. and 12:30 a.m. (second shift) shall receive eight (8) hours pay at the regular hourly rate of pay plus ten (10%) percent for seven and one-half (7½) hours work. Shift work performed between the hours of 12:30 a.m. and 8:00 a.m. (third shift) shall receive eight (8) hours pay at the regular hourly rate of pay plus fifteen (15%) percent for seven (7) hours work. A lunch period of thirty (30) minutes shall be allowed on each shift. All overtime work required after the completion of a regular shift shall be paid at one and one-half (1½) times the shift hourly rate.

NO. 33: Means the standard work day and week shall be eight (8) consecutive hours of work between the hours of 6:00 a.m. and 6:00 p.m., excluding the lunch period Monday through Friday, or shall conform to the practice on the job site. Four (4) days at ten (10) hours a day may be worked at straight time, Monday through Friday and need not be consecutive. All overtime, except for Sundays and holidays shall be at the rate of time and one-half (1½). Overtime worked on Sundays and holidays shall be at double (2) time.

NO. 40: Means the regular working week shall consist of five (5) consecutive (8) hour days' labor on the job beginning with Monday and ending with Friday of each week. Four (4) 10-hour days may constitute the regular work week. The regular working day shall consist of eight (8) hours labor on the job beginning as early as 6:00 a.m. and ending as late as 5:30 p.m. All full or part time labor performed during such hours shall be recognized as regular working hours and paid for at the regular hourly rate. All hours worked on Saturday and all hours worked in excess of eight (8) hours but not more than twelve (12) hours during the regular working week shall be paid for at time and one-half (1½) the regular hourly rate. All hours worked on Sundays and holidays and all hours worked in excess of twelve (12) hours during the regular working day shall be paid at two (2) times the regular hourly rate. In the event of rain, snow, cold or excessively windy weather on a regular working day, Saturday may be designated as a "make-up" day. Saturday may also be designated as a "make-up" day, for an employee who has missed a day of work for personal or other reasons. Pay for "make-up" days shall be at regular rates.
NO. 42: Means eight (8) hours between the hours of 8:00 a.m. and 4:30 p.m. shall constitute a work day. The starting time may be advanced one (1) or two (2) hours. Employees shall have a lunch period of thirty (30) minutes. The Employer may provide a lunch period of one (1) hour, and in that event, the workday shall commence at 8:00 a.m. and end at 5:00 p.m. The workweek shall commence at 8:00 a.m. on Monday and shall end at 4:30 p.m. on Friday (or 5:00 p.m. on Friday if the Employer grants a lunch period of one (1) hour), or as adjusted by starting time change as stated above. All work performed before 8:00 a.m. and after 4:30 p.m. (or 5:00 p.m. where one (1) hour lunch is granted for lunch) or as adjusted by starting time change as stated above or on Saturday, except as herein provided, shall be compensated at one and one-half (1½) times the regular hourly rate of pay for the work performed. All work performed on Sunday and on recognized holidays shall be compensated at double (2) the regular hourly rate of pay for the work performed. When working a five 8-hour day schedule and an Employer is prevented from working forty (40) hours, Monday through Friday, or any part thereof by reason of inclement weather (rain or mud), Saturday or any part thereof may be worked as a make-up day at the straight time rate. The Employer shall have the option of working five eight (8) hour days or four ten (10) hour days Monday through Friday. If an Employer elects to work five (5) eight (8) hour days during any work week, hours worked more than eight (8) per day or forty (40) hours per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer elects to work four (4) ten (10) hour days in any week, work performed more than ten (10) hours per day or forty (40) hours per week shall be paid at time and one-half (1½) the hourly rate Monday through Friday. If an Employer is working ten (10) hour days and loses a day due to inclement weather, they may work ten (10) hours Friday at straight time. All hours worked over the forty (40) hours Monday through Friday will be paid at time and one-half (1½) overtime rate. Overtime shall be computed at half-hour intervals. Shift Work: Two (2) or three (3) shifts shall be permitted, provided such shifts are scheduled for a minimum of three (3) consecutive days. The second shift shall begin at 4:30 p.m. and end at 12:30 a.m. with one-half (1/2) hour for lunch between 7:30 p.m. and 9:00 p.m. and shall received eighty (80) hours’ pay. The third shift shall begin at 12:30 a.m. and end at 8:00 a.m. with one-half (1/2) hour for lunch between 3:30 a.m. and 5:00 a.m. and shall receive (8) hour’s pay. There shall be at least one (1) foreman on each shift on jobs where more than one shift is employed, provided that there are two (2) or more employees on second and on the third shifts. All shifts shall arrange to interchange working hours at the end of each week. When three shifts are used, the applicable rate must be paid from Saturday at 8:00 a.m. until the following Monday at 8:00 a.m. When three shifts are employed, the second and third shifts shall contain at least one-half (1/2) as many employees as the first shift.

NO. 43: Eight (8) hours shall constitute a work day between the hours of 7:00 a.m. and 4:30 p.m. Forty (40) hours within five (5) days, Monday through Friday inclusive, shall constitute the work week. Work performed in the 9th and 10th hour, Monday through Friday, shall be paid at time and one-half (1½) the regular straight time rate of pay. Contractor has the option to pay two (2) hours per day at the time and one-half (1½) the regular straight time rate of pay between the hours of 6:00 a.m. and 5:00 p.m., Monday through Friday. Work performed outside the regular scheduled working hours and on Saturdays, Sundays and recognized legal holidays, or days celebrated as such, shall be paid for at the rate of double (2) time.

NO. 55: Means the regular work day shall be eight (8) hours between 6:00 a.m. and 4:30 p.m. The first two (2) hours of work performed in excess of the eight (8) hour work day, Monday through Friday, and the first ten (10) hours of work on Saturday, shall be paid at one & one-half (1½) times the straight time rate. All work performed on Sunday, observed holidays and in excess of ten (10) hours a day, Monday through Saturday, shall be paid at double (2) the straight time rate.
NO. 57: Means eight (8) hours per day shall constitute a day's work and forty (40) hours per week, Monday through Friday, shall constitute a week's work. The regular starting time shall be 8:00 a.m. If a second or third shift is used, the regular starting time of the second shift shall be 4:30 p.m. and the regular starting period for the third shift shall be 12:30 a.m. These times may be adjusted by the employer. The day shift shall work a regular eight (8) hours shift as outlined above. Employees working a second shift shall receive an additional $0.25 above the regular hourly rate and perform seven and one-half (7\%\) hours work for eight (8) hours pay. Third shift employees shall be paid an additional $0.50 above the regular hourly rate and work seven (7) hours for eight (8) hours pay. When circumstances warrant, the Employer may change the regular workweek to four (4) ten-hour days at the regular time rate of pay. All time worked before and after the established workday of eight (8) hours, Monday through Friday, and all time worked on Saturday shall be paid at the rate of time and one-half (1½%) except in cases where work is part of an employee's regular Friday shift. All time worked on Sunday and recognized holidays shall be paid at the double (2) time rate of pay except in cases where work is part of an employee's previous day's shift. For all overtime hours worked $27.76 of the fringe benefits portion of the prevailing wage shall be paid at the same overtime rate at which the cash portion of the prevailing wage is to be paid. The remaining $1.37 of the fringe benefit portion of the prevailing wage may be paid at straight time.

NO. 59: Means that except as herein provided, eight (8) hours a day shall constitute a standard work day, and forty (40) hours per week shall constitute a week's work. All time worked outside of the standard eight (8) hour work day and on Saturday shall be classified as overtime and paid the rate of time and one-half (1½%). All time worked on Sunday and holidays shall be classified as overtime and paid at the rate of double (2) time. The Employer has the option of working either five (5) eight hour days or four (4) ten hour days to constitute a normal forty (40) hour work week. When the four (4) ten-hour work week is in effect, the standard work day shall be consecutive ten (10) hour periods between the hours of 6:30 a.m. and 6:30 p.m. Forty (40) hours per week shall constitute a week's work, Monday through Thursday, inclusive. In the event the job is down for any reason beyond the Employer's control, then Friday and/or Saturday may, at the option of the Employer, be worked as a make-up day; straight time not to exceed ten (10) hours or forty (40) hours per week. When the five day eight (8) hour work week is in effect, forty (40) hours per week shall constitute a week's work, Monday through Friday, inclusive. In the event the job is down for any reason beyond the Employer's control, then Saturday may, at the option of the Employer, be worked as a make-up day; straight time not to exceed eight (8) hours or forty (40) hours per week. The regular starting time (and resulting quitting time) may be moved to 6:00 a.m. or delayed to 9:00 a.m. Make-up days shall not be utilized for days lost due to holidays.

NO. 60: Means the Employer shall have the option of working five 8-hour days or four 10-hour days Monday through Friday. If an Employer elects to work five 8-hour days during any work week, hours worked more than eight (8) per day or forty (40) per week shall be paid at time and one-half (1½) the hourly wage rate plus fringe benefits Monday through Friday. SATURDAY MAKE-UP DAY: If an Employer is prevented from working forty (40) hours, Monday through Friday, or any part thereof by reason of inclement weather (rain or mud), Saturday or any part thereof may be worked as a make-up day at the straight rate. It is agreed by the parties that the make-up day is not to be used to make up time lost due to recognized holidays. If an Employer elects to work four 10-hour days, between the hours of 6:30 a.m. and 6:30 p.m. in any week, work performed more than ten (10) hours per day or forty (40) hours per week shall be paid at time and one half (1½) the hourly wage rate plus fringe benefits Monday through Friday. If an Employer is working 10-hour days and loses a day due to inclement weather, the Employer may work ten (10) hours on Friday at straight time. All hours worked over the forty (40) hours Monday through Friday will be paid at time and one-half (1½) the hourly wage rate plus fringe benefits. All Millwright work performed in excess of the regular work day and on Saturday shall be compensated for at time and one-half (1½) the regular Millwright hourly wage rate plus fringe benefits. The regular work day starting at 8:00 a.m. (and resulting quitting time of 4:30 p.m.) may be moved forward to 6:00 a.m. or delayed one (1) hour to 9:00 a.m. All work accomplished on Sundays and recognized holidays, or days observed as recognized holidays, shall be compensated for at double (2) the regular hourly rate of wages plus fringe benefits. NOTE: All overtime is computed on the hourly wage rate plus an amount equal to the fringe benefits.
NO. 86: The regular workday shall consist of eight (8) consecutive hours, exclusive of a thirty (30) minute lunch period, with pay at the straight time rate with all hours in excess of eight (8) hours in any one day to be paid at the applicable overtime rate at time and one-half (1½). The regular workday shall begin between the hours of 6:00 a.m. and 8:00 a.m. The Employer may have the option to schedule the work week from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be paid at the applicable overtime rate at time and one-half (1½). If the Employer elects to work from Monday through Thursday and is stopped due to inclement weather, holiday or other conditions beyond the control of the Employer, they shall have the option to work Friday at the straight time rate of pay to complete the forty (40) hours for the workweek. All overtime work performed on Monday through Saturday shall be paid at time and one-half (1½) the hourly rate. Fringe benefits shall be paid at the one and one half the hourly rate. All work performed on Sundays and recognized holidays shall be paid at double (2) the hourly rate. Fringe benefits shall be paid at double the hourly rate. Shifts may be established when considered necessary by the Employer. Shift hours and rates will be as follows. If shifts are established, work on the First Shift will begin between 6:00 a.m. and 9:00 a.m. and consist of eight (8) hours of work plus one-half hour unpaid lunch. Hours worked during the first shift will be paid at the straight time rate of pay. The second shift shall start eight hours after the start of the first shift and consist of eight (8) hours of work plus one-half hour unpaid lunch. Work on the second shift will begin between 2:00 p.m. and 5:00 p.m. and be paid the straight time rate plus $2.50 per hour. The third shift shall start eight hours after the start of the second shift and consist of eight (8) hours plus one-half hour unpaid lunch. Work on the third shift will begin between 10:00 p.m. and 1:00 a.m. and be paid the straight time rate plus $3.50 per hour. The additional amounts that are to be paid are only applicable when working shifts. Shifts that begin on Saturday morning through those shifts which end on Sunday morning will be paid at time and one-half these rates. Shifts that begin on Sunday morning through those shifts which end on Monday morning will be paid at double time these rates.

NO. 91: Means eight (8) hours shall constitute a day’s work commencing at 7:00 a.m. and ending at 3:30 p.m., allowing one-half (½) hour for lunch. The option exists for the Employer to use a flexible starting time between the hours of 6:00 a.m. and 9:00 a.m. The regular workweek shall consist of forty (40) hours of five (5) workdays, Monday through Friday. The workweek may consist of four (4) ten (10) hour days from Monday through Thursday, with Friday as a make-up day. If the make-up day is a holiday, the employee shall be paid at the double (2) time rate. The employees shall be paid time and one-half (1½) for work performed on Saturdays, before the regular starting time or after the regular quitting time or over eight (8) hours per work day (unless working a 10-hour work day, then time and one-half (1½) is paid for work performed over ten (10) hours a day) or over forty (40) hours per work week. Work performed on Sundays and recognized holidays shall be paid at the double (2) time rate of pay. SHIFT WORK: When it is necessary for the project to operate in shifts, there will be three (3) eight (8) hour shifts commencing at 8:00 a.m. Shift work must continue for a period of not less than three (3) consecutive work days, two (2) days which must be regular work days (Monday through Friday). In the event the second or third shift of any regular work day shall fall into a Saturday or a holiday, such extension into a Saturday or holiday shall be considered as part of the previous workday and employees shall be paid at the regular shift rate. The first day shift shall work a regular eight (8) hour day at regular rates. The second shift shall be eight (8) hours regular time pay plus $2.50 per hour premium for eight (8) hours work. Third shift will be for eight (8) hours regular time pay plus $3.00 per hour premium for eight (8) hours work.

NO. 94: Means eight (8) hours shall constitute a day’s work between the hours of 8:00 a.m. and 5:00 p.m. The regular workday starting time of 8:00 a.m. (and resulting quitting time of 4:30 p.m.) may be moved forward to 6:00 a.m. or delayed one (1) hour to 9:00 a.m. All work performed in excess of the regular work day and on Saturday shall be compensated at one and one-half (1½) times the regular pay. In the event time is lost during the work week due to weather conditions, the Employer may schedule work on the following Saturday at straight time. All work accomplished on Sunday and holidays shall be compensated at double the regular rate of wages.
NO. 101: Means that except as provided below, eight (8) hours a day shall constitute a standard work day, and forty (40) hours per week shall constitute a week's work, which shall begin on Monday and end on Friday. All time worked outside of the standard work day and on Saturday shall be classified as overtime and paid the rate of time and one-half (1½) (except as herein provided). All time worked on Sunday and recognized holidays shall be classified as overtime and paid at the rate of double (2) time. The regular starting time of 8:00 a.m. (and resulting quitting time of 4:30 p.m.) may be moved forward to 6:00 a.m. or delayed one (1) hour to 9:00 a.m. The Employer has the option of working either five (5) eight-hour days or four (4) ten-hour days to constitute a normal forty (40) hour work week. When a four (4) ten-hour day work week is in effect, the standard work day shall be consecutive ten (10) hour periods between the hours of 6:30 a.m. and 6:30 p.m. Forty (40) hours per week shall constitute a week's work Monday through Thursday, inclusive. In the event the job is down for any reason beyond the Employer's control, then Friday and/or Saturday may, at the option of the Employer, be worked as a make-up day; straight time not to exceed ten (10) hours per day or forty (40) hours per week. Starting time will be designated by the employer. When the five (5) day eight (8) hour work week is in effect, forty (40) hours per week shall constitute a week's work, Monday through Friday, inclusive. In the event the job is down for any reason beyond the Employer's control, then Saturday may, at the option of the Employer, be worked as a make-up day; straight time not to exceed eight (8) hours per day or forty (40) hours per week. Make-up days shall not be utilized for days lost due to holidays.

NO. 122: Means the regular workday shall be (8) hours. The regular work week shall be forty (40) hours, beginning 6:00 a.m. on Monday and ending 6:00 p.m. on Friday. Saturday will be time and one-half (1½). Sunday and Holidays shall be double (2) time. Saturday can be a make-up day if weather has forced a day off.

NO. 124: Means eight (8) hours shall constitute a day's work on all classes of work between the hours of 6:00 a.m. and 5:30 p.m., Monday through Friday. The pay for time worked during these hours shall be at the regular wage rate. The regular workweek shall be Monday through Friday. Employment from 4:30 p.m. to 12:00 midnight, Monday through Friday, shall be paid for at one and one-half (1½) times the regular hourly rate. From 12:00 midnight until 8:00 a.m. on any day shall be paid for at twice the regular hourly rate. All time worked on Sundays and the recognized holidays shall be paid at the rate of double (2) time. It is understood that forty (40) hours shall constitute a regular workweek, (5-8's) Sunday Midnight through Friday Midnight, understanding anything over eight (8) hours is one and one-half (1½) times the hourly wage rate.
BOONE COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 3: All work done on New Year's Day, Decoration Day, July 4th, Labor Day, Veteran's Day, Thanksgiving and Christmas shall be compensated at the double (2) time rate of pay. When any of these holidays fall on a Sunday, the following Monday shall be observed.

NO. 4: All work done on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving and Christmas Day shall be paid at the double time rate of pay. If any of the above holidays fall on Sunday, Monday will be observed as the recognized holiday. If any of the above holidays fall on Saturday, Friday will be observed as the recognized holiday and holidays falling on Sunday will be observed on the following Monday.

NO. 5: All work that shall be done on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day shall be paid twice the amount of his or her regular hourly wage rate for each hour or fraction thereof worked on any such day.

NO. 7: The following days are assigned days and are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This is applied to protect Labor Day. When a holiday falls during the normal workweek, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week. However, no reimbursement for these eight (8) hours is to be paid to the workman unless worked. If workman are required to work the above enumerated holidays or days observed as such, or on Sunday, they shall receive double (2) the regular rate of pay for such work.

NO. 8: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day, or the days observed in lieu of these holidays, shall be paid at the double time rate of pay.

NO. 15: All work accomplished on the recognized holidays of New Year's Day, Decoration Day (Memorial Day), Independence Day (Fourth of July), Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, or days observed as these named holidays, shall be compensated for at double (2) the regular hourly rate of wages plus fringe benefits. If a holiday falls on Saturday, it shall be observed on the preceding Friday. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day, Christmas Day, Decoration Day or Independence Day except to preserve life or property.

NO. 19: All work done on New Year's Day, Memorial Day, July 4th, Labor Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. The employee may take off Friday following Thanksgiving Day. However, the employee shall notify his or her Foreman, General Foreman or Superintendent on the Wednesday preceding Thanksgiving Day. When one of the above holidays falls on Sunday, the following Monday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate. When one of the holidays falls on Saturday, the preceding Friday shall be considered a holiday and all work performed on either day shall be at the double (2) time rate.

NO. 23: All work done on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day and Sundays shall be recognized holidays and shall be paid at the double time rate of pay. When a holiday falls on Sunday, the following Monday shall be considered a holiday. When a holiday falls on Saturday, Friday is recognized as a holiday.

NO. 44: All work done on New Year's Day, Decoration Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, and Christmas Day shall be paid at the double time rate of pay. If a holiday falls on a Sunday, it shall be observed on the Monday following. If a holiday falls on a Saturday, it shall be observed on the proceeding Friday. No work shall be performed on these days except in emergency to protect life or property. All work performed on these holidays shall be compensated at double the regular hourly rate for the work performed. Overtime shall be computed at half-hour intervals.

NO. 45: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the day after Thanksgiving, the day before Christmas, and Christmas Day, shall be paid at the double time rate of pay.

ANNUAL WAGE ORDER NO. 24
BOONE COUNTY
HOLIDAY SCHEDULE – BUILDING CONSTRUCTION

NO. 54: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Veteran's Day, Thanksgiving Day, the Friday after Thanksgiving Day, and Christmas Day shall be paid at the double (2) time rate of pay. When a holiday falls on Saturday, it shall be observed on Friday. When a holiday falls on Sunday, it shall be observed on Monday.

NO. 55: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 60: All work performed on New Year's Day, Armistice Day (Veteran's Day), Decoration Day (Memorial Day), Independence Day (Fourth of July), Thanksgiving Day and Christmas Day shall be paid at the double time rate of pay. No work shall be performed on Labor Day except when triple (3) time is paid. When a holiday falls on Saturday, Friday will be observed as the holiday. When a holiday falls on Sunday, the following Monday shall be observed as the holiday.

NO. 66: All work performed on Sundays and the following recognized holidays, or the days observed as such, of New Year's Day, Decoration Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, shall be paid at double (2) the hourly rate plus an amount equal to the hourly Total Indicated Fringe Benefits. Whenever any such holidays fall on a Sunday, the following Monday shall be observed as a holiday.

NO. 69: All work performed on New Year's Day, Memorial Day, July Fourth, Labor Day, Veteran's Day, Thanksgiving Day or Christmas Day shall be compensated at double (2) their straight-time hourly rate of pay. Friday after Thanksgiving and the day before Christmas are also holidays, however, if the employer chooses to work the normal work hours on these days, the employee will be paid at straight-time rate of pay. If a holiday falls on a Saturday, the holiday will be observed on Saturday; if a holiday falls on a Sunday, the holiday will be observed on the following Monday.

NO. 74: All work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day and Christmas Day, shall be paid at double (2) time of the hourly rate of pay. In the event one of the above holiday's falls on Saturday, the holiday shall be celebrated on Saturday. If the holiday falls on Sunday, the holiday will be celebrated on Monday.

NO. 76: The following days are recognized as holidays: New Years Day, Memorial Day, Independence Day, Labor Day, Veterans Day, Thanksgiving Day, and Christmas. No work of any pretense shall be performed on Charismas Day or Independence Day. Any work performed on the other holidays shall be paid for at least two (2) times the regular rate of pay. If a holiday falls on a Sunday, the following Monday will be observed. If a holiday falls on a Saturday, the preceding Friday will be observed.
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<td>12</td>
<td>$25.89</td>
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<td>Oiler-Driver</td>
<td>6/17</td>
<td>$31.02</td>
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<td>6/17</td>
<td>$26.415</td>
<td>9</td>
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<td>$9.045</td>
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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.
REPLACEMENT PAGE
BOONE COUNTY
OVERTIME SCHEDULE - HEAVY CONSTRUCTION

FED: Minimum requirement per Fair Labor Standards Act means time and one-half (1 ½) shall be paid for all work in excess of forty (40) hours per work week.

NO. 2: Means a regular workweek shall be forty (40) hours and will start on Monday and end on Friday. The Employer shall have the option of working five 8-hour days or four 10-hour days Monday through Friday. If an Employer elects to work five 8-hour days during any workweek, hours worked more than eight (8) per day or 40 per week shall be paid at time and one-half the hourly rate Monday through Friday. If an Employer elects to work four 10-hour days in a week, work performed more than ten (10) per day or 40 hours per week shall be paid at time and one-half the hourly rate Monday through Friday. When working a five 8-hour day schedule and an Employer is prevented from working forty (40) hours Monday through Friday, or any part thereof, by reason of inclement weather, Saturday or any part thereof may be worked as a make-up day at the straight time rate. If an Employer is working a four 10-hour day schedule and loses a day due to inclement weather, he may work 10 hours Friday at straight time. All hours worked over the 40 hours Monday through Friday will be paid at 1 ½ overtime rate. A workday shift is to begin at the option of the Employer, between 6:00 a.m. and not later than 9:00 a.m. However, the project starting time may be advanced or delayed if required. If workmen are required to work the enumerated holidays or days observed as such or Sundays, they shall receive double (2) the regular rate of pay for such work. Overtime shall be computed at one-half (1/2) hour intervals. Shift: The Contractor may elect to work one, two or three shifts on any work. When operating on more than one shift, the shifts shall be known as the day shift, swing shift, and graveyard shift as such terms are recognized in the industry. When two shifts are worked on any operation, the shifts will consist of eight (8) or ten (10) hours exclusive of lunchtime. When three shifts are worked the first day or day shift will consist of eight (8) hours exclusive of lunchtime. The second or swing shift shall consist of seven and one-half (7 1/2) hours work for eight hours pay, exclusive of lunchtime, and the third or the graveyard shift shall consist of seven (7) hours work for eight (8) hours pay, exclusive of the lunchtime. All time in excess of normal shifts shall be considered overtime. Multiple shift (the two or three shift) operation will not be construed on the entire project if at anytime it is deemed advisable and necessary for the Employer to multiple shift a specific operation. However, no shift shall be started between midnight and six a.m. except the graveyard shift on a three-shift operation, or except in an unusual or emergency situation. If an Employer starts a shift between midnight and 6 a.m. except the graveyard shift on a three-shift operation, he shall reimburse all employees for the entire shift at the double time rate. Completion of the second shift on a two-shift operation or completion of the graveyard shift on a three-shift operation that carries over into Saturday morning, shall be at the straight time rate. Overtime shall be computed at ½ hour intervals.

NO. 9: Eight (8) hours shall constitute a work day between the hours of 7:00 a.m. and 4:30 p.m. Forty (40) hours within five (5) days, Monday through Friday inclusive, shall constitute the work week. Work performed in the 9th and 10th hour, Monday through Friday, shall be paid at time and one-half (1½) the regular straight time rate of pay. Contractor has the option to pay two (2) hours per day at the time and one-half (1½) the regular straight time rate of pay between the hours of 6:00 a.m. and 5:30 p.m., Monday through Friday. Work performed in the first eight (8) hours on Saturday shall be paid at the rate of one and eight tenths (1.8) the regular straight time rate. Work performed outside these hours and on Sundays and recognized legal holidays, or days celebrated as such, shall be paid for at the rate of double (2) time.

NO. 21: Means the regular workday for which employees shall be compensated at straight time hourly rate of pay shall, unless otherwise provided for, begin at 8:00 a.m. and end at 4:30 p.m. However, the project starting time may be advanced or delayed at the discretion of the Employer. At the discretion of the Employer, when working a five (5) day eight (8) hour schedule, Saturday may be used for a make-up day. If an Employer is prohibited from working on a holiday, that employer may work the following Saturday at the straight time rate. However, the Employer may have the option to schedule his work from Monday through Thursday at ten (10) hours per day at the straight time rate of pay with all hours in excess of ten (10) hours in any one day to be paid at the applicable overtime rate. If the Employer elects to work from Monday through Thursday and is stopped due to circumstances beyond his control, he shall have the option to work Friday or Saturday at the straight time rate of pay to complete his forty (40) hours. If an Employer is prohibited from working a holiday, that Employer may work the following Friday or Saturday at the straight time rate. Overtime will be at one and one-half (1½) times the regular rate. If workmen are required to work the enumerated holidays or days observed as such, or Sundays, they shall receive double (2) the regular rate of pay for such work.
NO. 23: Means the regular workweek shall start on Monday and end on Friday, except where the Employer elects to work Monday through Thursday, (10) hours per day. All work over ten (10) hours in a day or forty (40) hours in a week shall be at the overtime rate of one and one-half (1½) times the regular hourly rate. The regular workday shall be either eight (8) or ten (10) hours. If a job can't work forty (40) hours Monday through Friday because of inclement weather or other conditions beyond the control of the Employer, Friday or Saturday may be worked as a make-up day at straight time (if working 4-10's). Saturday may be worked as a make-up day at straight time (if working 5-8's). An Employer, who is working a four (4) ten (10) hour day work schedule may use Friday as a make-up day when a workday is lost due to a holiday. A workday is to begin at the option of the Employer but not later than 11:00 a.m. except when inclement weather, requirements of the owner or other conditions beyond the reasonable control of the Employer prevent work. Except as worked as a make-up day, time on Saturday shall be worked at one and one-half (1½) times the regular rate. Work performed on Sunday shall be paid at two (2) times the regular rate. Work performed on recognized holidays or days observed as such, shall also be paid at the double (2) time rate of pay. For all overtime hours worked during the week or on Saturday $16.25 of the fringe benefits portion of the prevailing wage shall be paid at time and one-half (1½). For all overtime hours worked on Sundays or recognized holidays $16.25 of the fringe benefits portion of the prevailing wage shall be paid double time. The remaining $.60 of the fringe benefit portion of the prevailing wage shall be paid at straight time.

NO. 25: Means a regular work week of forty (40) hours, starting on Monday and ending on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof maybe worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A work day is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time maybe advanced or delayed if mutually agreed to by the interest parties. All hours worked on recognized holidays, or days observed as such, double (2) time shall be paid.

NO. 28: Means a regular work week of forty (40) hours will start on Monday and end on Friday. The regular work day shall be either eight (8) or ten (10) hours. If a crew is prevented from working forty (40) hours Monday through Friday, or any part thereof by reason of inclement weather, Saturday or any part thereof maybe worked as a make-up day at the straight time rate. Employees who are part of a regular crew on a make-up day, notwithstanding the fact that they may not have been employed the entire week, shall work Saturday at the straight time rate. A work day is to begin between 6:00 a.m. and 9:00 a.m. However, the project starting time may be advanced or delayed if mutually agreed to by the interest parties. For all time worked on recognized holidays, or days observed as such, double (2) time shall be paid.

NO. 32: Means the overtime rate shall be time and one-half the regular rate for work over forty (40) hours per week. Sundays and Holidays shall be paid at double the straight time rate.
BOONE COUNTY
HOLIDAY SCHEDULE – HEAVY CONSTRUCTION

NO. 4: All work performed on New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day, Christmas Day, or observed as such, shall be paid at the double time rate of pay. When a Holiday falls on a Sunday, Monday shall be observed. No work shall be performed on Labor Day, except in case of jeopardy to life or property. This is applied to protect Labor Day.

NO. 5: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. If a holiday falls on a Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward a forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workman unless worked. If workmen are required to work the above recognized holidays or days observed as such, or Sundays, they shall receive double (2) the regular rate of pay for such work. The above shall apply to the four 10’s Monday through Friday work week. The ten (10) hours shall be applied to the forty (40) hour work week.

NO. 12: All work performed on New Year's Day, Memorial Day, Fourth of July, Labor Day, Veteran's Day, Thanksgiving Day, Christmas Day, or days celebrated as such, shall be paid at the double time rate of pay. When one of the foregoing holidays falls on Sunday, it shall be celebrated on the following Monday. When one of the foregoing holidays falls on Saturday, it shall be celebrated on the Friday before the holiday.

NO. 16: The following days are recognized as holidays: New Year's Day, Memorial Day, Fourth of July, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on Sunday, it shall be observed on the following Monday. If a holiday falls on Saturday, it shall be observed on the preceding Friday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the worker unless worked. If workers are required to work the above recognized holidays or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 21: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workman unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make-up day when an observed holiday occurs during the work week. Employees have the option to work that make-up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

NO. 27: The following days are recognized as holidays: New Year's Day, Memorial Day, Independence Day, Labor Day, Thanksgiving Day and Christmas Day. If a holiday falls on a Sunday, it shall be observed on the following Monday. No work shall be performed on Labor Day except in case of jeopardy to work under construction. This rule is applied to protect Labor Day. When a holiday falls during the normal work week, Monday through Friday, it shall be counted as eight (8) hours toward the forty (40) hour week; however, no reimbursement for this eight (8) hours is to be paid the workmen unless worked. An Employer working a four (4) day, ten (10) hour schedule may use Friday as a make up day when an observed holiday occurs during the work week. Employees have the option to work that make up day. If workmen are required to work the above enumerated holidays, or days observed as such, they shall receive double (2) the regular rate of pay for such work.

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SECTION 1.H  ALTERNATES

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:  M148 Flooring
Base Bid:  Patch and repair existing resinous floor and integral cove as indicated.
Add Alternate:  Demolish existing resinous floor throughout, patch and repair existing slab to receive new finishes, test and mitigate moisture as required, and install new resinous epoxy floor and integral cove as specified.
All for sum of:

__________________________________________

DOLLARS ($__________).

(2)  Additive Alternate No. 2:  M123 Sprinklers
Base Bid:  Existing to remain.
Add Alternate:  Extend sprinkler coverage throughout M123 and surrounding spaces as indicated.
All for sum of:

__________________________________________

DOLLARS ($__________).

(3)  Additive Alternate No. 3:  M124 & M145 Finishes
Base Bid:  Patch and repair existing VCT floor and rubber base as indicated. Paint new construction walls in corridor to match existing.
Add Alternate:  Demolish existing VCT floor and rubber base throughout as indicated, patch and repair existing slab to receive new finishes, test and mitigate moisture as required, and install new VCT floor and rubber base as specified. Paint new and existing walls per schedule.
All for sum of:

__________________________________________

DOLLARS ($__________).

END OF SECTION
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SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 - GENERAL
1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY
A. Section includes administrative and procedural requirements for 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. Related Requirements:
   1. Section 024119 "Selective Demolition" for disposition of waste resulting from partial demolition of buildings, structures, and site improvements.
   2. Sections 020810 "Universal/Hazardous Materials Removal and Disposal" as provided by University of Missouri Environmental Health & Safety
   3. Section 028233 "Friable and Non-friable Asbestos Removal" as provided by University of Missouri Environmental Health & Safety for disposition of hazardous waste.
   4. Division 2 - "Asbestos Survey" and "Lead Survey Report" as provided by University of Missouri Environmental Health & Safety for information regarding known asbestos and lead containing materials in the building.

1.3 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. Goal: A non-mandatory project objective.
E. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.
F. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.
G. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
H. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

1.4 WASTE MANAGEMENT PLAN
A. General: Develop a waste management plan.
B. Track waste quantities by weight by utilizing truck tickets at landfill and at recycling location.
C. Turn in waste ticket receipt totals for waste and recycled materials on a monthly basis along with applications for payment.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION
3.1 PLAN IMPLEMENTATION
A. General: Implement approved waste management plan. 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.
   1. Distribute waste management plan to everyone concerned within seven days of submittal return.
   2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

3.2 SALVAGING DEMOLITION WASTE
A. Salvaged Items for Sale and Donation: Not permitted on Project site.
3.3 RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL

A. General: Recycle paper and beverage containers used by on-site workers, as well as construction and demolition waste to the extent feasible without incurring additional costs.

B. Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Contractor.

C. Preparation of Waste: Prepare and maintain recyclable waste materials according to recycling or reuse facility requirements. Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.

3.4 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. Burning: Do not burn waste materials.

C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419
TECHNICAL SPECIFICATIONS - UNIVERSAL/HAZARDOUS MATERIALS REMOVAL AND DISPOSAL

For

UNIVERSITY OF MISSOURI
PROJECT #CP171091
MEDICAL SCIENCE
1ST FLOOR LABS RENOVATION

Prepared for

UNIVERSITY OF MISSOURI – COLUMBIA
Campus Facilities
Columbia, Missouri 65211

Prepared by
UNIVERSITY OF MISSOURI-COLUMBIA
ENVIRONMENTAL HEALTH & SAFETY
PART 1 - GENERAL

Provisions of the General Conditions and Special Conditions are part of this Division.

1.1 WORK COVERED BY CONTRACT DOCUMENTS

1.1.1 The Contractor shall inform him/herself of the conditions for the project, and is responsible for verifying the quantities and location of all work to be performed as outlined in this section. Failure to do so shall not relieve the Contractor of his obligation to furnish all materials and labor necessary to carry out the provisions of the Contract. The work of the Contract can be summarized as follows:

The work consists of the proper removal of the following approximate quantities of hazardous materials from Medical Science 1st Floor Labs Renovation:

**Items considered to be Hazardous Materials**
- Eleven (11) hydraulic door closers
- Eleven (11) thermostats

**Items considered to be Universal Waste**
- Four (4) exit signs
- Two (2) emergency fire lights
- One hundred twenty six (126) 4 foot fluorescent light fixtures, with their bulbs
- Ninety two (92) 2 foot fluorescent light fixtures, with their bulbs

**Items painted with Lead-based Paint**
- Twenty (20) double hung wood windows
  These twenty windows have ACM caulk around their perimeter and will be removed as ACM, but it should be noted that they also are painted with lead-based paint.

1.2 CODES AND REGULATIONS:

1.1.2.1 All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

1.1.2.2 Federal and State requirements which govern universal and hazardous removal work or hauling and disposal of such waste materials include but are not limited to the following:

1.1.2.2.1.1 Construction Industry - 29 CFR 1926.1101
1.1.2.2.1.2 Respiratory Protection – 29 CFR 1910.134
1.1.2.2.1.3 Hazard Communication – 29 CFR 1910.1200
1.1.2.2.1.4 Accident Prevention Signs – 29 CFR 1910.145

1.1.2.2.2 U.S. Environmental Protection Agency (EPA)

1.1.2.2.1.5 CONTRACTOR'S DUTIES

1.1.3.1 Except as specifically noted, provide and pay for:

- Labor, materials, and equipment.
- Tools, construction equipment, and machinery.
- Other facilities and services necessary for proper execution and completion of work.

1.1.3.2 Pay legally required sales, consumer, use, payroll, privilege and other taxes. Retail sales tax shall not be included in the bid amount.

1.1.3.3 Secure and pay for, as necessary for proper execution and completion of work, and as applicable at the time of bids:

- Permits
- Government Fees
- Licenses
- Except where specifically noted, provide and pay for waste disposal permits and costs

1.1.3.4 Give required notices.

1.1.3.5 Contractor shall assume full responsibility and liability for compliance with all codes, ordinances, rules, regulations, orders and other legal requirements of Local, State, and Federal public authorities including Environmental Protection Agency (EPA) regulations, Missouri Department of Natural Resources (MDNR) and Occupational Safety and Health Administration (OSHA) which bear on performance work. Where conflicts occur between these specifications and/or the above-mentioned regulations, the more stringent shall govern. The Contractor shall hold the owner and owner’s air monitoring firm harmless for failure to comply with any applicable work, hauling, safety, health, or other regulations on the part of the contractor, contractor’s employees, or contractor’s subcontractors.

1.1.3.6 If the Contractor observes that any of the Contract Documents are at variance therewith in any respect, he shall promptly notify MU in writing, and any necessary changes shall be accomplished by appropriate modification. It is not the Contractor’s responsibility to make certain
that the Contract Documents are in accordance with applicable laws, statutes, building codes and regulations. If the Contractor performs any work knowing it to be contrary to such laws, ordinances, rules and regulations, and without such notice to MU, he shall assume full responsibility therefore and shall bear all cost attributable thereto.

1.1.3.7 Enforce strict discipline and good order among employees. Do not employ unfit persons or persons not skilled in assigned task.

1.1.3.8 Comply with all applicable federal, state, and local laws regarding job discrimination and payment of prevailing wage rates for the base bid.

1.1.3.9 The use of the best available technology, procedures, and methods for preparation, execution, cleanup, disposal, and safety are absolutely required. This compliance is the sole responsibility of the abatement contractor.

1.1.3.10 Assume responsibility for the proper and safe execution of the work.

1.1.8 COORDINATION: The hazard remediation contractor shall be responsible for the coordination of the universal/hazardous materials removal for this project. The hazard remediation contractor shall coordinate with all other on-site contractors and all subcontractors working under separate contracts so as to facilitate the general progress of the work. Each trade shall afford all trades every reasonable opportunity for the installation of their work.

1.2 STOP WORK

1.2.1 If the Owner, or his designated representative, presents a written or verbal stop work order, immediately stop all work or that portion of the work designated. A verbal stop work order shall be confirmed by a written stop work order within 24 hours. Do not commence referenced work until authorized in writing by the Owner or his representative.

1.3 CONTRACTOR USE OF PREMISES

1.3.1 GENERAL: During the construction period for each building, the hazard remediation contractor will have full access to Medical Science 1st Floor Labs Renovation for construction operations. Owner will keep the elevators operational.

1.3.2 USE OF THE SITE: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

1.3.2.1 Keep existing driveways and entrances serving the premises clear and available to the Owner and his employees at all times. Contractor will be allowed to use the parking lot to the north of the building for parking and/or storage of materials.
1.3.2.2 Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage to areas acceptable to Owner. If additional storage is necessary, obtain and pay for such storage off-site.

1.3.2.3 Do not load structure with weight that will endanger structure.

1.3.2.4 Assume full responsibility for protection and safekeeping of products stored on premises.

1.3.2.5 Move any stored products which interfere with operations of Owner or other contractors.

1.3.2.6 Contractor personnel shall utilize only those entrances/exits and parking lots designated by the Owner.

1.3.2.7 Contractor shall utilize only those areas designated by the Owner for the storage of equipment and the placement of dumpsters/transport containers.

1.3.2.8 Take all cautions necessary to ensure there is no universal and hazardous material contamination to those areas not included in work schedule. Should areas outside the work area become contaminated with hazardous materials, the Contractor shall immediately clean them utilizing the wet cleaning and HEPA vacuum methods specified herein. The hazard remediation contractor is responsible for the proper cleanup of all items in the work areas to maintain a clean and safe environment.

1.3.3 CONTRACTOR'S USE OF THE EXISTING BUILDING: Maintain the existing building in a safe and weather tight condition throughout the construction period. Take all precautions necessary to protect the building and its occupants during the construction period.

1.3.3.1 Keep areas such as walkways and stairs free from accumulation of waste material, rubbish or construction debris.

1.3.3.2 Smoking or open fires are prohibited within the building or on the premises.

1.4 OWNER OCCUPANCY

1.4.1 PARTIAL OWNER OCCUPANCY: The Owner reserves the right to occupy areas of the building in which universal/hazardous waste removal has been completed, provided that such occupancy does not substantially interfere with completion of the work. The Owner also reserves the right to occupy portions of the building not involved in this Scope of Work. Such partial occupancy shall not constitute acceptance of the work or any part of the work. The Owner shall also maintain the right to access areas where no universal and hazardous waste work is being performed.

2.1 SUBMITTAL REQUIREMENTS
2.1.1 The following will be submitted by the contractor prior to commencement of work for approval by Owner’s Certified Industrial Hygienist (one copy for the Owner’s Representative). The Owner’s C.I.H. will return reviewed copies to contractor and Owner’s Representative.

2.1.1.1 One copy of any Safety Data Sheets (SDS) for products to be used by the contractor in the performance of his work. Contractor will also maintain copies of SDS on site per OSHA.

2.1.2 Submit the following for all Supervisor(s) and Workers who will be on the project site prior to commencement of work:

2.1.2.1 A list of project personnel and contact phone numbers
2.1.2.2 Current training certificates, if applicable
2.1.2.3 Physician’s Statement that each person is physically fit to wear a respirator, if respirator use is required
2.1.2.4 Respirator Fit Test, if respirator use is required

2.1.3 Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification. Include in the plan the layout and location of work areas, route of ingress and egress for the work areas, methods used to assure safety of building occupants and visitors, method of removal of material, and disposal container requirements for lead based paint material to be disposed.

2.1.4 Proposed disposal site for lead-based paint materials, including a disposal plan to detail type of disposal container, method of transportation to disposal site, and waste hauler.

2.1.5 Any other submittals as required by MU.

2.1.6 Upon completion of the universal/hazardous material removal, submit to the Owner’s Representative, copies of hazardous materials shipping records, disposal receipts, incineration documentation, etc. for all hazardous materials removed from the project site.

2.1.7 Upon completion of the universal waste/hazardous material removal, the following information shall be submitted by the Owner’s C.I.H. to the contractor:

2.1.7.1 Construction and demolition waste landfill receipts, disposal receipts, truck tickets, incineration/recycling receipts and documentation.
2.1.7.2 Written visual certification from the Owner’s Certified Industrial Hygienist that universal waste/hazardous material have been removed from the facility.

2.2 TERMINOLOGY (Definitions)

2.2.1 APPROVED Construct and Demolition WASTE DISPOSAL SITE: A permitted solid waste landfill that is authorized by the Missouri Department of Natural Resources to receive construction and demolition wastes.
2.2.2 **AUTHORIZED VISITOR:** The Building Owner, the Building Owner's representative, PSI's personnel, or a representative of any regulatory or other agency having jurisdiction over the project.

2.2.3 **BARRIER:** Any surface that seals off the work area to non-authorized personnel from entering the work area.

2.2.4 **BUILDING OWNER:** A representative of the University of Missouri.

2.2.5 **DISPOSAL CONTAINER:** A properly labeled container for universal/hazardous materials. The proposed disposal container for lead-based paint will be provided to the Owner's Representative and part of the hazard remediation contractor's pre-work.

2.2.6 **HEPA VACUUM EQUIPMENT:** High efficiency particulate air filtered vacuuming equipment with a filter system capable of collecting and retaining hazardous particulates. Filters should be of 99.97% efficiency for retaining particulates greater than 0.3 microns.

2.2.7 **ON-SITE REPRESENTATIVE:** MU’s full-time representative responsible for air monitoring and enforcement of the specifications.

2.2.8 **OWNER'S CERTIFIED INDUSTRIAL HYGIENIST (C.I.H.):** An Industrial Hygienist, certified in comprehensive practice by the American Board of Industrial Hygiene (ABIH).

2.2.9 **HAZARDOUS MATERIAL SHIPMENT RECORD/DISPOSAL RECEIPT:** The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of universal/hazardous materials.

2.2.10 **WET CLEANING/WIPING:** The process of eliminating contamination from building surfaces and objects by using cloths, mops, or other cleaning tools which have been dampened with water, and by afterwards disposing of these cleaning tools as necessary.

2.2.11 **WORK AREA:** A specific isolated area in which universal/hazardous waste materials are required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.

2.3 **EXISTING CONDITIONS**

2.3.1 Building Owner and Contractor shall agree on building conditions prior to commencement of work. It shall be the Contractor's responsibility to replace or repair to the Owner's satisfaction, prior to close-out of the project, all damaged items caused by the Contractor and not proven otherwise. All items damaged prior to remediation shall be noted during preconstruction walk-through.

3.1 **PERSONNEL PROTECTION REQUIREMENTS**
3.1.1 Prior to commencement of work, the workers shall be instructed and shall be knowledgeable on the hazards of the universal hazardous materials involved and other environmental exposures, use and fitting of respirators, protective clothing, decontamination procedures, and all aspects of remediation work procedures; workers shall have medical examinations.

3.1.2 The Contractor acknowledges that he alone is responsible for enforcing personnel protection requirements and that these specifications provide only a minimum acceptable standard for each phase of operation.

3.1.3 If required or requested of the workers, provide workers with personally issued and marked respiratory equipment approved by NIOSH and accepted by OSHA.

3.1.4 No visitors shall be allowed in work areas, except as authorized.

3.1.5 Where required or if requested by the workers, provide workers with sufficient sets of disposable protective full-body clothing. Such clothing shall consist of full-body coveralls, footwear, and head gear, one-piece coveralls or equal. Provide eye protection and hard hats as required by applicable safety regulations. Disposable clothing shall not be allowed to accumulate and shall be disposed of as contaminated waste.

3.1.6 Provide authorized visitors with suitable protective clothing, headgear, footwear, and gloves as described above whenever they are required to enter the work area.

3.2 MATERIALS

3.2.1 Deliver all materials in the original packages, containers, or bundles bearing the name of the manufacturer and the brand name.

3.2.1.1 Store all materials subject to damage off the ground, away from wet or damp surfaces, and under cover sufficient to prevent damage or contamination.

3.2.1.2 Damaged or deteriorating materials shall not be used and shall be removed from the premises.

3.2.2 PLASTIC SHEETING: A minimum 6-mil (or as specified).

3.2.3 TAPE: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheets to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water, duct tape, poly prep tapes or approved equal.

3.2.4 ADHESIVES: Capable of sealing joints of adjacent sheets of polyethylene and for attachment of polyethylene sheet to finished or unfinished surfaces of dissimilar materials and capable of adhering under both dry and wet conditions, including use of amended water.

3.2.5 IMPERMEABLE CONTAINERS: Suitable to receive and retain any universal hazardous materials until disposal by the owners rep. The containers shall be labeled as required by OSHA and DOT. Containers must be resistant to damage and rupture.
3.2.6 **WARNING LABELS AND SIGNS:** As required by OSHA, EPA and DOT regulations.

3.2.7 **OTHER MATERIALS:** Provide all other materials, such as, but not limited to lumber, plywood, nails, and hardware, which may be required to properly prepare and complete this project.

3.3 **TOOLS AND EQUIPMENT**

3.3.1 Provide suitable tools for universal/hazardous waste removal and disposal.

3.3.1.1 **Water Sprayer:** Airless or a low pressure sprayer for amended water application as applicable.

3.3.1.2 **Air-Purifying Equipment:** High Efficiency Particulate Air Filtration Systems (HEPA) shall comply with ANSI Z9.2-91. No air movement system or air equipment should discharge particulates outside the work area. Thus, the negative air unit shall be equipped with a three filter bank with the last being the HEPA filter capable of removing 99.97% of fibers/particulates >0.3 microns.

3.3.1.3 **Scaffolding:** As required to accomplish the specified work and meet all applicable safety regulations.

3.3.1.4 **Vacuums:** Use HEPA type from a known manufacturer.

3.3.1.5 **Other tools and equipment as necessary.**

3.4 **SUPERVISION OF UNIVERSAL/HAZARDOUS Material REMOVAL**

3.4.1 The contractor shall designate a competent supervisor subject to the approval of the Owner’s C.I.H. and the Owner’s Representative. The supervisor shall be the Contractor’s representative on the project, shall meet the requirements of all applicable regulations, and perform or meet the following minimum requirements:

3.4.1.1 Be knowledgeable in all aspects of removal, cleanup and proper disposal of universal hazardous materials as listed in the Scope of Work.

3.4.1.2 Be onsite and supervise all removal, cleanup and disposal activities.

3.4.1.3 Maintain a daily log on the project documenting events, violations, problems, equipment failures, accidents, and inspections.

3.4.1.4 Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.

3.4.1.5 Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner’s Certified Industrial Hygienist. Inspection shall be documented.

3.5 **WORKER PROTECTION / TRAINING**
3.5.1 The contractor shall be responsible for providing his employees with proper respiratory protection, respiratory training, a written respirator program, medical examinations, maintaining medical records, protective clothing and equipment to comply with OSHA requirements, if necessary.

3.5.2 All workers shall be trained in the dangers inherent in handling universal waste, and hazardous materials, in proper work procedures, and personal protective measures.

3.6 OWNER’S CERTIFIED INDUSTRIAL HYGIENIST

3.6.1 It will be the Owner’s responsibility to hire a Certified Industrial Hygienist. The Certified Industrial Hygienist will also be required to perform the following duties as a minimum:

3.6.1.1 Approval of the Contractor’s work plan and methods of remediation to meet regulatory requirements and ensure the health and safety of University faculty, staff, and students.

3.6.1.2 Verify that the Contractor is satisfactorily performing the work in accordance with OSHA regulations.

3.6.1.3 Visual inspection of the work areas.

3.6.1.4 Certify in writing that the Contractor’s procedures, methods, and practices were, to the best of his/her knowledge and belief, in compliance with current EPA, OSHA, State, and Local applicable regulations, that the work areas meet the requirements for a final visual inspection prior to re-occupancy, and an accounting of any known deviations.

3.7 SEPARATION OF WORK AREAS FROM NONWORK AREAS

3.7.1 Visual separation shall be accomplished at all "see-through" locations using opaque polyethylene. This separation shall not be incorporated within the other seals involved on this project.

3.8 EMERGENCY PROTECTION PLAN / FIRE EXITS

3.8.1 The contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan onsite. The plan shall include considerations of fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injury. All employees shall be instructed and trained in the procedures.

3.8.2 The Emergency Protection Plan shall also include written notification of police, fire, and medical personnel of the planned remediation activities, work schedule, and layout of the work area, particularly barriers that may affect response capabilities.

3.8.3 Designate and maintain emergency and fire exits from the work area in accordance with local codes and regulations. All exits shall be clearly marked with fluorescent tape or red paint and shall be clearly visible from any part of
3.9 LOCAL AREA PROTECTION / SITE SECURITY

3.9.1 The contractor shall secure the work areas to make sure of no inadvertent entry. Any breach to the exterior of the building shall be secured by the hazard remediation contractor. The Contractor shall be responsible for maintaining security of the remediation areas throughout the contract period.

3.9.2 The contractor shall be responsible for all areas of the building used by contractor and/or subcontractors in the performance of the work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of the existing building, except such controls as may be specifically reserved to the owner.

3.9.3 Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection, and shall require all persons in the work area to observe the same regulations required of Contractor’s employees.

3.9.4 The contractor shall have control of site security during remediation operations in order to protect the work environment and equipment. Contractor shall have the owner’s assistance in notifying building occupants of impending activity and enforcement of restricted access by owner’s employees.

3.9.5 The contractor shall keep a minimum of two (2) 10lb type ABC fire extinguishers onsite. One shall be maintained outside the work area and one inside each work area. Contractor employees shall be trained in the operation of fire extinguishers.

3.9.6 The contractor shall maintain the work area free from rubbish, debris, and dirt, and keep a clean, safe working area.

3.10 UNIVERSAL Waste HAZARDOUS MATERIALS REMOVAL OPERATIONS

3.10.1 Any light fixtures, housings, etc. concealing items considered to be universal waste/hazardous material shall be removed and left on site for disposal by MU Environmental Health and Safety. This does not include Freon containing equipment which should be managed by the contractor.

3.10.3 **FLUORESCENT LIGHT TUBES** may contain small amounts of Mercury. This can potentially be harmful to human health and the environment. The bulbs should be placed in fiberboard boxes provided by MU Environmental Health and Safety to minimize breakage. MU Environmental Health and Safety will manage disposal of this material.

3.10.4 **POLYCHLORINATED BIPHENYL (PCBS)** are a known carcinogenic material. Its use was discontinued January 1, 1979. Due to the age of the building, it should be assumed that any ballast can contain PCBs unless it is labeled as
PCB free by the manufacturer. Due to this, any light ballasts presumed to contain PCBs should be properly disposed of. MU Environmental Health and Safety will provide collection container for this purpose. Non-PCB ballasts will also be managed by MU Environmental Health and Safety. Collection containers will be provided to the contractor upon their request.

3.10.5 **SMOKE DETECTORS** are typically ionization smoke detectors that may contain a small amount of radioactive material. MU Environmental Health and Safety will provide collection containers for this material and will also be responsible for the disposal of this material.

3.10.6 **FIRE ALARMS (STROBE LIGHT)** are typically not considered a universal or hazardous waste. However, for the purposes of this project, these items should be collected by the contractor and managed by MU Environmental Health and Safety. Collection containers will be provided to the contractor upon their request.

3.10.7 **EXIT SIGNS AND EMERGENCY LIGHTS** typically have backup batteries that may contain small amounts of lead. Some exit signs are powered by a small amount of radioactive material. Powered exit signs and emergency lights should have the battery removed and disposed of by MU Environmental Health and Safety. Non powered exit signs should be assumed to contain radioactive material and should be collected for disposal via MU Environmental Health and Safety. MU Environmental Health and Safety will provide collection containers for these items.

3.10.8 **DRINKING FOUNTAINS**: Some drinking fountains have reservoirs that may contain lead and a CFC/HCFC refrigerant that must be recovered. The lead reservoirs should be removed and recycled. The CFC/HCFC refrigerant must be recovered by a contractor licensed and trained in this type of work. The remainder of the unit should be managed as scrap metal.

3.10.9 **DOOR CLOSURES**: Some of the older door closures have oil reservoirs for lubrication. These oils may contain small amounts of PCBs. MU Environmental Health and Safety will provide a collection container for this material, and will be responsible for disposal.

3.10.10 **THERMOSTATS** may contain Mercury. This can potentially be harmful to human health and the environment. Mercury containing thermostats shall be disposed of as a hazardous waste at an EPA and State approved landfill. MU Environmental Health and Safety will provide a collection container for this material, and will be responsible for disposal.

3.10.11 **WINDOW AIR CONDITIONING UNITS**: Where possible, these window units should be removed and stored for use elsewhere. Otherwise these units may contain CFC/HCFC refrigerants that must be recovered. CFC/HCFC refrigerants are suspected to damage the atmosphere. The CFC/HCFC refrigerant must be recovered by a contractor licensed and trained in this type of work. The remainder of the unit should be managed as scrap metal.
3.12 DISPOSAL OF UNIVERSAL WASTE/HAZARDOUS MATERIALS

3.12.1 Universal waste and hazardous materials (i.e. lead and mercury, etc.), the contractor is to properly containerize the waste and notify MU Environmental Health and Safety of the need for pickup.

3.13 REESTABLISHMENT OF THE WORK AREA

3.13.1 Reestablishment of the work area shall only occur after the Contractor has received a final visual inspection from the Owner’s C.I.H. documenting that the universal/hazardous waste materials have been removed from the project site.

END OF SECTION
LEAD SURVEY REPORT
PROJECT CP171091
MEDICAL SCIENCE 1ST FLOOR LABS
7/7/17

TO: Jude Wawrzyniak
Planning, Design, and Construction

FROM: Pete Kohler
Environmental Health and Safety

MU EHS has completed a lead survey of specific areas on 1st floor of Medical Science Building, as designated by the survey request:

1. The existing M148 Gross Anatomy Lab area (West Side), and,
2. The L-shaped area consisting of existing M129-M134 PBL Classrooms and M113, M114, M126 and M128 Office areas (East Side).

The purpose of this survey is to identify lead paint that might represent a potential worker safety hazard and/or might require special handling and waste disposal prior to the demolition or renovation.

The EPA and the U.S. Department of Housing and Urban Development (HUD) consider lead-based paint as containing a lead concentration equal to or greater than 1.0 milligram per square centimeter (mg/cm²) or 0.5% lead by weight, as defined by Title X of the 1992 Housing and Community Development Act. The US Consumer Product Safety Commission considers paint with up to 600 ppm of lead to be “Lead Free”.

Finished surfaces were tested for lead, using a Niton XL2 analyzer. The analyzer was checked before and after the survey and found to be in calibration. The survey was made by Pete Kohler (Missouri Lead Inspector #00783, expires 5/17/19.) The lead survey was conducted on July 7, 2017.
As a result of the survey, some finished surfaces were identified having lead in concentrations which reach the HUD standard.

Wood double-hung windows are painted with lead-based paint.

OSHA has found that certain work, including aggressive disturbance of the painted surface, may result in lead levels exceeding the Action Level or the Permissible Exposure Limit (PEL)- even when the concentration is below 1 mg/cm².

### LEAD SURVEY

#### SAMPLING LOCATIONS

**PROJECT CP171091**

**MEDICAL SCIENCE 1ST FLOOR LABS**

<table>
<thead>
<tr>
<th>LOCATION/DESCRIPTION</th>
<th>LEAD READINGS (mg/cm²)</th>
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</thead>
<tbody>
<tr>
<td>Medical Science M148, white sheet rock walls</td>
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<td>M148, green metal door frames</td>
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<td>Hallway outside M148, tan metal lockers</td>
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<td>Hallway outside M148, white sheet rock walls</td>
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<tr>
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<td>Coordinates</td>
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<td>M113, green wood windows</td>
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<td>M122, tan paint on sheet rock</td>
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<td>M122, green vinyl corner protection</td>
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<td>M122, oak trim varnished</td>
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<td>M122, EW hall multi-color wall (both sides)</td>
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<td>M125B, green metal door</td>
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<td>M126, green wood trim</td>
<td>0.03, 0.04</td>
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<tr>
<td>Location</td>
<td>Description</td>
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</tr>
<tr>
<td>M126</td>
<td>green concrete wall behind sheet rock</td>
</tr>
<tr>
<td>M126</td>
<td>formica green windowsill</td>
</tr>
<tr>
<td>M126</td>
<td>oak varnish trim</td>
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<tr>
<td>Corridor M122</td>
<td>red fire cabinet</td>
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<td>Corridor M122</td>
<td>multi-colored finish on walls</td>
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<td>tan metal lockers</td>
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<td>Corridor M122</td>
<td>green vinyl corner protectors</td>
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<tr>
<td>Corridor M122</td>
<td>varnished oak trim</td>
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<td>M128</td>
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<td>glazed ceramic block wall behind sheet rock</td>
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<td>M128</td>
<td>green wood trim</td>
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<td>M130</td>
<td>white sheet rock walls</td>
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<td>green metal door frames</td>
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<td>M130</td>
<td>green wood windows</td>
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<tr>
<td>M130</td>
<td>glazed ceramic block wall behind sheet rock</td>
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<tr>
<td>Description</td>
<td>Measurements</td>
</tr>
<tr>
<td>------------------------------------------------</td>
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<td>M130, green wood trim</td>
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<td>M130, windowsill</td>
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<td>M131, white sheet rock walls</td>
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<td>M131, green metal door frames</td>
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<td>M132, varnished doors</td>
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<td>M134, green metal door frames</td>
<td>0.03, 0.01</td>
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<tr>
<td>M134, glazed ceramic block wall behind sheet rock</td>
<td>0.03, 0.01, 0.01, 0.01</td>
</tr>
</tbody>
</table>

**LEAD SUMMARY**

The wood sashes of twenty (20) double hung windows are finished with lead-based paint. The trim around these windows appears to be the same as the windows, but the trim has a different history, and does not have lead-based paint.
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SECTION 024119 - SELECTIVE DEMOLITION

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
1. Demolition and removal of selected portions of building or structure.
2. Salvage of existing items to be reused or recycled.

B. Related Requirements:
1. Sections 020810 “Universal/Hazardous Materials Removal and Disposal” as provided by University of Missouri Environmental Health & Safety
2. Section 028233 “Friable and Non-friable Asbestos Removal” as provided by University of Missouri Environmental Health & Safety for disposition of hazardous waste.
3. Division 2 - “Asbestos Survey” and “Lead Survey Report” as provided by University of Missouri Environmental Health & Safety for information regarding known asbestos and lead containing materials in the building.

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 ready for reuse.
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.

1.5 PREINSTALLATION MEETINGS
A. Pre-demolition 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.
6. List existing utilities in each demolition zone that are to remain in operation or are to be removed.
   a. Confirm with Owner that utility items to be removed do not serve other areas, have been planned to be taken off-line, or have been replaced by other services.

1.6 INFORMATIONAL SUBMITTALS
A. Proposed Protection Measures: Submit report, including drawings, that indicates the measures proposed. Indicate proposed locations and construction of barriers.
1. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
2. Indicate proposed locations and construction of barriers.
3. Secure, 1-hour fire-rated partitions are required to separate demolition and construction zones from occupied areas.
4. Egress paths as indicated need to be maintained during construction.
5. Work that requires disruption to egress paths (as indicated) shall be done at scheduled times/days when building occupants are minimal and/or segregated from the work area in a manner approved by the Owner and the Architect.

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. Obtain Owner's permission in writing prior to interrupting services as noted in the Special Conditions.

3. Coordination for shutoff, capping, and continuation of utility services.

4. Use of elevator and stairs. Allow for Owner's continuing use of service elevator.

5. Locations of temporary partitions and means of egress.

6. Coordination of Owner's continuing occupancy of portions of existing building and of Owner's partial occupancy of completed Work.

7. Secure, 1-hour fire-rated partitions are required to separate demolition and construction zones from occupied areas.

8. Egress paths as indicated need to be maintained during construction.

9. Work that requires disruption to egress paths (as indicated) shall be done at scheduled times/days when building occupants are minimal and/or segregated from the work area in a manner approved by the Owner and the Architect.

C. Pre-demolition Photographs or Video: Submit before Work begins. Include areas below the project area.

D. Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

1.7 QUALITY ASSURANCE

A. Refrigerant Recovery Technician Qualifications: Certified by an EPA-approved certification program.

1.8 FIELD CONDITIONS

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

1. Before selective demolition, As far as practicable, Owner will remove items that are desired:
   a. DDC Controls on units that will be removed in the scope of the project.

2. Coordinate with Owner any remaining items to be salvaged.

B. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.

C. Hazardous Materials: Hazardous materials are present in buildings and structures to be selectively demolished. A report on the presence of hazardous materials is provided by the owner within the project manual for review and use. Examine report to become aware of locations where hazardous materials are present.

1. Hazardous material remediation is specified in owner provided documents contained elsewhere in the Project Manual

2. Do not disturb hazardous materials or items suspected of containing hazardous materials except under procedures specified elsewhere in the Contract Documents.

3. Owner will provide material safety data sheets for suspected hazardous materials that are known to be present in buildings and structures to be selectively demolished because of building operations or processes performed there.

D. Storage or sale of removed items or materials on-site is not permitted.

E. 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 or provide 24 hour fire watch.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

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

2.2 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

2. Use materials whose installed performance equals or surpasses that of existing materials.

B. Comply with material and installation requirements specified in individual Specification Sections.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected and capped 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 measured drawings preconstruction photographs, and preconstruction video recordings.
   1. Inventory and record the condition of items to be removed and salvaged. Provide photographs or video of conditions that might be misconstrued as damage caused by salvage operations.

3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

A. Existing Services/Systems to Remain: Maintain services/systems indicated to remain and protect them against damage.
B. Existing Services/Systems to Be Removed, Relocated, or Abandoned: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
   1. Do not close, shut off, or disrupt existing utility branches or take offs that are in use without at least 7 days prior written notification to Owner's Representative.
   2. If services/systems are required to be removed, relocated, or abandoned, provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
   3. Disconnect, demolish, and remove fire-suppression systems, plumbing, and HVAC systems, equipment, and components indicated to be removed and or in conflict with new work.
      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. Only abandon piping in place where specifically indicated.
      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. Only abandon ducts in place where specifically indicated.
   C. Refrigerant: Remove refrigerant from mechanical equipment to be selectively demolished according to 40 CFR 82 and regulations of authorities having jurisdiction.

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.
   4. Provide, erect, and maintain temporary dust barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent spaces and occupants.
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. The use of cutting torches is to be avoided. In the event that cutting torches are required, Notify Owner a minimum of 3 days prior to operation. 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. Avoid use of hot work where possible. Maintain adequate ventilation when using cutting torches. Hot work permits may be required.

5. When fire protection system is out of service, provide 24 hour fire on-site watch and work to repair immediately. Fire watch personnel shall be provided with at least one approved means for notification of the fire department and their sole duty shall be to perform constant patrols and watch for occurrence of fire.

6. Services (including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
   a. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   b. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   c. Verify that abandoned services serve only abandoned facilities before removal.
   d. Remove abandoned pipe, ducts, conduits, and equipment, including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification.

7. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

8. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.

9. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

10. Dispose of demolished items and materials promptly. Comply with requirements in Special Conditions.

B. Removed and Salvaged Items:
   1. Clean salvaged items.
   2. Store items in a secure area until delivery to Owner.
   3. Transport items to Owner's storage area as designated by Owner.

C. Removed and Reinstalled Items:
   1. Clean and repair items to functional condition adequate for intended reuse.
   2. 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.

3.5 SELECTIVE DEMOLITION PROCEDURES FOR SPECIFIC MATERIALS

A. Concrete: Demolish in small sections. Using power-driven saw, cut concrete to a depth of at least 3/4 inch at junctures with construction to remain. Dislodge concrete from reinforcement at perimeter of areas being demolished, cut reinforcement, and then remove remainder of concrete. Neatly trim openings to dimensions indicated.

B. Roofing: Remove no more existing roofing than what can be covered in one day by new roofing and so that building interior remains watertight and weathertight. See Section 075216 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing" and 070150 "Preparation for Roofing Repair" for roofing modification requirements.
3.6 PATCHING AND REPAIRS
A. General: Where possible, promptly repair damage to adjacent construction caused by selective demolition operations.

3.7 DISPOSAL OF DEMOLISHED MATERIALS
A. General: Except for items or materials indicated to be recycled, reused or salvaged, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
   1. Do not allow demolished materials to accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
B. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.8 CLEANING
A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

END OF SECTION 024119
TECHNICAL SPECIFICATIONS - ASBESTOS-CONTAINING MATERIALS REMOVAL AND DISPOSAL

For

UNIVERSITY OF MISSOURI
PROJECT CP171091
MEDICAL SCIENCE
1ST FLOOR LAB RENOVATIONS

Prepared for

UNIVERSITY OF MISSOURI – COLUMBIA
Campus Facilities
Columbia, Missouri 65211

Prepared by
UNIVERSITY OF MISSOURI-COLUMBIA
ENVIRONMENTAL HEALTH & SAFETY
SECTION 02 8233
FRIABLE AND NON-FRIABLE ASBESTOS REMOVAL

PART 1 - GENERAL

Provisions of the General Conditions and Special Conditions are part of this Division.

1.1 SCOPE OF WORK

1. General: The work specified herein shall be the abatement of asbestos containing materials by certified and registered persons who are knowledgeable, qualified and trained in the abatement, handling, and disposal of asbestos containing material, and subsequent cleaning of the affected environment.

2. The Contractor shall furnish all labor, material, equipment, testing, services, permits, insurance, notifications, necessary or required to perform the work in accordance with applicable local, state, and federal regulations for the abatement of asbestos containing materials and for other work as specified in this section or as indicated in associated drawings, sketches, or reports of the work.

All fees required for notification requirements, renotifications, and/or inspections by the regulatory agencies shall be paid by the Contractor. Bulk sample analysis information required by the Department of Natural Resources, U.S. Environmental Protection Agency or local authority having jurisdiction in conjunction with the notification shall also be provided by the Contractor unless provided within this section.

3. The work shall include the removal and legal disposal of non-friable asbestos containing materials including:

   Friable Asbestos:
   The contractor shall remove and legally dispose of:
   · Five hundred twenty five (525) linear feet of ACM pipe insulation
   · Two hundred eighty (280) square feet of ACM tar on seams of fiberglass duct insulation
   · ACM caulk on twenty (20) double hung wood windows

   Non-friable asbestos:
   The contractor shall remove and legally dispose of:
   · Thirty nine (39) linear feet of ACM transite fume hood ducts
   · Eleven (11) fire doors with cores presumed to contain asbestos
     (Doors removed intact)
1.2 DEFINITIONS

1. Abatement - Procedures to decrease or eliminate the source of fiber release from asbestos containing building materials. Includes encapsulation, enclosure, and removal.

2. Adequately Wet - To sufficiently mix or penetrate with liquid to prevent the release of particulate.

3. Aggressive Air Sampling - Sweeping of floors, ceilings and walls and other surfaces with the exhaust of a minimum of one (1) horsepower leaf blower or equivalent immediately prior to air monitoring.

4. Approved Waste Disposal Site - A solid waste disposal area that is authorized by the Department of Natural Resources to receive asbestos containing solid wastes.

5. Asbestos - The asbestiform varieties of serpentine (chrysotile, antigorite), riebeckite (crocidolite), cummingtonite-grumerite (amosite), anthophyllite, and actinolite-tremolite.

6. Asbestos Abatement Supervisor - An individual who directs, controls, or supervises others in asbestos abatement projects.

7. Asbestos Containing Building Material (ACBM) - Surfacing ACM, thermal system insulation ACM, or miscellaneous ACM that is found in or on interior structural members or other parts of a building.

8. Asbestos Containing Material (ACM) - Any material containing more than 1 percent asbestos by weight.

9. Barrier - Any surface that seals off the work area to inhibit the movement of fibers.

10. Category I Nonfriable ACM - Asbestos-containing packings, gaskets, resilient floor covering and asphalt roofing products containing more than one percent (1%) asbestos as determined using the method specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy.

11. Category II Nonfriable ACM - Any material, excluding category I nonfriable ACM, containing more than one percent (1%) asbestos as determined using the methods specified in 40 CFR part 763, subpart F, Appendix A, section 1, Polarized Light Microscopy that, when dry, cannot be crumbled, pulverized or reduced to powder by hand pressure.

12. Containment - Area where asbestos abatement project is conducted. Area must be enclosed either by a glove bag or plastic sheeting barrier.

13. Contractor's Competent Person (Qualified Person) - One who is capable of identifying existing asbestos hazards in the workplace and selecting the appropriate control strategy for asbestos exposure, who has the authority to take prompt corrective measures to eliminate them, as specified in 29 CFR 1926.32 (f); in addition, for Class I, II, III, and IV work, who is specially trained in training courses which meet the criteria of EPA's Model Accreditation Plan (40 CFR Part 763) for project designer or supervisor, or its equivalent.
14. Decontamination Area - Enclosed area adjacent and connected to the regulated area which is used for decontamination of workers, materials, and equipment that are contaminated with asbestos.

15. Demolition - the wrecking or taking out of any load bearing structural member of a facility together with any related handling operations.

16. Disposal Bag - A properly labeled 6 mil. thick leak-tight plastic bag used for transporting asbestos waste from work area to disposal site.

17. Encapsulant (Sealant) - A liquid material which can be applied to asbestos-containing material and which prevents the release of asbestos fibers from the material either by creating a membrane over the surface or by penetrating into the material and binding its components together.


19. Enclosure - The construction of an airtight, impermeable, permanent barrier around asbestos containing material to control the release of asbestos fibers into the air.

20. Friable Asbestos Material - Any material containing more than one percent asbestos as determined using the method specified in appendix A, subpart F, 40 CFR part 763 section 1, Polarized Light Microscopy, that, when dry, can be crumbled, pulverized, or reduced to powder by hand pressure.

21. Glove Bag - A manufactured or fabricated device, typically constructed of six (6) mil transparent polyethylene or polyvinyl chloride plastic. This device consists of two (2) inward projecting long sleeves, an internal tool pouch and an attached, labeled receptacle for asbestos waste.

22. Homogeneous Work Site - Continuous areas with the same type of ACM and in which one type of abatement process is performed.

23. Negative Initial Exposure Assessment - An assessment by a "Competent Person" in which it is concluded that employee exposures during the job are likely to be consistently below the Permissible Exposure Levels.

24. Outside Air - Air outside of the containment.

25. Owner's Air Monitoring Firm - Air Monitoring conducted by a person who is not under the direct control of the person carrying out the asbestos abatement project and who has been selected by the Owner.

26. Owner's Air Sampling Professional - An individual who holds a valid certification from the State of Missouri. The individual shall conduct, oversee, or be responsible for air monitoring of asbestos abatement projects before, during, and after the project has been completed. The air sampling professional must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and supervised by the Owner's Certified Industrial Hygienist (C.I.H.).
27. Owner's Air Sampling Technician - An individual who has been trained by and is under the supervision of an air sampling professional to do air monitoring before, during, and after the asbestos abatement project. The air sampling technician must hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate, and be supervised by the Owner's Certified Industrial Hygienist (C.I.H.).

28. Owner's Certified Industrial Hygienist (C.I.H.) - an Industrial Hygienist, Certified in Comprehensive Practice by the American Board of Industrial Hygiene. The Owner's C.I.H. must also be certified by the Missouri Department of Natural Resources as an air sampling professional and hold a 40 hour AHERA Asbestos Contractor/Supervisor Certificate. The Owner will identify C.I.H. before application for permit.

29. Personal Monitoring - Sampling of the asbestos fiber concentrations within the breathing zone.

30. Regulated Asbestos Containing Material (RACM) - Friable asbestos material; Category I nonfriable ACM that has become friable; Category I nonfriable ACM that will be or has been subjected to sanding, grinding, cutting, or abrading; Category II nonfriable ACM that has a high probability of becoming or has become crumbled, pulverized or reduced to powder by the forces expected to act on the material in the course of demolition or renovation operations.

31. Remove - To take out RACM or facility components that contain or are covered with RACM from any facility.

32. Renovation - Altering a facility or one or more facility components in any way, including the stripping or removal of RACM from a facility component.

33. Repair - The restoration of asbestos material that has been damaged. Repair consists of the application of rewettable glass cloth, canvas, cement or other suitable material. It may also involve filling damaged areas with non-asbestos substitutes and re-encapsulating or painting previously encapsulated materials.

34. Strip - To take off RACM from any part of a facility or facility components.

35. Waste Shipment Record - The shipping document, required to be originated and signed by the waste generator, used to track and substantiate the disposition of asbestos containing waste material.

36. Work Area - A specific isolated area, other than the space enclosed within a glove bag, in which friable asbestos-containing materials is required to be handled. The area is designated as a work area from the time that the area is secured and access restrictions are in place. The area remains designated as a work area until the time that it has been cleaned in accordance with any requirements applicable to the operations conducted.
1.3 CODES AND REGULATIONS

1. General Applicability Of Codes, Regulations and Standards - All applicable codes, regulations, standards, statutes, laws, and rules have the same force and effect (and are made a part of the contract documents by reference) as if copied directly into the contract documents, or as if published copies are bound herewith. Where conflicts arise, the most stringent specification shall apply.

2. Contractor Responsibility - The Contractor shall assume full responsibility and liability for the compliance with all applicable federal, state, and local regulations pertaining to work practices, hauling, disposal and protection of workers, visitors to the site, and persons occupying areas adjacent to the site. The Contractor is responsible for providing medical examinations and maintaining medical records of personnel as required by the applicable federal, state, and local regulations. The Contractor shall hold the owner harmless for failure to comply with any applicable work, hauling, disposal, safety, health, or other regulations on the part of the contractor, contractor's employees, or contractor's subcontractors.

3. Federal and State requirements which govern asbestos abatement work or hauling and disposal of asbestos waste materials include but are not limited to the following:

   1. U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) including but not limited to:


   2. U.S. Environmental Protection Agency (EPA) including but not limited to:


   3. U.S. Department of Transportation (DOT) including but not limited to:

4. State of Missouri including but not limited to:

1. H.B. 77, 85th General Assembly.

2. Missouri Air Conservation Law Chapter 643.

3. Missouri Department of Natural Resources, Division 10, Chapter 6 of the Code of State Regulations as follows:

   (1) 10 CSR 10-6.020, Definitions

   (2) 10 CSR 10-6.080, Emission Standards for Hazardous Air Pollutants

   (3) 10 CSR 10-6.230, Administrative Penalties

   (4) Volume 18, Missouri Register, Page 44

   (5) 10 CSR 10-6.250, Asbestos Abatement Projects - Certification, Accreditation, and Business Exemption Requirements

1.4 NOTIFICATIONS

1. Notifications meeting the requirements of Volume 18, Missouri Register, page 44, shall be completed and sent by the Contractor not less than ten (10) days before the intended starting date of the project. Send notification to the following:

   1. Department of Natural Resources
      Air Pollution Control Program (Asbestos)
      P.O. Box 176
      Jefferson City, Missouri  65102

   2. U.S. Environmental Protection Agency
      Region VII
      Air & Toxic Division, Air Branch
      ATTN:  Air Compliance
      726 Minnesota Avenue
      Kansas City, Kansas  66101

   3. Provide a copy to the Owner's Representative. Five (5) day notification to the Owner's Representative is required on jobs less than the reportable quantity.

   4. If the project is under the jurisdiction of the Kansas City Air Quality Section, St. Louis County Air Pollution Control Branch, or the Springfield-Green County Air Pollution Control Authority, send notification directly to the appropriate agency.
1.5 SUBMITTALS

1. The following will be submitted by contractor prior to commencement of work for approval by the Owner's Certified Industrial Hygienist (one copy for the Owner's Representative). Owner's C.I.H. will return reviewed copies to contractor and Owner's Representative.

1. One copy of material safety data sheets (MSDS) for products to be used by the Contractor in the performance of his work. Contractor will also maintain copies of MSDS on site per OSHA.

2. One copy of the notifications to, or any correspondence with, the regulatory agencies. Submit a listing of all prior regulatory violations.

2. Friable Abatement:

1. Current Certificates of training and statement of qualifications for the project asbestos abatement supervisor and the Missouri Asbestos Occupational Certificates for all project personnel. List a summary of project personnel and contact phone numbers.

2. Name, address, and contact person's name of testing laboratory or laboratories to be utilized analyzing samples for bulk analysis or air samples.

3. Submit a detailed plan of the procedures proposed for use in complying with requirements of this specification and Volume 18, Missouri Register, page 44, and 29 CFR 1926.1101. Include in the plan the layout and location of barriers, decontamination units, route of ingress and egress for work area, methods used to assure safety of building occupants and visitors, methods used to isolate or closing out of HVAC system, personal air monitoring strategy, method of removal of material, and engineering controls utilized to prevent emissions from the work area.

4. Provide a disposal plan to detail type of disposal container, method of transportation to disposal site, waste hauler, and disposal site.

5. Copy of notifications required as part of the emergency notification plan.

3. Non-Friable Abatement:

1. Submit a detailed plan of the procedures proposed to minimize emissions and to prevent the material from becoming friable during removal.

2. Copy of emergency protection plan to be used if the nonfriable material should become friable during removal.

3. Current Certificates of training and statement of qualifications for the "Competent Person".

4. One copy of the Negative Initial Exposure Assessment.
4. Upon completion of the abatement work, the following information shall be submitted to the Owner's Representative.

   1. Waste disposal receipts and waste shipment record on all asbestos waste removed from the project.

5. Upon completion of the abatement work, the following information shall be submitted by the Owner's C.I.H. to the Contractor.

   1. Air sampling test results for personal (non-OSHA) and final clearance air samples taken under the supervision of Owner's Certified Industrial Hygienist. Results must be in writing in final report form.

   2. Written certification from the Owner's Certified Industrial Hygienist.

**PART 2 - PRODUCTS - NOT USED**

**PART 3 - EXECUTION**

**3.1 SUPERVISION OF ABATEMENT**

   1. The Contractor shall designate a competent supervisor subject to the approval of the Owner's C.I.H. and the Owner's Representative. The supervisor shall be the Contractor's representative on the project and shall meet the requirements of all applicable regulations and perform the following minimum requirements.

      1. Be Certified by the State of Missouri as an Asbestos Abatement Supervisor, a minimum of one year prior full time experience in asbestos abatement work and a minimum of two years experience as a supervisor, and be qualified as a Competent Person in accordance with OSHA regulation 1926.1101.

      2. Be on site and supervise all abatement work in accordance with OSHA and Volume 18, Missouri Register, page 44.

      3. Conduct all OSHA required air monitoring.

      4. Maintain a daily log on the project documenting events, visitations, problems, equipment failures, accidents, and inspections.

      5. Be responsible for implementation of first aid, safety training, respiratory protection, and ensuring all workers are trained in emergency procedures.

      6. Be responsible for conducting a visual inspection of the work area prior to a visual inspection by the Owner's Certified Industrial Hygienist. Inspection shall be documented.
3.2 NEGATIVE INITIAL EXPOSURE ASSESSMENT

1. The Contractor must conduct a Negative Initial Exposure Assessment (non-friable asbestos) prior to removal of the asbestos material. The Negative Initial Exposure Assessment shall be performed by a "Competent Person" to determine whether the material may be removed and maintained in a nonfriable condition. If the material cannot be removed without becoming friable then the contractor shall comply to the requirements in this specification at no additional cost to the Owner.

2. The method of removal is the Contractor's option. However, in the event of any of the following:

   1. Visible emissions are observed
   2. Sanding, grinding, cutting, or abrading of the material
   3. Air samples exceed 0.1 f/cc

The contractor shall immediately stop work, implement corrective work practices, make any necessary notifications to all regulatory agencies of the changes in work practices and material conditions, and comply with the requirements as set forth in this specification.

3.3 WORKER PROTECTION & TRAINING

1. The Contractor shall be responsible for providing his employees with proper respiratory protection, respiratory training, written respirator program, medical examinations, maintaining medical records, and protective clothing and equipment to comply with OSHA requirements.

2. The Contractor shall be responsible for all testing and costs incurred for complying with requirements of OSHA regulations for Personal Air Sampling.

3. All workers shall be trained in the dangers inherent in handling asbestos and breathing asbestos dust and in proper work procedures and personal and protective measures.

4. All workers shall hold valid diplomas as accredited Asbestos Abatement Workers as required by 10 CSR 10-6.250.

3.4 INDEPENDENT TESTING LABORATORY

1. Testing Laboratories utilized by the Contractor for sample analysis during the project shall meet the following minimum requirements and be approved by the Owner's C.I.H. This information shall be submitted to the Owner's Representative for review.
1. All air monitoring samples shall be analyzed by a testing laboratory accredited by the American Industrial Hygiene Association (AIHA) or by an individual who is currently on the Asbestos Analyst Registry.

2. All bulk samples shall be analyzed by a testing laboratory accredited by the National Voluntary Laboratory Accreditation Program (NVLAP).

3.5 OWNER'S AIR SAMPLING PROFESSIONAL & CERTIFIED INDUSTRIAL HYGIENIST

1. It will be the Owner's responsibility to hire an Air Sampling Professional & Certified Industrial Hygienist. The Air Sampling Professional & Industrial Hygienist will also be required to perform the following duties as a minimum:

1. Approval of the Contractor's work plan and methods of abatement to meet regulatory requirements and ensure the health and safety of University faculty, staff, and students.

2. Verify that the contractor is satisfactorily performing personal air monitoring as directed by OSHA regulations.

3. Visual inspection of the work area and final clearance air monitoring.

4. Certify in writing that the Contractor's procedures, methods and practices were, to the best of my knowledge and belief, in compliance with current EPA, OSHA, State and/or applicable local regulations and that the work areas meet the requirements for final clearance testing and account of any known deviations.

5. Issue final air clearance.

3.6 EMERGENCY PROTECTION PLAN

1. The contractor shall be responsible for developing a written Emergency Protection Plan and shall maintain this plan on site. The plan shall include considerations of asbestos leakage from the site, fire, explosion, toxic atmospheres, electrical hazards, slips, falls, and heat related injury. All employees shall be instructed and trained in the procedures.

2. Emergency protection plan shall also include written notification of police, fire and medical personnel of the planned abatement activities, work schedule, and layout of work area, particularly barriers that may affect response capabilities.

3.7 LOCAL AREA PROTECTION & SITE SECURITY

1. The contractor shall be responsible for all areas of the building used by him and/or subcontractors in the performance of the work. Contractor shall exert full control over the actions of all employees and other persons with respect to the use and preservation of the existing building, except such controls as may be specifically reserved to the owner.
2. Contractor has the right to exclude from the work area all persons who have no purpose related to the work or its inspection, and shall require all persons in the work area to observe the same regulations required of Contractor's employees.

3. The contractor shall have control of site security during abatement operations in order to protect work environment and equipment. Contractor shall have the owners assistance in notifying building occupants of impending activity and enforcement of restricted access by owners employees.

4. The contractor shall keep a minimum of two 10 lbs. type ABC fire extinguishers on site. One shall be maintained outside the work area and one inside the work area. The employees shall be trained in the operation of extinguishers.

5. Where areas cannot be isolated by existing walls and doors from employees, clients, or the public, barriers must be constructed of 1/2" plywood and 2"x4" framing 16" o.c. to isolate the area. The barriers must be installed in such a manner to prevent damage to existing walls, floors, or ceilings. Barrier may have a lockable door.

6. The contractor shall maintain the work area free from rubbish, debris, and dirt and keep a clean, safe working area.

7. The Contractor shall provide warning signage around the regulated area as required by OSHA.

8. The Contractor shall isolate any and all air supply and returns to the abatement space as required by OSHA. Contractor shall coordinate with the Owner’s Representative.

9. The Contractor shall keep all areas where adhesive stripper is in use (such as mastic removal) under negative pressure and exhausted to the outside ambient air.

3.8 FINAL CLEARANCE REQUIREMENTS (FRIABLE ASBESTOS)

1. Upon completion of the abatement work, the supervisor shall perform a visual inspection of the work area. If satisfactory, the supervisor shall then request the Owner's C.I.H. or the C.I.H.’s air sampling technician to perform a visual inspection. When the Owner's C.I.H. feels the area is ready based on the results of their visual inspection, the Contractor shall apply a lockdown encapsulant. Following application of lockdown encapsulant, the Owner's C.I.H. shall perform the final clearance sampling for airborne fiber concentrations.

2. The Owner's C.I.H. or designee will perform final clearance testing per the following requirements:

   1. Aggressive sampling shall be required for all areas where removal has taken place with the exception of glove bag projects where nonaggressive sampling is permitted.

   2. P.C.M. samples analyzed on site shall be counted by an accredited registered microscopist.
3. For areas specifically specified for clearance by Transmission Electron Microscopy, the method shall be NIOSH 7402.

3. Any work areas failing to meet the clearance requirements of this section shall be recleaned and retested at the contractor’s expense until satisfactory levels are obtained.

4. The Owner's C.I.H. shall provide a written report of the air monitoring activities to the contractor within 7 days after the final clearance testing.

3.9 REESTABLISHMENT OF THE WORK AREA AND SYSTEMS

1. Reestablishment of the work area shall only occur after the contractor has received final clearance in writing from the Owner's C.I.H.

2. All damage to finishes, equipment, and/or the area affected by the abatement shall be repaired by the contractor to equal or better condition as it was prior to the work, at no cost to the owner.

3.10 WASTE DISPOSAL

1. All asbestos containing waste and/or asbestos contaminated debris shall as a minimum be double bagged in approved 6 mil. disposal bags. Each bag shall be tagged to meet requirements of NESHAPs with an asbestos caution label and a source identification label.

2. Transportation shall meet the requirements of all regulatory agencies for asbestos containing materials and shall be transported in an enclosed truck.

3. The waste disposal site shall be approved by the Missouri Department of Natural Resources for asbestos disposal. A chain of custody letter/waste shipment record and disposal receipts shall be provided to the owner for all materials disposed of.

3.11 DRAWINGS

1. Drawings, when provided, are not intended to be used for anything but a "reference" to the work area. Information is not specific to quantities or to exact location of ACM unless explicitly noted. Contractor will be required to field verify the conditions and quantities.

3.12 REPORTS

1. Reports, when provided, are intended to be used as a basis for the type and composition of the asbestos present for both bidding purposes and for the information required for the notifications to the governing agencies.
TO: Jude Wawrzyniak  
Planning, Design, & Construction

FROM: Pete Kohler  
Environmental Health & Safety

MU EHS has completed a survey of a specific area on 1st floor of Medical Science Building (Building C37-060). The survey was made to identify asbestos-containing material (ACM) which will be disturbed by the upcoming renovation. The survey is limited to an area designated by the survey request:

Two separate Laboratory Areas:
1. The existing M148 Gross Anatomy Lab area (West Side), and,
2. The L-shaped area consisting of existing M129-M134 PBL Classrooms and M113, M114, M126 and M128 Office areas (East Side).

The inspection was conducted to satisfy the requirements of 40CFR 61, subpart M, which stipulates that all buildings be “thoroughly inspected” for asbestos before the commencement of renovation or demolition activities. The asbestos inspection was conducted by Yuliya Pushechnikova (Missouri Asbestos Inspector #19060, expires 5/3/18) and Pete Kohler (Missouri Asbestos Inspector #10883, expires 1/19/18), who prepared this report. The survey was conducted May-July, 2017, and the report was completed on July 7, 2017.

As a result of sampling and analysis, asbestos containing material was identified within the scope of the project.

Some pipe insulation contains asbestos.
Transite ducts in chases contain asbestos.
Tar at seams on fiberglass ducts contains asbestos.
Caulk on wood windows contains asbestos.
Fire doors are presumed to have asbestos-containing cores.
Floor tile was analyzed by transmission electron microscopy (TEM). Other samples were analyzed by polarized light microscopy (PLM), with an additional step in the preparation of hard-to-analyze samples like adhesive floor mastic and tar (PLM NOB).

FIELD OBSERVATIONS

Flooring throughout the east end of this space is 12” floor tile, gray and light blue, laid in a checkerboard pattern with black mastic. Both colors of tile and the mastic were sampled at various locations and found to be negative for asbestos. Negative black mastic is unusual, but the most rigorous analysis method found no asbestos in the samples. Enough samples were collected to be representative of the area. One sample of 12” blue floor tile in M113 was analyzed at <0.1% chrysotile. This amount of chrysotile does not quantify as asbestos-containing material, and as the only trace found in many samples, I consider this incongruous.

Flooring in the gross anatomy lab (M148) is a poured epoxy floor, which is relatively new and is not slated to be removed.

Office M114 has carpet squares on top of white leveler on concrete. The leveler does not contain asbestos.

The floor in mechanical rooms is bare concrete.

At the north end of Corridor M122, there is a soft fibrous underlayment beneath the floor tile. This sub-floor was sampled and analyzed. It does not contain asbestos.

Cove base is vinyl throughout both areas, and is not considered suspect material.

Walls are typically sheet rock construction on metal studs. Sheet rock joint compound was sampled and analyzed. No asbestos-containing sheet rock joint compound was identified. Substantial changes are likely to be made to the walls, and sampling was adequate to cover these areas.

There are blackboards in several offices in the east part of this space. The blackboards are painted metal, and are not ACM.

Behind the sheet rock walls, the original construction is glazed block. This is not considered suspect material.
Behind the sheet rock in Room M132, there is tar on concrete. The tar was sampled and analyzed. It does not contain asbestos.

The ceiling is typically 2x2 acoustic ceiling tile in a suspended metal grid. The various styles of ceiling tiles were sampled and analyzed. They do not contain asbestos. Ceiling tile in M148 is 2x2 gypsum board, covered with vinyl. It is negative for asbestos.

Above the drop ceiling is a concrete deck. There is no spray-on material on the 1st floor deck.

In Mechanical Room M255, directly above the gross anatomy Lab, there is spray-on fireproofing on the west half of the deck. This material was sampled and analyzed. It does not contain asbestos.

Pipe insulation above the drop ceiling is generally negative for asbestos. Most TSI is fiberglass, sometimes clad with PVC. Insulation on some water pipes is black neoprene. Drain pipes are bare cast iron or PVC. Fiberglass and neoprene insulation was inspected but not necessarily sampled.

However, there are pipes remaining in the scope of this project which are insulated with ACM. Above the drop ceiling of the gross anatomy lab, there is substantial ACM piping, some of which is 12” steam pipe.

In the rooms along the north-south hallway (Rooms M130, M128, M126) there is ACM pipe remaining, particularly inside chases. In M132 and M133, there is discarded ACM insulation in the bottom of the chase. There is ACM mud on pipes inside the chases in M113 and M133. Small stretches of ACM straights are in other chases. **Any pipe which is not clearly neoprene or fiberglass is presumed positive for asbestos.**
There is old insulation on some water piping that is not fiberglass or neoprene. These pipes are insulated with a package that is mostly cardboard, but the last layer of the wrap (closest to the pipe) is tarpaper, and the tarpaper contains asbestos. The presence of the positive tarpaper makes this asbestos-containing material. The **cardboard-type water pipe insulation contains asbestos.** Negative results in analysis of this type of insulation are due to incomplete sampling or, possibly, the analyst missing the tarpaper layer.

Although outside the strict scope of the project, I surveyed TSI on the 2\textsuperscript{nd} floor. Directly above the project, much of the pipe insulation is ACM. **Any work-plan for this project which occurs on the 2\textsuperscript{nd} floor should anticipate the presence of asbestos pipe insulation.** An area which does not fit this rule is M255. The pipe insulation in Mechanical Room M255 is new and is labelled non-asbestos.

Within the scope of the project, there are five 12” ACM transite ducts: M114, M126, M134, and two in M128. Three of these ducts drop into the space of the room; two stop at the ceiling. Some of these ducts are damaged. The flanges where these ducts fit together likely contain asbestos rope gasket material, which is almost pure chrysotile.

These same chases contain small pipes with ACM insulation, and some of this material is severely damaged.
Most of the 1st floor HVAC ductwork is negative for asbestos, with bare sheet metal ducts and fiberglass branch flex-duct. But above the main east-west corridor (M122), there is old fiberglass ductwork with no fabric covering, and with ACM tar at the insulation joints. This type of ductwork, with positive tar, has been found at many locations in Medical Science hallways.

Red firestop caulk, above the drop ceilings at wall penetrations is negative for asbestos. New sheet rock repairs above the drop ceilings have negative sheet rock joint compound.
Windows in the first floor offices are wood double-hung units. The window glazing compound does not contain asbestos. The caulk, around the exterior perimeter of the windows, does contain asbestos. Some samples of the caulk were found to contain more than one layer of different material. Some of the layers are negative, but some of them are also positive, making these combined samples ACM.

Most of the doors are fire-rated. Some of the doors have no fire-rating labels, but they look the same as the fire doors. It is prudent to presume these doors are fire doors, which have lost their labels. Fire doors are presumed to have asbestos-containing cores. These doors can be re-used, if their hardware stays in place. If the hardware is to be removed, or if the doors are to be discarded, it must be done by asbestos-certified workers.

Mechanical Room M120 is mentioned in the survey request; the insulation appears new, and is fiberglass or black neoprene. I did not identify any suspect material in this room.

Just outside the scope of the project, there is another mechanical room, M112. This mechanical room also has insulation consisting of neoprene and fiberglass. While the insulation in this room is older and in damaged condition, no suspect material is present.

**ASBESTOS SAMPLING TABLE**
**MEDICAL SCIENCE 1ST FLOOR LABS**
**PROJECT CP171091**

<table>
<thead>
<tr>
<th>SAMPLE NUMBER</th>
<th>DESCRIPTION/LOCATION</th>
<th>ANALYSIS</th>
</tr>
</thead>
<tbody>
<tr>
<td>17052301</td>
<td>12&quot; Gray Floor Tile, Med Sci M133</td>
<td>100% Non-Fibrous</td>
</tr>
<tr>
<td>17052301A</td>
<td>Black Mastic on Floor Tile, Med Sci M133</td>
<td>100% Non-Fibrous</td>
</tr>
<tr>
<td>17052302</td>
<td>12&quot; Blue Floor Tile, Med Sci M133</td>
<td>100% Non-Fibrous</td>
</tr>
<tr>
<td>Code</td>
<td>Description</td>
<td>Composition</td>
</tr>
<tr>
<td>--------------</td>
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</tr>
<tr>
<td>17052302A</td>
<td>Black Mastic on Floor Tile, Med Sci M133</td>
<td>100% Non-Fibrous</td>
</tr>
<tr>
<td>17052303</td>
<td>Sheet Rock joint compound, Med Sci M133</td>
<td>100% Non-Fibrous</td>
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<tr>
<td>17052304-Mud</td>
<td>Sheet Rock joint compound, Med Sci M133</td>
<td>100% Non-Fibrous</td>
</tr>
<tr>
<td>17052304-Tape</td>
<td>Sheet Rock tape, Med Sci M133</td>
<td>100% Cellulose</td>
</tr>
<tr>
<td>17052305-Ceiling Tile</td>
<td>2x2 Ceiling Tile Recessed, Med Sci M133</td>
<td>26% Cellulose, 35% Min. Wool, 26% Perlite, 13% Non-fibrous (Other)</td>
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<tr>
<td>17052305-Insulation</td>
<td>2x2 Ceiling Tile Recessed, Med Sci M133</td>
<td>93% Min. Wool, 7% Non-fibrous (Other)</td>
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<tr>
<td>17052306-Glazing</td>
<td>Window Glaze Comp. Med Sci M133</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17052306-Glazing 2</td>
<td>Window Glaze Comp. Med Sci M133</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17052307-Caulk</td>
<td>Window Caulk Med Sci M133</td>
<td>98% Non-fibrous (Other), 2% Chrysotile</td>
</tr>
<tr>
<td>17052307-Caulk 2</td>
<td>Window Caulk Med Sci M133</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17052307-Caulk 3</td>
<td>Window Caulk Med Sci M133</td>
<td>100% Non-fibrous (Other)</td>
</tr>
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<td>Code</td>
<td>Description</td>
<td>Fiber Content</td>
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<tr>
<td>17053001</td>
<td>12&quot; Gray Floor Tile, Med Sci M134</td>
<td>100% Non-Fibrous</td>
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<tr>
<td>17053001A</td>
<td>Black Mastic on Floor Tile, Med Sci M134</td>
<td>100% Non-Fibrous</td>
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<td>17053002</td>
<td>2x2 Ceiling Tile Recessed, Gray Body, Med Sci M134</td>
<td>27% Cellulose, 36% Min. Wool, 27% Perlite, 10% Non-fibrous (Other)</td>
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<tr>
<td>17053003</td>
<td>Med Sci M134, sheet rock joint compound</td>
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<tr>
<td>17053004</td>
<td>Window Glaze Compound Ext. Med Sci M130</td>
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<tr>
<td>17053005</td>
<td>Ext. Window Caulk, Med Sci M130</td>
<td>98% Non-fibrous (Other), 2% Chrysotile</td>
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<td>17053006</td>
<td>12&quot; Blue Floor Tile, Med Sci M130</td>
<td>100% Non-Fibrous</td>
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<td>17053006A</td>
<td>Black Mastic on Floor Tile, Med Sci M130</td>
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<td>17053007</td>
<td>Sheet rock joint compound, Med Sci M130</td>
<td>100% Non-fibrous (Other)</td>
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<td>17053101-Mud</td>
<td>Sheet Rock joint compound, Med Sci M148</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17053101-Tape</td>
<td>Sheet Rock joint tape, Med Sci M148</td>
<td>100% Cellulose</td>
</tr>
<tr>
<td>17053102</td>
<td>Sheet Rock joint compound, Med Sci M148</td>
<td>100% Non-fibrous (Other)</td>
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<td>Item</td>
<td>Description</td>
<td>Composition</td>
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<td>17053103- mud</td>
<td>Sheet Rock joint compound, center column, Med Sci, M148</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17053103-Tape</td>
<td>Sheet Rock joint tape, Column, Med Sci, M148</td>
<td>100% Cellulose</td>
</tr>
<tr>
<td>17053104</td>
<td>Ceiling Tile, Med Sci M148</td>
<td>28% Cellulose, 37% Min. Wool, 28% Perlite, 7% Non-fibrous (Other)</td>
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<tr>
<td>17053105</td>
<td>Spray-on Fireproofing, Med Sci M255</td>
<td>19% Cellulose, 81% Non-fibrous (Other)</td>
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<td>17053106</td>
<td>Spray-on Fireproofing, Med Sci M255</td>
<td>86% Min. Wool, 14% Non-fibrous (Other)</td>
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<td>17053107</td>
<td>Red fire stop Caulk, Med Sci M255</td>
<td>7% Glass, 93% Non-fibrous (Other)</td>
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<tr>
<td>17053108</td>
<td>2x2 gray body recessed ceiling tile, Med Sci. M113</td>
<td>28% Cellulose, 37% Min. Wool, 28% Perlite, 7% Non-fibrous (Other)</td>
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<tr>
<td>17053109</td>
<td>12” gray floor tile, Med Sci. M113</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>17053109A</td>
<td>Black mastic, Med Sci. M113</td>
<td>100% non-fibrous (other)</td>
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<tr>
<td>17053110</td>
<td>Window caulk, Med Sci. M113</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17053111</td>
<td>Window glazing compound, Med Sci. M113</td>
<td>100% Non-fibrous (Other)</td>
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<td>17053112</td>
<td>2x2 ceiling tile, radical bumps recessed, Med Sci. M114</td>
<td>29% Cellulose, 38% Min. Wool, 29% Perlite, 4% Non-fibrous (Other)</td>
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<tr>
<td>17053113- leveler</td>
<td>White floor leveler, M114</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17053113- adhesive</td>
<td>White floor leveler, M114</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>Code</td>
<td>Description</td>
<td>Fiber Composition</td>
</tr>
<tr>
<td>------------</td>
<td>------------------------------------------------------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
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<tr>
<td>17060501</td>
<td>2x2 Ceiling tile, Med Sci., hallway outside M125</td>
<td>26% cellulose, 35% min wool, 26% perlite, 13% non-fibrous</td>
</tr>
<tr>
<td>17060502-wrap</td>
<td>TSI 3” straight, Med Sci. hall by M125</td>
<td>37% cellulose, 17% glass, 46% non-fibrous (other)</td>
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<tr>
<td>17060502-TSI</td>
<td>TSI 3” straight, Med Sci. hall by M125</td>
<td>94% min. wool, 6% non-fibrous (other)</td>
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<tr>
<td>17060503</td>
<td>12x12 blue-gray floor tile, Med Sci. hallway across from stairway U</td>
<td>100% non-fibrous (other)</td>
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<tr>
<td>17060504</td>
<td>Soft subfloor, Med Sci. hallway across from stair U</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>17060505</td>
<td>12x12 blue floor tile, Med Sci. outside M113</td>
<td>100% non-fibrous (other), &lt; 0.1% Chrysotile</td>
</tr>
<tr>
<td>17060506-mud</td>
<td>Sheet rock joint compound, Med Sci. ceiling outside M133</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>17060506-tape</td>
<td>Sheet rock tape, Med Sci. ceiling outside M133</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>17060601</td>
<td>Above ceiling tile duct cement, Med Sci. M134</td>
<td>38% fibrous (other), 62% non-fibrous (other)</td>
</tr>
<tr>
<td>17060602</td>
<td>Above ceiling tile dark gray caulk, Med Sci. M134</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>17060603</td>
<td>Above ceiling tile TSI-cement at butt joint, Med Sci. M133</td>
<td>100% non-fibrous (other)</td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Details</td>
</tr>
<tr>
<td>------------</td>
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<tr>
<td>17060604</td>
<td>TSI-residual on threaded fitting Med Sci M133</td>
<td>96% min. wool, 4% non-fibrous (other)</td>
</tr>
<tr>
<td>17060801</td>
<td>Med Sci. east end of main east-west hall, Fire stop above ceiling tile</td>
<td>38% Perlite, 62% Non-fibrous</td>
</tr>
<tr>
<td>17060802</td>
<td>Tar paper wrap on TSI, Med Sci. east end of main east-west hall</td>
<td>100% matrix material (PLM NOB) no asbestos detected</td>
</tr>
<tr>
<td>17060803</td>
<td>TSI 3” straight, Med Sci. M114</td>
<td>89% Cellulose, 11% non-fibrous</td>
</tr>
<tr>
<td>17060803A</td>
<td>TSI 3” straight, Med Sci. M114</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17060803B</td>
<td>TSI 3” straight, Med Sci. M114</td>
<td>89% Cellulose, 11% non-fibrous</td>
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<tr>
<td>17060804</td>
<td>Mud at hanger, Med Sci. M128</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17060804A</td>
<td>Mud at hanger, Med Sci. M128</td>
<td>36% cellulose, 16% glass, 48% non-fibrous</td>
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<tr>
<td>17060804B</td>
<td>Mud at hanger, Med Sci. M128</td>
<td>93% min wool, 7% non-fibrous</td>
</tr>
<tr>
<td>17060805</td>
<td>TSI 3” 90, Med Sci. M128</td>
<td>37% Min. Wool, 56% Non-fibrous (Other), 7% Chrysotile</td>
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<tr>
<td>17060901</td>
<td>Black tar on fiberglass, Med Sci., ceiling across from M112</td>
<td>Non-Fibrous</td>
</tr>
<tr>
<td>17060902</td>
<td>Black tar on fiberglass, Med Sci., ceiling next to M114</td>
<td>5.1% Chrysotile</td>
</tr>
<tr>
<td>Date</td>
<td>Description</td>
<td>Asbestos Composition</td>
</tr>
<tr>
<td>------------</td>
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<td>-----------------------------------------------</td>
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<tr>
<td>17060903</td>
<td>Tar paper wrap, Med Sci. ceiling by M114</td>
<td>Non-Fibrous</td>
</tr>
<tr>
<td>17060904</td>
<td>Mortar, Med Sci., ceiling next to M113</td>
<td>28% quartz, 72% non-fibrous</td>
</tr>
<tr>
<td>17060905</td>
<td>TSI wrap, Med Sci. ceiling across from M125A</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17060906</td>
<td>Yellow caulk, Med Sci., M134</td>
<td>100% Non-fibrous (Other)</td>
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<tr>
<td>17060907</td>
<td>White caulk on tar paper, Med Sci. M133</td>
<td>100% Non-fibrous (Other)</td>
</tr>
<tr>
<td>17062101</td>
<td>TSI 3” 45° above ceiling tile, Med Sci. M148</td>
<td>85% non-fibrous, 15% Chrysotile</td>
</tr>
<tr>
<td>17062103</td>
<td>TSI 3” valve above ceiling tile, Med Sci. M148</td>
<td>82% non-fibrous, 3% Chrysotile, 15% Amosite</td>
</tr>
<tr>
<td>170628-01</td>
<td>Med Sci, M126, TSI- 3” straight (last layer of wrapped insulation on water line)</td>
<td>CONTAINS 2% CHRYSTOTILE, 90% cellulose, 8% other</td>
</tr>
<tr>
<td>170628-02</td>
<td>Med Sci M126, chase in east wall, TSI- 3” 90</td>
<td>15% CHRYSTOTILE, 85% non-fibrous</td>
</tr>
<tr>
<td>170628-03</td>
<td>Med Sci M132, west wall, tar on concrete wall behind sheet rock wall</td>
<td>100% matrix material (PLM NOB) no asbestos detected</td>
</tr>
<tr>
<td>170628-04</td>
<td>Med Sci M132, east wall, tar on concrete wall behind sheet rock wall</td>
<td>100% matrix material (PLM NOB) no asbestos detected</td>
</tr>
</tbody>
</table>
ASBESTOS SUMMARY

Within the scope of Project CP171091, there are:

· Thirty nine (39) linear feet of 12” transite ACM duct

· Five hundred twenty five (525) linear feet of ACM pipe insulation

· Twenty (20) double hung windows with ACM caulk- The positive caulk is around the exterior perimeter of each window. Each window is approximately 36x48.

· Two hundred eighty (280) square feet of ACM tar on seams of fiberglass insulation on ductwork in ceiling of east-west hall M122

· Eleven (11) fire doors with presumed asbestos-containing cores (including double doors into Mechanical Room M120)

UNIVERSAL WASTE
PROJECT CP171091
MED SCI 1ST FLOOR LABS

In addition to the asbestos-containing material in the survey above, the following items should be removed from the project area:

· Eleven (11) hydraulic door closers
· Eleven (11) thermostats
· Four (4) exit signs
· Two (2) emergency fire lights
· One hundred twenty six (126) 4’ fluorescent light fixtures w/their bulbs
· Ninety two (92) 2’ fluorescent light fixtures w/their bulbs
ASBESTOS SAMPLING LOCATIONS
MEDICAL SCIENCE M148
PROJECT 171091
ASBESTOS SAMPLING LOCATIONS
MEDICAL SCIENCE 1ST FLOOR LABS
PROJECT CP171091
ASBESTOS SAMPLING LOCATIONS
ADDITIONAL SAMPLES
MEDICAL SCIENCE 1ST FLOOR LABS
PROJECT CP171091

170609-07
170609-06
170609-01
170608-03
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SECTION 035416 - HYDRAULIC CEMENT UNDERLAYMENT

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 polymer-modified, self-leveling, hydraulic cement underlayment for application below interior floor coverings.
B. Related Sections:
   1. Section 096519 - Resilient Tile Flooring

1.3 UNIT PRICES
A. Work of this Section is affected by Underlayment Unit Price.
B. Provide base bid quantity of area shown on drawings x 1/2 inch thickness.
C. Provide Unit Price for modifying quantities in conformance with Unit Price Specification in base bid.

1.4 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.

1.5 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Include plans indicating substrates, locations, and average depths of underlayment based on survey of substrate conditions.

1.6 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: Installer who is approved by manufacturer for application of underlayment products required for this Project.

1.8 FIELD CONDITIONS
A. Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ventilation, ambient temperature and humidity, and other conditions affecting underlayment performance.
   1. Place hydraulic cement underlayments only when ambient temperature and temperature of substrates are between 50 and 80 deg F.

PART 2 - PRODUCTS

2.1 HYDRAULIC CEMENT UNDERLAYMENTS FOR AREAS TO RECEIVE FLOOR COVERINGS
A. Hydraulic Cement Underlayment: Polymer-modified, self-leveling, hydraulic cement product that can be applied in minimum uniform thickness of 1/4 inch and that can be feathered at edges to match adjacent floor elevations.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. ARDEX Americas; Ardex K-15.
      b. BASF Construction Chemicals, LLC; CX Self-Leveling Underlayment Mastertop 110 Plus.
      c. Dayton Superior Corporation; LevelLayer.
      d. L&M Construction Chemicals, Inc.; Levelex.
      e. Lambert Corporation; Lambco L-16 Self-Level.
      f. MAPEI Corporation; Novoplan 2 Plus
      g. Maxxon Corporation; Level-Right
      h. TEC; H.B. Fuller Construction Products, Inc.; TEC EZ Level Self Leveling Underlayment
      i. USG Hydraulic Cement Underlayment meeting above requirements.
   2. Cement Binder: ASTM C 150/C 150M, portland cement, or hydraulic or blended hydraulic cement as defined by ASTM C 219.
   3. Compressive Strength: Not less than 4200 psi (27.6 MPa) at 28 days when tested according to ASTM C 109/C 109M.
   4. Underlayment Additive: Resilient-emulsion product of underlayment manufacturer, formulated for use with underlayment when applied to substrate and conditions indicated.
B. Water: Potable and at a temperature of not more than 70 deg F.
C. Reinforcement: For underlayment applied to wood substrates, provide galvanized metal lath or other corrosion-resistant reinforcement recommended in writing by underlayment manufacturer.
D. Primer: Product of underlayment manufacturer recommended in writing for substrate, conditions, and application indicated.
   1. VOC Content: Provide primer with VOC content of 200 g/L or less.
   2. Low-Emitting Primer: Primer shall comply with the testing and product 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."
   3. Corrosion-Resistant Coating: Recommended in writing by underlayment manufacturer for metal substrates.
   4. VOC Content: Provide coating with VOC content of 250 g/L or less.
   5. Low-Emitting Coating: Coating shall comply with the testing and product 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."
   6. Surface Sealer: Designed to reduce porosity as recommended by manufacturer for type of floor covering to be applied to underlayment.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, with Installer present, for conditions affecting performance of the Work.
B. Proceed with application only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. General: Prepare and clean substrate according to manufacturer's written instructions.
   1. Treat nonmoving substrate cracks according to manufacturer's written instructions to prevent cracks from telegraphing (reflecting) through underlayment.
   2. Fill substrate voids to prevent underlayment from leaking.
B. Concrete Substrates: Mechanically remove, according to manufacturer's written instructions, laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants that might impair underlayment bond.
   1. Moisture Testing: Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates do not exceed a maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
C. Adhesion Tests: After substrate preparation, test substrate for adhesion with underlayment according to manufacturer's written instructions.

3.3 APPLICATION
A. General: Mix and apply underlayment components according to manufacturer's written instructions.
   1. Close areas to traffic during underlayment application and for time period after application recommended in writing by manufacturer.
   2. Coordinate application of components to provide optimum adhesion to substrate and between coats.
   3. At substrate expansion, isolation, and other moving joints, allow joint of same width to continue through underlayment.
B. Apply primer over prepared substrate at manufacturer's recommended spreading rate.
C. Apply underlayment to produce uniform, level surface.
   1. Apply a final layer without aggregate to product surface.
   2. Feather edges to match adjacent floor elevations.
D. Cure underlayment according to manufacturer's written instructions. Prevent contamination during application and curing processes.
E. Do not install floor coverings over underlayment until after time period recommended in writing by underlayment manufacturer.
F. Apply surface sealer at rate recommended by manufacturer.
G. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

3.4 PROTECTION
A. Protect underlayment from concentrated and rolling loads for remainder of construction period.

END OF SECTION 035416
SECTION 042200 - CONCRETE UNIT MASONRY

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: Repair and infill of existing CMU walls.
   1. Concrete masonry units.
   2. Mortar and grout.

1.3 DEFINITIONS
A. CMU(s): Concrete masonry unit(s).

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.5 INFORMATIONAL SUBMITTALS
A. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
   1. Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91/C 91M for air content.
   2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.

1.6 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.

1.7 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.
PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Source Limitations for Masonry Units: Obtain masonry units from single source from single manufacturer for each product required.
B. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, 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. Fire-Resistance Ratings: Comply with requirements for fire-resistance-rated assembly designs indicated.
1. Where fire-resistance-rated construction is indicated, units shall be listed and labeled by a qualified testing agency acceptable to authorities having jurisdiction.

2.3 CONCRETE MASONRY UNITS
A. 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.
B. CMUs: ASTM C 90.
   1. Density Classification: Lightweight.
   2. Size (Width): Manufactured to dimensions 3/8 inch less-than-nominal dimensions.
   3. 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 CONCRETE 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 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. Portland Cement: ASTM C 150/C 150M, Type I or II.
   1. Alkali content shall not be more than 0.1 percent when tested according to ASTM C 114.
B. Hydrated Lime: ASTM C 207, Type S.
C. Portland Cement-Lime Mix: Packaged blend of portland cement and hydrated lime containing no other ingredients.
D. Aggregate for Mortar: ASTM C 144.
   1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
   2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
E. Aggregate for Grout: ASTM C 404.
F. Water: Potable.

2.6 REINFORCEMENT
A. Masonry-Joint Reinforcement, General: Ladder type complying with ASTM A 951/A 951M.
   1. Interior Walls: Mill-galvanized carbon steel.
   2. Wire Size for Side Rods: 0.148-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.
B. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.7 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 mortar unless otherwise indicated.
   3. For reinforced masonry, use portland cement-lime mortar.
B. Preblended, Dry Mortar Mix: Furnish dry mortar ingredients in form of a preblended mix. Measure quantities by weight to ensure accurate proportions, and thoroughly blend ingredients before delivering to Project site.

C. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion 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 reinforced masonry, use Type N.
   2. For interior nonload-bearing partitions, Type O may be used instead of Type N.

D. Grout for Unit Masonry: Comply with ASTM C 476.
   1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with TMS 602/ACI 530.1/ASCE 6 for dimensions of grout spaces and pour height.
   2. Proportion grout in accordance with ASTM C 476, Table 1.
   3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

E. Epoxy Pointing Mortar: Mix epoxy pointing mortar to comply with mortar manufacturer's written instructions.
   1. Application: Use epoxy pointing mortar for exposed mortar joints with pre-faced CMUs.

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 plus 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 every 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. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
H. Build nonload-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
1. Wedge nonload-bearing partitions against structure above with small pieces of tile, slate, or metal. Fill joint with mortar after dead-load deflection of structure above approaches final position.
2. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Section 078443 "Joint Firestopping."

3.5 MORTAR BEDDING AND JOINTING

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

3.6 MASONRY-JOINT REINFORCEMENT

A. General: Install entire length of longitudinal side rods in mortar with equal cover on either side of walls. Lap reinforcement a minimum of 6 inches.
1. Space reinforcement not more than 16 inches o.c.
2. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
B. Provide continuity at wall intersections by using prefabricated T-shaped units.
C. Provide continuity at corners by using prefabricated L-shaped units.
D. Cut and bend reinforcing units as directed by manufacturer for continuity at corners, returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 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.

3.8 REINFORCED UNIT MASONRY INSTALLATION

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. 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 12.67 ft.

3.9 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.

3.10 MASONRY WASTE DISPOSAL

A. Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

END OF SECTION 042200
SECTION 055000 - METAL FABRICATIONS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Steel framing and supports for mechanical and electrical equipment.
   2. Steel framing and supports for applications where framing and supports are not specified in other Sections.
B. Products furnished, but not installed, under this Section:
   1. Steel weld plates and angles for casting into concrete for applications where they are not specified in other Sections.
C. Related Sections:
   1. Section 099123 “Interior Painting”
   2. Section 099600 “High-Performance Coatings”

1.3 ACTION SUBMITTALS
A. Shop Drawings: Show fabrication and installation details for metal fabrications.
   1. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items.

1.4 INFORMATIONAL SUBMITTALS
A. Welding certificates.
B. Paint Compatibility Certificates: From manufacturers of topcoats applied over shop primers certifying that shop primers are compatible with topcoats.

1.5 QUALITY ASSURANCE
B. Welding Qualifications: Qualify procedures and personnel according to the following:

1.6 PROJECT CONDITIONS
A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

1.7 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.
   1. For High-Performance Coatings, provide shop primer as specified in 09 9600 High-Performance Coatings specification.

PART 2 - PRODUCTS

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

2.2 FERROUS METALS
A. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
B. Steel Tubing: ASTM A 500, cold-formed steel tubing.
C. Steel Pipe: ASTM A 53/A 53M, standard weight (Schedule 40) unless otherwise indicated.
D. Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4.
   1. Size of Channels: As indicated or required for loads.
   2. Material: Galvanized steel, ASTM A 653/A 653M, commercial steel, Type B, Grade 33, with G90 coating.
2.3 FASTENERS

A. General: Unless otherwise indicated, provide Type 316 stainless-steel fasteners for exterior use and zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, at exterior walls. Select fasteners for type, grade, and class required.

B. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 307, Grade A; with hex nuts, ASTM A 563; and, where indicated, flat washers.

C. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.

D. Stainless-Steel Bolts and Nuts: Regular hexagon-head annealed stainless-steel bolts, ASTM F 593; with hex nuts, ASTM F 594; and, where indicated, flat washers.

E. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.

1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.

F. Eyebolts: ASTM A 489.

G. Machine Screws: ASME B18.6.3.


I. Wood Screws: Flat head, ASME B18.22.1.


L. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel.

M. Post-Installed Anchors: Torque-controlled expansion anchors or chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.


N. Slotted-Channel Inserts: Cold-formed, hot-dip galvanized-steel box channels (struts) complying with MFMA-4, 1-5/8 by 7/8 inches by length indicated with anchor straps or studs not less than 3 inches long at not more than 8 inches o.c. Provide with temporary filler and tee-head bolts, complete with washers and nuts, all zinc-plated to comply with ASTM B 633, Class Fe/Zn 5, as needed for fastening to inserts.

2.4 MISCELLANEOUS MATERIALS

A. Welding Rods and Bare Electrodes: Select according to AWS specifications for metal alloy welded.

B. Shop Primers: Provide primers that comply with Section 099123 Interior Painting." and Section 099600 "High-Performance Coatings".

C. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.

1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.

D. Epoxy Zinc-Rich Primer: Complying with MPI#20 and compatible with topcoat.

E. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.

F. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187.

G. Nonshrink, Metallic Grout: Factory-packaged, ferrous-aggregate grout complying with ASTM C 1107, specifically recommended by manufacturer for heavy-duty loading applications.


I. Concrete: normal-weight, air-entrained, concrete with a minimum 28-day compressive strength of 3000 psi.

2.5 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 and contour of welded surface matches that of adjacent surface.

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. Fabricate seams and other connections that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.

2.6 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.
1. Fabricate units from slotted channel framing where indicated.
2. Furnish inserts for units installed after concrete is placed.
C. Galvanize miscellaneous framing and supports where indicated.
D. Hot dip galvanize all steel which is exposed to the exterior.
E. Prime miscellaneous framing and supports with zinc-rich primer where indicated.
F. Exterior duct and pipe support is to remain hot dip galvanized without finish paint.

2.7 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.
C. Galvanize exterior miscellaneous steel trim.
D. Prime exterior miscellaneous steel trim with zinc-rich primer. Primer specified in Section 099600 "High-Performance Coatings."

2.8 LOOSE BEARING AND LEVELING PLATES
A. Provide loose bearing and leveling plates for steel items bearing on concrete construction. Drill plates to receive anchor bolts and for grouting.
B. Galvanize plates.
C. Prime plates with zinc-rich primer. Primer specified in Section 099600 "High-Performance Coatings."

2.9 STEEL WELD PLATES AND ANGLES
A. Provide steel weld plates and angles not specified in other Sections, for items supported from concrete construction as needed to complete the Work. Provide each unit with no fewer than two integrally welded steel strap anchors for embedding in concrete.

2.10 FINISHES, GENERAL
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
B. Finish metal fabrications after assembly.
C. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

2.11 STEEL AND IRON FINISHES
A. Galvanizing: Hot-dip galvanize items as indicated 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.
B. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
1. Shop prime with universal shop primer unless zinc-rich primer is primers specified in Section 099600 "High-Performance Coatings" are indicated.
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 inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
   E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

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
   B. Set bearing and leveling plates on wedges, shims, or leveling nuts. After bearing members have been positioned and plumbed, tighten anchor bolts. Do not remove wedges or shims but, if protruding, cut off flush with edge of bearing plate before packing with grout.
      1. Use nonshrink grout, either metallic or nonmetallic, in concealed locations where not exposed to moisture; use nonshrink, nonmetallic grout in exposed locations unless otherwise indicated.
      2. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.4 ADJUSTING AND CLEANING
   A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
      1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
   B. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint are specified in Section 099123 "Interior Painting" and Section 099600 "High performance coatings".
   C. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055000
SECTION 061053 - MISCELLANEOUS 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. Fire retardant treated wood blocking, nailers or furring.
      2. Fire retardant plywood backing panels.
      3. Countertop Bracket for mounting to FR wood blocking in stud cavity.
   B. Related Sections:
      1. Section 123661 “Solid Surfacing Countertops” for countertops supported by brackets in this section.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
      1. Include data for fire-retardant treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Include physical properties of treated materials based on testing by a qualified independent testing agency.
      2. For fire-retardant treatments, include physical properties of treated lumber both before and after exposure to elevated temperatures, based on testing by a qualified independent testing agency according to ASTM D 5664.
      3. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.

1.4 INFORMATIONAL SUBMITTALS
   A. Evaluation Reports: For the following, from ICC-ES:
      1. Fire-retardant-treated wood.
      2. Power-driven fasteners.
      3. Post-installed anchors.
      4. Metal framing anchors.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 FIRE-RETARDANT-TREATED MATERIALS
   A. General: Only fire-retardant-treated materials are to be used on this project. Materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
   B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
      1. Treatment shall not promote corrosion of metal fasteners.
      2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201 at 92 percent relative humidity. Use where exterior type is not indicated.
   C. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Kiln-dry plywood after treatment to a maximum moisture content of 15 percent.
   D. Identify fire-retardant-treated wood with appropriate classification marking of qualified testing agency.

2.2 DIMENSION LUMBER FRAMING
   A. Other Framing: No. 2 Construction or No. 2 grade of any of the following species:
      1. Southern pine; SPIB.
      2. Douglas fir-larch; WCLIB or WWPA.
2.3 MISCELLANEOUS LUMBER
A. General: Provide fire retardant treated miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:
1. Blocking.
2. Nailers.
3. Furring.
B. Concealed Boards: 19 percent maximum moisture content of any of the following species and grades:
1. Mixed southern pine or southern pine, No. 2 grade; SPIB.
2. Hem-fir or hem-fir (north), Construction or No. 2 Common grade; NLGA, WCLIB, or WWPA.
3. Spruce-pine-fir (south) or spruce-pine-fir, Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.
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.
D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.
E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.4 FIRE-RETARDANT-TREATED PLYWOOD
A. General: Only fire-retardant-treated materials are to be used on this project. Materials shall comply with requirements in this article, that are acceptable to authorities having jurisdiction, and with fire-test-response characteristics specified as determined by testing identical products per test method indicated by a qualified testing agency.
B. Fire-Retardant-Treated Plywood by Pressure Process: Products with a flame-spread index of 25 or less when tested according to ASTM E 84, and with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
1. Use treatment that does not promote corrosion of metal fasteners.
2. Interior Type A: Treated materials shall have a moisture content of 28 percent or less when tested according to ASTM D 3201/D 3201M at 92 percent relative humidity. Use where exterior type is not indicated.
3. Design Value Adjustment Factors: Treated lumber plywood shall be tested according to ASTM D 5516 and design value adjustment factors shall be calculated according to ASTM D 6305. Span ratings after treatment shall be not less than span ratings specified.
C. Kiln-dry material after treatment to a maximum moisture content of 15 percent. Do not use material that is warped or does not comply with requirements for untreated material.
D. Identify fire-retardant-treated plywood with appropriate classification marking of qualified testing agency.
E. Application: Treat all plywood unless otherwise indicated.
1. Subflooring and underlayment for raised platforms.

2.5 PLYWOOD BACKING PANELS
A. Equipment Backing Panels: Plywood, DOC PS 1, Exterior, A-C, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
1. Plywood shall comply with the testing and product 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."

2.6 FASTENERS
A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.
B. Screws for Fastening to Metal Framing: ASTM C 954, length as recommended by screw manufacturer for material being fastened.
C. Power-Driven Fasteners: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC70.
D. Post-Installed Anchors: Fastener systems with an evaluation report acceptable to authorities having jurisdiction, based on ICC-ES AC01 as appropriate for the substrate.
2. Material: Stainless steel with bolts and nuts complying with ASTM F 593 and ASTM F 594, Alloy Group 1 or 2.
2.7 METAL FRAMING ANCHORS
A. Manufacturers: Subject to compliance with requirements,
B. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:
   1. KC Metals Products, Inc.
   2. Simpson Strong-Tie Co., Inc.
   1. Use for interior locations unless otherwise indicated.

2.8 MISCELLANEOUS FRAMING AND SUPPORTS
A. Provide premanufactured supports brackets for countertops as manufactured by:
   1. A&M Corporation: aandmhardware.com
      a. Standard Wall bracket with angle cut out at top for wire pass through.
      b. Coordinate location with wall studs and extra wood blocking (required).
      c. Size: 21 x 21 for 24 inch deep countertops; 24x24 for 30 inch deep countertop; 24x29 for 36 inch deep countertop.

2.9 MISCELLANEOUS MATERIALS
A. Adhesives for Gluing Furring to Concrete: Formulation complying with ASTM D 3498 that is approved for use indicated by adhesive manufacturer.
   1. Adhesives shall have a VOC content of 70 g/L or less.
   2. Adhesives shall comply with the testing and product 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."

PART 3 - EXECUTION
3.1 INSTALLATION, GENERAL
A. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.
B. Set carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit carpentry accurately to other construction. Locate furring, nailers, blocking and similar supports to comply with requirements for attaching other construction.
C. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant-treated plywood backing panels with classification marking of testing agency exposed to view.
D. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.
E. Sort and select lumber so that natural characteristics do not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.
F. Securely attach carpentry work to substrate by anchoring and fastening as indicated, complying with the following:
   2. ICC-ES evaluation report for fastener.

3.2 WOOD BLOCKING AND NAILER INSTALLATION
A. Install where indicated and where required for attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.
   1. Application: Provide blocking at the following wall locations as a minimum:
      a. Cabinets.
      b. Countertop support wall brackets.
      c. TV Monitor Supports.
      d. Wall-mounted door stops.
      e. Signage - whether within this contract or provided by owner
      f. Display Rails, marker boards, and other visual display items.
   2. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.
B. Provide permanent grounds of dressed, pressure-preservative-treated, key-beveled lumber not less than 1-1/2 inches wide and of thickness required to bring face of ground to exact thickness of finish material. Remove temporary grounds when no longer required.
3.3 COUNTERTOP SUPPORTS
   A. Space brackets evenly across span and securely attach support brackets into blocking and studs at maximum spacing as indicated but not exceeding 48 inches on center.

3.4 WOOD FURRING INSTALLATION
   A. Use only fire retardant treated wood. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.
   B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-2-inch minimum nominal-size furring at o.c.
   C. Provide fire blocking in wood furred spaces as follows:
      1. Fire block furred spaces of walls at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

END OF SECTION 061053
SECTION 070150 - PREPARATION FOR ROOFING REPAIR

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. Selective patch and repair of existing roof membrane
   2. Temporary roofing.
B. Related Requirements:
   1. Sections 020810 “Universal/Hazardous Materials Removal and Disposal” as provided by University of Missouri Environmental Health & Safety
   2. Section 028233 “Friable and Non-friable Asbestos Removal” as provided by University of Missouri Environmental Health & Safety for disposition of hazardous waste.
   3. Division 2 - “Asbestos Survey” and “Lead Survey Report” as provided by University of Missouri Environmental Health & Safety for information regarding known asbestos and lead containing materials in the building.
   4. Section 1E “Special Conditions” for information regarding existing roofing warranty.
   5. Section 075216 “Styrene Butadiene Styrene (SBS) Modified Bituminous Membrane Roofing”

1.3 DEFINITIONS
A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.
B. Partial Roof Tear-Off: Removal of selected components and accessories from existing roofing system.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: Include plans, sections, and details.
C. Temporary Roofing Submittal: Product data and description of temporary roofing system. If temporary roof remains in place, include surface preparation requirements needed to receive permanent roof, and submit a letter from roofing manufacturer, stating acceptance of the temporary roof and that its inclusion does not adversely affect the roofing system's resistance to fire and wind.

1.5 INFORMATIONAL SUBMITTALS
A. Photographs or Video recording: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by roofing repair operations. Submit before Work begins.

1.6 QUALITY ASSURANCE
A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning roofing removal. Comply with hauling and disposal regulations of authorities having jurisdiction.
B. Reroofing Conference: Conduct conference at Project site.
   1. Meet with Owner; Architect; Owner's insurer if applicable; testing and inspecting agency representative; roofing system manufacturer's representative; roofing Installer, including project manager, superintendent, and foreman; and installers whose work interfaces with or affects roofing repair, including installers of roof deck, roof accessories, and roof-mounted equipment.
   2. Review methods and procedures related to roofing system including, but not limited to, the following:
      a. Reroofing preparation, including roofing system manufacturer's written instructions.
      b. Temporary protection requirements for existing roofing system components that are to remain.
      c. Existing roof drains and roof drainage during each stage of roofing repair, and roof-drain plugging and plug removal.
      d. Construction schedule and availability of materials, Installer's personnel, equipment, and facilities needed to avoid delays.
      e. Condition and acceptance of existing roof deck and base flashing substrate for reuse.
      f. Structural loading limitations of roof deck during roofing repair.
      g. Base flashings, special roofing details, drainage, penetrations, equipment curbs, and condition of other construction that affect roofing repair.
      h. HVAC shutdown and sealing of air intakes.
      i. Asbestos removal and discovery of asbestos-containing materials.
1.7 FIELD CONDITIONS

A. Existing Roofing System: SBS-modified bituminous protected membrane roofing. Owner will occupy portions of building immediately below area of roofing patch and repair. Conduct roofing work so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
1. Coordinate work activities daily with Owner so Owner can place protective dust and water-leakage covers over sensitive equipment and furnishings, shut down HVAC and fire-alarm or -detection equipment if needed, and evacuate occupants from below work area.
2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below affected area. Verify that occupants below work area have been evacuated before proceeding with work over impaired deck area.

B. Owner will occupy portions of building immediately below area of roofing patch and repair. Conduct roofing work so Owner's operations are not disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.

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

D. Conditions existing at time of inspection for bidding are maintained by Owner as far as practical.

E. Weather Limitations: Proceed with roofing repair preparation only when existing and forecasted weather conditions permit Work to proceed without water entering existing roofing system or building.
1. Remove only as much roofing in one day as can be made watertight in the same day.

F. Hazardous Materials: It is not expected that hazardous materials, such as asbestos-containing materials, will be encountered in the Work.
1. If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner.

PART 2 - PRODUCTS

2.1 TEMPORARY PROTECTION MATERIALS

A. Expanded Polystyrene (EPS) Insulation: ASTM C 578.
B. Plywood: DOC PS1, Grade CD Exposure 1.
C. OSB: DOC PS2, Exposure 1.

2.2 TEMPORARY ROOFING MATERIALS

A. Design and selection of materials for temporary roofing are Contractor's responsibilities.

2.3 REPAIR MATERIALS

A. Use repair materials matching existing roofing system materials unless otherwise indicated.
1. Repair materials are specified in Section 075216 "Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing" unless otherwise indicated.
B. Wood blocking, curbs, and nailers are specified in Section 061053 Miscellaneous Rough Carpentry."

2.4 AUXILIARY REROOFING MATERIALS

A. General: Use auxiliary roofing repair preparation materials recommended by roofing system manufacturer for intended use and compatible with components of existing roofing system.

PART 3 - EXECUTION

3.1 PREPARATION

A. Shut off rooftop utilities and service piping before beginning the Work. Coordinate schedule with owner.
B. Test existing roof drains to verify that they are not blocked or restricted. Immediately notify Owner and Architect of any blockages or restrictions.
C. Protect existing roofing system to remain.
1. Loosely lay 1-inch-minimum thick, expanded polystyrene (EPS) insulation over existing roofing in areas affected. Loosely lay 15/32-inch plywood or OSB panels over EPS. Extend EPS past edges of plywood or OSB panels a minimum of 1 inch.
2. Limit traffic and material storage to areas of existing roofing that have been protected.
3. Maintain temporary protection and leave in place until roofing work has been completed. Remove temporary protection on completion of roofing work.
D. Coordinate with Owner to shut down air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with roofing repair work that could affect indoor air quality or activate smoke detectors in the ductwork.
E. During removal operations, have sufficient and suitable materials on-site to facilitate rapid installation of temporary protection in the event of unexpected rain.
F. Maintain roof drains in functioning condition to ensure roof drainage at end of each workday. Prevent debris from entering or blocking roof drains and conductors. Use roof-drain plugs specifically designed for this purpose. Remove roof-drain plugs at end of each workday, when no work is taking place, or when rain is forecast.

3.2 REPAIR MATERIALS INSTALLATION
A. Immediately after equipment removal, patch and repair to match existing roofing system construction.
1. Installation of repair materials is specified in Section 075216 “Styrene-Butadiene-Styrene (SBS) Modified Bituminous Membrane Roofing.”
2. Installation of wood blocking, curbs, and nailers is specified in Section 061053 Miscellaneous Rough Carpentry.”

3.3 TEMPORARY ROOFING
A. Install approved temporary roofing over area to be repaired.

3.4 BASE FLASHING REMOVAL
A. Remove existing base flashings. Clean substrates of contaminants, such as asphalt, sheet materials, dirt, and debris.
B. Do not damage metal counterflashings that are to remain. Replace metal counterflashings damaged during removal with counterflashings of same metal, weight or thickness, and finish.
C. Inspect parapet sheathing, wood blocking, curbs, and nailers for deterioration and damage. If parapet sheathing, wood blocking, curbs, or nailers have deteriorated, immediately notify Architect.

3.5 DISPOSAL
A. Collect demolished materials and place in containers. Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on-site.
1. Storage or sale of demolished items or materials on-site is not permitted.
B. Transport and legally dispose of demolished materials off Owner’s property.

END OF SECTION 070150
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SECTION 072100 - 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: (insulation primary use/location)
   1. Glass-fiber blanket insulation: stud cavities at interior walls as indicated for acoustical purpose.
   2. Loose-fill insulation: as needed.
B. Related Sections:
   1. Section 092216 "Non Structural Metal Framing"
   2. Section 092900 "Gypsum Board"

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.

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 QUALITY ASSURANCE
1. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1.6 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.

PART 2 - PRODUCTS

2.1 MINERAL-WOOL BLANKET INSULATION
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. Roxul Inc.
   2. Thermafiber.
B. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.
C. For use in hollow metal frames as sound deadening.

2.2 GLASS-FIBER BLANKET INSULATION
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. CertainTeed Corporation.
   2. Guardian Building Products, Inc.
   5. Owens Corning.
B. Unfaced, Glass-Fiber Blanket Insulation: ASTM C 665, Type I; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics. For use as sound attenuation blankets for interior walls.
C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
   1. 3-1/2 inches thick with a minimum thermal resistance of 11 deg F x h x sq. ft. /Btu at 75 deg F.
   2. 5-1/2 inches thick with a minimum thermal resistance of 19 deg F x h x sq. ft. /Btu at 75 deg F.
2.3 LOOSE-FILL INSULATION
   A. Glass-Fiber Loose-Fill Insulation: ASTM C 764, Type I for pneumatic application or Type II for poured
      application; with maximum flame-spread and smoke-developed indexes of 5, per ASTM E 84.

2.4 INSULATION FASTENERS
   A. Glass Fiber Blanket Insulation Wire Batt Supports Product with ability to attach glass fiber insulation to
      studs at walls thus preventing sag of insulation into cavity.
      1. For installation of batt or blanket insulation providing wire tie attachment to studs utilizing galvanized
         metal.
      2. Products: J&R Products, Inc. Wire Batt supports or equal

2.5 ACCESSORIES
   1. Spray Polyurethane Foam Insulation: ASTM C 1029, Type II, closed cell, with maximum flame-spread
      and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.

PART 3 - EXECUTION

3.1 PREPARATION
   A. Clean substrates of substances that are harmful to insulation 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 INSULATION FOR FRAMED CONSTRUCTION
   A. Glass-Fiber Blanket Insulation: Install in cavities formed by framing members according to the following
      requirements:
      1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one
         length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
      2. Place insulation in cavities formed by framing members to produce a friction fit between edges of
         insulation and adjoining framing members.
      3. Support unfaced blankets mechanically with wire batt supports between metal studs.
   B. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level
      horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not
      compact excessively.
   C. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent
      gaps in insulation using the following materials:
      1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a
         density of approximately 2.5 lb/cu. ft.

END OF SECTION 072100
SECTION 075216 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

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: Roofing Repair and infill consisting of same insulation, base sheets and cap sheet as existing. The existing roof over this area is reported to be modified roll roofing, over fiberglass felts, on perlite, on ISO foam, with a tar-based or asphalt-based vapor barrier on lightweight concrete. This an existing hot applied installation. The roofing repair is to be done with cold applied materials only. Confirm compatibility with existing conditions prior to ordering materials and beginning construction.
B. Original system installed based on Schuller Intl. Spec #4CID. This spec is intended to replicate the existing installation. Contractor to verify during investigation.
C. Section Includes:
1. Styrene-butadiene-styrene (SBS)-modified bituminous membrane roofing.
2. Lightweight Insulative Concrete infill.
3. Roof insulation.
4. Vapor Retarder.
D. Related Requirements:
1. Section 1E "Special Conditions" for information regarding existing roofing warranty.
2. Section 070150 "Preparation for Roofing Repair"
3. Section 076200 "Sheet Metal Flashing and Trim" for metal roof flashings and counterflashings.
4. Section 079200 "Joint Sealants" for joint sealants, joint fillers, and joint preparation.

1.3 DEFINITIONS
A. Roofing Terminology: Definitions in ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" apply to work of this Section.

1.4 PREINSTALLATION MEETINGS
A. Preinstallation Roofing Conference: Conduct conference at Project site.
1. Meet with Owner, Architect, Owner's testing and inspecting agency representative, roofing Installer, roofing system manufacturer's representative, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
2. Review methods and procedures related to roofing installation, including manufacturer's written instructions.
3. Review and finalize construction schedule, and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
4. Examine existing deck substrate conditions for compliance with requirements.
5. Review structural loading limitations of roof deck during roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that affects roofing system.
7. Review temporary protection requirements for roofing system during and after installation.
8. Review roof observation and repair procedures after roofing installation.

1.5 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work, including:
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Crickets, saddles, and tapered edge strips, including slopes.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.
C. Samples for Verification: For the following products:
1. Cap sheet, of color required.
2. Flashing sheet, of color required.
3. Aggregate surfacing material in gradation and color required.
4. Walkway pads or rolls, of color required.
1.6 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Product Test Reports: For components of membrane roofing system, for tests performed by manufacturer and witnessed by a qualified testing agency.
   C. Research/Evaluation Reports: For components of membrane roofing system, from ICC-ES.

1.7 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For roofing system to include in maintenance manuals.

1.8 QUALITY ASSURANCE
   A. Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product.

1.9 DELIVERY, STORAGE, AND HANDLING
   A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, approval or listing agency markings, and directions for storing and mixing with other components.
   B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer. Protect stored liquid material from direct sunlight.
      1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.
   C. Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store in a dry location. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.
   D. Handle and store roofing materials, and place equipment in a manner to avoid permanent deflection of deck.

1.10 FIELD CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to manufacturer's written instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Basis-of-Design Product: Subject to compliance with requirements, provide Johns Manville SBS Modified Bitumen Roof to match configuration of existing.

2.2 SBS-MODIFIED ASPHALT-SHEET MATERIALS
   A. Roofing Membrane Sheet: ASTM D 6162, Grade S, Type II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of Design: DynaPly

2.3 BASE FLASHING SHEET MATERIALS - SBS
   A. Backer Sheet: ASTM D 6162, Grade S, Type II, composite polyester- and glass-fiber-reinforced, SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of Design: DynaPly
   C. Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitch bonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Basis of Design: PermaFlash System

2.4 AUXILIARY ROOFING MEMBRANE
   A. General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.
   B. Roofing Asphalt: ASTM D 312, Type III or IV
   C. Asphalt Primer: ASTM D 41. Basis of Design: Asphalt Primer
   D. Asphalt Roofing Cement: ASTM D 4586, asbestos free, of consistency required by roofing system manufacturer for application. Basis of Design: Bestile Industrial Roof Cement
E. Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, two-component, asbestos-free, trowel-grade, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of Design: MBR Flashing Cement

F. Mastic Sealant: Polyisobutylene, plain or modified bitumen; nonhardening, nonmigrating, nonskinning, and nondrying.

G. Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Basis of Design: UltraFast Fasteners and Plates

H. Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer.

I. Coating: Acrylic elastomeric coating with unique bleed-blocking properties particularly well suited for coating over asphalt surfaces. Basis of Design: JM CR Seam Coating

J. Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

2.5 COVER BOARD

2.6 ROOF INSULATION
A. General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

B. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Basis of Design: ENRGY 3
   1. Provide insulation to match existing thickness and taper.

2.7 Tapered insulation
A. Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards fabricated to match existing slope or 1/4 inch per 12 inches (1:48) if not adjacent to existing sloped area. Basis of Design: Tapered ENRGY 3.

B. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.

2.8 INSULATION ACCESSORIES
A. General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatibility with roofing.

B. Fasteners: Factory-coated steel fasteners and metal or plastic plates complying with corrosion-resistance provisions in FM Global 4470, designed for fastening roof insulation to substrate, and acceptable to roofing system manufacturer.

C. Cold Fluid-Applied Adhesive: Manufacturer's No VOC, two-component cold fluid-applied adhesive formulated to adhere roof insulation to substrate. Basis of Design: MBR Bonding Adhesive or architect pre approved equal.

D. Insulation Adhesive: Insulation manufacturer's recommended adhesive formulated to attach roof insulation to substrate or to another insulation layer as follows:
   1. Modified asphaltic, asbestos-free, cold-applied adhesive.
   2. Bead-applied, low-rise, one-component or multicomponent urethane adhesive.

E. Insulation Cant Strips: ASTM C 208, Type II, Grade 1, cellulose-fiber insulation board.

F. Wood Nailer Strips: Comply with requirements in Section 061053 "Miscellaneous Rough Carpentry."

2.9 CELLULAR LIGHTWEIGHT INSULATING CONCRETE
A. Produce cellular lightweight insulating concrete with the following minimum physical properties using cementitious materials, air-producing liquid-foaming agents, and the minimum amount of water necessary to produce a workable mix.
   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. Elastizell Corporation of America.
      b. Siplast.
   2. As-Cast Unit Weight: 42 to 50 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
   3. Oven-Dry Unit Weight: 33 to 39 lb/cu. ft., when tested according to ASTM C 495.
   4. Compressive Strength: Minimum 250 psi, when tested according to ASTM C 495.
2.10 VAPOR RETARDER

A. SBS Vapor Retarder: SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of Design DynaBase or architect pre-approved equal.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements and other conditions affecting performance of the Work: Verify existing installed system is compatible and fully represented by all materials necessary and specified herein. Make adjustments and modifications to recommended materials for review and approval by Owner and Architect.

1. Verify that roof openings and penetrations are in place, curbs are set and braced, and roof-drain bodies are securely clamped in place.
2. Verify that wood cants, blocking, curbs, and nailers are securely anchored to roof deck at penetrations and terminations and that nailers match thicknesses of insulation.
3. Verify that minimum concrete drying period recommended by roofing system manufacturer has passed.
4. Verify that concrete substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
5. Verify that concrete-curing compounds that impair adhesion of roofing components to roof deck have been removed.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrate of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

B. Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction. Remove roof-drain plugs when no work is taking place or when rain is forecast.

C. Prime surface of concrete deck with asphalt primer at a rate of 3/4 gal. /100 sq. ft., and allow primer to dry.

D. Install insulation strips in ribs of acoustical roof decks according to acoustical roof deck manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Comply with roofing system manufacturer's written instructions.

B. Asphalt Heating: Heat asphalt to its equiviscous temperature, measured immediately before application. Circulate asphalt during heating. Do not raise asphalt temperature above equiviscous temperature range more than one hour before time of application. Do not exceed asphalt manufacturer's recommended temperature limits during asphalt heating. Do not heat asphalt within 25 deg F of flash point. Discard asphalt maintained at a temperature exceeding finished blowing temperature for more than four hours.

C. Substrate-Joint Penetrations: Prevent roofing asphalt and adhesives from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

3.4 INSULATION INSTALLATION

A. Install one lapped base-sheet course and mechanically fasten to substrate according to roofing system manufacturer's written instructions.

B. Nailer Strips: Mechanically fasten 4-inch nominal-width wood nailer strips of same thickness as insulation perpendicular to sloped roof deck at the following spacing:

1. 16 feet apart for roof slopes greater than 1 inch per 12 inches but less than 3 inches per 12 inches.
2. 48 inches apart for roof slopes greater than 3 inches per 12 inches.

C. Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing system with vertical surfaces or angle changes greater than 45 degrees.

D. Install tapered insulation under area of roofing to conform to existing slopes or slopes indicated.

E. Install insulation with long joints of insulation in a continuous straight line, with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch with insulation.

1. Cut and fit insulation within 1/4 inch of nailers, projections, and penetrations.

F. Mechanically Fastened and Adhered Insulation: Install first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type roof insulation to deck type.

1. Fasten first layer of insulation to resist uplift pressure at corners, perimeter, and field of roof.
2. Set each subsequent layer of insulation in ribbons of bead-applied insulation adhesive, firmly pressing and maintaining insulation in place.
G. Install cover boards over insulation with long joints in continuous straight lines with end joints staggered between rows. Offset joints of insulation below a minimum of 6 inches in each direction. Loosely butt cover boards together and fasten to roof deck. Tape joints if required by roofing system manufacturer.
   1. Fasten cover boards according to requirements in FM Global's "RoofNav" for specified Windstorm Resistance Classification.
   2. Fasten cover boards to resist uplift pressure at corners, perimeter, and field of roof.

3.5 ROOFING INSTALLATION, GENERAL

A. Install roofing system according to roofing system manufacturer's written instructions and applicable recommendations in ARMA/NRCA's "Quality Control Guidelines for the Application of Polymer Modified Bitumen Roofing."

B. Coordinate installation of roofing system so insulation and other components of the roofing system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is forecast.
   1. Provide tie-offs at end of each day's work to cover exposed roofing sheets and insulation with a course of coated felt set in roofing cement with joints and edges sealed.
   2. Complete terminations and base flashings, and provide temporary seals to prevent water from entering completed sections of roofing system.
   3. Remove and discard temporary seals before beginning work on adjoining roofing.

3.6 SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION

A. Install modified bituminous roofing cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:
   1. Adhere to substrate in cold-applied adhesive.

B. Laps: Accurately align roofing sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.
   1. Repair tears and voids in laps and lapped seams not completely sealed.

C. Install roofing sheets so side and end laps shed water.

3.7 FLASHING AND STRIPPING INSTALLATION

A. Install base flashing over cant strips and other sloped and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:
   1. Prime substrates with asphalt primer if required by roofing system manufacturer.
   2. Flashing-Sheet Application: Adhere flashing sheet to substrate in cold-applied adhesive at rate required by roofing system manufacturer.

B. Extend base flashing up walls or parapets a minimum of 8 inches above roofing membrane and 4 inches onto field of roofing membrane.

C. Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.
   1. Seal top termination of base flashing.

D. Install roofing cap-sheet stripping where metal flanges and edgings are set on roofing according to roofing system manufacturer's written instructions.

E. Roof Drains: Set 30-by-30-inch metal flashing in bed of asphaltic adhesive on completed roofing membrane. Cover metal flashing with roofing cap-sheet stripping, and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring.
   1. Install stripping according to roofing system manufacturer's written instructions.

3.8 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to inspect substrate conditions, surface preparation, membrane application, flashings, protection, and drainage components, and to furnish reports to Architect.

B. Final Roof Inspection: Arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion.
   1. Notify Architect and Owner 48 hours in advance of date and time of inspection.

3.9 PROTECTING AND CLEANING

A. Protect roofing system from damage and wear during remainder of construction period. When remaining construction does not affect or endanger roofing, inspect roofing for deterioration and damage, describing its nature and extent in a written report, with copies to Architect and Owner.
B. Correct deficiencies in or remove roofing system that does not comply with requirements, repair substrates, and repair or reinstall roofing system to a condition free of damage and deterioration at time of Substantial Completion and according to warranty requirements.

C. Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 075216
SECTION 076200 - SHEET METAL FLASHING AND TRIM

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes: Sheet metal work associated with repaired, and infill roofing areas. Intent is to match the existing flashings closely in type, detailing and color
1. Formed low-slope roof sheet metal fabrications.
2. Formed equipment support flashing.
B. Related Requirements:
1. Section 061053 "Miscellaneous Rough Carpentry" for wood nailers, curbs, and blocking.

1.3 COORDINATION
A. Coordinate sheet metal flashing and trim layout and seams with sizes and locations of penetrations to be flashed, and joints and seams in adjacent materials.
B. Coordinate sheet metal flashing and trim installation with adjoining roofing and wall materials, joints, and seams to provide leak-proof, secure, and noncorrosive installation.

1.4 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.
1. Review construction schedule. Verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
2. Review special roof details, roof drainage, roof-penetration flashing, equipment curbs, and condition of other construction that affect sheet metal flashing and trim.
3. Review requirements for insurance and certificates if applicable.
4. Review sheet metal flashing observation and repair procedures after flashing installation.

1.5 ACTION SUBMITTALS
A. Shop Drawings: For sheet metal flashing and trim.
1. Include plans, elevations, sections, and attachment details.
2. Include identification of material, thickness, weight, and finish for each item and location in Project.
3. Include details for joining, supporting, and securing, including layout and spacing of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Include details of roof-penetration flashing.
5. Include details of edge conditions, including counterflashings as applicable.
6. Detail formed flashing and trim at scale of not less than 1-1/2 inches per 12 inches.

1.6 QUALITY ASSURANCE
A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.
1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

1.7 DELIVERY, STORAGE, AND HANDLING
A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete.

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.

C. SPRI Wind Design Standard: Manufacture and install copings and roof edge flashings tested according to SPRI ES-1.

D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes to prevent buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss.
   1. Temperature Change: 120 deg F, ambient; 180 deg F, material surfaces.

2.2 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.

B. Confirm materials proposed are similar to those installed: Metallic-Coated Steel Sheet: Provide zinc-coated (galvanized) steel sheet according to ASTM A 653/A 653M, G90 coating designation; prepainted by coil-coating process to comply with ASTM A 755/A 755M.
   1. Surface: Smooth, flat.
   2. Exposed Coil-Coated Finish:
      a. Two-Coat Fluoropolymer: AAMA 621. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.
   3. Color: Match existing.

C. Stainless-Steel Sheet: ASTM A 240/A 240M, Type 304, dead soft, fully annealed; with smooth, flat surface.
   1. Finish: 2D (dull, cold rolled).

2.3 UNDERLAYMENT MATERIALS

A. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. minimum.

2.4 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal or manufactured item unless otherwise indicated.

B. Solder:
   1. For: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead.
   2. For Zinc-Tin Alloy-Coated: ASTM B 32, 100 percent tin, with maximum lead content of 0.2 percent, as recommended by sheet metal manufacturer.
   3. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.
   4. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.

2.5 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.
2. Use lapped expansion joints only where indicated on Drawings.

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. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

H. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

I. Do not use graphite pencils to mark metal surfaces.

2.6 LOW-SLOPE ROOF SHEET METAL FABRICATIONS

A. Copings: Confirm and match existing detailing. Fabricate in minimum 96-inch-long, but not exceeding 12-foot-long, sections. Fabricate joint plates of same thickness as copings. Furnish with continuous cleats to support edge of external leg and drill elongated holes for fasteners on interior leg. Miter corners, fasten and seal watertight.

B. Base Flashing: Confirm materials proposed are similar to those installed: Fabricate from the following materials:
   1. Galvanized Steel: 0.028 inch thick.

C. Counterflashing: Confirm materials proposed are similar to those installed: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

D. Flashing Receivers: Confirm materials proposed are similar to those installed: Fabricate from the following materials:
   1. Galvanized Steel: 0.022 inch thick.

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.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. Apply slip sheet, wrinkle free, before installing sheet metal flashing and trim.

3.3 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. 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. Space cleats not more than 12 inches apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
   4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
   5. Torch cutting of sheet metal flashing and trim is not permitted.
   6. 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 of corner or intersection.
   1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.
2. Use lapped expansion joints only where indicated on Drawings.

D. Fasteners: Use fastener sizes that penetrate substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. 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.

F. 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 into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
   2. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."

G. Rivets: Rivet joints in zinc where necessary for strength.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at staggered 3-inch centers.

C. Copings: Confirm materials and anchoring proposed are similar to those installed: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated.  
   1. Interlock exterior bottom edge of coping with continuous cleat anchored to substrate at 16-inch centers.
   2. Anchor interior leg of coping with washers and screw fasteners through slotted holes at 24-inch centers.

D. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.

E. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints minimum of 4 inches. Secure in waterproof manner by means of interlocking folded seam or blind rivets and sealant unless otherwise indicated.

F. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with butyl sealant and clamp flashing to pipes that penetrate roof.

G. Duct penetration: Coordinate with roofing installation, provide stainless steel flashings, umbrella and drawband.

3.5 MISCELLANEOUS FLASHING INSTALLATION

A. Equipment Support Flashing: Coordinate installation of equipment support flashing with installation of roofing and equipment. Weld or seal flashing with elastomeric sealant to equipment support member.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING 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
SECTION 078413 - PENETRATION FIRESTOPPING

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Penetrations in fire-resistance-rated walls.
   2. Penetrations in horizontal assemblies.
B. Related Sections:
   1. Reference Mechanical Electrical and Plumbing Drawings and specifications for specific notes and details related to anticipated MEP firestopping.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Product Schedule: For each penetration firestopping system. Include location and design designation of qualified testing and inspecting agency.
   1. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular penetration firestopping condition, submit illustration, with modifications marked, approved by penetration firestopping manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Installer Certificates: From Installer indicating penetration firestopping has been installed in compliance with requirements and manufacturer's written recommendations.
C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for penetration firestopping.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Must be a single installer and a firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance.
B. Installer shall be certified, licensed, FM approved in accordance with PM 4991, certified by UL as a qualified contractor.
C. Fire-Test-Response Characteristics: Penetration fire stopping shall comply with the following requirements:
   1. Penetration fire stopping tests are performed by a qualified testing agency acceptable to authorities having jurisdiction.
   2. Penetration fire stopping is identical to those tested per testing standard referenced in "Penetration Fire stopping" Article.
D. Provide rated systems complying with the following requirements:
   1. Penetration fire stopping products bear classification marking of a qualified testing and inspecting agency.
   2. Classification markings on penetration fire stopping correspond to designations listed by the following:
      a. UL in its "Fire Resistance Directory."
   3. Obtain fire stop systems for each type of penetration or joint opening and construction condition indicated from a single manufacturer. Fire Stopping Contractor shall submit certificates and qualifications for approval prior to commencement of work.
E. Preinstallation Conference: Conduct conference at Project site.

1.6 PROJECT CONDITIONS
A. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
B. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.
1.7 COORDINATION
A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.
C. Notify Owner's testing agency at least seven days in advance of penetration firestopping installations; confirm dates and times on day preceding each series of installations.

PART 2 - PRODUCTS
2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   2. Grace Construction Products.
   3. Hilti, Inc.
   6. NUCO Inc.
   8. RectorSeal Corporation.
   9. Specified Technologies Inc.
   10. 3M Fire Protection Products.
   12. USG Corporation.

2.2 PENETRATION FIRESTOPPING
A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Fire-resistance-rated walls include fire-barrier walls, smoke-barrier walls, and fire partitions.
   2. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
   1. Horizontal assemblies include floors, roofs, and ceiling membranes of rated ceiling assemblies.
   2. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
   3. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
   1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
F. Exposed Penetration Firestopping: Provide products with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
   1. Sealants: 250 g/L.
   2. Sealant Primers for Nonporous Substrates: 250 g/L.
   3. Sealant Primers for Porous Substrates: 775 g/L.
H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
   1. Permanent forming/damming/backing materials, including the following:
      a. Slag-wool-fiber or rock-wool-fiber insulation.
      b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
      c. Fire-rated form board.
      d. Fillers for sealants.
2. Temporary forming materials.
5. Steel sleeves.

2.3 FILL MATERIALS
   A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
   B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
   C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
   D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
   E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
   F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
   G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
   H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
   I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
   J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
      1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

2.4 MIXING
   A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of the Work.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
      1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
      2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
      3. Remove laitance and form-release agents from concrete.
   B. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
C. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping’s seal with substrates.

3.3 INSTALLATION
A. General: Install penetration firestopping to comply with manufacturer’s written installation instructions and published drawings for products and applications indicated.
B. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
   1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
C. Install fill materials for firestopping by proven techniques to produce the following results:
   1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.
   2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
   3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.

3.4 IDENTIFICATION
A. Identify penetration firestopping with preprinted metal or plastic labels. Attach labels permanently to surfaces adjacent to and within 6 inches of firestopping edge so labels will be visible to anyone seeking to remove penetrating items or firestopping. Use mechanical fasteners or self-adhering-type labels with adhesives capable of permanently bonding labels to surfaces on which labels are placed. Include the following information on labels:
   1. The words "Warning - Penetration Firestopping - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address, and phone number.
   3. Designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Manufacturer's name.
   6. Installer's name.

3.5 FIELD QUALITY CONTROL
A. Owner will engage a qualified testing agency to perform tests and inspections.
B. Where deficiencies are found or penetration firestopping is damaged or removed because of testing, repair or replace penetration firestopping to comply with requirements.
C. Proceed with enclosing penetration firestopping with other construction only after inspection reports are issued and installations comply with requirements.

3.6 CLEANING AND PROTECTION
A. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
B. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, immediately cut out and remove damaged or deteriorated penetration firestopping and install new materials to produce systems complying with specified requirements.

END OF SECTION 078413
SECTION 079200 - JOINT SEALANTS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section Includes:
   1. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.
B. Related Sections:
   1. Section 078413 "Penetration Firestopping" for sealing penetrations in fire-resistance-rated construction.
   2. Section 088000 "Glazing" for glazing sealants.
   3. Section 092900 "Gypsum Board" for sealing perimeter joints.
   4. Section 095113 "Acoustical Panel Ceilings" for sealing edge moldings at perimeters with acoustical sealant.

1.3 PRECONSTRUCTION TESTING
A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use ASTM C 1087 manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
   2. Submit not fewer than eight pieces of each kind of material, including joint substrates, shims, joint-sealant backings, secondary seals, and miscellaneous materials.
   3. Schedule sufficient time for testing and analyzing results to prevent delaying the Work.
   4. For materials failing tests, obtain joint-sealant manufacturer's written instructions for corrective measures including use of specially formulated primers.
   5. Testing will not be required if joint-sealant manufacturers submit joint preparation data that are based on previous testing, not older than 24 months, of sealant products for adhesion to, and compatibility with, joint substrates and other materials matching those submitted.
B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints at existing unknown surfaces (existing painted or prefinished materials).
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated at affected locations.
   3. Notify Owner and Architect seven days in advance of dates and times when test joints will be erected.
         1) For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
   4. Report whether sealant failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. For sealants that fail adhesively, retest until satisfactory adhesion is obtained.
   5. Evaluation of Preconstruction Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing, in absence of other indications of noncompliance with requirements, will be considered satisfactory. Do not use sealants that fail to adhere to joint substrates during testing.

1.4 ACTION SUBMITTALS
A. Product Data: For each joint-sealant product indicated.
B. Joint-Sealant Schedule: Include the following information:
   1. Joint-sealant application, joint location, and designation.
   2. Joint-sealant manufacturer and product name.
1.5 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For qualified Installer and testing agency.
   B. Product Certificates: For each kind of joint sealant and accessory, from manufacturer.
   C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.
   B. Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.
   C. Product Testing: Test joint sealants using a qualified testing agency.
      1. Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
      2. Test according to SWRI's Sealant Validation Program for compliance with requirements specified by reference to ASTM C 920 for adhesion and cohesion under cyclic movement, adhesion-in-peel, and indentation hardness.

1.7 PROJECT CONDITIONS
   A. Do not proceed with installation of joint sealants under the following conditions:
      1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F
      2. When joint substrates are wet.
      3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
      4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

1.8 WARRANTY
   A. Special Installer's Warranty: Manufacturer's standard form in which 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's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.
      1. Warranty Period: 10 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 structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
      2. Disintegration of joint substrates from natural causes exceeding design specifications.
      3. Mechanical damage caused by individuals, tools, or other outside agents.
      4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL
   A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.
   B. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.
      1. Suitability for Immersion in Liquids. Where sealants are indicated for Use I for joints that will be continuously immersed in liquids, provide products that have undergone testing according to ASTM C 1247. Liquid used for testing sealants is deionized water, unless otherwise indicated.
      2. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.
      3. Suitability for Contact with Food: Where sealants are indicated for joints that will come in repeated contact with food, provide products that comply with 21 CFR 177.2600.
2.2 URETHANE SEALANTS: JS-#1
A. Urethane, M, P, 50, T, NT: Multicomponent, pourable, plus 50 percent and minus 50 percent movement capability, traffic- and nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade P, Class 50, Uses T and NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. LymTal International Inc. ISOFlex 888 QC sealant
   b. Or approved equal.

2.3 URETHANE SEALANTS: JS-#2
A. General information: Minimum Requirements are stated: Products capable of greater movement are also indicated and are acceptable but not required.
B. Urethane, M, NS, 25, NT: Multicomponent, nonsag, plus 25 percent and minus 25 percent movement capability, nontraffic-use, urethane joint sealant; ASTM C 920, Type M, Grade NS, Class 25, Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Sherwin-Williams Company (The); Stampede-2NS.
   c. LymTal International, Inc.; Iso-Flex 881 Iso-Flex 885 SG.
   d. Sika Corporation U.S.; Sikaflex - 2c NS EZ Mix.
   e. Pecora Corporation; Dynatrol II.
   f. Tremco Incorporated; Dymeric 240.
   g. Or approved equal.

2.4 SILICONE JOINT SEALANTS JS-#3
A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 50, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; Omniseal 50.
   b. Dow Corning Corporation; 791.
   c. Pecora Corporation; 895.
   e. Sika Corporation, Construction Products Division; SikaSil-C995.
   f. Tremco Incorporated; Spectrem 2.
   g. Or approved equal.

1.1 SILICONE JOINT SEALANTS: JS-#4
A. Mildew-Resistant, Single-Component, Nonsag, Neutral-Curing Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; 898.
   b. Dow Corning Corporation; 786 Mildew Resistant
   c. Tremco; Tremsil 600.
   d. Or approved equal.

2.5 LATEX JOINT SEALANTS: JS-#5
A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. BASF Building Systems; Sonolac.
   c. Pecora Corporation; AC-20+.
   d. Tremco Incorporated; Tremflex 834.
   e. Or approved equal.

2.6 ACOUSTICAL JOINT SEALANTS: JS#6
A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
   a. Pecora Corporation; AC-20 FTR.
   b. USG Corporation; SHEETROCK Acoustical Sealant.
   c. Or approved equal.

2.7 JOINT SEALANT BACKING
   A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates, sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
   B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, 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.

2.8 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 joint-sealant performance.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:
      1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
      2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:
         a. Concrete.
         b. Masonry.
         c. Unglazed surfaces of ceramic tile.
         d. Exterior insulation and finish systems.
      3. Remove laitance and form-release agents from concrete.
      4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants. Nonporous joint substrates include the following:
         a. Metal.
         b. Glass.
         c. Porcelain enamel.
         d. Glazed surfaces of ceramic tile.
   B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.
C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.

F. Tooling of 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. Remove excess sealant from surfaces adjacent to joints.
   2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
   3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.
   4. Provide flush joint profile where indicated per Figure 8B in ASTM C 1193.
   5. Provide recessed joint configuration of recess depth and at locations indicated per Figure 8C in ASTM C 1193.
      a. Use masking tape to protect surfaces adjacent to recessed tooled joints.

G. Installation of Preformed Silicone-Sealant System: Comply with the following requirements:
   1. Apply masking tape to each side of joint, outside of area to be covered by sealant system.
   2. Apply silicone sealant to each side of joint to produce a bead of size complying with preformed silicone-sealant system manufacturer's written instructions and covering a bonding area of not less than 3/8 inch. Hold edge of sealant bead 1/4 inch inside masking tape.
   3. Within 10 minutes of sealant application, press silicone extrusion into sealant to wet extrusion and substrate. Use a roller to apply consistent pressure and ensure uniform contact between sealant and both extrusion and substrate.
   4. Complete installation of sealant system in horizontal joints before installing in vertical joints. Lap vertical joints over horizontal joints. At ends of joints, cut silicone extrusion with a razor knife.

H. Installation of Preformed Foam Sealants: Install each length of sealant immediately after removing protective wrapping. Do not pull or stretch material. Produce seal continuity at ends, turns, and intersections of joints. For applications at low ambient temperatures, apply heat to sealant in compliance with sealant manufacturer's written instructions.

I. Acoustical Sealant Installation: At sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
   1. Extent of Testing: Test completed and cured sealant joints as follows:
      a. Perform 10 tests for the first 1000 feet of joint length for each kind of sealant and joint substrate.
      b. Perform 1 test for each 1000 feet of joint length thereafter or 1 test per each floor per elevation.
   a. For joints with dissimilar substrates, verify adhesion to each substrate separately; extend cut along one side, verifying adhesion to opposite side. Repeat procedure for opposite side.
3. Inspect tested joints and report on the following:
   a. Whether sealants filled joint cavities and are free of voids.
   b. Whether sealant dimensions and configurations comply with specified requirements.
   c. Whether sealants in joints connected to pulled-out portion failed to adhere to joint substrates or tore cohesively. Include data on pull distance used to test each kind of product and joint substrate. Compare these results to determine if adhesion passes sealant manufacturer's field-adhesion hand-pull test criteria.
4. Record test results in a field-adhesion-test log. Include dates when sealants were installed, names of persons who installed sealants, test dates, test locations, whether joints were primed, adhesion results and percent elongations, sealant fill, sealant configuration, and sealant dimensions.
5. Repair sealants pulled from test area by applying new sealants following same procedures used originally to seal joints. Ensure that original sealant surfaces are clean and that new sealant contacts original sealant.
B. Evaluation of Field-Adhesion Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

3.5 CLEANING
A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION
A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE
A. JS-#1 Joint-Sealant Application: interior joints in horizontal traffic surfaces
   1. Joint Locations:
      a. Horizontal joints in surfaces of concrete, between metal and concrete, mortar, stone and masonry.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
B. JS#2 Joint-Sealant Application: Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M,G, and A; single component
   1. Joint Locations:
      a. Control, expansion, and soft joints in masonry.
      b. Joints between concrete and other materials.
      c. Joints between metal frames and other materials.
      d. Other exterior joints for which no other sealant is indicated.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
C. JS-#3 Joint-Sealant Application:
   1. Joint Sealant Location:
      a. Exposed joints within glazed curtain-wall framing system,
      b. Joints in aluminum window framing system.
      c. Joints in masonry where silicone sealant was previously used.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.
D. JS-#4 Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.
   2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.
E. JS-#5 Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces
   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
b. Perimeter joints of exterior openings where indicated.
c. Tile control and expansion joints.
d. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.
f. Interior wall and ceiling control joints.
g. Joints between door and window frames and wall surfaces.
h. Other interior joints for which no other type of sealant is indicated.

2. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

F. **JS-#6.** Joint-Sealant Application: Interior acoustical joints in vertical surfaces and horizontal nontraffic surfaces
   1. Joint Location:
      a. Acoustical joints where indicated.
      b. Joint-Sealant Color: As selected by Architect from manufacturer's full range (where exposed to view).

END OF SECTION 079200
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SECTION 081213 - HOLLOW METAL 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 frames.
   B. Related requirements:
      1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.
      2. Section 088000 "Glazing" for glazing requirements.

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, fire-resistance ratings, and finishes.
   B. Shop Drawings: Include the following:
      1. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
      2. Locations of reinforcement and preparations for hardware.
      3. Details of each different wall opening condition.
      4. Details of anchorages, joints, field splices, and connections.
      5. Details of moldings, removable stops, and glazing.
      6. Details of conduit and preparations for power, signal, and control systems.

1.5 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.
   B. Provide additional protection to prevent damage to factory-finished units.
   C. 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 unit 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. Amweld International, LLC.
      2. Ceco Door Products; an Assa Abloy Group company.
      3. Curries Company; an Assa Abloy Group company.
      4. Custom Metal Products.
      5. Gensteel Doors Inc.
      6. Mesker Door Inc.
      7. Republic Doors and Frames.
      8. Steelcraft; an Ingersoll-Rand company.
   B. Source Limitations: Obtain hollow-metal 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 and temperature-rise limits 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 FRAMES
A. Construct interior frames to comply with the standards indicated for materials, fabrication, hardware locations, hardware reinforcement, tolerances, and clearances, and as specified.
B. Heavy-Duty Frames:
   1. Physical Performance: Level B according to SDI A250.4.
   2. Materials: uncoated steel sheet, minimum thickness of 16 gage (0.060 inch).
   3. Sidelite Frames: Fabricated from same thickness material as adjacent door frame.

2.4 FRAME ANCHORS
A. Jamb Anchors:
   1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
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.

2.5 MATERIALS
A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.
B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.
C. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
D. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z coating designation; mill phosphatized.
E. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M
F. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers manufactured from slag or rock wool with 6- to 12-lb/cu. ft. density; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; passing ASTM E 136 for combustion characteristics.

2.6 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 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. Sidelite Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
   3. Jamb Anchors: Provide number and spacing of anchors as follows:
      a. 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.
         2) Five anchors per jamb from 90 to 96 inches high.
      b. Postinstalled Expansion Type: Locate anchors not more than 6 inches from top and bottom of frame. Space anchors not more than 26 inches o.c.
   4. Head Anchors: Two anchors per head for frames more than 42 inches wide and mounted in metal-stud partitions.
   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.
C. 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 frames to receive nontemplated, mortised, and surface-mounted hardware.
   2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with mitered hairline joints.
   1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
4. Provide loose stops and moldings on inside of hollow-metal work.
5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

2.7 STEEL FINISHES
A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
   1. Shop Primer: Manufacturer's standard, fast-curing, 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.

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. Drill and tap frames to receive nontemplated, mortised, and surface-mounted 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 for doors, transoms, sidelites, borrowed lites, and other openings, 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. 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. 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.
   3. 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.
   4. In-Place Metal or Wood-Stud Partitions: Secure slip-on drywall frames in place according to manufacturer's written instructions.
   5. 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. Glazing: Comply with installation requirements in Section 088000 “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: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.

B. 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.

C. Metallic-Coated Surface Touchup: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.

D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081213
SECTION 081416 - FLUSH WOOD 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.

1.2 SUMMARY
   A. Section Includes:
      1. Factory finished solid-core doors with wood-veneer faces.
   B. Related Sections
      1. Section 087100 “Door Hardware”

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of door. Include details of core and edge construction and trim for openings.
   B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:
      1. Dimensions and locations of blocking.
      2. Dimensions and locations of mortises and holes for hardware.
      3. Dimensions and locations of cutouts.
      4. Undercuts.
      5. Routed edges for Door edge protection
      6. Requirements for veneer matching.
      7. Fire-protection ratings for fire-rated doors.
   C. Samples for Verification:
      1. Factory finishes applied to actual door face materials, approximately 8 by 10 inches, for each material and finish. For each wood species and transparent finish, provide set of three Samples showing typical range of color and grain to be expected in finished Work.
      2. Corner sections of doors, approximately 8 by 10 inches, with door faces and edges representing actual materials to be used.
         a. Provide Samples for each species of veneer and solid lumber required.
         b. Provide Samples for each color, texture, and pattern of plastic laminate required.

1.4 INFORMATIONAL SUBMITTALS
   A. Sample Warranty: For special warranty.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Comply with requirements of referenced standard and manufacturer's written instructions.
   B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.
   C. Mark each door on bottom rail with opening number used on Shop Drawings.

1.6 FIELD CONDITIONS
   A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during remainder of construction period.
   B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during remainder of construction period.

1.7 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
         b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.
      2. Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.
PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Manufacturers: Subject to compliance with requirements, provide products by the following provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
   1. Algoma Hardwoods, Inc.
   2. Eggers Industries.
   3. Graham Wood Doors; an Assa Abloy Group company.
   5. Oshkosh Door Company.
   6. VT Industries, Inc.
   7. Or approved equal.
B. Source Limitations: Obtain flush wood doors from single manufacturer.

2.2 FLUSH WOOD DOORS, GENERAL
A. Quality Standard: In addition to requirements specified, comply with AWI's, AWMAC's, and WI's "Architectural Woodwork Standards WDMA I.S.1-A, "Architectural Wood Flush Doors."
   1. Contract Documents contain selections chosen from options in quality standard and additional requirements beyond those of quality standard. Comply with those selections and requirements in addition to quality standard.
B. WDMA I.S.1-A Performance Grade:
   1. 1-3/4 inches thick.
   2. Extra Heavy Duty.
C. Fire-Rated Wood Doors: Doors 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. 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 above ambient after 30 minutes of standard fire-test exposure.
   2. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   3. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   4. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
   5. Pairs: Provide formed-steel edges and astragals with intumescent seals.
      a. Finish steel edges and astragals with baked enamel.
      b. Finish steel edges and astragals to match door hardware (locksets or exit devices).
D. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
E. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as
      a. 5-inch-top-rail blocking.
      b. 5-inch-bottom-rail blocking, in doors indicated to have protection plates.
      c. 5-inch-midrail blocking, in doors indicated to have armor plates.
      d. 5-inch-midrail blocking, in doors indicated to have exit devices.
   3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH
A. Interior Solid-Core Doors:
   1. Grade: Premium, with Grade A faces.
   2. Species: Red oak.
   5. Assembly of Veneer Leaves on Door Faces: Balance match.
   6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Exposed Vertical Edges: Same species as faces - edge Type A.
8. Core: Either glued wood stave or structural composite lumber.
9. Construction: Five or seven plies. Stiles and rails are bonded to core, and then entire unit is abrasive planed before veneering.
10. WDMA I.S.1-A Performance Grade: Extra Heavy Duty.

2.4 FABRICATION
A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
   1. Comply with NFPA 80 requirements for fire-rated doors.
B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, BHMA-156.115-W, and hardware templates.
   1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
   2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-rated doors.
C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.
   1. Fabricate door and transom panels with full-width, solid-lumber, rabbeted, meeting rails. Provide factory-installed spring bolts for concealed attachment into jambs of metal door frames.
D. Openings: Factory cut and trim openings through doors.
   1. Light Openings: Trim openings with moldings of material and profile indicated.
   2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."
E. Route edges to accommodate flush mounted door edge protection on doors as indicted. Coordinate with Section 087100 Door Hardware

2.5 FACTORY FINISHING
A. Transparent Finish:
   1. Grade: Premium.
   2. Finish: AWI's, AWMAC's, and WI's "Architectural Woodwork Standards" System 11, catalyzed polyurethane.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine doors and installed door frames, with Installer present, before hanging doors.
   1. Verify that installed frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
   2. Reject doors with defects.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. Hardware: For installation, see Section 087100 "Door Hardware."
B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
   1. Install fire-rated doors according to NFPA 80.
   2. Install smoke- and draft-control doors according to NFPA 105.
C. Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels as indicated below; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal edges of doors, edges of cutouts, and mortises after fitting and machining.
   1. Clearances: Provide 1/8 inch at heads, jambs, and between pairs of doors. Provide 1/8 inch from bottom of door to top of decorative floor finish or covering unless otherwise indicated. Where threshold is shown or scheduled, provide 1/4 inch from bottom of door to top of threshold unless otherwise indicated.
      a. Comply with NFPA 80 for fire-rated doors.
2. Bevel fire-rated doors 1/8 inch in 2 inches at lock edge; trim stiles and rails only to extent permitted by labeling agency.

3.3 **ADJUSTING**

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if Work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416
SECTION 083113 – 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. This Section includes the following:
   1. Access doors and frames for walls and ceilings.

1.3 SUBMITTAL
A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.
C. Access Door and Frame Schedule: Provide complete access door and frame schedule, including types, locations, sizes, latching or locking provisions, and other data pertinent to installation.

1.4 QUALITY ASSURANCE
A. Source Limitations: Obtain access door(s) and frame(s) through one source from a single manufacturer.
B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. NFPA 252 for vertical access doors and frames.
   2. NFPA 288 for horizontal access doors and frames.

1.5 COORDINATION
A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.

PART 2 - PRODUCTS

2.1 ACCESS DOOR AND PANEL APPLICATIONS
A. Walls, Unless Otherwise Indicated:
   1. Material: Steel.
   2. Size: 24x24 inches, unless otherwise indicated.
   4. Tool-operated spring or cam lock; no handle.
   5. In All Wall Types: Surface mounted face frame and door surface flush with frame surface.
   6. In Gypsum Board: Drywall bead frame with door surface flush with wall surface.
B. Fire Rated Walls: See drawings for wall fire ratings.
   1. Material: Steel.
   2. Size: 24x24 inches, unless otherwise indicated.
   3. Insulated, double skin door panel.
   4. Tool-operated spring or cam lock; no handle.
C. Ceilings, Unless Otherwise Indicated: Same type as for walls.
   1. Material: Steel.
   2. Size in Lay-in Grid Ceilings: To match grid module.
   3. Size in Other Ceilings: 24x24 inches, unless otherwise indicated.
   4. In Gypsum Board ceiling: Drywall bead frame with door surface flush with ceiling surface.

2.2 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS
A. Manufacturers: Basis of Design Product: Provide Acudor Products Inc; Product AP5010: www.acudor.com. or comparable product by one of the following:
   a. Acudor Products, Inc.
   b. Babcock-Davis; A Cierra Products Co.
   c. Cendrex Inc.
   d. Jensen Industries.
B. Access Doors: Factory fabricated door and frame units, fully assembled units with corner joints welded, filled, and ground flush; square and without rack or warp; coordinate requirements with assemblies units are to be installed in.

1. Style: Recessed door panel for infill with wall/ceiling finish.
   a. In Gypsum Board: Use drywall bead type frame.
2. Door Style: Single thickness with rolled or turned in edges.
3. Frames: 16 gage, 0.0598 inch, minimum.
4. Heavy Duty Single Thickness Steel Door Panels: 14 gage, 0.0747 inch, minimum.
5. Double-Skinned Hollow Steel Door Panels: 16 gage, 0.059 inch, minimum, on both sides and all edges.
6. Units in Fire Rated Assemblies: Fire rating as required by applicable code for the fire rated assembly in which they are to be installed.
   a. Provide products listed and labeled by UL or ITS (Warnock Hersey) as suitable for the purpose specified and indicated.
7. Hardware:
   a. Hardware for Fire Rated Units: As required for listing.
9. Fire-Resistance Rating: Not less than hourly rating of the wall or ceiling assembly.
10. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
11. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.

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 panels to types of supports indicated.
   1. Exposed Flanges: As indicated.
   2. For trimless frames with drywall bead, provide edge trim for gypsum board securely attached to perimeter of frames.
   3. For trimless frames with plaster bead for full-bed plaster applications, provide zinc-coated expanded metal lath and exposed casing bead welded to perimeter of frames.
   4. Provide mounting holes in frames for attachment of units to metal or wood framing.
D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.
   1. For cylinder lock, 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.
E. Extruded Aluminum: After fabrication, apply manufacturer's standard protective coating on aluminum that will come in contact with concrete.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.
B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.
3.2 ADJUSTING AND CLEANING

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 083113
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SECTION 085113 - ALUMINUM WINDOWS

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. Extruded aluminum windows with fixed sash and applied muntins.
   2. Factory glazing - refer to section 088000 "Glazing" for Insulated Glazing type.

1.3 REFERENCE STANDARDS

C. AAMA CW-10 - Care and Handling of Architectural Aluminum From Shop to Site; American Architectural Manufacturers Association.
D. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; American Society of Civil Engineers.

1.4 PREINSTALLATION MEETINGS

A. Preinstallation Conference: Conduct conference at Project site.
   1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   2. Review and discuss the finishing of aluminum windows that is required to be coordinated with the finishing of other aluminum work for color and finish matching.
   3. Review, discuss, and coordinate the interrelationship of aluminum windows with other exterior wall components. Include provisions for anchorage, flashing, sealing perimeters, and protecting finishes.
   4. Review and discuss the sequence of work required to construct a watertight and weathertight exterior building envelope.
   5. Inspect and discuss the condition of substrate and other preparatory work performed by other trades.

1.5 PERFORMANCE REQUIREMENTS

A. Performance Requirements: As specified in PART 2, with the following additional requirements.
   1. Design and size windows to withstand the following load requirements, when tested in accordance with ASTM E 330 using test loads equal to 1.5 times the design wind loads with 10 second duration of maximum load:
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Movement: Accommodate movement between window and perimeter framing and deflection of lintel, without damage to components or deterioration of seals.
   3. Air Infiltration: Limit air infiltration through assembly to 0.3 cu ft/min/sq ft of wall area, measured at a reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E 283.
   4. Water Leakage: None, when measured in accordance with ASTM E 331 with a test pressure difference of 2.86 lbf/sq ft.
5. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly.
6. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, or migrating moisture occurring within system.

1.6 SUBMITTALS
   A. See General Conditions and Special Conditions for requirements for submittal procedures.
   B. Product Data: For each type of product:
      1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for aluminum windows.
   C. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.

1.7 QUALITY ASSURANCE
   A. Manufacturer and Installer: Company specializing in fabrication of aluminum windows of types required, with not fewer than three years of experience.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Comply with requirements of AAMA CW-10.
   B. Protect finished surfaces with wrapping paper or strippable coating during installation. Do not use adhesive papers or sprayed coatings that bond to substrate when exposed to sunlight or weather.

1.9 FIELD CONDITIONS
   A. Do not install sealants when ambient temperature is less than 40 degrees F.
   B. Maintain this minimum temperature during and 24 hours after installation of sealants.

1.10 WARRANTY
   A. Provide five year manufacturer warranty against failure of glass seal on insulating glass units, including interpane dusting or misting. Include provision for replacement of failed units.
   B. Provide five year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. EFCO; Product Fixed sash series 6700
   B. NO SUBSTITUTIONS
   C. Other Acceptable Manufacturers:

2.2 WINDOWS
   A. Windows: Tubular aluminum sections, factory fabricated, factory finished, thermally broken, vision glass, related flashings, anchorage and attachment devices.
   B. Fixed, Non-Operable Type:
      2. Interior Glazed.
      3. Glazing: Double; clear; low-e. (see 088000 "Glazing")
      4. Exterior and interior Finish: 50% fluoropolymer 2 coat finish
         a. Color: Mineral Brown

2.3 COMPONENTS
   A. Frames: thermally broken with interior portion of frame insulated from exterior portion.
   B. Sills: extruded aluminum; sloped for positive wash; fit under sash leg to 1/2 inch beyond wall face; one piece full width of opening jamb angles to terminate sill end.
   C. Muntins: integral (within glass panel) and applied muntins matching existing window configurations and dimensions.
   D. Glass and Glazing Materials: As specified in Section 088000.

2.4 MATERIALS
   A. Extruded Aluminum: ASTM B 221, 6063 alloy, T6 temper.

2.5 FINISHES
   A. High-Performance Organic Finish (Two-Coat Fluoropolymer): AA-M12-C42-R1X
B. Manufacturer's standard two-coat, system consisting of specially formulated inhibitive primer and fluoropolymer color topcoat containing not less than 50 percent polyvinylidene fluoride resin by weight. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with AAMA 2604-98 and with coating and resin manufacturers' written instructions.
   1. Color and Gloss: to match existing windows as determined by Architect and Owner

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Verify that wall openings and adjoining air and vapor seal materials are ready to receive aluminum windows.

3.2 INSTALLATION
   A. Install windows in accordance with manufacturer's instructions.
   B. Attach window frame and shims to perimeter opening to accommodate construction tolerances and other irregularities.
   C. Align window plumb and level, free of warp or twist. Maintain dimensional tolerances and alignment with adjacent work.
   D. Install sill and sill end angles.
   E. Provide thermal isolation where components penetrate or disrupt building insulation. Fill shim spaces at perimeter of assembly with fibrous insulation or spray foam insulation to maintain continuity of thermal barrier.
   F. Coordinate attachment and seal of perimeter air barrier and vapor retarder materials.
   G. Install glass and infill panels in accordance with requirements specified in Section 088000.

3.3 TOLERANCES
   A. Maximum Variation from Level or Plumb: 1/16 inches every 3 ft. non-cumulative or 1/8 inches per 10 ft., whichever is less.

3.4 FIELD QUALITY CONTROL
   A. Test installed windows for compliance with performance requirements for water penetration, in accordance with ASTM E 1105 using uniform pressure and the same pressure difference as specified for laboratory testing.
      1. Test one window of each type, as directed by Architect/Engineer.
      2. If any window fails, test additional windows at Contractor's expense.
   B. Replace windows that have failed field testing and retest until performance is satisfactory.

3.5 CLEANING
   A. Remove protective material from factory finished aluminum surfaces.
   B. Wash surfaces by method recommended and acceptable to sealant and window manufacturer; rinse and wipe surfaces clean.
   C. Remove excess sealant by moderate use of mineral spirits or other solvent acceptable to sealant and window manufacturer.

END OF SECTION 085113
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SECTION 087100 - DOOR HARDWARE

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. Mechanical door hardware for swinging doors.
   2. Electrified door hardware.
B. Related Sections:
   1. Section 102600 – “Wall And Door Protection”

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product indicated.
B. Shop Drawings: Details of electrified door hardware.
C. Samples: For each exposed product and for each color and texture specified.
D. Other Action Submittals:
   1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
      a. Format: Use same scheduling sequence and format and use same door numbers as in the Contract Documents.
      b. Content: Include the following information:
         1) Identification number, location, hand, fire rating, size, and material of each door and frame.
         2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
         3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
         4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.
B. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
C. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
D. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
E. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the U.S. Architectural & Transportation Barriers Compliance Board’s ADA-ABA Accessibility Guidelines and ICC/ANSI A117.1.
   1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
   2. Comply with the following maximum opening-force requirements:
      a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
      b. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
   3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
   4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

1.5 COORDINATION
A. Coordinate layout and installation of floor-recessed door hardware with floor construction.
B. 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.

C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.

D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.

E. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled in Part 3 "Door Hardware Schedule" Article to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and named manufacturers' products.
2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

B. Designations: Requirements for design, grade, function, finish, size, and other distinctive qualities of each type of door hardware are indicated in Part 3 "Door Hardware Schedule" Article. Products are identified by using door hardware designations, as follows:

1. Named Manufacturers' Products: Manufacturer and product designation are listed for each door hardware type required for the purpose of establishing minimum requirements. Manufacturers' names are abbreviated in Part 3 "Door Hardware Schedule" Article.
2. References to BHMA Designations: Provide products complying with these designations and requirements for description, quality, and function.
3. Basis of Design Products: Where Specifications name a product, or refer to a scheduled product and include a list of manufacturers, provide the specified or indicated product or a comparable product by one of the other named manufacturers. Drawings and Specifications indicate sizes, profiles, dimensions, and other characteristics that are based on the product named. Architect will consider Contractor's request for comparable product when the following conditions are satisfied. If the following conditions are not satisfied, Architect may return requests without action, except to record noncompliance with these requirements:
   a. Evidence that the proposed product does not require revisions to the Contract Documents, that it is consistent with the Contract Documents, and that it will produce the indicated results, and that it is compatible with other portions of the Work.
   b. Detailed comparison of significant qualities of proposed product with those named in the Specifications. Significant qualities include attributes such as performance, weight, size, durability, visual effect, and specific features and requirements.
   c. Evidence that proposed product provides specified warranty.
   d. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners, if requested.
   e. Samples, if requested.
4. Product, Manufacturer: Where Specifications name a single product and manufacturer, provide the named product that complies with requirements. Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements.
5. Owner's Standard: Where Specifications refer to a product or manufacturer as an owner standard, substitutions are not allowed.

2.2 HINGES

A. Hinges: BHMA A156.1. Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.

B. Hinges mortised to doors and frames.

1. Provide ball bearing heavy duty grade hinges.

C. Continuous Hinges: BHMA A156.26; minimum 0.120-inch- (3.0-mm-) thick, hinge leaves with minimum overall width of 4 inches (102 mm); fabricated to full height of door and frame and to template screw locations; with components finished after milling and drilling are complete.

D. Basis-of-Design Products: Subject to compliance with requirements, provide scheduled product manufactured by IVES Hardware; Allegion, PLC, (IVE) or a comparable product by:

1. Hager Companies. (HAG)
2. McKinney Products Company; an ASSA ABLOY Group company. (MCK)
3. Stanley Commercial Hardware; Div. of The Stanley Works. (STA)
4. Bommer.

2.3 ELECTRIC POWER TRANSFER
A. Manufacturer: Subject to compliance with requirements, provide scheduled product manufactured by Von Duprin; Allegion, PLC, (VON)
B. Provide power transfer sufficient for number and gage of wires to accommodate electric function of specified hardware.
C. Locate electric power transfer per manufacturer’s template and UL requirements.

2.4 MECHANICAL LOCKS AND LATCHES
A. Bored Locks: BHMA A156.2; Grade 1; Series 4000, tested to exceed 1,000,000 cycles.
B. Product: Subject to compliance with requirements, provide scheduled products manufactured by Best Lock Corporation; Stanley Security Solutions; (BES), or equivalent products by manufacturers listed below:
1. Schlage Lock Corporation; Allegion, PLC; (SCH). ND Series, SPA lever.
2. Sargent Lock; Assa Abloy Co.; (SAR). 10 Line, LP trim.
3. Yale 5400 LN Series
4. Corbin Russwin CL330 Series
C. Requirements:
1. Latchbolt: Steel with minimum ½” throw deadlatch on keyed and exterior functions; ¾” throw anti-friction latchbolt on pairs of doors.
2. Strikes: Provide manufacturer's standard strike for HM frames, ANSI curved lip, 1 ¼” x 4 7/8”, 16 gauge, with 1” deep box construction, for each lock bolt or latchbolt. Provide extended lip strike, as required, for aluminum framing.

2.5 LOCK CYLINDERS
A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
1. Product: Permanent cores by Best Locking Systems. 7 pin SFIC
2. Hardware supplier to supply temporary construction cores to contractor for use during construction phase. Temporary cores shall be returned to supplier after final core installation has been completed by owner.

2.6 KEYING
A. Keying System: Hardware supplier to set up keying meeting with the owner to determine keying requirements. Provide 3 keys per lock and 3 keys for each master system.
B. Final cylinder cores and key blanks are Owner provided and installed. The contractor will provide temporary construction cores as needed for security until the owner installs final cores.

2.7 EXIT DEVICES AND AUXILIARY ITEMS
A. Exit Devices and Auxiliary Items: BHMA A156.3. Grade 1; except with extended cycle performance testing certified for minimum 8,000,000 cycles; listed by UL for accident and hazard; and conforming to applicable requirements of NFPA 80 and NFPA 101.
B. Product: Subject to compliance with requirements, provide scheduled products manufactured by Von Duprin (VON) or equivalent products by manufacturers listed below:
1. Precision (PRE) APEX 2000 Series
2. Sargent; Assa Abloy Co.; (SAR). GL-43-80 Series
3. Corbin Russwin ED5000 Series
4. Yale 7000 Series
5. Requirements:
   a. Internal springs: Coil compression type
   b. Provide security dead latching for active latch bolts
   c. Latch Bolts: Self-lubricating coating to reduce friction and wear. Plated latchbolts are not acceptable.
   d. Touch Pad: Stainless steel with return stroke fluid dampers and rubber bottoming dampers.
   e. Provide filler plates and shim kits as needed for flush mounting of devices on doors.
   f. Devices with exposed rivets or screws on back of device that would be visible through a glass light are not acceptable.
   g. Provide guarded latchbolts.
   h. Provide flush end caps
   i. Electric strikes by Von Duprin or 1006 series of HES
2.8 SURFACE CLOSERS
   A. Surface Closers: BHMA A156.4 Grade 1; except tested to exceed 10 million (10,000,000) full load operating cycles by an independent test laboratory;
   B. Product: Subject to compliance with requirements, provide scheduled products manufactured by LCN Closers (LCN) or equivalent products by manufacturers listed below:
      1. Norton (NOR) 9500
      2. Sargent; Assa Abloy Co.; (SAR). 281 Series
      3. Stanley D-4550 Series
      4. Corbin Russwin DC8200 Series
   C. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use.
   D. Provide factory-sized rack-and-pinion hydraulic type closers that are adjustable to meet field conditions and requirements for opening force.
   E. Provide closers, constructed with high strength cast iron cylinders, forged main arms, and one piece forged steel pistons, with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm.
   F. Cylinder Body: 1½" piston diameter with 3/4" journal double heat treated shaft, 5/8" full complement bearing, chrome silicon steel spring.
   G. Hydraulic Fluid: ULTRA X™ fluid with constant temperature control from +120° F (49° C) to -30° F (–35° C).
   H. Closers with pressure release valves are not acceptable.
   I. Thru bolts to be used on wood doors.

2.9 POWER SUPPLIES
   A. Products: Schlage Electronics PS900 series or Von Duprin PS914 series, as appropriate for the application Sargent 3500 series an approved equal
   B. Requirements:
      1. Provide power supplies complete with required circuit boards, recommended and approved by the manufacturer of the electrified locking component, for the operation of electrified locks, electrified exit devices, magnetic locks, electric strikes, and other components requiring a power supply.
      2. Provide the appropriate quantity of power supplies necessary for the proper operation of the electrified locking components as recommended by the manufacturer of the electrified locking components with consideration for each electrified component using the power supply, the location of the power supply, and the approved wiring diagrams. Locate the power supplies as directed by the Architect.
      3. Provide a power supply that is regulated and filtered 24 VDC, or as required, and UL class 2 listed.

2.10 MECHANICAL STOPS AND HOLDERS
   A. Wall- and Floor-Mounted Stops: BHMA A156.16.
      1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product manufactured by IVES Hardware; Allegion, PLC. (IVE) or a comparable product by:
         a. Hager Companies. (HAG)
         b. Rockwood Manufacturing Company. (ROC)
         c. Trimco Stops/Flatgoods Door Hardware is approved per substitution request.
         d. McKinney
   B. Provide door stops for all doors in accordance with the following requirements:
      1. Provide convex type wall stops wherever possible.
      2. Where wall stops cannot be used, provide floor stops of the proper height.
      3. At opening where wall or floor stop cannot be used, provide overhead stop.

2.11 OVERHEAD STOPS AND HOLDERS
   A. Overhead Stops and Holders: BHMA A156.8.
      1. Basis-of-Design Product: Subject to compliance with requirements, provide scheduled product manufactured by Glynn-Johnson; Allegion, PLC. (GLY) or comparable product by one of the following:
         a. Rixon
         b. Rockwood Manufacturing Company. (ROC)
         c. Sargent

2.12 DOOR GASKETING
   A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.
1. Manufacturers: Subject to compliance with requirements, provide the scheduled product or comparable product by one of the following:
   a. Hager Companies. (HAG)
   b. National Guard Products. (NGP)
   c. Reese Enterprises, Inc. (REE)
   d. Zero International. (ZER)

2.13 THRESHOLDS
   A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated, heavy duty grade
   1. Manufacturers: Subject to compliance with requirements, provide the scheduled product or comparable product by one of the following:
      a. Hager Companies
      b. National Guard Products
      c. McKinney
      d. Pemko
      e. Zero International

2.14 FABRICATION
   A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
   2. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
   3. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.15 FINISHES
   A. Provide finishes complying with BHMA A156.18 as indicated in door hardware schedule.
   B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION
3.1 HARDWARE INSTALLATION
   A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
   B. Mounting Heights: Mount door hardware units at heights indicated or as required to comply with governing regulations.
      2. Custom Steel Doors and Frames: HMMA 831.
   C. Install each door hardware item to comply 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 with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
      1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
      2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
   D. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
   E. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room. Verify location with Architect.
      1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.
F. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."

G. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

H. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

I. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

J. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

3.2 SYSTEMS, SOFTWARE, AND HARDWARE

A. Coordinate with the Owner to ensure that the new components will be properly programmed into the system.

3.3 FIELD QUALITY CONTROL

A. Perform tests and inspections.
   1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections: After installation of cables and connectors, demonstrate product capability and compliance with requirements. Test each signal path for end-to-end performance from each end of all pairs installed. Remove temporary connections when tests have been satisfactorily completed.

3.4 DOOR HARDWARE SCHEDULE

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OPERATION: DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

HW SET NO. 02

FOR USE ON MARK/DOOR #(S):

087100 - 6/10
**MU Medical Science Building**  
First Floor Research Laboratory Renovation  
CP171091  

**Bid Documents**  
November 6, 2017

M148-1

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1 EA GASKETING 488S-BK W/ INTUMESCENT SEAL IF REQUIRED

1 EA POWER SUPPLY PS902 900-2RS

1 EA NOTE CARD READER BY OWNER

OPERATION: DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

**HW SET NO. 03**

FOR USE ON MARK/DOOR #(S):

M128

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1 EA DOOR BOTTOM 361AA6

1 EA POWER SUPPLY PS902 900-2RS

1 EA NOTE CARD READER BY OWNER

OPERATION: DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

**HW SET NO. 04**

FOR USE ON MARK/DOOR #(S):

M122 M148-2

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OPERATION: DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

**DOOR HARDWARE**  
087100 - 7/10
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**OPERATION:** DOOR ALWAYS CLOSED AND LOCKED. ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE. INSIDE LEVER ALWAYS FREE EGRESS.

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OPERATION:  DOORS ALWAYS CLOSED AND LOCKED.  ENTRY BY WALL MOUNT CARD READER, MOMENTARILY RELEASING ELECTRIC STRIKE.  INSIDE LEVER ALWAYS FREE EGRESS.

END OF SECTION 087100
SECTION 088000 - GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes glazing for the following products and applications, including those specified in other Sections where glazing requirements are specified by reference to this Section:
   1. Exterior Windows.
   2. Interior Doors.
   3. Interior sidelights.
   4. Interior borrowed lites.
   5. Rated glazing.

1.3 DEFINITIONS

A. Glass Manufacturers: Firms that produce primary glass, fabricated glass, or both, as defined in referenced glazing publications.
B. Glass Thicknesses: Indicated by thickness designations in millimeters according to ASTM C 1036.
C. Interspace: Space between lites of an insulating-glass unit.

1.4 PERFORMANCE REQUIREMENTS

A. General: Installed glazing systems shall withstand normal thermal movement and wind and impact loads (where applicable) without failure, including loss or glass breakage attributable to the following: defective manufacture, fabrication, or installation; failure of sealants or gaskets to remain watertight and airtight; deterioration of glazing materials; or other defects in construction.
B. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes acting on glass framing members and glazing components.
   1. Temperature Change: 120 deg F ambient; 180 deg F, material surfaces.

1.5 ACTION SUBMITTALS

A. Product Data: For each glass, glass film and glazing material indicated.
B. Glass Samples: For each type of glass product other than clear monolithic vision glass; 12 inches square.
   1. Fire-resistive glazing products.
   2. Insulating glass.
C. Plastic Film Sample. mounted to 12 inches square clear glass sample.
D. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

1.6 INFORMATIONAL SUBMITTALS

A. Product Certificates: For glass and glazing products, from manufacturer.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for tinted glass coated glass insulating glass.
   1. For glazing sealants, provide test reports based on testing current sealant formulations within previous 36-month period.
C. Warranties: Sample of special warranties.

1.7 QUALITY ASSURANCE

A. Manufacturer Qualifications for Insulating-Glass Units with Sputter-Coated, Low-E Coatings: A qualified insulating-glass manufacturer who is approved by coated-glass manufacturer.
B. Installer Qualifications: A qualified installer who employs glass installers for this Project who are certified under the National Glass Association's Certified Glass Installer Program.
C. Glass Testing Agency Qualifications: A qualified independent testing agency accredited according to the NFRC CAP 1 Certification Agency Program.
D. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.
E. Glazing Publications: Comply with published recommendations of glass product manufacturers and organizations below, unless more stringent requirements are indicated. Refer to these publications for glazing terms not otherwise defined in this Section or in referenced standards.

F. Safety Glazing Labeling: Where safety glazing labeling is indicated, permanently mark glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.

G. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name, test standard, whether glazing is for use in fire doors or other openings, whether or not glazing passes hose-stream test, whether or not glazing has a temperature rise rating of 450 deg F, and the fire-resistance rating in minutes.

H. Insulating-Glass Certification Program: Permanently marked either on spacers or on at least one component lite of units with appropriate certification label of IGCC.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Protect glazing materials according to manufacturer's written instructions. Prevent damage to glass and glazing materials from condensation, temperature changes, direct exposure to sun, or other causes.

B. Comply with insulating-glass manufacturer's written recommendations for venting and sealing units to avoid hermetic seal ruptures due to altitude change.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not proceed with glazing when ambient and substrate temperature conditions are outside limits permitted by glazing material manufacturers and when glazing channel substrates are wet from rain, frost, condensation, or other causes.

1. Do not install glazing sealants when ambient and substrate temperature conditions are outside limits permitted by sealant manufacturer or below 40 deg F.

1.10 WARRANTY

A. Manufacturer's Special Warranty on Insulating Glass: Manufacturer's standard form in which insulating-glass manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GLASS PRODUCTS, GENERAL

A. Thickness: Where glass thickness is indicated, it is a minimum. Provide glass lites in thicknesses as needed to comply with requirements indicated.

1. Minimum Glass Thickness for Exterior Lites: Not less than 6.0 mm.

2. Thickness of Tinted Glass: Provide same thickness for each tint color indicated throughout Project.

B. Strength: Where float glass is indicated, provide annealed float glass, Kind HS heat-treated float glass, or Kind FT heat-treated float glass. Where heat-strengthened glass is indicated, provide Kind HS heat-treated float glass or Kind FT heat-treated float glass. Where fully tempered glass is indicated, provide Kind FT heat-treated float glass.

C. Thermal and Optical Performance Properties: Provide glass with performance properties specified, as indicated in manufacturer's published test data.

1. For fire rated safety glazing properties are based on products of construction indicated.

2. For insulating-glass units, properties are based on units of thickness indicated for overall unit and for each lite.

3. U-Factors: Center-of-glazing values, according to NFRC 100 and based on LBL's WINDOW 5.2 computer program, expressed as Btu/sq. ft. x h x deg F.

4. Solar Heat-Gain Coefficient and Visible Transmittance: Center-of-glazing values, according to NFRC 200 and based on LBL's WINDOW 5.2 computer program.

5. Visible Reflectance: Center-of-glazing values, according to NFRC 300.
2.2 INSULATING GLASS
   A. Insulating-Glass Units: Factory-assembled units consisting of sealed lites of glass separated by a
dehydrated interspace, qualified according to ASTM E 2190, and complying with other requirements
specified.
   1. Sealing System: Dual seal, with manufacturer's standard primary and secondary.
   2. Spacer: Manufacturer's standard spacer material and construction. Provide Black Anodic finish or
match existing new glazing as directed by Owner and Architect.
   3. Desiccant: Molecular sieve or silica gel, or blend of both.
   4. Tint: Match tint of existing building glazing unless otherwise directed by Owner and Architect.
   B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in
"Insulating-Glass Types" Article.

2.3 FIRE-PROTECTION-RATED GLAZING
   A. Fire-Protection-Rated Glazing, General: Listed and labeled by a testing agency acceptable to authorities
having jurisdiction, for fire-protection ratings indicated, based on testing according to NFPA 252 for door
assemblies.
   B. Glass: Comply with applicable requirements in "Glass Products" Article as indicated by designations in
"Fire-Protection-Rated Glazing Types" Article.

2.4 GLAZING GASKETS
   A. Dense Compression Gaskets: Molded or extruded gaskets of profile and hardness required to maintain
watertight seal, made from one of the following:
   1. Neoprene complying with ASTM C 864.
   2. EPDM complying with ASTM C 864.
   4. Thermoplastic polyolefin rubber complying with ASTM C 1115.
   B. Soft Compression Gaskets: Extruded or molded, closed-cell, integral-skinned neoprene EPDM silicone or
thermoplastic polyolefin rubber gaskets complying with ASTM C 509, Type II, black; of profile and
hardness required to maintain watertight seal.
   1. Application: Use where soft compression gaskets will be compressed by inserting dense compression
gaskets on opposite side of glazing or pressure applied by means of pressure-glazing stops on
opposite side of glazing.

2.5 GLAZING SEALANTS
   A. General:
   1. Compatibility: Provide glazing sealants that are compatible with one another and with other materials
they will contact, including glass products, seals of insulating-glass units, and glazing channel
substrates, under conditions of service and application, as demonstrated by sealant manufacturer
based on testing and field experience.
   2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing
sealants suitable for applications indicated and for conditions existing at time of installation.
   3. Sealants used inside the weatherproofing system, shall have a VOC content of not more than 250 g/L
when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   4. Colors of Exposed Glazing Sealants: As selected by Architect from manufacturer's full range.
   B. Glazing Sealants for Fire-Rated Glazing Products: Products that are approved by testing agencies that
listed and labeled fire-resistant glazing products with which they are used for applications and
fire-protection ratings indicated.

2.6 PLASTIC FILMS
   A. Glass Type: Plastic window film
   1. Applications: Interior glazing as indicated on drawings
   B. Basis of design product Designtex Casper Grid PF006-801 Grid/White or as otherwise indicated on
Material Legend: Designtex: www.designtex.com
   C. Subject to review and approval by Architect, alternate manufacturer's which may be considered include:
   1. 3M Window Films: www.3m.com/us/arch_construct/scpd/windowfilm
   2. Decorative Films LLC: www.decorativefilm.com
   3. Flexvue Films: www.flexvuefilms.com
   D. Product: As indicated on Material Legend
   E. Provide custom cut window film panels on carrier medium.
2.7 MISCELLANEOUS GLAZING MATERIALS

A. General: Provide products of material, size, and shape complying with referenced glazing standard, requirements of manufacturers of glass and other glazing materials for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.

C. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

D. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.

E. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).

F. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

G. Perimeter Insulation for Fire-Resistive Glazing: Product that is approved by testing agency that listed and labeled fire-resistant glazing product with which it is used for application and fire-protection rating indicated.

2.8 FABRICATION OF GLAZING UNITS

A. Fabricate glazing units in sizes required to fit openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with written instructions of product manufacturer and referenced glazing publications, to comply with system performance requirements.

B. Clean-cut or flat-grind vertical edges of butt-glazed monolithic lites to produce square edges with slight chamfers at junctions of edges and faces.

C. Grind smooth and polish exposed glass edges and corners.

2.9 MONOLITHIC GLASS SCHEDULE

A. Glass Type: Clear fully tempered float glass. Provide where glass not required to be fire rated or insulated.

1. Minimum Thickness of Each Glass Ply: 1/4” (6 mm)

2.10 INSULATING-GLASS TYPES

A. Glass Type IG-1: Low-e-coated, insulating glass.

1. Match tinting and appearance of existing insulated glazing units, if any.
2. Manufacturer: subject to compliance with requirements: provide either of the following or approved equal.
   a. AGC (Asahi Glass Co)-Comfort E2
   b. Guardian Industries Corp: SN68
   c. Pilkington: Energy Advantage
   d. PPG Solarban 60

3. Overall Unit Thickness 1”
4. Thickness of Each Lite: 1/4-inch (6.0 mm.)
5. Interspace Content: air.
6. Integral muntin between glass panels. Coordinate with Aluminum Windows
7. Outdoor Lite: Class 1 annealed float glass.
8. Indoor Lite: Class 1 annealed float glass.
9. Low-E Coating: on no 3 surface.

2.11 FIRE-PROTECTION-RATED GLAZING TYPES

A. Manufacturer: Basis of Design Manufacturers are listed below utilizing clear non-ceramic glazing.

B. Glass Type GL-1: 20-minute fire-rated glazing without hose-stream test.

1. Applications: Provide in door lites in 20 minute rated doors.
2. Manufacturer: Nippon Electric Glass Co., Ltd. (distributed by Technical Glass Products): Contact Sean Williams at TGP ph 817-808-9431; email seanw@fireglass.com
3. Product: TGP Fireglass20
   a. 1/4” thick.
   b. Fire rated 20 minutes
   c. Impact safety rated.

C. Glass Type GL-2: 45-minute fire-rated glazing.

1. Applications: Provide in the following locations:
   a. Sidelites adjacent to rated doors.
      1) Provide safety glazing labeling at sidelites
   b. Interior borrowed lites in rated partitions.
   c. Note: where rated doors are adjacent to 45 minute sidelites, glazing of door shall match glazing of sidelite for appearance purposes.
2. Manufacturer: Pilkington Pyrostop
a. Designation 45-200
b. 3/4” thickness
c. Fire Rated 45 minutes
d. Impact Safety Rated

3. Alternate Manufacturers: Products by alternate manufacturers as listed below may be considered.
   a. Alternate Manufacturers:
      1) InterEdge, Inc., a subsidiary of AFG Industries, Inc.
      2) Nippon Electric Glass Co., Ltd.
      3) Pilkington Group Limited (distributed by Technical Glass Products)
      4) Safi First;
      5) Schott North America, Inc.
      6) Vetrotech Saint-Gobain;

4. In order to provide for similar transparency in all glazed openings, all fire protection glazing must be
   either of the following: mixing types will not be permitted.
   a. Clear non-ceramic product
   b. Ceramic product

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine framing, glazing channels, and stops, with Installer present, for compliance with the following:
      1. Manufacturing and installation tolerances, including those for size, squareness, and offsets at corners.
      2. Present and functioning of weep systems.
      3. Minimum required face and edge clearances.
      4. Effective sealing between joints of glass-framing members.
   B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Clean glazing channels and other framing members receiving glass immediately before glazing. Remove
      coatings not firmly bonded to substrates.
   B. Examine glazing units to locate exterior and interior surfaces. Label or mark units as needed so that
      exterior and interior surfaces are readily identifiable. Do not use materials that will leave visible marks in
      the completed work.

3.3 GLAZING, GENERAL
   A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing
      materials, unless more stringent requirements are indicated, including those in referenced glazing
      publications.
   B. Adjust glazing channel dimensions as required by Project conditions during installation to provide
      necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with
      reasonable tolerances.
   C. Protect glass edges from damage during handling and installation. Remove damaged glass from Project
      site and legally dispose of off Project site. Damaged glass is glass with edge damage or other
      imperfections that, when installed, could weaken glass and impair performance and appearance.
   D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction
      testing.
   E. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications,
      unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable
      for heel bead.
   F. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
   G. Provide spacers for glass lites where length plus width is larger than 50 inches.
      1. Locate spacers directly opposite each other on both inside and outside faces of glass. Install correct
         size and spacing to preserve required face clearances, unless gaskets and glazing tapes are used that
         have demonstrated ability to maintain required face clearances and to comply with system
         performance requirements.
      2. Provide 1/8-inch minimum bite of spacers on glass and use thickness equal to sealant width. With
         glazing tape, use thickness slightly less than final compressed thickness of tape.
   H. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing
      channel, as recommended in writing by glass manufacturer and according to requirements in referenced
      glazing publications.
   I. Set glass lites in each series with uniform pattern, draw, bow, and similar characteristics.
   J. Set glass lites with proper orientation so that coatings face exterior or interior as specified.
K. Where wedge-shaped gaskets are driven into one side of channel to pressurize sealant or gasket on opposite side, provide adequate anchorage so gasket cannot walk out when installation is subjected to movement.

L. Square cut wedge-shaped gaskets at corners and install gaskets in a manner recommended by gasket manufacturer to prevent corners from pulling away; seal corner joints and butt joints with sealant recommended by gasket manufacturer.

3.4 GASKET GLAZING (DRY)

A. Cut compression gaskets to lengths recommended by gasket manufacturer to fit openings exactly, with allowance for stretch during installation.

B. Insert soft compression gasket between glass and frame or fixed stop so it is securely in place with joints miter cut and bonded together at corners.

C. Installation with Drive-in Wedge Gaskets: Center glass lites in openings on setting blocks and press firmly against soft compression gasket by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

D. Installation with Pressure-Glazing Stops: Center glass lites in openings on setting blocks and press firmly against soft compression gasket. Install dense compression gaskets and pressure-glazing stops, applying pressure uniformly to compression gaskets. Compress gaskets to produce a weathertight seal without developing bending stresses in glass. Seal gasket joints with sealant recommended by gasket manufacturer.

E. Install gaskets so they protrude past face of glazing stops.

3.5 PLASTIC FILM INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Cut film edges neatly and square at a uniform distance of 1/8 inch to 1/16 inch of window sealant. Use new blade tips after 3 to 4 cuts.

C. After application of film, wait time recommended by manufacturer and wash film using cleaning solutions approved by manufacturer. Do not use abrasive type cleaning agents and bristle brushes to avoid scratching film. Use synthetic sponges or soft cloths.

3.6 CLEANING AND PROTECTION

A. Protect exterior glass from damage 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. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer.

C. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains; remove as recommended in writing by glass manufacturer.

D. Remove and replace glass that is broken, chipped, cracked, or abraded or that is damaged from natural causes, accidents, and vandalism, during construction period.

E. Wash glass on both exposed surfaces in each area of Project not more than four days before date scheduled for inspections that establish date of Substantial Completion. Wash glass as recommended in writing by glass manufacturer.

END OF SECTION 088000
SECTION 090561 – COMMON WORK RESULTS FOR FLOORING PREPARATION

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. Preparation of existing concrete floor slabs for installation of floor coverings.
2. Testing of concrete floor slabs for moisture and pH.
3. Remediation of concrete floor slabs due to unsatisfactory moisture or pH conditions. Contractor shall perform all specified remediation of concrete floor slabs where indicated by testing agency's report.
B. This section applies to all floors identified in the contract documents as to receive the following types of floor coverings:
1. Resinous Flooring
2. Resilient Tile Flooring including LVT and VCT
C. Related requirements
1. Section 096519 - Resilient Tile Flooring
2. Section 096723 - Resinous Flooring

1.3 PRICE AND PAYMENT PROCEDURES
A. Unit Prices: See Section 012200 - Unit Prices.
B. Unit Price for Remedial Floor Coating: include the cost of the floor coating in the base bid; state on the bid form the unit price per square foot for the floor coating, and the quantity anticipated to be installed, in the event such remediation is required. If not required, a credit will be provided per the unit price times the quantity not installed.
1. Base the unit price on the assumption that the floor area to be treated includes all areas of VCT, LVT, Resinous flooring, tile or other applied finish other than sealers.

1.4 SUBMITTALS
A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
1. Moisture and pH limits and test methods.
2. Manufacturer's required bond/compatibility test procedure.
B. Testing Agency's Report: Include:
1. Description of areas tested; include floor plans and photographs if helpful.
2. Summary of conditions encountered.
3. Moisture and pH test reports.
5. Recommendations for remediation of unsatisfactory surfaces.
7. Submit report not more than two business days after conclusion of testing.
C. Adhesive Bond and Compatibility Test Report.

1.5 QUALITY ASSURANCE
A. Moisture and pH testing shall be performed by an independent testing agency employed and paid by Contractor.
B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.
C. Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.
D. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Cost of testing to be included in Contractor's bid.
6. Notify Architect when specified ambient conditions have been achieved and when testing will start.
FIELD CONDITIONS
A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F or more than 85 degrees F.
B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Patching Compound: Floor covering manufacturer's recommended product, suitable for conditions, and compatible with adhesive and floor covering. In the absence of any recommendation from flooring manufacturer, provide a product with the following characteristics:
   1. Cementitious moisture-, mildew-, and alkali-resistant compound, compatible with floor, floor covering, and floor covering adhesive, and capable of being feathered to nothing at edges.
   2. Latex or polyvinyl acetate additions are permitted; gypsum content is prohibited.
   3. Compressive Strength: 3000 psi, minimum, after 28 days, when tested in accordance with ASTM C109/C109M or ASTM C472, whichever is appropriate.
B. Alternate Flooring Adhesive: Floor covering manufacturer's recommended product, suitable for the moisture and pH conditions present; low-VOC. In the absence of any recommendation from flooring manufacturer, provide a product recommended by adhesive manufacturer as suitable for substrate and floor covering and for conditions present. Verify in writing that warranty of each particular flooring manufacturer is unaffected by use of this adhesive.
C. Remedial Floor Coating: Coating intended by its manufacturer to resist water vapor transmission to degree sufficient to meet flooring manufacturer's emission limits, resistant to the level of pH found, and suitable for adhesion of flooring without further treatment or with only the addition of a skim coat of patching compound or adhesive. Verify in writing that warranty of each particular flooring manufacturer is unaffected by use of this floor coating.
   1. Thickness: 1/8 inch, maximum.
   2. Manufacturer shall provide written warranty for their system warranting the floor finish against failure due to moisture migration or moisture-born contaminates for a period of (15) years from the date of original installation. The warranty shall cover both labor and materials necessary to repair or replace the floor finish if repairs cannot be made. Provide Warranty from manufacturer of sealer
   3. Product subject to written agreement with manufacturer of various flooring finish products: CreteSeal CS2000 2 day system www.creteseal.com
   4. If testing agency recommends any particular products, use one of those.

PART 3 - EXECUTION

3.1 PREPARATION
A. Refer also to Section 035416 - Hydraulic Cement Underlayment for underlayment requirements.

3.2 CONCRETE SLAB PREPARATION
A. Perform following operations in the order indicated:
   1. Preliminary cleaning
   2. Moisture vapor emission tests; 3 tests in the first 1000 square feet and one test in each additional 1000 square feet, unless otherwise indicated or required by flooring manufacturer.
   3. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. pH tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   5. Specified remediation, if required.
   6. Patching, smoothing, and leveling, as required.
   7. Other preparation specified.
   9. Protection.
B. Remediations:
   1. Active Water Leaks or Continuing Moisture Migration to Surface of Slab: Correct this condition before doing any other remediation; re-test after correction.
   2. Excessive Moisture Emission or Relative Humidity: If an adhesive that is resistant to the level of moisture present is available and acceptable to flooring manufacturer, use that adhesive for installation of the flooring; if not, apply remedial floor coating over entire suspect floor area.
3. Excessive pH: If remedial floor coating is necessary to address excessive moisture, no additional remediation is required; if not, if an adhesive that is resistant to the level present is available and acceptable to the flooring manufacturer, use that adhesive for installation of the flooring; otherwise, apply a skim coat of specified patching compound over entire suspect floor area.

3.1 CONCRETE SLAB PREPARATION FOR RESILIENT FLOORING

A. Verify procedure meets manufacturer's recommendations.
B. Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to flooring manufacturer's written recommendations, but not less stringent than the following:
      a. Perform anhydrous calcium chloride test according to ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.
      b. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum 75 percent relative humidity level.

3.2 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
B. Where this specification conflicts with the referenced test method, comply with the more stringent requirements.
C. Moisture Testing: Perform tests so that each test area does not exceed 1000 sq. ft. (304.8 sq. m), and perform no fewer than three tests in each installation area and with test areas evenly spaced in installation areas.
   1. Internal Relative Humidity Test: Using in situ probes, ASTM F 2170. Install MVE-control system in locations where concrete substrates exhibit relative humidity level greater than 75 percent.
   2. Anhydrous Calcium Chloride Test: ASTM F 1869. Install MVE-control system in locations where concrete substrate MVER exceeds [3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) in 24 hours.
D. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.
E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet per 24 hours.
F. Report: Report the information required by the test method.

3.3 PH TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.
B. Note: This procedure is the equivalent of that described in ASTM F710, repeated here for reference.
C. Use a wide range pH paper, its associated chart, and distilled or deionized water.
D. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch in diameter. Allow the puddle to set for approximately 60 seconds, then dip the pH paper into the water, remove it, and compare immediately to chart to determine pH reading.
E. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value is over 10.

3.4 PREPARATION

A. See individual floor covering section(s) for additional requirements.
B. Comply with requirements and recommendations of floor covering manufacturer.
C. Fill and smooth surface cracks, grooves, depressions, control joints and other non-moving joints, and other irregularities with patching compound.
D. Do not fill expansion joints, isolation joints, or other moving joints.
3.5  **ADHESIVE BOND AND COMPATIBILITY TESTING**  
    A. Comply with requirements and recommendations of floor covering manufacturer.

3.6  **APPLICATION OF REMEDIAL FLOOR COATING**  
    A. Comply with full requirements and recommendations of coating manufacturer, including shot blasting and v-groove cut out of all cracks and control joints.  
    B. Manufacturer's representative shall be on site to document and oversee installation.

3.7  **PROTECTION**  
    A. Cover prepared floors with building paper or other durable covering.

END OF SECTION 090561
SECTION 092216 - 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, and grid systems.
B. Related Requirements:
1. Section 061053 "Miscellaneous Rough Carpentry" for blocking and plywood panels inserted into wall assemblies.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.4 INFORMATIONAL SUBMITTALS
A. Evaluation Reports: For steel studs and runners firestop tracks, from ICC-ES.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics: For fire-resistance-rated assemblies that incorporate non-load-bearing steel framing, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 119 by an independent testing agency.
B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated, according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

2.2 FRAMING SYSTEMS
A. 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.
B. Studs and Runners: ASTM C 645. Use steel studs and runners.
1. Steel Studs and Runners:
   a. Minimum Base-Metal Thickness: 0.027 inch.
   b. Depth: As indicated on Drawings.
C. Slip-Type Head Joints: Provide one of the following:
1. Double-Runner System: ASTM C 645 top runners, inside runner with 2-inch-deep flanges in thickness not less than indicated for studs and fastened to studs, and outer runner sized to friction fit inside runner.
2. Deflection Track: Steel sheet top runner manufactured to prevent cracking of finishes applied to interior partition framing resulting from deflection of structure above; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   a. Products: Subject to compliance with requirements, provide one of the following:
      1) Dietrich Metal Framing; SLP-TRK Slotted Deflection Track.
      2) MBA Building Supplies; FlatSteel Deflection Track Slotted Defecto Track.
      3) Steel Network Inc. (The); VertiClip SLD VertiTrack VTD Series.
      4) Superior Metal Trim; Superior Flex Track System (SFT).
      5) Telling Industries; Vertical Slip Track II.
D. Firestop Tracks: Top runner manufactured to allow partition heads to expand and contract with movement of the structure while maintaining continuity of fire-resistance-rated assembly indicated; in thickness not less than indicated for studs and in width to accommodate depth of studs.
   1. Products: Subject to compliance with requirements, provide one of the following:
      a. Fire Trak Corp.; Fire Trak System attached to studs with Fire Trak Posi Klip.
      b. Grace Construction Products; FlameSafe FlowTrak System.
      c. Metal-Lite, Inc.; The System.
E. Cold-Rolled Channel Bridging: Steel, 0.053-inch minimum base-metal thickness, with minimum 1/2-inch-wide flanges.
   1. Depth: 1-1/2 inches.
   2. Clip Angle: Not less than 1-1/2 by 1-1/2 inches, 0.068-inch-thick, galvanized steel.
F. Hat-Shaped, Rigid Furring Channels: ASTM C 645.
   1. Minimum Base-Metal Thickness: 0.027 inch.
   2. Depth: As indicated on Drawings.

2.3 SUSPENSION SYSTEMS
A. Tie Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.062-inch-diameter wire, or double strand of 0.048-inch-diameter wire.
B. Hanger Attachments to Concrete:
   1. Anchors: Fabricated from corrosion-resistant materials with holes or loops for attaching wire hangers and capable of sustaining, without failure, a load equal to 5 times that imposed by construction as determined by testing according to ASTM E 488 by an independent testing agency.
      a. Type: Postinstalled, chemical anchor or Postinstalled, expansion anchor.
   2. Powder-Actuated Fasteners: Suitable for application indicated, fabricated from corrosion-resistant materials with clips or other devices for attaching hangers of type indicated, and capable of sustaining, without failure, a load equal to 10 times that imposed by construction as determined by testing according to ASTM E 1190 by an independent testing agency.
C. Wire Hangers: ASTM A 641/A 641M, Class 1 zinc coating, soft temper, 0.16 inch in diameter.
D. Grid Suspension System for Gypsum Board Ceilings: ASTM C 645, direct-hung system composed of main beams and cross-furring members that interlock.
   1. Products: Subject to compliance with requirements, provide one of the following:
      b. Chicago Metallic Corporation; Drywall Grid System.
      c. USG Corporation; Drywall Suspension System.

2.4 AUXILIARY MATERIALS
A. General: Provide auxiliary materials that comply with referenced installation standards.
   1. Fasteners for Metal Framing: Of type, material, size, corrosion resistance, holding power and other properties required to fasten steel members to substrates.

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 PREPARATION
A. Suspended Assemblies: Coordinate installation of suspension systems with installation of overhead structure to ensure that inserts and other provisions for anchorages to building structure have been installed to receive hangers at spacing required to support the Work and that hangers will develop their full strength.
   1. Furnish concrete inserts and other devices indicated to other trades for installation in advance of time needed for coordination and construction.
B. Coordination with Sprayed Fire-Resistive Materials:
   1. Before sprayed fire-resistive materials are applied, attach offset anchor plates or ceiling runners (tracks) to surfaces indicated to receive sprayed fire-resistive materials. Where offset anchor plates are required, provide continuous plates fastened to building structure not more than 24 inches o.c.
   2. After sprayed fire-resistive materials are applied, remove them only to extent necessary for installation of non-load-bearing steel framing. Do not reduce thickness of fire-resistive materials below that required for fire-resistance ratings indicated. Protect adjacent fire-resistive materials from damage.

3.3 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.

3.4 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 jams to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
      a. Install two boxed studs at each jamb, install a third stud at the hinge side.
      b. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch clearance from jamb stud to allow for installation of control joint in finished assembly.
   3. Other Framed Openings: Frame openings other than door openings the same as required for door openings unless otherwise indicated. Install framing below sills of openings to match framing required above door heads.
   4. Fire-Resistance-Rated Partitions: Install framing to comply with fire-resistance-rated assembly indicated and support closures and to make partitions continuous from floor to underside of solid structure.
      a. Firestop Track: Where indicated, install to maintain continuity of fire-resistance-rated assembly indicated.
   5. Sound-Rated Partitions: Install framing to comply with sound-rated assembly indicated.

E. Direct Furring:
   1. Screw to wood framing.
   2. Attach to concrete or masonry with stub nails, screws designed for masonry attachment, or powder-driven fasteners spaced 24 inches o.c.

F. Installation Tolerance: Install each framing member so fastening surfaces vary not more than 1/8 inch from the plane formed by faces of adjacent framing.

3.5 INSTALLING SUSPENSION SYSTEMS

A. Install suspension system components according to spacings indicated, but not greater than spacings required by referenced installation standards for assembly types.
   1. Hangers: 48 inches o.c.
   2. Carrying Channels (Main Runners): 48 inches o.c.
   3. Furring Channels (Furring Members): 16 inches o.c.
B. Isolate suspension systems from building structure where they abut or are penetrated by building structure to prevent transfer of loading imposed by structural movement.
C. Suspend hangers from building structure as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or suspension system.
      a. Splay hangers only where required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with locations of hangers required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices.
      a. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced installation standards.
   3. Wire Hangers: Secure by looping and wire tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause hangers to deteriorate or otherwise fail.
4. Flat Hangers: Secure to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure and hanger, and in a manner that will not cause hangers to deteriorate or otherwise fail.
5. Do not attach hangers to steel roof deck.
6. Do not attach hangers to permanent metal forms. Furnish cast-in-place hanger inserts that extend through forms.
7. Do not attach hangers to rolled-in hanger tabs of composite steel floor deck.
8. Do not connect or suspend steel framing from ducts, pipes, or conduit.

D. Fire-Resistance-Rated Assemblies: Wire tie furring channels to supports.
E. Grid Suspension Systems: Attach perimeter wall track or angle where grid suspension systems meet vertical surfaces. Mechanically join main beam and cross-furring members to each other and butt-cut to fit into wall track.
F. Installation Tolerances: Install suspension systems that are level to within 1/8 inch in 12 feet measured lengthwise on each member that will receive finishes and transversely between parallel members that will receive finishes.

END OF SECTION 092216
SECTION 092900 - 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. Abuse resistant gypsum board for use at lower 48” of corridor walls and where otherwise indicated.
   3. Moisture resistant gypsum board.
B. Related Requirements:
   1. Section 092216 "Non-Structural Metal Framing" for non-structural framing and suspension systems that support gypsum board panels.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.

1.4 QUALITY ASSURANCE
A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.

1.5 STORAGE AND HANDLING
A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

1.6 PROJECT 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 interior products until installation areas are enclosed and conditioned.
C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL
A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

2.2 INTERIOR GYPSUM BOARD
A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      a. American Gypsum Co.
      b. G-P Gypsum.
      c. Lafarge North America Inc.
      e. USG Corporation.
B. Type X:
   1. Thickness: 5/8 inch.
   2. Long Edges: Tapered.
C. Ceiling Type: Manufactured to have more sag resistance than regular-type gypsum board.
   1. Thickness: 1/2 inch.
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.
   1. Core: 5/8 inch, Type X.
   2. Long Edges: Tapered.

   1. Core: 5/8 inch (15.9 mm).
   2. Long Edges: Tapered.

2.3 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.
   1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
   2. Shapes:
      a. Cornerbead.
      b. LC-Bead: J-shaped; exposed long flange receives joint compound.
      c. L-Bead: L-shaped; exposed long flange receives joint compound.
      d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
      e. Expansion (control) joint.
      f. Curved-Edge Cornerbead: With notched or flexible flanges.

2.4 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.
B. Joint Tape:
   1. Interior Gypsum Wallboard: Paper.
C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
   1. Prefilling: At open joints, rounded or beveled panel edges, 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 drying-type, all-purpose compound.
   5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.

2.5 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
B. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
   1. Use adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
C. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
   1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
   2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM 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.in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: Where required for fire-resistance-rated assembly and all vertical surfaces, unless otherwise indicated.
   2. Ceiling Type: Ceiling surfaces.
   3. Moisture- and Mold-Resistant Type: In the bathrooms, break room, janitor’s closet, and on the interior face of all exterior walls that receive a gypsum board finish.

B. 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 horizontally (perpendicular 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.
   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.

C. Abuse-Resistant Type: at lower 48 inches of hallways/corridors.

D. Multilayer Application:
   1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.
   2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.
   3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.
   4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

E. Laminating to Substrate: Where gypsum panels are indicated as directly adhered to a substrate (other than studs, joists, furring members, or base layer of gypsum board), comply with gypsum board manufacturer's written recommendations and temporarily brace or fasten gypsum panels until fastening adhesive has set.

3.4 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 at locations indicated on Drawings and according to ASTM C 840 and in specific locations approved by Architect for visual effect. Control joints shall be no more than 30'-0 max. distance apart horizontal and 15'-0 max. distance apart vertical. Architect to verify locations.

C. Interior Trim: Install in the following locations:
   1. Cornerbead: Use at outside corners.
   2. U-Bead: Use at exposed panel edges.

D. Aluminum Trim: Install in locations indicated on Drawings.
3.5 FINISHING GYPSUM BOARD
A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
B. Prefill open joints and damaged surface areas.
C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
   1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
      a. Concealed areas may include areas where permanent equipment blocks view. Does not include areas concealed by other finishes.
   2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
      a. Primer and its application to surfaces are specified in other Division 09 Sections.

3.6 PROTECTION
A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet, moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 095113 - ACOUSTICAL PANEL CEILINGS

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 acoustical panels and exposed suspension systems for interior ceilings.

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. Samples for Verification: For each component indicated and for each exposed finish required, prepared on Samples of size indicated below.
      1. Acoustical Panel: Set of 6-inch-square Samples of each type, color, pattern, and texture.
      2. Exposed Suspension-System Members, Moldings, and Trim: Set of 6-inch-long Samples of each type, finish, and color.

1.5 INFORMATIONAL SUBMITTALS
   A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
      1. Suspended ceiling components.
      2. Structural members to which suspension systems will be attached.
      3. Size and location of initial access modules for acoustical panels.
      4. Items penetrating finished ceiling including the following:
         a. Lighting fixtures.
         b. Air outlets and inlets.
         c. Speakers.
         d. Sprinklers.
         e. Access panels.
         f. Perimeter moldings.
   B. Qualification Data: For testing agency.
   C. Product Test Reports: For each acoustical panel ceiling, for tests performed by manufacturer and witnessed by a qualified testing agency.
   D. Evaluation Reports: For each acoustical panel ceiling suspension system and anchor and fastener type, from ICC-ES.
   E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For finishes to include in maintenance manuals.

1.7 QUALITY ASSURANCE
   A. Testing Agency Qualifications: Qualified according to NVLAP for testing indicated.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Deliver acoustical panels, suspension-system components, and accessories to Project site and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
   B. Before installing acoustical panels, permit them to reach room temperature and a stabilized moisture content.

1.9 FIELD CONDITIONS
   A. Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Source Limitations: Obtain each type of acoustical ceiling panel and its supporting suspension system from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS
A. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
   1. Flame-Spread Index: Class A according to ASTM E 1264.
   2. Smoke-Developed Index: 50 or less.

2.3 ACOUSTICAL PANELS: AT-1
A. Basis-of-Design Product: Subject to compliance with requirements, provide USG Clean Room 56060 / White perforated.

B. Subject to review and approval by Architect, alternate materials may be considered.

C. Acoustical Panel Standard: Provide manufacturer's standard panels according to ASTM E 1264 and designated by type, form, pattern, acoustical rating, and light reflectance unless otherwise indicated.

D. Thickness: 5/8 inch.

E. Modular Size: 24 by 24 inches.

2.4 ACOUSTICAL PANELS: AT-2
A. Basis-of-Design Product: Subject to compliance with requirements, provide Armstrong Cortega Angled Tegular 704 / White

B. Subject to review and approval by Architect, alternate materials may be considered.

C. Thickness: 3/4 inch.

D. Modular Size: 24 by 24 inches.

2.5 METAL SUSPENSION SYSTEM: AT-1 & AT-2
A. Manufacturers: subject to compliance with requirements, provide product by one of the following:
   1. Armstrong
   2. Chicago Metallic Corporation.

B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized, G30 coating designation; with prefinished 15/16 inch-wide metal caps on flanges.
   2. End Condition of Cross Runners: butt-edge type.
   3. Face Design: Flat, flush.

2.6 ACCESSORIES
A. Attachment Devices: Size for five times the design load indicated in ASTM C 635/C 635M, Table 1, "Direct Hung," unless otherwise indicated.
   1. Anchors in Concrete: Anchors of type and material indicated below, with holes or loops for attaching hangers of type indicated and with capability to sustain, without failure, a load equal to five times that imposed by ceiling construction, as determined by testing according to ASTM E 488/E 488M or ASTM E 1512 as applicable, conducted by a qualified testing and inspecting agency.
      a. Type: Postinstalled expansion anchors.
      b. Corrosion Protection: Carbon-steel components zinc plated according to ASTM B 633, Class SC 1 (mild) service condition.

   2. 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 hangers of type indicated and with capability to sustain, without failure, a load equal to 10 times that imposed by ceiling construction, as determined by testing according to ASTM E 1190, conducted by a qualified testing and inspecting agency.

B. Wire Hangers, Braces, and Ties: Provide wires as follows:
   2. Stainless-Steel Wire: ASTM A 580/A 580M, Type 304, nonmagnetic.

C. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.

D. Flat Hangers: Mild steel, zinc coated or protected with rust-inhibitive paint.
2.7 METAL EDGE MOLDINGS AND TRIM

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 Armstrong Axiom or comparable product by one of the following:
   1. Chicago Metallic Corporation.
   2. United States Gypsum Company.

C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.
   1. Edge moldings shall fit acoustical panel edge details and suspension systems indicated and match width and configuration of exposed runners unless otherwise indicated.
   2. For lay-in panels with reveal edge details, provide stepped edge molding that forms reveal of same depth and width as that formed between edge of panel and flange at exposed suspension member.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, including structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical panel ceilings.

B. Examine acoustical panels before installation. Reject acoustical panels that are wet, moisture damaged, or mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders unless otherwise indicated, and comply with layout shown on reflected ceiling plans.

B. Layout openings for penetrations centered on the penetrating items.

3.3 INSTALLATION

A. Install acoustical panel ceilings according to ASTM C 636/C 636M, and manufacturer's written instructions.

B. Suspend ceiling hangers from building's structural members and as follows:
   1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
   2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
   3. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension-system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
   4. Secure wire hangers to ceiling-suspension members and to supports above with a minimum of three tight turns. Connect hangers directly to structure or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
   5. Secure flat, angle, channel, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices that are secure and appropriate for both the structure to which hangers are attached and the type of hanger involved. Install hangers in a manner that will not cause them to deteriorate or fail due to age, corrosion, or elevated temperatures.
   6. Space hangers not more than 48 inches o.c. along each member supported directly from hangers unless otherwise indicated; provide hangers not more than 8 inches from ends of each member.
   7. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.

C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.

D. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
   1. Screw attach moldings to substrate at intervals not more than 16 inches o.c. and not more than 3 inches from ends. Miter corners accurately and connect securely.
2. Do not use exposed fasteners, including pop rivets, on moldings and trim.
3. Install acoustical sealant between metal and edge trim of perimeter of all acoustical panel ceilings.

E. Install suspension-system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
F. Install acoustical panels with undamaged edges and fit accurately into suspension-system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide precise fit.
   1. For reveal-edged panels on suspension-system runners, install panels with bottom of reveal in firm contact with top surface of runner flanges.
   2. For reveal-edged panels on suspension-system members with box-shaped flanges, install panels with reveal surfaces in firm contact with suspension-system surfaces and panel faces flush with bottom face of runners.
   3. Paint cut edges of panel remaining exposed after installation; match color of exposed panel surfaces using coating recommended in writing for this purpose by acoustical panel manufacturer.

3.4 ERECTION TOLERANCES
A. Suspended Ceilings: Install main and cross runners level to a tolerance of 1/8 inch in 12 feet, non-cumulative.
B. Moldings and Trim: Install moldings and trim to substrate and level with ceiling suspension system to a tolerance of 1/8 inch in 12 feet, non-cumulative.

3.5 FIELD QUALITY CONTROL
A. Owner reserves the right to engage a testing agency to provide the following field quality control testing:
   1. Within each test area, testing agency will select one of every 10 power-actuated fasteners and postinstalled anchors used to attach hangers to concrete and will test them for 200 lbf of tension; it will also select one of every two postinstalled anchors used to attach bracing wires to concrete and will test them for 440 lbf of tension.
   2. When testing discovers fasteners and anchors that do not comply with requirements, testing agency will test those anchors not previously tested until 20 pass consecutively and then will resume initial testing frequency.
B. Acoustical panel ceiling hangers, anchors, and fasteners will be considered defective if they do not pass tests and inspections.
C. Prepare test and inspection reports.

3.6 CLEANING
A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and suspension-system members. Comply with manufacturer's written instructions for cleaning and touchup of minor finish damage.
B. Remove and replace ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

END OF SECTION 095113
SECTION 096513 - RESILIENT BASE AND ACCESSORIES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. Section Includes:
      1. Resilient base.
      2. Resilient molding accessories.
   B. Related Sections:
      1. Section 090561 “Common Work Results For Flooring Preparation”.
      2. Section 096519 “Resilient Tile Flooring”.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
   B. Samples for Verification: For each type of product indicated and for each color, texture, and pattern required in manufacturer's standard-size Samples, but not less than 12 inches long.
   C. Product Schedule: For resilient base and accessory products. Use same designations indicated on Drawings.

1.4 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. Furnish not less than 10 linear feet for every 500 linear feet or fraction thereof, of each type, color, pattern, and size of resilient product installed.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F.

1.6 FIELD CONDITIONS
   A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive resilient products during the following time periods:
      1. 48 hours before installation.
      2. During installation.
      3. 48 hours after installation.
   B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
   C. Install resilient products after other finishing operations, including painting, have been completed.

PART 2 - PRODUCTS

2.1 THERMOSET-RUBBER BASE: RB-1
   A. Basis-of-Design Product: Subject to compliance with requirements, provide Johnsonite Traditional Rubber Wall Base as indicated on Drawings, or comparable product by one of the following:
      1. Flexco, Inc.
      2. Roppe Corporation
   B. Product Standard: ASTM F 1861, Type TS (rubber, vulcanized thermoset), Group I (solid, homogeneous).
      1. Style and Location:
         a. Style B, Cove: Provide in areas with resilient flooring or sealed concrete.
   C. Thickness: 0.125 inch.
   D. Height: 4 inches.
   E. Lengths: Coils in manufacturer's standard length.
   F. Outside Corners: Job formed.
   G. Inside Corners: Job formed.
   H. Colors: Burnt Umber or as otherwise indicated on Finish Legend on drawings.
2.2 RUBBER MOLDING ACCESSORY RT-1
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Johnsonite, Transition #CTA-XX-J.
B. Description: Transition from luxury vinyl tile flooring to concrete flooring.
C. Profile and Dimensions: As indicated.
D. Locations: Refer to finish plan.
E. Colors and Patterns: as selected by Architect from manufacturer’s full range.

2.3 RUBBER MOLDING ACCESSORY RT-2
A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Johnsonite, Adapter #CTA-XX-A.
B. Description: Transition from luxury vinyl tile flooring to existing VCT flooring.
C. Profile and Dimensions: As indicated or required.
D. Locations: Refer to finish plan.
E. Colors and Patterns: As selected by Architect from manufacturer’s full range.

2.4 INSTALLATION MATERIALS
A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended
   hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for
   applications indicated.
B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and
   substrate conditions indicated.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture
   content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other
      Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that
      might interfere with adhesion of resilient products.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
   1. Installation of resilient products indicates acceptance of surfaces and conditions.

3.2 PREPARATION
A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient
   products.
B. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove
   bumps and ridges to produce a uniform and smooth substrate.
C. Do not install resilient products until they are the same temperature as the space where they are to be
   installed.
   1. At least 48 hours in advance of installation, move resilient products and installation materials into
      spaces where they will be installed.
D. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

3.3 RESILIENT BASE INSTALLATION
A. Comply with manufacturer's written instructions for installing resilient base.
B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other
   permanent fixtures in rooms and areas where base is required. Extend base into knee spaces and behind
   equipment.
C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces
   aligned.
D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact
   with horizontal and vertical substrates.
E. Do not stretch resilient base during installation.
F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with
   manufacturer's recommended adhesive filler material.
G. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than
      3 inches in length.
      a. Form without producing discoloration (whitening) at bends.
2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than 3 inches in length.
   a. Miter corners to minimize open joints.

3.4 CLEANING AND PROTECTION

   A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
   B. Perform the following operations immediately after completing resilient-product installation:
      1. Remove adhesive and other blemishes from exposed surfaces.
      2. Sweep and vacuum horizontal surfaces thoroughly.
      3. Damp-mop horizontal surfaces to remove marks and soil.
   C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
   D. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513
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SECTION 096519 - RESILIENT TILE FLOORING

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. Luxury vinyl floor tile.
   2. Vinyl composite tile
B. Related Sections:
   1. Section 090561 “Common Work Results For Flooring Preparation”.
   2. Section 096513 “resilient base and accessories”

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
B. Shop Drawings: For each type of floor tile. Include floor tile layouts, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
   1. Show details of special patterns.
C. Samples for Verification: Full-size units of each color and pattern of floor tile required.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS
A. Maintenance materials are only required for LVT-3.
   1. Furnish extra materials that match product installed and that are packaged with protective covering for storage and identified with labels describing contents.
   2. Floor Tile LVT-3: Furnish three full boxes of floor tile installed.

1.7 QUALITY ASSURANCE
A. Installer Qualifications: A qualified installer who employs workers for this Project who are competent in techniques required by manufacturer for floor tile installation and seaming method indicated.
   1. Engage an installer who employs workers for this Project who are trained or certified by floor tile manufacturer for installation techniques required.

1.8 DELIVERY, STORAGE, AND HANDLING
A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more than 90 deg F. Store floor tiles on flat surfaces.

1.9 FIELD CONDITIONS
A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.
B. After installation and until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.
C. Close spaces to traffic during floor tile installation.
D. Close spaces to traffic for 48 hours after floor tile installation.
E. Install floor tile after other finishing operations, including painting, have been completed.
PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics: For resilient tile flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
   1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

2.2 LUXURY VINYL FLOOR TILE: LVT 1/2/3
A. Basis of Design Product: Mohawk Group- Hot and Heavy; Boulder. Subject to compliance with requirements, provide products listed in material legend.
B. Tile Standard: ASTM F 1700.
   1. Class: As indicated by product designations.
   2. Type: A, smooth surface.
C. Thickness: 0.20 inch (5mm).
D. Size: 36 by 36 inches.
E. Colors and Patterns: refer to Material Legend on drawings for color selection. refer to Finish Plan for floor pattern.

2.3 Vinyl Composite Tile: VCT 1/2/3
A. Basis of Design Product: provide Armstrong Standard Excelon Imperial Texture
B. Thickness: 1/8”
C. Size: 12” x 12”
D. Colors and Patterns: refer to Material Legend on drawings for color selection. refer to Finish Plan for floor pattern.

2.4 INSTALLATION MATERIALS
A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by floor tile manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by floor tile and adhesive manufacturers to suit floor tile and substrate conditions indicated.
   1. Adhesives shall comply with the following limits for VOC content:
      a. 50 g/L or less.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
   1. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Prepare substrates according to floor tile manufacturer's written instructions to ensure adhesion of resilient products.
B. Concrete Substrates: Prepare according to ASTM F 710.
   1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
   2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by floor tile manufacturer. Do not use solvents.
   3. Alkalinity and Adhesion Testing: Perform tests recommended by floor tile manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than 9 pH.
   4. Moisture Testing: Proceed with installation only after substrates pass testing according to floor tile manufacturer's written recommendations, but not less stringent than the following:
      a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after levels are suitable per Manufacturer’s recommendations.
C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
D. Do not install floor tiles until they are the same temperature as the space where they are to be installed.
1. At least 48 hours in advance of installation, move resilient floor tile and installation materials into spaces where they will be installed.

E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient floor tile.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles in pattern indicated on Finish Plan.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles in pattern of colors and sizes indicated on Finish Plan.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, knee spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

H. A perimeter glue and floating installation is not acceptable.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protecting floor tile.

B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Cover floor tile until Substantial Completion.

END OF SECTION 096519
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SECTION 096723 - RESINOUS FLOORING

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. Quartz resinous flooring system repair.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product. Include manufacturer's technical data, application instructions, and recommendations for each resinous flooring component required.

1.4 QUALITY ASSURANCE
   A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.
   B. Engage an installer who is certified in writing by resinous flooring manufacturer as qualified to apply resinous flooring systems indicated.
   C. Mockups: mockups a sample area to verify selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
      1. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.5 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.

1.6 FIELD 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 24 hours after application unless manufacturer recommends a longer period.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS
   A. VOC Content of Liquid-Applied Flooring Components: Not more than 100 g/L when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
   B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
   C. Flammability: Self-extinguishing according to ASTM D 635.

2.2 MANUFACTURERS
   A. Source Limitations: Obtain primary resinous flooring materials, including primers, resins, hardening agents, grouting coats, and topcoats, from single source from single manufacturer. 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.

2.3 RESINOUS FLOORING - QUARTZ AGGREGATE RES-1
   A. Resinous Flooring System: Abrasion-, impact-, and chemical-resistant, aggregate-filled, and resin-based monolithic floor surfacing designed to produce a seamless floor and integral cove base.
      1. Manufacturers: Basis of Design: provided products by Tnemec Company, Inc. or approved equal by one of the following:
         a. DUDICK Inc.
         b. Dur-A-Flex, Inc.
c. General Polymers; Sherwin-Williams.
d. Key Resin Company.
e. ITW Polymers Sealants North America (formerly Pacific Polymers, Inc.).
f. PolySpec.
g. Sika Corporation U.S.
h. Stonhard, Inc.
i. Tnemec Company, Inc.

B. System Characteristics:
1. For repair areas: RES-1 custom Mix: Color and Pattern: to match existing.
2. Wearing Surface: Textured for slip resistance Orange-peel texture.
3. Overall System match existing thickness.

C. Primer: Type recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated.

D. Reinforcing Membrane: Flexible resin formulation that is recommended by resinous flooring manufacturer for substrate and resinous flooring system indicated and that inhibits substrate cracks from reflecting through resinous flooring.
1. Provide fiberglass scrim embedded in reinforcing membrane.

E. Patching and Fill Material: Resinous product of or approved by resinous flooring manufacturer and recommended by manufacturer for application indicated.

F. Body Coats, Aggregate, Grout Coat and topcoat to be determined by field observation.
1. Application of system is intended to repair cracks, match performance of existing material and extend life of existing system.

PART 3 - EXECUTION

3.1 PREPARATION
A. Prepare and clean substrates according to resinous flooring manufacturer's written instructions for substrate indicated. Provide clean, dry 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.
2. Repair damaged and deteriorated concrete according to resinous flooring manufacturer's written instructions.

C. Resinous Materials: Mix components and prepare materials according to resinous flooring manufacturer's written instructions.

3.2 APPLICATION
A. 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.

B. Primer: Apply primer over prepared substrate at manufacturer's recommended spreading rate.

C. Reinforcing Membrane: Apply reinforcing membrane to substrate cracks.

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 topcoating of cove base. Round internal and external corners.
1. Integral Cove Base: 4 inches high.

E. Self-Leveling Body Coats: Apply self-leveling slurry body coats in thickness indicated for flooring system.
1. Aggregates: Broadcast aggregates at rate recommended by manufacturer and, after resin is cured, remove excess aggregates to provide surface texture indicated.

F. Troweled or Screeded Body Coats: Apply troweled or screeded body coats in thickness indicated for flooring system. Hand or power trowel and grout to fill voids. When body coats are cured, remove trowel marks and roughness using method recommended by manufacturer.

G. Grout Coat: Apply grout coat, of type recommended by resinous flooring manufacturer, to fill voids in surface of final body coat.
H. Topcoats: Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer and to produce wearing surface indicated.

3.3 PATCHING AND FILLING
A. Cut out and replace areas that evidence cracking and those that have lack of bond with substrate.
B. Random Crack Detail: For cracks over 1/16" width before surface preparation.
   1. Saw cut joint, abrade adjoining areas to eliminate areas with poor bond.
   2. Fill area with repair epoxy materials including fiberglass crack membrane and full system of materials.
C. Installation of Control-Joint Strips: Where cracking is determined to be due to excessive distance between joints, provide control joint: Manufacturer's standard detail full depth separation. Provided joint sealant of color matching base color of matrix.
D. Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.
   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 instructions.

3.4 PROTECTION
A. Protect resinous flooring from damage and wear during curing period. Use protective methods and materials, including temporary covering, recommended in writing by resinous flooring manufacturer.
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SECTION 097713 - STRETCHED-FABRIC 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 site-upholstered tackable wall systems.
B. Related Requirements:
   1. Section 092900 “Gypsum Board” for substrate installation requirements.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for stretched-fabric systems.
   2. Include furnished specialties and accessories.
B. Shop Drawings: For each stretched-fabric system. Include installation and system details; details at head, base, joints, and corners; and details at ceiling, floor base, and wall intersections. Indicate frame edge and core materials.
   1. Include elevations showing panel sizes and direction of fabric weave and pattern matching.
   2. Show sewn-seam locations, types, and methods.
C. Samples for Verification: For the following products prepared on Samples of size indicated below.
   1. Fabric: Full-width by approximately 36-inch-long Sample, but not smaller than required to show complete pattern repeat, from dye lot to be used for the Work, and with specified treatments applied. Mark top and face of fabric.
   2. Frame System: 12-inch-square Sample(s) showing each edge profile and corner.
   3. Core Material: 12-inch-square Sample at corner.

1.4 QUALITY ASSURANCE
A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of systems required for this Project.

1.5 FIELD CONDITIONS
A. Environmental Limitations: Do not install stretched-fabric systems until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work at and above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
B. Lighting: Do not install stretched-fabric systems until a permanent level of lighting is provided on surfaces to receive stretched-fabric systems.
C. Air-Quality Limitations: Protect stretched-fabric systems from exposure to airborne odors such as tobacco smoke, and install systems under conditions free from odor contamination of ambient air.

1.6 WARRANTY
A. Special Warranty: Manufacturer and Installer agree to repair or replace components of stretched-fabric systems that fail in performance, materials, or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Fabric sagging, distorting, or releasing from panel edge.
      b. Warping of core.
   2. Warranty Period: Two years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Basis-of-Design Product: Subject to compliance with requirements, provide NovaWall Systems Inc., as indicated on Drawings, or comparable product by one of the following:
   1. Accutrack Systems.
   2. Snap-Tex International LLC.
   3. Whisper Walls.
B. Source Limitations: Obtain stretched-fabric systems from single source from single manufacturer.
2.2 PERFORMANCE REQUIREMENTS
A. Fire-Test-Response Characteristics: Provide stretched-fabric systems meeting the following requirements as determined by testing identical products by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
   1. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
      a. Flame-Spread Index: 25 or less.
      b. Smoke-Developed Index: 450 or less.
   2. Fire Growth Contribution: Comply with acceptance criteria of local code and authorities having jurisdiction when tested according to NFPA 265.
2.3 STRETCHED-FABRIC WALL SYSTEMS - Callout FB1 on Finish Legend on drawings
A. Tackable Stretched-Fabric Systems: Manufacturer's standard systems consisting of facing material stretched taught over a frame and core material and secured in the frame.
2.4 MATERIALS
A. Core Materials:
   1. Manufacturer's standard tackable, impact resistant high density board for tackable installation. Thickness: 1/2".
B. Framework: Extruded polymer in edge profile of size selected.
   1. Frame-Edge: Square profile.
      a. Fabric-Insertion Point: Top-load.
   2. Frame Color: Natural, outside edge of system to be wrapped with surface fabric.
   3. Reveals between Panels: Midwall track to be square edge.
C. Drawing Designation FB-1
   1. Tackable Fabric Wrapped Panel
   2. Novawall / Maharam Meld
   3. 003 Skyline
   4. 54" Fabric Bolt Width
2.5 INSTALLATION MATERIALS
A. Installation Products, General: Concealed on back of system, recommended by stretched-fabric system manufacturer to support weight of system, fabric tension, and as follows:
B. Fasteners: Manufacturer's standard.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine fabric, materials, substrates, areas, and conditions, with Installer present, for compliance with requirements, installation tolerances, and other conditions affecting performance of stretched-fabric systems.
B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION
A. Measure each area and establish layout of panels and joints of uniform size with balanced borders at opposite edges within a given area.
B. Before installation, allow fabric to adjust and become stable in spaces where it will be installed in accordance with stretched-fabric system manufacturer's written instructions. Acclimatize fabric for minimum of 24 hours at ambient temperature and humidity conditions indicated for spaces when occupied for their intended use.
3.3 INSTALLATION
A. General: Install stretched-fabric systems in accordance with system manufacturer's written instructions.
   1. Provide continuous perimeter frames of each profile indicated, designed to be inconspicuous when covered by fabric facing, with smooth edges, and with surface finish that will not telegraph through fabric facing.
   2. Install framing around penetrations.
   3. Tightly fit framing to adjacent construction and securely attach to substrate.
   4. Install core material with full coverage, flush with face of stretched-fabric system frame.
   5. Attach frame and core to substrate with adhesive or fasteners or both to support system and prevent deformation of components.
   6. Install stretched-fabric systems vertical and plumb, unless otherwise indicated; true in plane; and with fabric square to the grain with straight, parallel seams.
7. Install jointed panels with butt joints as indicated.

B. Fabric Installation: Apply fabric monolithically in continuous run over area, without joints or reveals, except where panel joints or midspan frames are indicated.
   1. Fabric Direction: Run fabric up the bolt.
   2. Fabric Sequence: Maintain sequence of fabric drops; match and level fabric pattern and grain.
   3. Fabric Alignment: Install fabric with patterns or directional weaves so pattern or weave aligns with adjacent panels.
   4. Fabric Seams: Manufacturer's standard midwall condition as indicated on Drawings.
   5. Stretch and secure fabric to frame edges and so frame and frame attachment method are concealed by fabric unless otherwise indicated.

3.4 INSTALLATION TOLERANCES

A. Edge Straightness: Plus or minus 1/16 inch.
B. Variation from Level and Plumb: Plus or minus 1/16 inch.
C. Variation of Panel-Joint Width: Not more than 1/16 inch from reveal line.

3.5 CLEANING

A. Clip loose threads; remove pills and extraneous materials.
B. Clean panels on completion of installation to remove dust and other foreign materials according to manufacturer's written instructions.

END OF SECTION 097713
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SECTION 099123 - 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.

1.3 DEFINITIONS
A. MPI Gloss Level 1: Not more than five units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
B. MPI Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
C. MPI Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
D. MPI Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
E. MPI Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
F. MPI Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
G. MPI Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Include Printout of current "MPI Approved Products List" for each product category specified, with the proposed product highlighted.
   2. Indicate VOC content.
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 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.
C. Product List: Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules. Include color designations.

1.5 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. Paint: 5 percent, but not less than 1 gal. of each material and color applied.

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.
   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 paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin Williams or comparable product by one of the following:
   1. Benjamin Moore & Co.
   2. PPG Architectural Finishes, Inc.
2.2 PAINT, GENERAL
A. MPI Standards: Products shall comply with MPI standards indicated and shall be listed in its "MPI Approved Products Lists."
B. 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.
C. VOC Content: For field applications that are inside the weatherproofing system, paints and coatings shall comply with VOC content limits of authorities having jurisdiction and the following VOC content limits:
   1. Flat Paints and Coatings: 50 g/L.
   2. Nonflat Paints and Coatings: 50 g/L.
   3. Dry-Fog Coatings: 150 g/L.
   4. Primers, Sealers, and Undercoaters: 100 g/L.
   5. Rust-Preventive Coatings: 100 g/L.
   6. Zinc-Rich Industrial Maintenance Primers: 100 g/L.
   7. Pretreatment Wash Primers: 420 g/L.
   8. Shellacs, Clear: 730 g/L.
   9. Shellacs, Pigmented: 550 g/L.
D. Low-Emitting Materials: For field applications that are inside the weatherproofing system, 90 percent of paints and coatings shall 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."
E. Colors: As indicated on Material Legend on drawings.

2.3 PRIMERS/SEALERS MPI #50
A. Primer Sealer, Latex, Interior:
   1. SW ProGreen 200 Interior Latex Primer

2.4 METAL PRIMERS MPI #107
A. Primer, Rust-Inhibitive, Water Based:
   1. SW Pro-Cryl Universal Waterbased Primer

2.5 WATER-BASED PAINTS MPI #53
A. Latex, Interior, (Flat):
   1. ProMar 200 ZERO VOC Latex Flat
B. Latex, Interior, (Eg-shel): MPI #52
   1. ProMar 200 ZERO VOC Latex Eg-shel
C. Latex, Interior, (Semi-Gloss): MPI #54
   1. ProMar 200 ZERO VOC Latex Semi-Gloss

2.6 SOURCE QUALITY CONTROL
A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure:
   1. Owner will engage the services of a qualified testing agency to sample paint materials. Contractor will be notified in advance and may be present when samples are taken. If paint materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
   2. Testing agency will perform tests for compliance with product requirements.
   3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
2. Gypsum Board: 12 percent.

C. Gypsum Board Substrates: Verify that finishing compound is sanded smooth.

D. Verify 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.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. 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 paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceeds that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer.
   1. SSPC-SP 2.
   2. SSPC-SP 3.
   3. SSPC-SP 7/NACE No. 4.
   4. SSPC-SP 11.

G. 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 to recommendations in "MPI Manual."
   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 to topcoat manufacturers.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but 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.

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. Painting Fire Suppression, Plumbing, HVAC, Electrical, Communication, and Electronic Safety and Security Work:
   1. Paint the following work where exposed in equipment rooms:
      a. Equipment, including panelboards and switch gear.
      b. Uninsulated metal piping.
      c. Uninsulated plastic piping.
      d. Pipe hangers and supports.
      e. Metal conduit.
      f. Plastic conduit.
      g. Tanks that do not have factory-applied final finishes.
h. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.

2. Paint the following work where exposed in occupied spaces:
   a. Equipment, including panelboards.
   b. Uninsulated metal piping.
   c. Uninsulated plastic piping.
   d. Pipe hangers and supports.
   e. Metal conduit.
   f. Plastic conduit.
   g. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
   h. Other items as directed by Architect-all exposed items in rooms with no ceilings.

3. Paint portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets that are visible from occupied spaces.

3.4 FIELD QUALITY CONTROL
   A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
      1. Contractor shall touch up and restore painted surfaces damaged by testing.
      2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.5 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.

3.6 INTERIOR PAINT SCHEDULE
   A. Steel Substrates:
      1. High-Performance Architectural Latex System:
         a. Prime Coat: Primer, water based, anti-corrosive, for metal.  MPI #107
         b. Topcoat: Latex, interior, high performance Semi-Gloss, Sherwin Williams 0 VOC Acrylic Semi-Gloss.  MPI #141/153
         c. Topcoat: Latex, interior, high performance Semi-Gloss, Sherwin Williams 0 VOC Acrylic Semi-Gloss
   B. Gypsum Board Substrates:
      1. Latex System:
         d. Prime Coat: Primer sealer, latex, interior.  MPI #50
         e. Prime Coat: Latex, interior, matching topcoat.
         f. Intermediate Coat: Latex, interior, matching topcoat.  MPI #53
         g. Topcoat: Latex, interior, flat.
      2. Latex System:
         h. Prime Coat: Primer sealer, latex, interior.  MPI #50
         i. Prime Coat: Latex, interior, matching topcoat.  MPI #52
         k. Topcoat: Latex, interior, eg-shel.
      3. Latex System:
         l. Prime Coat: Primer sealer, latex, interior.  MPI #50
         m. Prime Coat: Latex, interior, matching topcoat.  MPI #54
         o. Topcoat: Latex, interior, semi-gloss.
      4. Epoxy System:
         p. Prime Coat: Primer, Epoxy, interior.  MPI #50
         q. Topcoat: Epoxy, interior, gloss, Sherwin Williams 0 VOC Waterbased Epoxy.  MPI #254
         r. Topcoat: Epoxy, interior, gloss, Sherwin Williams 0 VOC Waterbased Epoxy.
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SECTION 099600 - 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 application of high-performance coating systems on the following
      substrates:
      1. Exterior Steel - existing lintels in conjunction with window replacement.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product indicated. Include preparation requirements and application
      instructions.
   B. Samples for Verification: For each type of coating system and in each color and gloss of topcoat indicated.
      1. Submit Samples on rigid backing, 8 inches 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.
   C. Product List: For each product indicated, include the following:
      1. Cross-reference to paint system and locations of application areas. Use same designations indicated
         on Drawings and in schedules.
      2. VOC content.

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. Coatings: 5 percent, but not less than 1 gal. of each finish material and color applied (does not include
         primer).

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures
      continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 FIELD CONDITIONS
   A. Apply coatings only when temperature of surfaces to be coated and surrounding air temperatures are
      between 50 and 95 deg F.
   B. Do not apply coatings when relative humidity exceeds 85 percent; at temperatures less than 5 deg F
      above the dew point; or to damp or wet surfaces.
   C. Do not apply exterior coatings in snow, rain, fog, or mist.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. 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. Tnemec Company Incorporated
      2. Benjamin Moore & Co.
      3. ICI Paints.
      5. PPG Architectural Finishes, Inc.
      7. Sherwin-Williams Company (The).
   B. Products: Subject to compliance with requirements, available products that may be incorporated into the
      Work include, but are not limited to products listed in other Part 2 articles for the paint category indicated.

2.2 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. For each coat in a coating system, provide products recommended in writing by manufacturers of topcoat for use in coating system and on substrate indicated.
3. Provide products of same manufacturer for each coat in a coating system.

B. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction.
1. Nonflat Paints and Coatings: 340g/L.
2. Primers, Sealers, and Undercoaters: 340 g/L.

C. Colors: As selected by Architect.

2.3 MATERIALS
A. Basis of design products as manufactured by Tnemec.
B. Field Primer: Tnemec Series 1 Omnithane primer.
1. 61% solids
2. 3 mil minimum DFT
C. Intermediate Coat: Tnemec Endura-Shield Series 73 Urethane;
1. 58% solids
2. 3 mil minimum DFT
D. Final Coat: Tnemec Endura-Shield Series 73 Urethane
1. 58% solids
2. 3 mil minimum DFT

2.4 SOURCE QUALITY CONTROL
A. Testing of Coating Materials: Owner reserves the right to invoke the following procedure:
1. Owner may engage the services of a qualified testing agency to sample coating materials. Contractor will be notified in advance and may be present when samples are taken. If coating materials have already been delivered to Project site, samples may be taken at Project site. Samples will be identified, sealed, and certified by testing agency.
2. Testing agency may perform tests for compliance with product requirements.
3. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying coating materials from Project site, pay for testing, and recoat surfaces coated with rejected materials. Contractor will be required to remove rejected materials from previously coated surfaces if, on recoating with complying materials, the two coatings are incompatible.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.
B. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
C. Proceed with coating application only after unsatisfactory conditions have been corrected.
1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION
A. Comply with manufacturer's written instructions and recommendations applicable to substrates indicated.
B. Clean substrates of substances that could impair bond of coatings, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce coating systems indicated.
C. Steel Substrates: Remove rust, loose mill scale, and shop primer if any. Clean using following methods:
1. SSP C-SP 11, "Power Tool Cleaning to Bare Metal." after welding in field and prior to first applied field coat.

3.3 APPLICATION
A. 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 back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.
4. Do not apply coatings over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are to be applied. Tint undercoats to match color of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.
C. If undercoats or other conditions show through final coat, apply additional coats until cured film has a uniform coating finish, color, and appearance.
D. Apply coatings to produce surface films without cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections. Produce sharp glass lines and color breaks.

3.4 FIELD QUALITY CONTROL
A. Dry Film Thickness Testing: Owner reserves the right to engage the services of a qualified testing and inspecting agency to inspect and test coatings for dry film thickness.
   1. Contractor shall touch up and restore coated surfaces damaged by testing.
   2. If test results show that dry film thickness of applied coating does not comply with coating manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with coating manufacturer's written recommendations.

3.5 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 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.

END OF SECTION 099600
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SECTION 101100 - VISUAL DISPLAY UNITS

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. Marker boards and marker trays.
   2. Tack panels with stretched fabric.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, dimensions of individual components and profiles, finishes, and accessories for visual display units.
B. Shop Drawings: For visual display units.
   1. Include plans, elevations, sections, details, and attachment to other work.
   2. Show locations of panel joints. Show locations of field-assembled joints for factory-fabricated units too large to ship in one piece.
   3. Show locations and layout of special-purpose graphics.
   4. Include sections of typical trim members.
C. Samples for Initial Selection: For each type of visual display unit indicated, for units with factory-applied color finishes, and as follows:
   1. Samples of facings for each visual display panel type, indicating color and texture.
   3. Actual factory-finish color samples, applied to aluminum substrate.
   4. Include accessory Samples to verify color selected.
D. Samples: For each type of visual display unit indicated.
   1. Visual Display Panel: Not less than 8-1/2 by 11 inches, with facing, core, and backing indicated for final Work. Include one panel for each type, color, and texture required.
   2. Trim: 6-inch- long sections of each trim profile.
   3. Accessories: Full-size Sample of each type of accessory.
E. Product Schedule: For visual display units. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For qualified Installer.
B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for surface-burning characteristics of tackboards.
C. Sample Warranties: For special warranties.

1.5 CLOSEOUT SUBMITTALS
A. Maintenance Data: For visual display units 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 DELIVERY, STORAGE, AND HANDLING
A. Deliver factory-fabricated visual display units completely assembled in one piece. If dimensions exceed maximum manufactured unit size, or if unit size is impracticable to ship in one piece, provide two or more pieces with joints in locations indicated on approved Shop Drawings.

1.8 PROJECT CONDITIONS
A. Environmental Limitations: Do not deliver or install visual display units until spaces are enclosed and weathertight, wet-work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
B. Field Measurements: Verify actual dimensions of construction contiguous with visual display units by field measurements before fabrication.
   1. Allow for trimming and fitting where taking field measurements before fabrication might delay the Work.
1.9 WARRANTY

A. Special Warranty for Porcelain-Enamel Face Sheets: Manufacturer agrees to repair or replace porcelain-enamel face sheets that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Surfaces lose original writing and erasing qualities.
      b. Surfaces exhibit crazing, cracking, or flaking.
   2. Warranty Period: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MARKERBOARD PANELS

A. Porcelain-Enamel Markerboard Panels: Balanced, high-pressure, factory-laminated markerboard assembly of three-ply construction, consisting of moisture-barrier backing, core material, and porcelain-enamel face sheet with low-gloss finish. Laminate panels under heat and pressure with manufacturer's standard, flexible waterproof adhesive.
   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. Claridge Products and Equipment, Inc.
      b. Egan Visual Inc.
      c. Best-Rite Manufacturing; a brand division of MooreCo, Inc.
   2. Face Sheet Thickness: 0.021 inch uncoated base metal thickness.
   3. Manufacturer's Standard Core: Minimum 1/4 inch thick, with manufacturer's standard moisture-barrier backing.
   4. Laminating Adhesive: Manufacturer's standard moisture-resistant thermoplastic type.
   6. Width: As indicated on Drawings.
   7. Height: As indicated on Drawings.

B. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; standard size and shape.

C. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

D. Marker tray: Manufacturer's standard; continuous with closed ends.
   1. Solid Type: Extruded aluminum with ribbed section and smoothly curved exposed ends.

2.2 TACKBOARD PANELS TB-1 and TB-2

A. Tackboard Panels: Subject to compliance with requirements provide Forbo bulletin board panel.
   1. Facing: 1/4-inch thick natural cork.
   2. Direct mount to gypsum board wall surface.
   3. Colors and sizes as indicated on drawings.
   4. Seam only as indicted and required for color change.

B. Aluminum Frames and Trim: Fabricated from not less than 0.062-inch thick, extruded aluminum; standard size and shape.
   2. Field-Applied Trim: directly to wall surrounding bulletin board. Manufacturer's standard, snap-on trim with no visible screws or exposed joints.

C. Joints: Make joints only where total length exceeds maximum manufactured length. Fabricate with minimum number of joints, as indicated on approved Shop Drawings.

2.3 MATERIALS

A. Manufacturer's standard materials as described herein.

B. Adhesives for Field Application: Mildew-resistant, nonstaining adhesive for use with specific type of panels, sheets, or assemblies; and for substrate application; as recommended in writing by visual display unit manufacturer.
   1. Adhesives shall have a VOC content of 50 g/L or less.

C. Primer/Sealer: Mildew-resistant primer/sealer complying with requirements in Section 099123 "Interior Painting" and recommended in writing by visual display unit manufacturer for intended substrate.

2.4 ALUMINUM FINISHES

A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.
PART 3 - EXECUTION

3.1 EXAMINATION
   A. Examine substrates and conditions, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
   B. Examine walls and partitions for proper preparation and backing for visual display units.
   C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
   A. Comply with manufacturer's written instructions for surface preparation.
   B. Clean substrates of substances, such as dirt, mold, and mildew, that could impair the performance of and affect the smooth, finished surfaces of visual display boards.
   C. Prepare surfaces to achieve a smooth, dry, clean surface free of flaking, unsound coatings, cracks, defects, projections, depressions, and substances that will impair bond between visual display units and wall surfaces.
   D. Prime wall surfaces indicated to receive visual display units and as recommended in writing by primer/sealer manufacturer and visual display unit manufacturer.

3.3 INSTALLATION
   A. General: Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.
   B. Factory-Fabricated Visual Display Board Assemblies: Attach concealed clips, hangers, and grounds to wall surfaces and to visual display board assemblies with fasteners at not more than 16 inches o.c. Secure tops and bottoms of boards to walls.
   C. Visual Display Board Assembly Mounting Heights: Install visual display units at mounting heights indicated on Drawings, or if not indicated, at heights indicated below.
      1. Mounting Height: 36 inches above finished floor to top of marker tray.

3.4 CLEANING AND PROTECTION
   A. Clean visual display units according to manufacturer's written instructions. Attach one removable cleaning instructions label to visual display unit in each room.
   B. Touch up factory-applied finishes to restore damaged or soiled areas.
   C. Cover and protect visual display units after installation and cleaning.

END OF SECTION 101100
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SECTION 101200 - DISPLAY CASES

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-illuminated display cases.

1.3 DEFINITIONS
A. Display Case: Glazed cabinet with glass shelves.

1.4 ACTION SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for display cases.
B. Shop Drawings: For display cases. Include plans, elevations, sections, details, and attachments to other work.
   1. Include sections of typical trim members.

1.5 QUALITY ASSURANCE
A. Source Limitations: Obtain display cases from single source from single manufacturer.

1.6 PROJECT CONDITIONS
A. Environmental Limitations: Do not deliver or install display cases until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above ceilings is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
B. Field Measurements: Verify actual dimensions of openings for display cases by field measurements before fabrication.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Extruded-Aluminum Bars and Shapes: ASTM B 221, Alloy 6063.
B. Aluminum Tubing: ASTM B 429, Alloy 6063.
C. Clear Tempered Glass: ASTM C 1048, Kind FT, Condition A, Type I, Class 1, Quality Q3, with exposed edges seamed before tempering, and 6 mm thick unless otherwise indicated.
D. High-Pressure Plastic Laminate: NEMA LD 3.
E. Fasteners: Provide screws, bolts, and other fastening devices made from same material as items being fastened, except provide hot-dip galvanized, stainless-steel, or aluminum fasteners for exterior applications. Provide types, sizes, and lengths to suit installation conditions. Use security fasteners where exposed to view.

2.2 DISPLAY CASE
A. Manufacturers: Subject to compliance with requirements, provide products by the following or equal approved by Architect:
   1. C.R. Laurence Inc.
B. Surface-Mounted Cabinet: fabricated cabinet; with tack assembly on back inside surface, and glazed doors at front.
   1. Cabinet Box: Glazed front and side panels.
   2. Cabinet Frame: Aluminum.
C. Glazed Sliding Doors: Tempered glass; unframed; with extruded-aluminum top and bottom track; supported on nylon or ball-bearing rollers; with plastic top guide and rubber bumpers. Equip each door with ground finger pull and adjustable cylinder lock with two keys.
   1. Thickness: as indicated on drawings but not less than 6 mm thick.
   2. Number of Doors: As indicated on Drawings.
D. Shelves: 12-mm-thick tempered glass; supported on adjustable shelf standards and supports.
   1. Shelf Width: 10 inches unless otherwise indicated on drawings.
2. Shelf Bracket: Cardinal Shelf Brackets rated for 80 lb. capacity.
3. Number of Shelves: As indicated on Drawings.

2.3 FABRICATION
A. Fabricate display cases to requirements indicated for dimensions, design, and thickness and finish of materials.
B. Use metals and shapes of thickness and reinforcing to produce flat surfaces, free of oil-canning, and to impart strength for size, design, and application indicated.
C. Fabricate cabinets and door frames with reinforced corners, mitered to a hairline fit, with no exposed fasteners.

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.

2.5 ALUMINUM FINISHES
A. Clear Anodic Finish: AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine walls, with Installer present, for compliance with requirements for installation tolerances, surface conditions of wall, and other conditions affecting performance of the Work.
B. Examine walls and partitions for proper backing for display cases.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Install units in locations and at mounting heights indicated on Drawings, or if not indicated, at heights indicated below. Keep perimeter lines straight, level, and plumb. Provide grounds, clips, backing materials, adhesives, brackets, anchors, trim, and accessories necessary for complete installation.

1. Mounting Height: see details of display case above finished floor to top of cabinet.

B. Surface-Mounted Display Cases: Attach units to wall surfaces with concealed clips, hangers, or grounds fastened at not more than 16 inches o.c. Secure both top and bottom of display cases to walls.
C. Comply with requirements specified elsewhere for connecting illuminated display cases.

1. After installation is complete, install new fluorescent lamps.
D. Install display case shelving level and straight.

3.3 ADJUSTING AND CLEANING
A. Adjust doors to operate smoothly without warp or bind and so contact points meet accurately. Lubricate operating hardware as recommended by manufacturer.
B. Touch up factory-applied finishes to restore damaged or soiled areas.

END OF SECTION 101200
SECTION 101400 - SIGNAGE

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 SECTION INCLUDES
A. Interior code required signs.
B. Room identification signs.

1.3 RELATED REQUIREMENTS
A. Division 21 through Division 26 for Signage and Identification Requirements.

1.4 REFERENCE STANDARDS

1.5 DESIGN INTENT DRAWINGS
A. Design Drawings are intended to indicate the general type, location, and configuration of each sign included in the project. Bidders are responsible for reviewing existing conditions and preparing shop drawings to address specific conditions and construction for each sign type and location. Shop drawings are the sole responsibility of the fabricator in every respect.
B. Fabricator/Installer represents and warrants that all Shop Drawings shall be prepared by persons and entities having expertise and experience in the signage industry. By submitting Shop Drawings, the Fabricator/Installer represents such Shop Drawings strictly comply with the requirements of the Construction Documents and that the Fabricator/Installer 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 are in accordance with best practices in the industry. Fabricator/Installer shall be responsible for the correctness and accuracy of the dimensions, measurements, and other information contained in the Shop Drawings.
C. Shop Drawings. Architect and/or Owner shall review the shop drawings only for conformance with general design intent. Fabricator/installer shall not be relieved of responsibility for deviations from requirements of the Construction Documents by the Architect's approval of Shop Drawings, Product Data, Samples, or similar submittals. The Fabricator/Installer 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.

1.6 SUBMITTALS
A. Product Data: Manufacturer's printed product literature for each type of sign, indicating sign styles, font, foreground and background colors, locations, overall dimensions of each sign.
B. Signage Schedule: Provide information sufficient to completely define each sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
   1. Submit for approval prior to fabrication.
C. Samples: Submit one sample of each type of sign, of size similar to that required for project, illustrating sign style, font, and method of attachment. Samples, if approved may be incorporated into the finished work.
D. Selection Samples: Where colors are not specified, submit two sets of color selection charts or chips.
E. Verification Samples: Submit samples showing colors specified.
F. Manufacturer's Installation Instructions: Include installation templates and attachment devices.
G. Structure: All signs included are assumed to be suitable for installation directly to existing construction including but not limited to painted gypsum board, wood veneer and plastic laminate casework and doors, and interior glass windows and side lites. Installer shall be responsible for reviewing installation conditions including mounting surfaces and verifying suitability for installation without supplemental structure prior to submitting bids.

1.7 QUALITY ASSURANCE
A. Quality of workmanship: The fabricator shall be responsible for the quality and delivery of all materials and workmanship required for the execution of the contract including the materials and workmanship of any firms or individuals who act as subfabricators with complete and up-to-date drawings, specifications, graphic schedule, and other information issued.

B. Dimensions: Written dimensions on the drawings shall take precedence over scaled dimensions. Fabricator shall verify and be responsible for all dimensions and conditions noted in the drawings.

C. Execution: Fabricator shall notify Architect/Owner of any discrepancies in the drawings or graphic schedule, in field dimensions or conditions, and/or changes required in construction details. Problems such as messages being too long to fit onto the required formats, difficulty in accurately reproducing logo or logo-type components, etc., must be brought to the attention of Architect/Owner prior to execution.

D. Fabricator Recommendations: The fabricator shall review the provided drawings and propose recommendations and changes to improve the quality of any sign. Such recommendations and changes shall be approved in writing by Architect/Owner prior to preparation of shop drawings and/or fabrication of any signs.

E. Labeling: There shall be no visible labels, manufacturer or otherwise, code permitting, on the completed signs. If labels are required, a sample label and intended location along with an explanation of the requirement must be submitted for Architect/Owner review, prior to application and/or installation.

F. Materials: All materials, hardware, finishes, etc. used to fabricate all signs shall be new and free from any and all deformities and matched to the service conditions required of the site.

G. Inspection: The fabricator shall examine the substrates and conditions under which the signs are to be installed and notify the owner's designated representative in writing of conditions detrimental to the proper and timely completion of the work. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to all parties.

H. Acceptance: All work shall be complete in every respect and satisfactory to all governing legislative authorities and building codes, Owner, and Architect.

I. Warranty:
   1. Interior signage: manufacturer's standard one year warranty.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Interior framed signs with custom inserts:
   1. Manufacturer’s capable of replicating University of Missouri sign shop standards. Confirm with owner.

B. Interior Panel Signs: Confirm materials and methods with University of Missouri sign shop.
   1. Extruded aluminum with clear anodized finish.
   2. Laminated, Etched Photopolymer: Raised graphics with Braille 1/32 inch (0.8 mm) above surface with contrasting colors in finishes and color combinations indicated and laminated to acrylic back.
   3. Edge Condition: Manufacturer’s standard.
   4. Corner Condition: Manufacturer’s standard.
   5. Mounting: Framed, as indicated.
      a. Wall mounted with two-face tape and silicone adhesive.
      b. Manufacturer’s standard anchors for substrates encountered.
   7. Tactile Characters: Characters and Grade 2 Braille raised 1/32 inch (0.8 mm) above surface with contrasting colors.

2.2 SIGNAGE APPLICATIONS

A. Accessibility Compliance: All signs are required to comply with ADA Standards for Accessible Design and ANSI/ICC A 117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most comprehensive and specific requirements.

2.3 ACCESSORIES

A. Concealed Screws: Stainless steel, galvanized steel, chrome plated, or other non-corroding metal.
B. Sleeves: Cylindrical to cover attachment fasteners in same finish as sign.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.
3.2 INSTALLATION

A. Install in accordance with manufacturer's instructions.
B. Install neatly, with horizontal edges level.
C. Contractor shall be responsible for determining the erection and dismantling of all barricade or protective coverings necessary to safeguard the public and property during the performance and duration of his work.
D. Fabricator shall attach signs to substrates in accordance with and the manufacturer's instructions. Install level, plumb and at proper height. Repair or replace damaged units as directed by Architect/Owner. Visible abrasions to finished surfaces must be repaired as required to render damage invisible.
E. Installation of all signage items shall be by the Fabricator. Installation includes provision of any anchor bolts, fastenings, attachment metals, and all other miscellaneous metal items imbedded in concrete or building wall material as required, and security of sign units in place with no visible fasteners unless noted otherwise.
F. Signs installed on glass or other transparent surfaces shall be finished on all surfaces exposed to view, including surfaces visible through the glass. Adhesives or other forms of attachment exposed to view shall be invisible or match sign material color and finish. A finished backer panel on back side of glass will be acceptable.
G. Trim inserts square to fit securely in frame without bubbling or wrinkling.

3.3 CLEANING AND PROTECTION

A. Protect from damage until Substantial Completion; repair or replace damaged items.
B. All items to be installed under the signage fabricator shall be left in a clean and orderly condition. Upon completion of the installation of each sign structure, clean all soiled sign surfaces in accordance with the manufacturer's instructions and touch up as required. Removal of protective masking shall be removed by the fabricator upon completion of installation. All existing furniture, equipment, etc. moved to facilitate installation shall be returned to its original configuration by installer after contract items are installed.
C. Finish Surfaces: Sign units and inserts shall be warranted in writing by the fabricator for a period of no less than one year from the date of finished installation. There shall be:

1. No delamination of any parts of the sign or of lettering form the sign face.
2. No cupping, warping or dishing in excess of the requirements stipulated in the specifications.
3. No bubbling, crazing, chalking, rusting, or other disintegration of the sign face, messages or edge finish of the panels.
4. No movement of signs from their substrates. The signs must remain true and plumb on their substrate - except when the sign has sustained obvious post installation external damage.
5. No fading of the colors when matched against a sample of the original color and material.
6. No variation of any other performance specified on the drawing or in the specifications.

END OF SECTION
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SECTION 102600 - WALL AND DOOR 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. Stainless Steel corner guards and wall guards.
      2. Vinyl Cover Corner Guards.
   B. Related Sections:
      1. Section 087100 "Door Hardware" for door edge protection, metal armor, kick and push plates.

1.3 ACTION SUBMITTALS
   A. Product Data: Include construction details, material descriptions, impact strength, dimensions of individual
      components and profiles for each impact-resistant wall protection unit.
   B. Shop Drawings: For each impact-resistant wall protection unit showing locations and extent. Include
      sections, details, and attachments to other work.
   C. Samples for Initial Selection: For each type of impact-resistant wall protection unit indicated.
   D. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated
      below.

1.4 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For each impact-resistant wall protection unit to include in maintenance manuals.

1.5 QUALITY ASSURANCE
   A. Installer Qualifications: An employer of workers trained and approved by manufacturer.
   B. Source Limitations: Obtain impact-resistant wall protection units from single source from single
      manufacturer.
   C. Product Options: Drawings indicate size, profiles, and dimensional requirements of impact-resistant wall
      protection units and are based on the specific system indicated.
   D. Revise subparagraph below to suit Project.
      1. Do not modify intended aesthetic effects, as judged solely by Architect, except with Architect's
         approval. If modifications are proposed, submit comprehensive explanatory data to Architect for
         review.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Store impact-resistant wall protection units in original undamaged packages and containers inside
      well-ventilated area protected from weather, moisture, soiling, extreme temperatures, and humidity.

1.7 PROJECT CONDITIONS
   A. Environmental Limitations: Do not deliver or install impact-resistant wall protection units until building is
      enclosed and weatherproof, wet work is complete and dry, and HVAC system is operating and maintaining
      temperature at 70 deg F for not less than 72 hours before beginning installation and for the remainder of
      the construction period.

PART 2 - PRODUCTS

2.1 MATERIALS
   A. Stainless-Steel Sheet: ASTM A 240/A 240M.

2.2 STAINLESS STEEL CORNER GUARDS - DRAWING DESIGNATION CG1
   A. Surface-Mounted, Metal Corner Guards Fabricated from one-piece, formed or extruded metal with formed
      edges; with 90- or 135-degree turn to match wall condition.
      1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
         a. American Floor Products Co., Inc.
         b. Arden Architectural Specialties, Inc.
         c. Balco, Inc.
         d. Boston Retail Products.
         e. Construction Specialties, Inc.
f. IPC Door and Wall Protection Systems; Division of InPro Corporation.
g. Korogard Wall Protection Systems; a division of RJF International Corporation.
h. Pawling Corporation.
i. Tepromark International, Inc.
j. WallGuard.com.

2. Material: Stainless steel, Type 304.
a. Thickness: Minimum 0.0625 inch.
b. Finish: Directional satin, No. 4.

3. Wing Size: Nominal 2 inches each side.
4. Height: 48 inches

2.3 VINYL COVER CORNER GUARDS DRAWING DESIGNATION CG2

1. Surface-Mounted, high-impact vinyl corner guards:
2. Basis of Design Product: Subject to compliance with requirements, provide Pawling MODEL CG-20 vinyl cover guard consisting of snap-on, resilient vinyl cover installed over continuous aluminum retainer; including mounting hardware; fabricated with 90- or 135-degree turn to match wall condition. or comparable product by one of the following
   a. American Floor Products Company
   b. Construction Specialties
   c. InPro Corporation (IPC)
   d. JL Industries, Inc.
   e. Musson Rubber Co.
   f. Nystrom, Inc.
   g. Wallguard

   a. Class A Interior wall finish (NFPA 101 Life Safety) when tested in accordance with ASTM E84.
      1) Flame Spread: 25 or less
      2) Smoke Developed: 450 or less

4. Cover: Extruded rigid vinyl, minimum 0.085-inch (2.2 mm) wall thickness; as follows:
   a. Profile: Nominal 2-inch- (50-mm-) long leg and 1/4-inch (6-mm) corner radius.
   b. Height: 48 inches.
   c. Color and Texture: As selected by Architect from manufacturer's full range.

5. Continuous Retainer: Minimum 0.060-inch- (1.5-mm-) thick, one-piece, extruded aluminum.
7. Top and Bottom Caps: Prefabricated, injection-molded vinyl; color matching cover; field adjustable for close alignment with snap-on cover.

2.4 STAINLESS STEEL END-WALL GUARDS - DRAWING DESIGNATION WG1

A. Surface-Mounted, Metal, End-Wall Guards Fabricated from one-piece, formed or extruded metal that covers entire end of wall; with formed edges.

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. American Floor Products Co., Inc.
   b. Arden Architectural Specialties, Inc.
   c. Balco, Inc.
   d. Construction Specialties, Inc.
   e. IPC Door and Wall Protection Systems; Division of InPro Corporation.
   f. Korogard Wall Protection Systems; a division of RJF International Corporation.
   g. Pawling Corporation.
   h. WallGuard.com.

2. Material: Stainless steel, Type 304.
   a. Thickness: Minimum 0.0625 inch.
   b. Finish: Directional satin, No. 4.

3. Wing Size: Nominal 2 inches each side.
4. Height: 48 inches
2.5 FABRICATION
A. Assemble components in factory to greatest extent possible to minimize field assembly. Disassemble only as necessary for shipping and handling.
B. Fabricate components with tight seams and joints with exposed edges rolled. Provide surfaces free of wrinkles, chips, dents, uneven coloration, and other imperfections. Fabricate members and fittings to produce flush, smooth, and rigid hairline joints.

2.6 METAL FINISHES
A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
   1. Remove tool and die marks and stretch lines, or blend into finish.
   2. Grind and polish surfaces to produce uniform finish, free of cross scratches.
   3. Run grain of directional finishes with long dimension of each piece.
   4. When polishing is completed, passivate and rinse surfaces. Remove embedded foreign matter and leave surfaces chemically clean.
B. Protect finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine walls to which impact-resistant wall protection will be attached for blocking, grounds, and other solid backing that have been installed in the locations required for secure attachment of support fasteners.
   1. For impact-resistant wall protection units attached with adhesive or foam tape, 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. Complete finishing operations, including painting, before installing impact-resistant wall protection system components.
B. Before installation, clean substrate to remove dust, debris, and loose particles.

3.3 INSTALLATION
A. General: Install impact-resistant wall protection units level, plumb, and true to line without distortions. Do not use materials with chips, cracks, voids, stains, or other defects that might be visible in the finished Work.
   1. Install impact-resistant wall protection units in locations and at mounting heights indicated on Drawings or, if not indicated, at heights indicated below:
      a. 48 inches above base.
   2. Provide splices, mounting adhesives, hardware, anchors, and other accessories required for a complete installation.

3.4 CLEANING
A. Remove excess adhesive using methods and materials recommended in writing by manufacturer.

END OF SECTION 102600
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SECTION 104413 - FIRE EXTINGUISHER 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.

B. Related Sections:
   1. Section 1004416 "Fire Extinguishers."

1.3 SUBMITTALS
A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for fire protection cabinets.
   1. Fire Protection Cabinets: Include roughing-in dimensions, details showing mounting methods, relationships of box and trim to surrounding construction, door hardware, cabinet type, trim style, and panel style.

B. Product Schedule: For fire protection cabinets. Coordinate final fire protection cabinet schedule with fire extinguisher schedule to ensure proper fit and function. Use same designations indicated on Drawings.

C. Maintenance Data: For fire protection cabinets to include in maintenance manuals.

1.4 QUALITY ASSURANCE
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.

B. 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.

C. Preinstallation Conference: Conduct conference at Project site.

1.5 COORDINATION
A. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

B. Coordinate sizes and locations of fire protection cabinets with wall depths.

1.6 SEQUENCING
A. Apply vinyl lettering on field-painted, fire protection cabinets after painting is complete.

PART 2 - PRODUCTS

2.1 MATERIALS
A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

2.2 FIRE EXTINGUISHER CABINET - DRAWING DESIGNATION FEC
A. Cabinet Type: Suitable for fire extinguisher.
   1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
      b. Larsen's Manufacturing Company.
      c. Potter Roemer LLC

B. Cabinet Construction: Fire rated cabinet construction to match fire rating requirement of wall construction where the cabinet is installed, or nonrated if installed in nonrated wall construction.

C. Cabinet Material: Enameled steel sheet.
   1. Shelf: Same metal and finish as cabinet.

D. Semi-recessed Cabinet as indicated on drawings: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.
   1. Semi-recessed to receive Rolled-Edge Trim: 2-1/2 inch backbend depth.
FIRE EXTINGUISHER CABINETS

E. Cabinet size: 27 inches x 12 inches x 8 inches deep.
F. Cabinet Trim Material: Stainless Steel.
G. Door Material: Stainless Steel sheet.
H. Door Style: Solid Door with recessed handle.
I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
   1. Provide concealed hinge permitting door to open 180 degrees.
J. 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. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as directed by Architect.
      a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
         1) Location: Applied to cabinet door.
         3) Lettering Color: Red.
         4) Orientation: Vertical.
K. Finishes:
   1. Stainless Steel No. 4 finish at exterior of cabinet door and trim except for those surfaces indicated to receive another finish.
      a. Interior of cabinet and door. Painted in manufacturer’s standard color.

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.
B. Cabinet Doors: Fabricate doors according to manufacturer's standards, from materials indicated and coordinated with cabinet types and trim styles selected.
   1. Fabricate door frames with tubular stiles and rails and hollow-metal design, minimum 1/2 inch 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 "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.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Examine walls and partitions for suitable framing depth and blocking where recessed and semi recessed cabinets will be installed.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Prepare recesses for recessed and semi recessed fire protection cabinets as required by type and size of cabinet and trim style.

3.3 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.
   1. Fire Protection Cabinets: 54 inches above finished floor to top of cabinet. Comply with ADA requirements for installation height.
B. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.
1. Unless otherwise indicated, provide recessed fire protection cabinets. If wall thickness is not adequate for recessed cabinets, provide semi-recessed fire protection cabinets.
2. Fasten mounting brackets to inside surface of fire protection cabinets, square and plumb.

3.4 ADJUSTING AND CLEANING

A. Remove temporary protective coverings and strippable films, if any, as fire protection cabinets are installed unless otherwise indicated in manufacturer's written installation instructions.
B. Adjust fire protection cabinet doors to operate easily without binding.
C. On completion of fire protection cabinet installation, clean interior and exterior surfaces as recommended by manufacturer.
D. Touch up marred finishes, or replace fire protection cabinets that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by fire protection cabinet and mounting bracket manufacturers.
E. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 104413
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SECTION 104416-FIRE EXTINGUISHERS

PART 1 - GENERAL

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

1.2 SUMMARY
A. Section includes portable, fire extinguishers and mounting brackets for fire extinguishers.
B. Related Sections:
   1. Section 104413 "Fire Protection Cabinets."

1.3 SUBMITTALS
A. Product Data: For each type of product indicated. Include rating and classification, material descriptions, dimensions of individual components and profiles, and finishes for fire extinguisher and mounting brackets.
B. Product Schedule: For fire extinguishers. Coordinate final fire extinguisher schedule with fire protection cabinet schedule to ensure proper fit and function. Use same designations indicated on Drawings.
C. Operation and Maintenance Data: For fire extinguishers to include in maintenance manuals.
D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE
A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.
   1. Provide fire extinguishers approved, listed, and labeled by FMG.
C. Preinstallation Conference: Conduct conference at Project site.

1.5 COORDINATION
A. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.6 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
   1. Failures include, but are not limited to, the following:
      a. Failure of hydrostatic test according to NFPA 10.
      b. Faulty operation of valves or release levers.
   2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE FIRE EXTINGUISHERS - DRAWING DESIGNATION FE
A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket 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:
      b. Larsen's Manufacturing Company.
   2. Valves: Manufacturer's standard.
   3. Handles and Levers: Manufacturer's standard.
   4. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B and bar coding for documenting fire extinguisher location, inspections, maintenance, and recharging.
   B. Multipurpose Dry-Chemical Type: UL-rated 4-A:80:B:C, 10-lb. nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

2.2 MOUNTING BRACKETS
A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated black baked-enamel finish.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine fire extinguishers for proper charging and tagging.
   1. Remove and replace damaged, defective, or undercharged fire extinguishers.
B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Install fire extinguishers and mounting brackets in locations indicated and in compliance with requirements of authorities having jurisdiction.
   1. Mounting Brackets: 54 inches above finished floor to top of fire extinguisher.
   2. Omit mounting brackets where fire extinguishers are installed in cabinets.
B. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.

END OF SECTION 104416
SECTION 105113 - METAL LOCKERS

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:
   B. Welded lockers.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of metal locker.
      1. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal locker.
   B. Shop Drawings: For metal lockers.
      1. Include plans, elevations, sections, details, and attachments to other work.
      2. Show locker trim and accessories.
      3. Include locker identification system and numbering sequence.
   C. Product Schedule: For lockers. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For adjusting, repairing, and replacing locker doors and latching mechanisms to include in maintenance manuals.

1.6 DELIVERY, STORAGE, AND HANDLING
   A. Do not deliver metal lockers until spaces to receive them are clean, dry, and ready for their installation.

1.7 FIELD CONDITIONS
   A. Field Measurements: Verify actual dimensions of recessed openings by field measurements before fabrication.

1.8 COORDINATION
   A. Coordinate sizes and locations of site-built bases for metal lockers.
   B. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of work specified in other Sections to ensure that metal lockers can be supported and installed as indicated.

1.9 WARRANTY
   A. Special Warranty: Manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.
      1. Failures include, but are not limited to, the following:
         a. Structural failures.
         b. Faulty operation of latches and other door hardware.
      2. Damage from deliberate destruction and vandalism is excluded.
      3. Warranty Period for Welded Metal Lockers: 20 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
   A. Source Limitations: Obtain metal lockers and accessories from single source from single locker manufacturer.

2.2 PERFORMANCE REQUIREMENTS
   A. Accessibility Requirements: For lockers indicated to be accessible, comply with applicable provisions in the U.S. Architectural & Transportation Barriers Compliance Board's ADA-ABA Accessibility Guidelines and ICC A117.1.

2.3 WELDED LOCKERS
   A. Products: Subject to compliance with requirements, provide one of the following:
METAL LOCKERS

2.4 FABRICATION

A. Fabricate metal lockers square, rigid, without warp, and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.
1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.
B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

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C. Equipment: Provide each locker with an identification plate and the following equipment:
   1. Double-Tier Units: two single-prong wall hooks.

D. Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:
   1. Locate bottom shelf no lower than 15 inches above the floor.
   2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.
   3. Provide latch meeting accessibility requirements
   4. Provide in quantity meeting 5% of supplied lockers.

F. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.
   1. Sloping-top corner fillers, mitered outside and inside corners.

G. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

H. Finishing End Panels: Fabricated with 1-inch-(25-mm-) wide edge dimension, and designed for concealing fasteners and holes at exposed ends of nonrecessed metal lockers; finished to match lockers.
   1. Provide one-piece panels for double-row (back-to-back) locker ends.

2.5 ACCESSORIES

A. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

B. Anchors: Material, type, and size required for secure anchorage to each substrate.
   1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls, and elsewhere as indicated, for corrosion resistance.
   2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine walls, floors, and support bases, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install lockers level, plumb, and true; shim as required, using concealed shims.
   1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
   2. Anchor single rows of metal lockers to walls near top and bottom of lockers of lockers and to floor.
   3. Anchor back-to-back metal lockers to floor and to each other.

B. Welded Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

C. Equipment:
   1. Attach hooks with at least two fasteners.
   2. Identification Plates: Identify metal lockers with identification indicated on Drawings.
      a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

3.3 ADJUSTING

A. Clean, lubricate, and adjust hardware. Adjust doors and latches to operate easily without binding.

3.4 PROTECTION

A. Protect metal lockers from damage, abuse, dust, dirt, stain, or paint. Do not permit use during construction.

B. Touch up marred finishes, or replace metal lockers that cannot be restored to factory-finished appearance. Use only materials and procedures recommended or furnished by locker manufacturer.

END OF SECTION 105113
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SECTION 115313 – LABORATORY FUME HOODS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
1. Bench-top High-Performance Laboratory Fume Hoods.
2. Service fixtures (i.e. water, gas, etc.) and electrical service fittings in fume hoods.
3. Piping and wiring within service fittings, light fixtures, switches, and other electrical devices.
4. Fume hood base support.
5. Work Surfaces within fume hoods.
6. Laboratory sinks and cup sinks in fume hoods.
7. Filler panels for fume hoods.

B. Related Sections:
1. Division 22: Furnish and installation of plumbing utilities and final connections to fume hoods.
2. Division 23: Furnishing and installation of exhaust duct work and equipment, and final connection of hoods.
3. Division 26: Furnishing and installation of electrical utilities and final connections to hoods.

C. This specification covers the requirements for the purchase of bench mounted laboratory fume hoods for use with remote exhaust blower systems.

1.2 SCOPE AND CLASSIFICATION

1. Bench-mounted laboratory fume hoods in widths as indicated on plans, internal depth of 29.6", and external depth of 37.7" is required.
2. This specification sets the intent for quality, performance and appearance.

1.3 REFERENCES:

A. The laboratory hoods must conform to the following regulations and standards.
1. SEFA 1-2010, Scientific Equipment and Furniture Association, Recommended Practices for Laboratory Fume Hoods
2. SEFA 8-2010, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests
4. ASTM E84-09C, ANSI 2.5, NFPA 255, UL 723, UBC 8-1 (42-1), Standard Test method for Surface Burning Characteristics of Building Materials
5. ASHRAE 110-95, American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Method of Testing Performance of Laboratory Hoods
6. ANSI/AIHA Z9.5-2011, American Industrial Hygiene Association, Laboratory Ventilation
7. OSHA, Federal Register 29 CFR Part 1910, Occupational Safety & Health Administration, U.S. Department of Labor, Occupational exposures to hazardous chemicals in laboratories.

B. The laboratory hoods must carry the ETL listed mark for the following.
1. UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use
2. CAN/CSA C22.2 No. 61010-1, Canadian Standards Association, Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use
3. UL 1805, Underwriters Laboratories Inc., Standard for Laboratory Hoods and Cabinets

1.4 PERFORMANCE REQUIREMENTS

A. General Design Requirements (See Part 2 for details)
1. Fume hoods shall function as ventilated, enclosed workspaces, designed to capture, contain and exhaust fumes, vapors and particulate matter produced or generated within the enclosure.
2. Fume hood shall be factory designed to function as a variable air volume fume hood.
3. Structure and Materials of construction
   a. Hoods are of double-wall construction
   b. Powder-coated, cold rolled steel exterior
   c. Galvanized steel support members
   d. Sheet molded composite panel internal liner
4. Baffles
   a. Baffle slot pattern designed to optimize face velocity profile.
   b. Moving or adjustable baffles are not acceptable
5. Sash
   a. Maximum opening is 28".
   b. Unobstructed viewing height is 37.5".
   c. Hood incorporates a perforated sash handle to bleed air into the hood chamber directing fume concentrations away from the user's breathing zone.
6. Airfoil:
   a. Hoods are provided with an air foil across the bottom of the sash area to allow airflow into the hood regardless of user's position.
7. Besides the exhaust blower, no additional blowers are required for specified containment.
8. Access for maintenance is from both the front, interior, and exterior sides of the hood.
9. Services:
   a. Furnishing and delivering all service outlets, accessory fittings, electrical receptacles and switches, as listed in these specifications, equipment schedules or as shown on drawings.
   b. Plumbing fittings mounted on the fume hood superstructures shall be pre-plumbed per section 2.03.
   c. Final plumbing and electrical connections are the responsibility of those contractors fulfilling requirements of Divisions 22 and 26.
   d. All electrical services are pre-wired to a single point internal junction box at the top right of the hood.
   e. Refer to drawings for location of service fittings ensuring access for future maintenance.
10. Hoods without service fixtures pass through a 38" opening without disassembly.

1.5 CONTAINMENT

A. The purpose of this section is to set a standard of performance for the bidder's laboratory fume hood before award of contract, and may not necessarily represent the operating conditions of the hoods after installation. Before or after award of contract, owners may require representative witness to said testing at their option, with failure to meet passing criteria as grounds for rejection of the bidder. Test data shall be provided at no cost to the owner.

B. Hood shall be tested to ASHRAE 110 modified test method as detailed below.
1. Some fume hoods may use face velocity controls, motorized baffles, integral auxiliary make up, or supply fans. Because all of these devices are subject to failure, containment testing shall show both operational containment and product containment with these systems off.
2. Fume hood sashes shall be placed in their full open position, at least 28" from the work surface, unless noted otherwise.
3. Ambient Temperature: 68 to 74 degrees F

C. Average Face Velocity: Face velocity average shall be 60 fpm, as noted below in subsection 8.d, parts 1 and 2, plus or minus 5%.
1. An imaginary grid is formed comprised of equal 12" by 12" squares, or smaller, across the face opening of the laboratory hood. Airflow velocity readings are taken at the intersections of these grids with calibrated hot wire anemometer over a twenty second period of time. Probes shall communicate readings to a computer data acquisition package, which will provide an average of each reading over the one-minute period and also an overall average upon completion of data acquisition. Face velocity shall be determined by averaging readings at the hood face.
2. Average face velocity must be achieved without exceeding the CFM noted in part C.

D. Tracer Gas Detection: Hood shall achieve a rating of 4.0AM0.00 maximum average and 4.0AM0.01 maximum spike (unless specifically otherwise noted), wherein:
1. 4.0 = tracer gas release in liters/minute, AM = as manufactured, 0.01 = tracer gas in parts per million (PPM)
2. With the ejector body 6" from the rear of the sash plane, the test shall be conducted for each ejector position noted.
   a. Left position with ejector 12" from the left interior wall.
   b. Center position with ejector equidistant from the sidewalls.
   c. Right position with ejector 12" from the right interior wall.
3. Install mannequin positioned in front of the hood, centered on the ejector.
4. Detector probes shall be placed 3" in front of the sash plane. The test shall be conducted for each detector probe position and corresponding face velocity.
   a. Detector probe in the region of the nose and mouth of the mannequin. Test with average face velocity of 60 fpm.
   b. With the mannequin height reduced 4", place detector probe in the chest of the mannequin, and even with the height of the ejector. Test with average face velocity of 60 fpm.
5. Open tracer gas valve, and collect readings with a computer data acquisition package, which is capable of monitoring and visually recording a minimum of one reading per second for a minimal five minute time period for each position.
6. The single control rating of the fume hood shall be the results of the test position yielding the highest average levels of tracer gas in any of the six mannequin/ejector configurations.
7. With the ejector and mannequin in the center position, detector probe in the region of the nose and mouth of the mannequin, average face velocity of 60 fpm, tracer gas released, and concentration recorded, open and close the sash in a smooth motion. Test to be repeated three times, with peak values of 0.01 PPM or less.

8. With the mannequin removed, the periphery of the hood is traversed by the probe at 1" in front of the hood opening at a rate of 3 inches per second. The hood shall have a maximum perimeter reading of 0.03 PPM or less.

E. Flow Visualization:
1. Test the operation of the lower air bypass airflow opening and hood periphery by introducing light smoke under the air foil, and around the perimeter of the sash opening. If any smoke that enters the hood reverses directions and escapes from any of these locations, the hood fails this portion of the test and receives no rating.

2. Introduce smoke along both walls and the hood floor in a line parallel to the hood face and 6 inches back into the hood. Define air movement toward the face of the hood as reverse airflow and define lack of movement as dead air space. All smoke should be carried to the back of the hood and out.

3. Introduce a large volume of smoke at the work surface in the center of the hood, and 6" inside the plane of the sash. Define air movement toward the face of the hood as reverse airflow and define lack of movement as dead air space. All smoke should be carried to the back of the hood and out.

4. All data on the above, including instrumentation and equipment, and test conditions shall be provided on a report, including the average face velocities, and a separate graph-type performance curve on all tracer gas tests for all required fume hood widths. Performance test data for a 6' representative hood shall be conducted by an independent testing agency and by a specific individual certified to perform such tests by the National Environmental Balancing Bureau (NEBB).

F. Efficiencies
1. The fume hood shall demonstrate a minimization of the volumetric rate of air (CFM) requirement at any given face velocity. Required CFM to achieve desired face velocity shall not exceed that which is noted in the chart below.

2. The fume hood shall demonstrate a minimization of static pressure loss (inches of H2O) at any given CFM. Static pressure loss at desired face velocity, and corresponding CFM, shall not exceed that which is noted in the chart below.

<table>
<thead>
<tr>
<th>Face Velocity (fpm)</th>
<th>Airflow, Volumetric Rate (CFM) @ Static Pressure (inches of H2O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'</td>
<td>4'</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>28&quot; Open</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>495, 0.13&quot;</td>
</tr>
<tr>
<td>80</td>
<td>395, 0.08&quot;</td>
</tr>
<tr>
<td>60</td>
<td>295, 0.05&quot;</td>
</tr>
<tr>
<td>50*</td>
<td>250, 0.03&quot;</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Face Velocity (fpm)</th>
<th>Airflow, Volumetric Rate (CFM) @ Static Pressure (inches of H2O)</th>
</tr>
</thead>
<tbody>
<tr>
<td>3'</td>
<td>4'</td>
</tr>
<tr>
<td>---------------------</td>
<td>---------------------------------------------------------------</td>
</tr>
<tr>
<td>18&quot; Open</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>310, 0.05&quot;</td>
</tr>
<tr>
<td>80</td>
<td>250, 0.03&quot;</td>
</tr>
<tr>
<td>60</td>
<td>185, 0.02&quot;</td>
</tr>
</tbody>
</table>

*There is not a written standard that would suggest a design face velocity below 60 fpm. This data is for informational purposes only.

G. Illumination: Shall be a minimum average of 80 foot-candles inside the work area. Work area is defined as the area inside the lined portion of the fume hood, from the face of baffle to sash plane, from interior left to interior right, and from the work surface to a height of 28 inches.

H. Materials of Construction: Interior and Exterior materials of construction and finishes shall meet the requirements in Part 2 of this specification.

1.6 QUALITY ASSURANCE

A. Fume hoods shall be designed, including comprehensive engineering analysis, by a qualified, licensed Professional Engineer.

B. Manufacturer's Qualifications
1. ISO 9001 Certified manufacturing plant and processes.
2. Ten installations of equal or larger size and requirements. Provide contact at each.
3. Only hood manufacturers who have had fume hoods as a principal product for 30 years are considered.
4. 95% or more of raw material and component suppliers shall be United States based.
5. Stainless and cold rolled steel used in manufacturing shall be sourced from United States steel mills.
6. Final product must be fabricated and assembled within the United States of America.
7. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

C. Supply all equipment in accordance with this specification. Offering a product differing in materials, construction, or performance from this specification requires written approval obtained seven days or more before the proposal deadline.

D. The owner/architect reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

E. Manufacturer's warranty against defects in material or workmanship on its fume hoods will be for 1 year from date of installation or 2 years from date of purchase, whichever is sooner, and includes replacement of parts (except lamps) and labor.

1.7 ACTION SUBMITTALS
A. Laboratory hood specification sheets and product manuals shall be submitted by the hood manufacturer upon request, and include safe and proper operation and maintenance information.
B. Shop Drawings: Include plans, elevations, sections, and details.
   1. Indicate details for anchoring fume hoods to permanent building construction including locations of blocking and other supports.
   2. Indicate locations and types of service fittings together with associated service supply connection required.
   3. Indicate duct connections, electrical connections, and locations of access panels.
   4. Include roughing-in information for mechanical, plumbing, and electrical connections.
   5. Provide face opening, volumetric rates, and static pressure drop data.
C. Submit a document detailing the information supplied on the Hood Safety Practices Label to verify compliance to specifications.

1.8 INFORMATIONAL SUBMITTALS
A. Product Test Reports: Showing compliance with specified performance requirements, including NEBB representative test report as defined previously.
B. Independent validation:
   1. Written verification that the laboratory fume hoods carry the ETL listed mark for the following.
      a. UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use
      b. UL 1805, Underwriters Laboratories Inc., Standard for Laboratory Hoods and Cabinets
   2. Written verification that 230 volt model fume hoods carry the CE conformity marking as required by the Council of European Communities.
   3. Written verification from an outside testing agency confirming coating compliance to SEFA 8-2010, Recommended Practices for Laboratory Grade Metal Casework, 8.0 Cabinet Surface Finish Tests
   C. Documentation of ISO 9001 Certified manufacturing plant and processes.
   D. List of five installations (of equal or larger size and requirements) is available upon request. Provide contact at each.
   E. Declaration of Made in America. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

1.9 MATERIAL SUBMITTALS
A. Samples for Verification: of the hood exterior wall material, interior liner and baffle material, epoxy work surface material, and color selection chips are available from the hood manufacturer upon request.

1.10 PROJECT CONDITIONS
A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or another suitable material.
B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.
C. Environmental Limitations: Do not deliver or install fume hoods until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.
PART 2 - MANUFACTURERS

2.1 Basis of Design Product: Supreme Air fume hood as manufactured by Kewaunee Scientific Corporation, 2700 West Front Street, Statesville, North Carolina or equal by the following:

A. Labconco XL Hood, Kansas City, Missouri.
B. AIR Master Systems Corp.

2.2 MATERIALS

A. Hood Interior Liner and Baffle

1. Liner material must comply with UL 1805, and be listed within NRTL test report as proof of compliance.

2. General Material Properties
   a. Nonflammable, corrosion and chemical-resistant
   b. Sheet molded homogenous polyester panels
   c. Minimum thickness is 3/16”
   d. Smooth, white finish

3. Mechanical Properties
   a. Tensile Strength: 7,500 PSI
   b. Tensile Modulus: 1.7 x 10^6 PSI
   c. Flexural Strength: 21,000 PSI
   d. Flexural Strength at 130 degrees C: 12,900 PSI
   e. Compressive Strength: 32,500 PSI
   f. IZOD Impact Strength (Notched): 8.4 Ft Lb/in (4.5 J/cm)

4. Flame and Smoke Characteristics
   a. Flame retardant, self-extinguishing, with a flame spread rating of 25 or less in accordance with ASTM-E84
   b. Oxygen Index: 35%
   c. Smoke Density: 115

5. Physical Properties
   a. Water Absorption: 0.4%
   b. Specific Gravity: 4.81
   c. Coefficient of Thermal Expansion: 2 In/in/ degree C x 10^-5
   d. Thermal Conductivity: 1.9 BTU/Hr/Ft^2/In/degree F

6. Chemical Resistance
   a. Splash and Spill Resistance:
      1) Suspend sample panel in a vertical plane
      2) Apply five drops of each reagent listed with an eyedropper
      3) Apply liquid reagents at top of panel and allow to flow down full panel height

7. Fume Resistance:
   a. Place 25 milliliters of reagent into 100 milliliters beakers and position panel over beaker tops in the proper sequence. Ensure beaker pouring lip permits air to enter the interior atmosphere.
   b. After 24 hours remove panel, flush with water, clean with detergent, rinse, wipe dry and evaluate

8. Evaluation ratings: Change in surface finish and function shall be described by the following ratings
   a. No Effect: No change in color or gloss
   b. Excellent: Slight detectable change in color or gloss, but no change to the function or life of the work surface material
   c. Good: Clearly discernible change in color or gloss, but no significant impairment of function or life
   d. Fair: Objectionable change in appearance due to surface discoloration or etch, possibly resulting in deterioration of function over an extended period
   e. Failure: Pitting, cratering or erosion of work surface material; obvious and significant deterioration

9. Required minimum results for each reagent (Reagent: Fume Resistance Rating, Splash and Spill Resistance Rating)
   a. Hydrochloric Acid (37%): 2,1
   b. Sulfuric Acid (33%): 2,1
   c. Sulfuric Acid (77%): 1,1
   d. Sulfuric Acid (96%): 1,2
   e. Formic Acid (90%): 2,1
   f. Nitric Acid (20%): 2,2
   g. Nitric Acid (30%): 1,2
   h. Nitric Acid (70%): 3,2
   i. Hydrofluoric Acid (48%): 2,2
   j. Phosphoric Acid (85%): 1,1
   k. Chromic Acid (60%): 1,4
   l. Acetic Acid (98%): 1,1
m. Ammonium Hydroxide (20%): 1,1
n. Sodium Hydroxide (10%): 1,1
o. Sodium Hydroxide (20%): 1,3
p. Sodium Hydroxide (40%): 1,3
q. Sodium Hydroxide Flake: 1,-
r. Sodium Sulfide: 1,1
s. Zinc Chloride: 2,1
t. Tincture of Iodine: 3,3
u. Silver Nitrate: 2,1
v. Methyl Alcohol: 1,1
w. Ethyl Alcohol: 1,1
x. Butyl Alcohol: 1,1
y. Benzene: 1,1
z. Xylene: 1,1
aa. Toluene: 1,1
bb. Gasoline: 1,1
c. Dichloro Acetic Acid: 2,2
d. Dimethyl Formamide: 2,2
e. Ethyl Acetate: 1,1
f. Amyl Acetate: 1,1
g. Acetone: 1,1
h. Chloroform: 1,1
i. Carbon Tetrachloride: 1,1
j. Phenol: 2,2
k. Creso!. 1,1
l. Formaldehyde: 1,1
mm. Trichloroethylene: 1,1
nn. Ethyl Ether: 1,1
oo. Furfural: 1,3
pp. Methylene Chloride: 1,1
qq. Mono Chloro Benzene: 1,1
rr. Dioxane: 1,1
ss. Methyl Ethyl Ketone: 1,1
t. Acid Dichromate: 1,2
uu. Hydrogen Peroxide: 1,1
vv. Naphthalene: 1,1

B. Sheet Steel
1. Side panels and access panels 20-gauge (or heavier) sheet steel.
2. Hood corner posts are 16-gauge sheet steel.
3. Ceiling enclosure panels are 18 gauge sheet steel.
4. Cold-rolled, commercial steel (CS) sheet, complying with ASTM A 1008/A 1008M.

C. Chemical Resistant Finish
1. General: Prepare, treat, and finish welded assemblies after welding. Prepare, treat, and finish components that are to be assembled with mechanical fasteners before assembling.
2. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8. Third party validation required.
3. Powder-coat process required. Paint processes that release Volatile Organic Compounds (VOC) are not acceptable
4. Color for Fume Hood Finish:
   a. Glacier White

D. Safety Glass
1. Tempered
   b. Surface and interior visible quality to be as specified per ASTM C 1036, Standard Specification for Flat Glass, Table 4, Quality level Q3.

E. Superstructure
1. Self-supporting, rigid structural assembly, to support inner wall consisting of fume hood liner and outer wall of sheet metal exterior.
2. Fabricated from galvanized steel.
3. Space shall accommodate fume hood wiring and plumbing components for service fixtures.
4. Access to fixture valves concealed in wall provided by exterior removable access panels, gasket access panels on the inside liner walls, or through removable access panels on the front posts.

F. Exterior
   1. Fabricate from steel sheet with component parts screwed together.
   2. Apply chemical-resistant finish to interior and exterior surfaces of component parts before assembly.
   3. Interchangeable side panels shall lift off without the use of tools to allow access to plumbing lines, service fittings, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and Velcro type fasteners, are not acceptable.
   4. Corner posts
      a. Pre-punched and plugged to accommodate up to 4 service fixtures per side
      b. All services are accessible from the front of the hood.
      c. Aerodynamic shape
      d. Accommodate two electrical duplexes per side.
      e. Right hand corner post includes electrical switches and pre-cut for Airflow monitor installation.
      f. Un-used penetrations shall be plugged.
   5. Top and sides of face opening to provide an aerodynamic shape to ensure smooth, even flow of air into fume hood.
   6. Panel above header shall be removable without the use of tools to allow access to mechanical connection, electrical wiring, counterbalance sash weights, and light fixtures. Exposed fasteners or hardware, and "hook-and-loop" type fasteners, are not acceptable.

G. Dimensions
   1. Overall exterior dimensions are as follows:
      a. 6 foot nominal width: 72” w x 59” h x 37.7”
   2. Overall interior dimensions are as follows:
      a. 6 foot nominal width: 62.1” w x 48” h x 29.6”

H. Hood Liner
   1. Adhere interior liner components to superstructure.
   2. Stainless steel fasteners shall be used on the interior ceiling for structural integrity.
   3. Fasteners exposed to chemical environment are not acceptable.
   4. Punch fume hood lining side panels to receive four service fittings, for use with remote controls, per side. Provide removable plug buttons for holes not used for indicated fittings.
   5. Each side wall shall include an oval interior access panel to provide access to the side wall of the fume hood for plumbing service access. Access panel material shall be that of the liner, and gasketed to form a vapor proof seal.

I. Hood Baffle
   1. Baffle system shall be designed to optimize the face velocity profile, and to capture a wide range of gaseous densities without adjustment or moving components.
   2. Shall provide a continuous horizontal slot at the work surface. Baffle panels shall have multiple horizontal slots, with a chamfered entry. Slot pattern shall be proven to optimize face velocity profile.
   3. The baffle system shall be constructed with the same material as the fume hood liner.
   4. The baffles shall be removable for cleaning. The primary baffles shall be three pieces to allow removal without the use of tools.
   5. Exposed components to be non-metallic. Metal components exposed to chemical environment are not acceptable.
   6. Moving parts or adjustment of any kind is not acceptable.

J. Exhaust Connection
   1. 316 stainless steel with Chemical-Resistant Finish
   2. 12.81" ID to accommodate any 12" nominal duct without the need for a transition adapter. Additional components required to accommodate 12" nominal mechanical system are not acceptable.
   3. Ducting shall go inside the duct collar to ensure condensate travels into the hood and evaporates. Duct collars that allow duct connection over the collar are not acceptable.

K. Airfoil
   1. Cold Rolled Steel with Chemical-Resistant Finish.
   2. Airfoil shall have an aerodynamic radius to sweep the air into the hood with minimal turbulence. Airfoil directs airflow across work top to remove heavier-than-air gases.
   3. Must have 5 rows of perforations to allow the air to bypass underneath and through the foil and sweep across the work surface to prevent any back flow of fumes escaping from the front of the hood opening. This airflow continues even if blocked by the presence of the operator.
   4. Foil must extend back under the sash to prevent closure of the lower by-pass opening when the sash is in the fully closed position, directly on top of the airfoil.

L. Sash Assembly
2. Dimensions: The full sash opening height is 28”, the total unobstructed viewing height is 37.5” measured from the work surface.
3. Sash Tracks: Steel with Chemical Resistant Finish. Shall include bump stops for opening and closing.
4. Sash Handle: extruded aluminum with Chemical Resistant Finish. Sash handle includes a perforated air passage directly atop the handle to bleed air into the hood chamber and direct chemical fumes away from the user’s breathing zone. The handle is ergonomic in design and is easy to grasp when operating.
5. Sash guides: Corrosion resistant extruded poly-vinyl chloride.
6. Sash System
   a. Vertical Sash with intelligence
   b. Hoods have a single vertical sash counterbalanced by a single weight.
   c. Sash and weight to be connected via #35 chains.
   d. Rear sprockets shall be connected via timing shaft to prevent sash tilting and permit operation at any point along full width sash handle.
   e. Design system to hold sash at any position without creep and to prevent sash drop in the event of chain failure.
   f. Sash shall only rise manually.
   g. Operating height shall be configurable in the field.
   h. Sash shall automatically close without occupancy after a user set delay period has elapsed.
   i. Optical sensor shall prevent sash from disturbing an obstruction to the plane of the sash upon closure.
   j. Do not include a defeatable, and automatically resetting sash stop on hoods with sash intelligence.

M. Electrical Components
1. Lighting
   a. Provide UL Listed, LED lighting systems.
   b. Vapor-Proof: all electrical components shall be outside of the contaminated air space. Lighting shall be located behind a laminated safety glass shield, sealed to the top of the hood liner.
   c. The LED light assemblies shall be serviceable from outside the fume hood cavity, without the use of tools.
2. Light switch to be included on the lower right corner post, at heights compliant with the Americans with Disabilities Act (ADA).

N. Blower Switch
1. Hoods shall be provided without a blower switch, as they will share a single mechanical system with other hoods.

O. Electrical Receptacles
1. The hoods shall accommodate up to four (two per corner post) electrical receptacles and have one factory install in the lower right hand side location:
2. 115 volt, 60 Hz, three-wire polarized and grounded electrical duplex, with Ground Fault Circuit Interruption (GFCI)
3. Receptacles shall be individually wired to field wiring box, and each rated at 20 Amperes.
4. Cover plates shall be acid resistant thermoplastic.

P. Wiring
1. Every electrical component shall be individually wired to a single point internal field wiring box (including individual duplexes/receptacles).
2. Field wiring box to be 7” x 4” x 2.5”, grounded, and have (12) 7/8” diameter knock out penetrations.
3. Final wiring and circuit dedication is to be by others.
4. Each receptacle circuit shall accommodate being wired to a dedicated building circuit rated at 20A, or the receptacles ganged together on a building circuit with the total load not exceeding 20 Amperes.

Q. Fume hood to have third party validation of compliance to UL 1805 and UL 61010-1 by a Nationally Recognized Testing Laboratory (NRTL)

R. By-Pass Opening
1. Shall offer a significant restriction to the by-pass opening to allow the use of a VAV mechanical system.

S. Hood Safety Practices Label: Corrosion resistant plate attached to the left corner post of the fume hood with the following Hood Safety Practices:
1. For use with substances that produce hazardous levels of airborne chemicals: gas, fumes, vapors, dust
2. Do not put your head in the hood.
3. Minimize drafts and sudden movements in front of the hood.
4. Work a minimum of six inches inside the hood.
5. Elevate equipment above the work surface.
6. Keep sill and baffle unobstructed.
7. Do not use the hood for storage.
8. Adjust the sash to smallest opening possible when in use.
9. Close sash when unattended.
10. Do not remove any of the hood components.
11. Do not place flammable solvents near heat, flame or sparks.
12. Do not evaporate large amounts of flammable liquids.
13. Wipe up spills immediately.
15. If the ventilation system malfunctions, or airflow alarm indicates unsafe condition, close sash and
discontinue hood operation immediately-call for help.
16. Do not use with Biohazards or Perchloric Acid

2.3 FUME HOOD ACCESSORIES

A. Service Fixtures: Color-coded hose nozzle outlets and valves mounted inside the fume hood and
controlled from the exterior with color-coded index handles
1. The hoods are equipped with cold water gooseneck on the left, and vacuum and air on right.
2. Hose connectors located inside the fume hood cavity arechemically-resistant, glass-filled
polypropylene with 6 serrations.
3. Service lines shall be factory installed from valve to outlet
   a. Copper tubing unless otherwise noted
   b. Connections shall be made with quick-connect compression fittings on the inlet and outlet of the
      valve body, soldered and brazed connections not easily disassembled are not acceptable.
   c. Services pre-piped to the top of the hood
   d. Refer to A710 for location of service fittings. Place services on end with access for maintenance –
      see plans.
4. Valves
   a. Extruded brass valve and rotating seat, TFE-coated silicone bronze stem and TFE packing.
   b. Fixture handles are plastic and color coded as well as labeled for the designated type of service.
   c. Fixtures are rated at maximum pressure of 200 psi.
   d. Coefficient of flow for the valve, \(Cv=0.43\).
   e. Valves are front loaded, located on the fume hood corner post for remote use, and include:
      1) Cold tap water with gooseneck (flow rate 3.5 GPM or 13.25 LPM at 67 psi at full open
      2) Air (theoretical flow rate of 59 CFM at 100psi)
      3) Vacuum (theoretical flow rate of 6 CFM at 10 psi)

B. Tissue Screen: Provide epoxy-coated, stainless-steel screen at bottom baffle opening to prevent paper
from being drawn into the exhaust plenum behind baffles.

C. Ceiling Enclosure Panels:
1. Provide filler panels matching fume hood exterior to enclose space above fume hoods at front and
   sides of fume hoods and extending from tops of fume hoods to ceiling.
2. Exposed fasteners are not acceptable.
3. Height adjustment to be within the following range.
   a. 11.0” - 14.0”

D. Face Velocity Monitor/Alarm
1. Variable Air Volume (VAV) Prepared
   a. Fume hoods shall come factory prepared with the proper cutouts and brackets to field mount Green
      Energy ATA1000E, VAV controller system.

2.4 WORK SURFACE

A. 1.25” thick, molded from solid modified epoxy resin, with smooth, non-specular, black finish.
B. One inch radius front edge for optimal fume hood performance.
C. 3/8” dished area to match the fume hood interior work space and form a water tight pan for spill
   containment.
D. Include a 2.5” diameter hole on each side for service pass-through and piping. Hole to be covered by
   hood superstructure upon installation.
E. Include two 1.5” diameter penetrations to accommodate base cabinet venting. Holes to be located outside
   of dished area and under the fume hood baffles. Include plugs.
F. Physical Properties:
   1. Flexural Strength: Not less than 10,000 psi.
   2. Modulus of Elasticity: Not less than 2,000,000 psi.
   3. Hardness (Rockwell M): Not less than 100.
   4. Water Absorption (24 Hours): Not more than 0.02 percent.
   5. Heat Distortion Point: Not less than 260 deg F (127 deg C).
6. Flame-Spread Index: 25 or less per ASTM E 84.

G. Cupsink
1. 3 x 6” dimension, polypropylene construction
2. Provide with strainers and tailpieces, NPS 1-1/2 (DN 40)To sit flush with dished area of work surface
4. Cupsink to be located:
   a. Refer to A710 for location of services.

2.5 SUPPORTING BASE CABINETS
A. Base cabinets shall be in depths of 22", widths, quantities, and types called out in the drawings, and meet the requirements of this specification.

B. Construction requirements for all cabinets
1. Exterior construction is 18 gauge (or heavier) cold rolled sheet steel with Chemical Resistant Finish.
2. Hinges are 10 gauge (or heavier) plate with self-clinching pilot pin. Knuckle, bullet, or piano type hinges are not accepted.
3. The rear panel will feature a 12” x 8” removable plumbing access panel.
4. Units 24” wide or less have only one door.
5. Each cabinet includes four leveling feet.
6. Capable of supporting up to 800 pounds.
7. A filler panel is required to increases the cabinet depth to work surface depth.

C. Acid Storage (located under left side of hood)
1. Overall exterior dimensions:
   a. 36” w x 22” d x 35.5”-36.75”
2. Completely lined with a polyethylene corrosion resistant liner. The liner is 3/16” thick, with a vacuum formed PVC liner pan at the bottom to contain spills. Each door has a 3/16” sheet polyethylene liner.
3. The cabinet is labeled: “ACID”.
4. Flush pull handles are ABS, low gloss black.
5. Each cabinet is vented into the fume hood with a 1-1/2” vent pipe. It should provide a positive airflow directly into the fume hood exhaust system.
6. Supply an epoxy coated steel shelf with PVC liner pan if indicated in the schedule.
7. Acid cabinets with louvers are not acceptable

D. Solvent Storage (located under right side of hood)
1. Overall exterior dimensions:
   a. 36” w x 22” d x 35.5”-36.75”
2. Solvent storage cabinets are specifically designed for the storage of flammable and combustible liquids.
3. Solvent Storage Cabinet must be compliant with NFPA 30 “Flammability and Combustible Liquids Code.”
4. Cabinets 30” wide and greater shall be tested and approved by Factory Mutual to meet Factory Mutual Approval Standard 6050.
5. The bottoms, top, sides, and doors are fabricated of 18 gauge steel and are all double panel construction with a 1-1/2” air space between panels.
6. All joints are welded or screwed to provide a rigid enclosure. A 2” deep liquid tight pan that covers the entire bottom of the cabinet is furnished to contain liquid leaks and spills.
7. A full-depth, 18 gauge steel, adjustable shelf is also provided. Shelves are sealed leak tight.
8. Two diametrically opposed flame arrestor vents with spark screens are provided in the back of the cabinet, as well as a grounding screw.
9. The cabinet has an interior finish same as the exterior.
10. The cabinet is labeled: "FLAMMABLE - KEEP FIRE AWAY".
11. The right hand door shall have a three point latching device.
12. Door handles include a key lock. Solvent storage handles are locking lever handles with bright chrome finish.

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 fume hoods.

B. Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of the hood.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION
A. General: Install fume hoods according to shop drawings and manufacturer's written instructions.
B. Install level, plumb, and true; shim as required, using concealed shims, and securely anchor to building and adjacent laboratory casework.

C. Securely attach access panels, but provide for easy removal and secure reattachment. Where fume hoods abut other finished work, apply filler strips and scribe for accurate fit, with fasteners concealed where practical.

D. Neighboring splash blocks shall not be attached directly to the hood.

E. Install according to standards required by authority having jurisdiction.

F. Sequence installations to ensure utility connections are achieved in an orderly and expeditious manner.

G. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.3 FIELD QUALITY CONTROL

A. NFPA 45 requires that fume hoods be field tested when installed.

B. Field test installed fume hoods according to ASHRAE 110 to verify compliance with performance requirements.

C. Adjust fume hoods, hood exhaust fans, building's HVAC system, and make other corrections until tested hoods perform as specified in fume hood schedule.

D. After making corrections, retest fume hoods that failed to perform as specified.

E. Coordinate commissioning/field testing sequence with control valve programmer and Owner to ensure fume hood sash settings and control valves are operating as intended.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Adjust sashes for uniform contact of rubber bumpers. Verify that counterbalances operate without interference.

B. 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.

C. Clean adjacent construction and surfaces that may have been soiled in the course of installation of work in this section.

D. Provide all necessary protective measures to prevent exposure of equipment and surfaces from exposure to other construction activity.

E. Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

END OF SECTION 115313
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SECTION 115353 - BIOLOGICAL SAFETY 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. Bench-top Class II Biological Safety Cabinet
   2. Biological Safety Cabinet Supporting Base Stand
   3. Exhaust Thimble/Canopy Connection (confirm needed)
B. Related Sections
   1. Division 22 Plumbing
   2. Division 23 HVAC
   3. Division 26 Electrical

1.3 SCOPE AND CLASSIFICATION
A. This specification covers the requirements for providing and installing bench-mounted Class II, Type A2 biological safety cabinets.

1.4 REFERENCES
A. The bench-mounted Class II, Type A2 biosafety cabinets must conform to the following regulations and standards.
   1. NSF International – NSF/ANSI Standard 49 for Biohazard Cabinetry.
B. The bench-mounted Class II, Type A2 biosafety cabinet must carry the ETL listed mark for the following.
   1. UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use.

1.5 PERFORMANCE REQUIREMENTS
A. General Design Requirements (See Part 2 for details)
   1. Class II, Type A2 – suitable for testing and experimentation with low to moderate risk biological agents.
   2. Canopy/Thimble connection added to Class II, Type A2 required for work with volatile and/or toxic hazardous chemical vapors below appropriate exposure limits.
   3. Base Stands
      a. Telescoping Stands – Support base adjustable for eight static height positions allowing the work surface height to be set between 30” (Seated Positions) and 37” (Standing Positions).
B. Containment & Safety
   1. Cabinet shall provide biological containment protection for both operator and product proven by an actual test, (as conducted by NSF) and routinely validated by the manufacturer.
   2. Containment of biological hazards is achieved through a combination of HEPA filtration and directional, controlled airflow.
C. Airflow
   1. Calculated Air Velocity: 100 to 110 fpm through 8” OR 10” sash opening with audible alarms which sound when safety glass sash window is not at its proper operating height.
   2. Measured Downflow Velocity: 50 to 60 fpm measured 4” above operating sash opening height. Must be true laminar (uniform) downflow as defined in NSF/ANSI Standard 49.
   3. Blower with Electronically Commutated Motor (ECM) shall be programmed to deliver a precise volume of air as required and automatically adjusts as filters load without relying on airflow sensors and protected from voltage (electrical) fluctuation. Systems using air (velocity or volume) sensors or pressure transducers to control blower speed are not acceptable.
   4. The Cabinet shall provide an audio signal accompanied by digital display of alert or alarm status type specific to the alarm with diagnostic measures displayed on a line-of-sight (while seated) color display.
D. HEPA Filters
   1. One supply and one exhaust HEPA filter. Each shall be a minimum of 99.99% efficient on all particles 0.3µm as scan-tested with DOP or equivalent.
   2. HEPA filters shall be industry-standard size.
3. Motor-Blower shall be positioned so as to promote even filter loading, thereby prolonging the life of HEPA filters.

4. Motor-Blower shall automatically handle HEPA filter pressure equal to 200% of initial pressure without reducing total air delivery by more than 2%.

E. Controls and Display
1. Cabinet shall utilize a microprocessor control system.
2. Accessible mounted controls for operation of:
   a. Blower
   b. Light
   c. Electrical Outlets
   d. UV Light
   e. Timers
   f. Alarm Mute (5 minute ring-back)
   g. Menu navigation
   
   E. Controls and Display
   3. Easy to Use/Navigate Operating System performs the following Functions.
      a. User Programmable and customizable biosafety cabinet operation (including blower, light, optional UV light, and timer functions) controllable by movement and position of the Safety Glass Sash.
      b. User Programmable and customizable biosafety cabinet operation that idles the motor in a reduced flow mode, reducing energy consumption by over 80% while maintaining ISO Class 5 conditions.
      c. Digital 12- or 24-hour clock.
      d. HEPA filter life is displayed as a percentage using real time feedback from the ECM-blower’s performance. HEPA filter life timers are not acceptable.
      e. Complete diagnostic and troubleshooting functionality.
      f. Security password protection of cabinet use.
      g. Programmable timed operation of LED and (optional) germicidal ultraviolet (UV) light.
      h. Password Protected Service menu for calibration and configuration of biosafety cabinet installation and operational parameters.
      i. Selectable units of measure (Imperial or Metric).

4. Alarms and Alerts – The cabinet shall provide both an audio signal and digital display that communicates and describes the alarm condition, provides corrective actions and utilizes a cross sectional diagram highlighting the potentially affected areas of the biosafety cabinet. Alarms shall exist for the following conditions:
   a. Sash Height Alarm – indicating that the sash is higher than its nominal set point.
   b. Airflow Alert – signifies that the automatically adjusting blower has had to make an abrupt change in order to maintain safe airflow.
   c. Airflow Alarm – (If equipped with an airflow sensor) indicates that inflow or downflow velocities are excessively high or low.
   d. Canopy Alarm – (If Canopy Kit is installed) indicates insufficient exhaust system airflow. (See Canopy Kit Accessory Details)
   e. System Error – Indicates a failure in the communication between the microprocessor controller and the ECM blower.

F. Noise
1. Sound level (as factory tested) shall be no more than 63 dBA measured 15 inches above the work surface and 12 inches in front of the safety glass sash, as stated by NSF/ANSI Standard 49.

G. Illumination
1. LED lighting shall provide 90 to 150 foot-candles on work surface per NSF/ANSI Standard 49. The ballast is to be electronic containing thermal protection with automatic reset.
2. LED lighting shall be externally mounted from the work zone, energy efficient, and replaceable from front of the biosafety cabinet.
3. Optional UV light shall be a 254 nanometer germicidal lamp with life timer and replacement notifications.
4. The UV light shall be operable only when the sash is closed.

H. Pass-Through and Bulkheads
1. Sealed Service Pass-Through – All permanent and durable structures for the passing of electrical wires, cords and tubes are to be permanently sealed air-tight, and shall not allow for movement of the items passing through.
2. Sealed Service Penetration – Penetrations will be air tight and sealed, and will provide for the addition of field installed service fixture/valves or testing equipment.
3. User-Modified Pass-Through – Cord, Tube & Cable Portals for the passing of such so to connect to instruments, one inside the biosafety cabinet, the other outside. Shall provide an airtight seal and be protected by a vacuum or negative pressure source.
4. All Pass-Through & Bulkhead types shall be tested and approved by NSF to the NSF/ANSI Standard 49.

I. Efficiency
   1. Biosafety cabinets shall operate at, or lower than, the listed energy usage and heat output during normal operation:
      a. 4’ Models – 290 Watts / 990 BTU-HR
      b. 6’ Models – 490 Watts / 1672 BTU-HR
   2. During periods of non-use, the cabinet’s set-back mode should operate at an 85% reduction in energy consumption.

1.6 QUALITY ASSURANCE
A. NSF Qualification
   1. Biosafety cabinets, Class II, Type A2 will meet or exceed the minimum requirements of NSF/ANSI Standard 49, bear the NSF Mark, and appear in NSF’s Official Product Listings.

B. Manufacturer Qualification
   1. ISO 9001 Certified manufacturing plant and processes.
   2. Manufacturer must maintain a testing facility at their place of business for the performance testing of bench-mounted Class II, Type A2 biosafety cabinets.
   3. The test facility and manufacturing facility must be available for owner/user inspection and its quality control procedures.
   4. Manufacturer shall provide evidence and documentation of specialization and manufacturing of biosafety cabinets with a minimum of no less than ten years’ experience to the market.
   5. All biosafety cabinets wired for 115V, 60 Hz shall be built to meet or exceed all minimum requirements of UL Standard 61010-1 (formerly 3101-1). The biosafety cabinets shall be listed by a Nationally Recognized Testing Laboratory (NRTL).
   6. 95% or more of raw material and component suppliers shall be United States based.
   7. Stainless and cold rolled steel used in manufacturing shall be sourced from United States steel mills.
   8. Final product must be fabricated and assembled within the United States of America.
   9. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

C. Supply all equipment in accordance with this specification. Offering a product differing in materials, construction, or performance from this specification requires written approval obtained seven days or more before the proposal deadline.

D. The owner/architect reserves the right to reject qualified or alternate proposals and to award based on product value where such action assures the owner greater integrity of product.

E. Manufacturer’s warranty against defects in material or workmanship on its biosafety cabinets will be for 5 years from the date of installation or 6 years from date of purchase, whichever is sooner, and includes replacement of parts (excluding filters and lamps) and labor.

1.7 SUBMITTALS
A. Action Submittals
   1. Biosafety Cabinet specification sheets and product manuals shall be submitted by the manufacturer upon request, and include safe and proper operation and maintenance information.
   2. Shop Drawings: Include plans, elevations, sections, and details.
      a. Indicate details for anchoring biosafety cabinets to floor as required by seismic code.
      b. Indicate locations and types of service fittings together with associated service supply connection required.
      c. Indicate duct connections if thimble/canopy connection is required, electrical connections, and User-Modified Pass Through.
      d. Include roughing-in information for mechanical, plumbing, and electrical connections.
      e. If thimble/canopy connection is required Provide face opening, volumetric rates, and static pressure drop data.

B. Informational Submittals
   1. Production Test Reports: A copy of the “as manufactured” test reports conducted prior to shipping ensures compliance with NSF/ANSI Standard 49 and is shipped with each biosafety cabinet.
   2. Independent validation:
      a. Written verification that the biosafety cabinets carry listed markings for the following:
         1) NSF/ANSI Standard 49, National Sanitation Foundation, (Laminar Flow) Biological Safety Cabinetry
         2) UL 61010-1 (formerly 3101-1), Underwriters Laboratories Inc., Electrical Equipment for Laboratory Use. (115V & 230V, 60Hz Models)
3) CAN/CSA C22.2 No. 61010-1, Canadian Standards Association, Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. (115V & 230V, 60Hz Models)


5. List of five installations (of equal or greater size/scope and requirements) is available upon request.

6. Declaration of Made in America. Owner reserves the right to evaluate Made in America claims for compliance with the Bureau of Consumer Protection.

7. Start-Up Test Report shall be submitted by independent 3rd party, accredited by NSF to test and balance biosafety cabinets.

1.8 DELIVERY, STORAGE AND HANDLING

A. Protect finished surfaces during handling, installation and thru completion of construction with protective covering of polyethylene film or another suitable material.

B. Schedule delivery of equipment so that spaces are sufficiently complete that equipment can be installed immediately following delivery.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install biosafety cabinet until building is enclosed, wet work and utility roughing-in are complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Labconco Purifier Logic+ as manufactured by Labconco Corporation, 8811 Prospect Avenue, Kansas City, Missouri 64132 or equal.

1. 4’ Models – 30241 & 30248 Series: Exterior Dims – 54.3” w x 31.2” d x 61.7” h
2. 6’ Models – 30261 & 30268 Series: Exterior Dims – 78.3” w x 31.2” d x 61.7” h

B. Comparable product by one of the following permitted following substitution request and approval.

C. Kewaunee Biosafety Cabinets.

D. Other substitutions are not permitted.

2.2 MATERIALS

A. Biosafety Cabinet Interior

1. The Interior Liner (sides and back) shall be 16 gauge, Type 304 Stainless Steel.
2. The Work Surface shall be 18 gauge or greater, Type 304 Stainless Steel.
3. Motor shall be a thermally protected, DC-ECM type with resilient mounted bearings. Motors with bushings are not acceptable.
   a. ½ HP ECM shall provide 42 Oz-Ft of torque.
   b. ¾ HP ECM shall provide 66 Oz-Ft of torque.
4. Electrical Outlets will have interlocking ground fault interruption.
5. Internal ductwork and plenums shall be galvanized and/or stainless steel shall be RoHS compliant. Flexible, removable or replaceable plenums and ductwork are not acceptable.
6. Safety Glass Sash shall be ¼” thick tempered safety glass.

B. Biosafety Cabinet Exterior

1. Exterior panels shall be powder-coated, 18 gauge cold rolled steel.

C. HEPA Filters

1. Filters are to be borosilicate glass, mini-pleat, and separator-less HEPA filters.
2. Filter frames shall be aluminum with closed cell neoprene gaskets.

2.3 CONSTRUCTION

A. Biosafety Cabinet Interior

1. Unitized single-frame construction of 16 gauge, 304 Stainless Steel. Shall pass factory test for holding pressure of 2” w.g. per NSF/ANSI Standard 49.
2. Cabinet assembly shall be constructed such that all positive pressure contaminated plenums are surrounded by negative pressure plenums.
3. Drain trough beneath the work tray is equipped to accommodate a 3/8” ball-type drain valve.
4. Optional service fixture (on models with fixture) shall be quarter-turn, ball valve.
   a. Valve shall be constructed of chrome-plated brass (or other based on requirements of service/utility provided).
b. Location of fixtures shall be ADA compliant for wheelchair accessibility.

5. Internal air balancing system shall be accessible from the outside of the biosafety cabinet, and adjustable with a standard hex-nut driver.

6. The Work Surface shall be of single piece, stamped, construction with no welding, applied sealant or solder used to seal any surface. All internal radiuses are ½" or greater.

7. A metallic diffuser screen shall promote true laminar air flow.

8. The cabinet shall accommodate up to 4 service fixtures.

9. The cabinet shall be double wall construction with negative pressure airflow from drain pan to top surrounding the back of work area.

B. Biosafety Cabinet Exterior

1. Exterior front panel shall slope approximately 10° and has no visibility-interfering protrusions.

2. Cabinet is designed such that all major service operations can be performed from the front of the cabinet.

3. HEPA filters are removable from the front of the cabinet.

4. A steel diffuser shall be mounted on top of the biosafety cabinet to promote proper exhaust airflow and protect the Exhaust HEPA filter.

C. Dimensions

1. The biosafety cabinet shall be capable of transport through a 32” wide opening.

2. Overall exterior dimensions are as follows: (excluding Base Support)
   a. 4 foot nominal width: 54.3” w x 61.7” h x 31.2” d
   b. 6 foot nominal width: 78.3” w x 61.7” h x 31.2” d

3. Overall interior dimensions are as follows:
   a. 4 foot nominal width: 48.5” w x 61.7” h x 25.6” d
   b. 6 foot nominal width: 72.5” w x 61.7” h x 25.6” d

D. Blower

1. Blower assembly shall be direct drive powered by energy saving ECM motor type.
   a. 4’ models will utilize a ½ HP ECM.
   b. 6’ models will utilize a ¾ HP ECM.
   c. Motor mounting system shall consist of 16 Gauge, stamped steel legs with integral vibration isolation.

2. Blower shall be optimally determined forward-curved fan for each model size/width to maximize both energy efficiency and filter loading capacity.

E. Sash Assembly

1. Sash shall be single pane, tempered safety glass and angled 10° from vertical and be of a sliding operation.

2. Sash shall be capable of being closed when cabinet is not in operation.

3. Sash shall fully open to a height of 21.7”.

4. Total sash height shall provide a viewing window that is no less than 27.0” tall.

5. A sash position indicator shall identify to the user where the sash is to be open to its optimum operating level.

6. Sash shall not require removal for routine filter or motor/blower service.

7. Bottom edge of sash shall be frameless and ground to a smooth edge so as to not disrupt line of sight. Framed sashes are not acceptable.

8. Sash will be interlocked to cabinet operation such that UV light will not operate when sash is open, and the biosafety cabinet will alarm (audio & visual) when the sash is opened beyond its nominal height when the blower is in operation.

9. Provide guides capable of holding the sash in place regardless of position and cushion sash with bumpers when fully opened or closed.

10. Maximum force required to operate sash shall not exceed 7 lbs.

F. Airflow and Foils

1. Bottom of sash opening (Air Inlet Grille) is an aerodynamic, radiused foil to ensure smooth, even flow of air into biosafety cabinet.

2. Air inlet grille will have perforations on the leading edge to draw air into the biosafety cabinet should the operator inadvertently block the grille area.

3. Corner posts are designed to be aerodynamic to ensure smooth, even flow of air into the sides of the sash opening on the biosafety cabinet.

4. A negative pressure channel shall exist at the top of the sash opening to prevent loss of containment at the top of the sash. Mechanical wipers at the top of the work area promote the creation of hazardous aerosols, and are not acceptable.

G. Electrical

1. A 10 foot 3-wire cord and plug will be provided to connect to electrical supply.
   a. 3’ and 4’ 115V models will be provided with an IEC 60320 connector and NEMA 5-15 plug.
b. 6' 115V models will be provided with an IEC 60320 connector and NEMA 5-20 plug.

2. Two internal Electrical Outlet Duplexes will be standard, one mounted on each side wall. Outlets mounted on the rear wall of the work area are not ADA compliant, and are not acceptable.
   a. Duplexes shall be mounted flush to the stainless steel side walls of the biosafety cabinet’s interior for easy cleaning.
   b. Duplexes will have a self-closing stainless steel splash cover with dampened (slowed action) operation for safe operator use. Splash covers shall close not be fully closed in less than 1 second. Undampened, spring-loaded doors are not acceptable.
   c. Duplexes will be located in compliance with ADA for wheelchair accessibility.
   d. 115V model receptacles are NEMA 5-15.

3. All major electronic components (ballasts, starters, switches, circuit breakers) shall be housed in a removable module for service or testing and be accessible from the front.

4. Wiring Harness shall be color coded and alphanumerically labeled for identification. Removable wire tags shall not be used.

5. Biosafety Cabinet shall have two separate internal circuits with breaker protection. One for service of controls, lighting and blower motor; one for internal electrical outlets.

6. Biosafety Cabinet shall have optional dry relay contacts for connection to building management system. Will communicate alarms or use for control of HVAC Mechanical System (remote blower, valves) devices.

H. Decontamination

1. Cabinet shall be easily fumigated employing an established procedure such as that recommended by NSF/ANSI Standard 49.

2. Cabinet shall be provided with a 1” nominal diameter corrugated tube supplying a vaporized sterilant (Vaporized Hydrogen Peroxide – VHP, or Chlorine Dioxide – CD) to the positive pressure contaminated plenum for maximizing decontamination efficiency. Tube shall have a bright orange safety cap and be accessible from the front of the cabinet.

3. Liner assembly shall have an integral face flange for sealing the cabinet during decontamination and pressure test operations.

4. The biosafety cabinet’s controls will provide a program that cycles the motor blower for maximizing decontamination efficiency.

I. HEPA filters and Plenums

1. The positive pressure, contaminated plenum shall be permanent in construction, telescoping steel and provide uniform HEPA filter loading. Flexible, consumable plasticized plenums are not acceptable.

2. Supply HEPA filter shall be of full cabinet work zone width and depth, and be tilted with the angle of the biosafety cabinet’s front so as to provide laminar airflow behind the sash.

3. Supply HEPA filter shall be protected by a perforated metal diffuser covering the entire top of the work zone.

4. Supply and Exhaust HEPA filters are secured in the upper cabinet assembly by clamps.

J. Controls and Display

1. Control panel with easy-to-clean membrane touchpad for system operations (blower, lights, mute) and Operating System navigation are mounted on the front of the cabinet and shall be ADA compliant. Controls mounted above sash are not acceptable.

2. The audible/visual alarm indicator and mute switch shall be ADA compliant.

3. The mute function will silence audible alarms for 5 minutes before engaging a ring-back function.

4. Display shall be mounted in a position where it is line-of-sight while seated at the cabinet and can be viewed without strain to the operator.

5. Display shall be Digital LCD and communicate cabinet status, HEPA filter life, alarms and cabinet set up. Analog pressure gauges do not adequately provide user communication adequate to specific to cabinet function and are not acceptable.

K. Pass-Through and Bulkheads

1. Service Fixture Provisions will be provided to accommodate up to four valve installations, shall be sealed to meet air tight pressure requirements, and shall be ADA Compliant.

2. Cord and Cable Portal shall ship with a solid closed cell neoprene plug and be user-modified as needed per application.

3. Cord and Cable Portals shall not require further space requirements than recommended by the manufacturer and NSF/ANSI Standard 49.

4. Cord and Cable Portal design shall be approved by NSF testing.

L. Ergonomics – The biosafety cabinet shall be ergonomically designed for maximum user comfort and adjustability to meet the requirements of the American with Disabilities Act (ADA).

1. Biosafety Cabinet installation with base stand shall be positioned to provide work surface heights between 30” and 37”, and be in compliance with ADA.
2. Safety Glass Sash Assembly shall be anti-racking and counterbalanced with a weight and pulley system allowing for effortless movement up and down with one hand. Sash shall open to 21.7”. Spring-loaded sash counterbalances require greater force as the sash raises and exerts force against the user’s arms, this design is not acceptable.

3. Air Inlet Grille shall have a large (greater than 2”) integrated curved armrest to provide comfort for user when in a resting position while maintaining containment performance. Hard and sharp angles and elevated add-on arm/elbow rests promote poor ergonomic posture and are not acceptable.

4. Maximum visibility into cabinet work zone shall be at least 27” from front access airfoil to exterior light housing.

5. The biosafety cabinets work surface shall have easy-lift knobs located on the front corners and be removable through the front opening. The stamped dish will have coved corners for easy cleaning.

6. The biosafety cabinet shall have a 10° slope front.

7. All controls (touchpad, service fixtures valves, electrical outlet duplexes, cord and cable portals) shall be in compliance with ADA.

8. The digital display shall be positioned line-of-sight while seated at the biosafety cabinet and communicate cabinet status and programming in full intuitive sentences.

M. Required Accessories

1. Telescoping Base Stands – shall be adjustable at installation to provide work surface heights between 30° and 37° and come with leg levelers. – Shall be NSF Approved.
   a. Powder coated steel square tubing construction.
   b. Shall include a full width storage shelf.
   c. Shall be capable of adding 5” casters.
   d. Seismic restraints with anchor bolts for floor mount design.

2. Ultraviolet (UV) lamp – germicidal 254 nm wavelength lamp – Shall be NSF Approved.

3. IV Bar with stainless steel hooks – shall be NSF Approved.

4. Mass Airflow Monitor with integration into operating system that provides digital display of airflow readings and audible/visual alarms should readings be excessively low or high.

5. Aspirator (Pump) Systems – for safe removal and handling of hazardous fluids.

6. Gross Particulate Pre Filters
   a. Consumable G4 Filter kits OR
   b. RS 232 Connection ports

7. Work surface with designated area to control temperature for heat/cold sensitive tissues or cultures.

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 biosafety cabinets.

B. Coordinate with other trades for the proper and correct installation of plumbing and electrical rough-in and for rough opening dimensions required for the installation of biosafety cabinets.

C. Examine the carton and its contents for damage that might have occurred in transit.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. General: Install biosafety cabinets according to shop drawings and manufacturer’s written instructions.

B. Install level, plumb and true; securely anchor as required.

C. Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

D. Install according to standards required by authority having jurisdiction.

E. Touch up minor damaged surfaces caused by installation. Replace damaged components as directed by Architect.

3.3 FIELD QUALITY CONTROL

A. NSF/ANSI Standard 49 requires that biosafety cabinets be field tested after installation and prior to use.
   1. A qualified independent (3rd party) certifier should certify the cabinet in accordance with NSF/ANSI Standard 49, Annex F.
   2. Make all corrections until biosafety cabinet passes NSF/ANSI 49 Field Certification.
   3. If connected to building HVAC system, retest all other ventilation equipment that failed to perform as specified.

3.4 ADJUSTING AND CLEANING

A. Adjust moving parts for smooth, near silent, accurate sash operation with one hand. Verify that counterbalances operate without interference.
B. 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.

C. Clean adjacent construction and surfaces that may have been soiled or damaged in the course of installation of work in this section.

D. Provide all necessary protective measures to prevent exposure of equipment and surfaces from exposure to other construction activity.

E. Advise contractor of procedures and precautions for protection of material and installed equipment and casework from damage by work of other trades.

END OF SECTION 115353
SECTION 122413 - ROLLER WINDOW SHADES

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. Manually operated roller shades with single rollers at all exterior windows.
   B. Related Requirements:
      1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking and grounds for mounting roller shades and accessories.
      2. Section 079200 "Joint Sealants" for sealing the perimeters of installation accessories for light-blocking shades with a sealant.

1.3 ACTION SUBMITTALS
   A. Product Data: For each type of product.
      1. Include styles, material descriptions, construction details, dimensions of individual components and profiles, features, finishes, and operating instructions for roller shades.
   B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
   C. Samples for Verification: For each type of roller shade.
      1. Roller Shade: Full-size operating unit, not less than 16 inches wide by 36 inches long for each type of roller shade indicated.
      2. Installation Accessories: Full-size unit, not less than 10 inches long.
   D. Roller-Shade Schedule: Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.

1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For roller shades to include in maintenance manuals.

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. Roller Shades: Full-size units equal to 5 percent of quantity installed for each size, color, and shadeband material indicated, but no fewer than two units.

1.7 QUALITY ASSURANCE
   A. Installer Qualifications: Fabricator of products.

1.8 DELIVERY, STORAGE, AND HANDLING
   A. Deliver roller shades in factory packages, marked with manufacturer, product name, and location of installation using same designations indicated on Drawings.

1.9 FIELD CONDITIONS
   A. Environmental Limitations: Do not install roller shades until construction and finish work in spaces, including painting, is complete and dry and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.
   B. Field Measurements: Where roller shades are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication and indicate measurements on Shop Drawings. Allow clearances for operating hardware of operable glazed units through entire operating range. Notify Architect of installation conditions that vary from Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Mechoshade Thermoveil 1500 Series or comparable product by one of the following:
   1. Draper Inc.

B. Source Limitations: Obtain roller shades from single source from single manufacturer.

2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS drawing designation WS-1

A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
   1. Bead Chains: Manufacturer's standard.
      a. Loop Length: Full length of roller shade.
      b. Limit Stops: Provide upper and lower ball stops.
      c. Chain-Retainer Type: Chain tensioner, jamb mounted.

B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
   1. Roller Drive-End Location: Right side of inside face of shade.
   2. Direction of Shadeband Roll: Regular, from back of roller.

C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.

D. Shadebands:
   2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
      a. Type: Enclosed in sealed pocket of shadeband material.
      b. Color and Finish: As selected by Architect from manufacturer's full range.

E. Installation Accessories:
   1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
      a. Shape: L-shaped.
      b. Height: Manufacturer's standard height required to conceal roller and shadeband when shade is fully open, but not less than 3 inches.
   2. Endcap Covers: To cover exposed endcaps.
   3. Recessed Shade Pocket: Rectangular, extruded-aluminum enclosure designed for recessed ceiling installation; with front, top, and back formed as one piece, end plates, and removable bottom closure panel.
      a. Height: Manufacturer's standard height required to enclose roller and shadeband when shade is fully open, but not less than 4 inches.
      b. Provide pocket with lip at lower edge to support acoustical ceiling panel.
   4. Installation Accessories Color and Finish: As selected from manufacturer's full range.

2.3 SHADEBAND MATERIALS

A. Shadeband Material Flame-Resistance Rating: Comply with NFPA 701. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

B. Light-Filtering Fabric: Woven fabric, stain and fade resistant.
   2. Type: PVC-coated polyester.
   4. Roll Width: As indicated on Drawings.
   5. Orientation on Shadeband: As indicated on Drawings.
   6. Openness Factor: 3 percent.
   7. Color: As indicated on Drawings.

2.4 ROLLER-SHADE FABRICATION

A. Product Safety Standard: Fabricate roller shades to comply with WCMA A 100.1, including requirements for flexible, chain-loop devices; lead content of components; and warning labels.

B. Unit Sizes: Fabricate units in sizes to fill window and other openings as follows, measured at 74 deg F:
1. Between (Inside) Jamb Installation: Width equal to jamb-to-jamb dimension of opening in which shade is installed less 1/4 inch per side or 1/2-inch total, plus or minus 1/8 inch. Length equal to head-to-sill or floor dimension of opening in which shade is installed less 1/4 inch, plus or minus 1/8 inch.

C. Shadeband Fabrication: Fabricate shadebands without battens or seams to extent possible except as follows:
   1. Vertical Shades: Where width-to-length ratio of shadeband is equal to or greater than 1:4, provide battens and seams at uniform spacings along shadeband length to ensure shadeband tracking and alignment through its full range of movement without distortion of the material.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ROLLER-SHADE INSTALLATION
   A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

3.3 ADJUSTING
   A. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.

3.4 CLEANING AND PROTECTION
   A. Clean roller-shade surfaces after installation, according to manufacturer's written instructions.
   B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that roller shades are without damage or deterioration at time of Substantial Completion.
   C. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413
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SECTION 123553 - WOOD LABORATORY CASEWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
A. Drawings and general provisions of the Contract, including General and Supplementary Conditions, apply to this Section.

1.2 SUMMARY
A. Section Includes:
   1. Movable Bench System - complete with piped utilities power and data at each unit
   2. Wood laboratory casework
   3. Utility-space framing at backs of base cabinets
   4. Filler and closure panels
   5. Laboratory casework system that includes support and utility-space framing, filler and closure panels, under cabinet LED lighting, wiremold power strips and modular countertops
   6. Shelves
   7. Laboratory sinks
   8. Laboratory accessories
   9. Water, laboratory gas, and electrical service fittings
B. Related Requirements:
   1. Section 061053 "Miscellaneous Rough Carpentry" for wood blocking for anchoring laboratory casework
   2. Section 092216 "Non-Structural Metal Framing" for reinforcements in metal-framed partitions for anchoring laboratory casework
   3. Section 096513 "Resilient Base and Accessories" for resilient base applied to wood laboratory casework
   4. Section 115313 "Laboratory Fume Hoods" for fume hoods
   5. Section 123653 "Laboratory Worksurfaces" for epoxy tops installed on wood casework

1.3 DEFINITIONS
A. Exposed Surfaces of Casework: Surfaces visible when doors and drawers are closed, including bottoms of cabinets more than 48 inches above floor, and visible surfaces in open cabinets or behind glass doors.
   1. Ends of cabinets, including those installed directly against walls or other cabinets, are defined as "exposed."
   2. Ends of cabinets indicated to be installed directly against and completely concealed by walls or other cabinets are defined as "concealed."
B. Semi exposed Surfaces of Casework: Surfaces behind opaque doors, such as cabinet interiors, shelves, and dividers; interiors and sides of drawers; and interior faces of doors. Tops of cases 78 inches or more above floor and bottoms of cabinets more than 24 inches but less than 48 inches above floor are defined as semi exposed.
C. Concealed Surfaces of Casework: Include sleepers, web frames, dust panels, and other surfaces not usually visible after installation.
D. MDF: Medium-density fiberboard.
E. Hardwood Plywood: A panel product composed of layers, or plies, of veneer, or of veneers in combination with lumber core, hardboard core, MDF core, or particleboard core, joined with adhesive and faced both front and back with hardwood veneers.

1.4 PREINSTALLATION MEETINGS
A. Preinstallation Conference: Conduct conference at Project site.
B. Keying Conference: Conduct conference at Project site. Incorporate keying conference decisions into final keying requirements.

1.5 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.

1.6 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 and keying of locks.
3. Indicate locations and types of service fittings.
4. Indicate locations of blocking and reinforcements required for installing laboratory casework.
5. Include details of utility spaces showing supports for conduits and piping.
6. Include details of support framing system.
7. Include details of exposed conduits, if required, for service fittings.
8. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
9. Include coordinated dimensions for laboratory equipment specified in other Sections.

C. Keying Schedule: Include schematic keying diagram, and index each key set to unique designations that are coordinated with the Contract Documents.

D. Samples for Verification: For each type of cabinet finish in manufacturer's standard sizes.

1.7 INFORMATIONAL SUBMITTALS

A. Qualification Data: For manufacturer.

1.8 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish complete touchup kit for each type and color of wood laboratory casework provided. Include scratch fillers, stains, finishes, and other materials necessary to perform permanent repairs to damaged laboratory casework finish.

B. Manufacturer Qualifications: A qualified manufacturer that produces casework of types indicated for this Project that has been tested for compliance with SEFA 8 W.

1.9 DELIVERY, STORAGE, AND HANDLING

A. Protect finished surfaces during handling and installation with protective covering of polyethylene film or other suitable material.

1.10 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 MOVABLE BENCH SYSTEM

A. Modular movable h-frame-style laboratory casework units with matching stand-alone table frames, as shown on the drawings.

B. Manufacturers: Products complying with this specification may be provided by the following manufacturers. All products specified in this section shall be the provided by a single manufacturer.
1. Air Master Systems
2. Bedcolab Ltd
3. CiF Lab Solutions
4. Kewaunee Scientific Corporation
5. Mott Manufacturing Ltd.

C. System requirements:
1. Fully-welded framework with slotted uprights to support work surface table frames and shelving components; and matching stand-alone table frames.
2. The vertical framework shall be designed to allow for piped utility service fixtures, electrical/data outlets and supply pipework/cabling lines utilizing the vertical frame system as a utility chase.
3. The vertical height of work surfaces shall be adjustable from 30 inches high to 37 inches high, in 1 inch increments.
4. The upper shelving units shall be adjustable in 1 inch increments.

D. Vertical Framework and cross rails: minimum 11 gauge steel.
1. Vertical uprights shall allow for internal plumbing, electrical and data cabling.
   a. Gas piping and high/low voltage cabling shall be separated in opposite and separate vertical members.
   b. Cabled vertical upright shall have two channels to separate low voltage from high voltage cabling.
   c. Uprights shall include removable panels to allow access to piping and electrical services.
2. Top and bottom of the vertical support members shall be capped if not used for services and leveling.
3. Upright to have slots punched on 1 inch increments starting at nominal 55 inches above the floor to the top of the uprights.
4. Lower horizontal cross rail shall serve as an integral power/data raceway with removable bottom cover. Bottom cover shall be held in place with screws. Provide metal dividers within raceway between power and data cabling compartments.
5. Upper horizontal cross rail may be used for routing of power and electrical cables. Provide metal dividers between power and data cabling compartments. Upper horizontal cross rail shall be provided with a top enclosure panel secured with screws.
6. Provide piped utilities, power, and data services at each unit as shown on the drawings.
   a. All utility services (plumbing, power, phone and data) shall terminate at one end of the top of the vertical framework.
   b. Electrical power devices shall comply with the requirements of Division 26.
      1) Power services shall have a restrained cord and plug extending 4 foot above the top of the upright. Plug end to be twist lock, appropriate for the quantity of circuits at each workstation as shown on the drawings.
7. Worksurface frame shall be 11 gauge formed steel. Rear corners shall have 2 ¼ inch diameter X 6 inch high 11 gauge collar. The front half of the collar shall be welded to the worksurface frame with supporting gussets and the back half mechanically fastened to the rear uprights with socket head button cap and bolt.
8. Worksurface table frame shall be able to detach from the rear frame and form a four-leg adjustable height table with the addition of two legs.
E. Matching Stand-Alone Table Frames: Stand-alone table frames designed to match the profile and style of the movable metal casework system.
F. Levelers: Provide levelers at the bottom of each frame member.
   1. Levelers to be 3/8 inch diameter, 2 ½ inch long.
   2. Provide two levelers per shared vertical framework upright.
   3. Provide one leveler per workstation framework table frame leg.
   4. Provide one leveler per movable table frame leg.
G. Load rating:
   1. 100 lbs. per linear foot of width to maximum of 800 lbs.
   2. With 800 lbs. of uniformly distributed load the maximum allowable deflection shall be 0.125 inch measured at the front center rail.
H. Work Surfaces:
   1. As specified elsewhere in this section.
I. Adjustable Shelving
   1. High-Pressure Decorative Plastic Laminate Shelving as specified elsewhere in this section.
   2. Shelf depth: 12 inches, unless otherwise indicated.
   3. Shelf Brackets: 11 gauge (1.6 mm thick) bookend type, as detailed on drawings.
   4. Safety edging:
J. Load capacity:
   1. Shelves shall have a load capacity of 40 pounds per square foot, up to a maximum of 200 pounds per shelf.
   2. Worksurface: SEFA 10 Loading Category 3 (1,000 Pounds).
K. Privacy Panels:
   1. Tackable acoustically-absorptive ¾ inch thick wood fiber panel wrapped in fully-adhered flame-retardant fabric with metal channel perimeter frame.
   2. Fabric to be tackable and self-healing. Color to be selected by the Architect.
   3. Fire rating: Class C.
   4. Frame panel in 14 gauge channel-shaped steel frame, ½ inch tall.
L. Hardware: As specified elsewhere in this Section.
M. Metal Casework Color: As selected by the Architect from manufacturer's full color line and complying with finish requirements described below.

2.2 WOOD LABORATORY CASEWORK MANUFACTURERS
A. Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   1. CIF Lab Solutions
   2. Kewaunee Scientific Corporation; Laboratory Products Group.
   3. Mott Manufacturing Ltd.
4. ICI Wood Laboratory Casework
5. Diversified Woodcrafts Inc.

B. Source Limitations: Obtain laboratory casework from single source from single manufacturer unless otherwise indicated.
   1. Obtain accessories and service fittings from casework manufacturer.

C. Product Designations: Drawings indicate sizes and configurations of laboratory casework by referencing designated manufacturer's standard sizes. Other manufacturers' laboratory casework of similar sizes and similar door and drawer configurations and complying with Specifications may be considered.

2.3 PERFORMANCE REQUIREMENTS
A. System Structural Performance: Laboratory casework and support framing system shall withstand the effects of the following gravity loads and stresses without permanent deformation, excessive deflection, or binding of drawers and doors:
   2. Wall Cabinets (Upper Cabinets): 160 lb/ft.
B. Model building codes and ASCE/SEI 7 establish criteria for buildings subject to earthquake motions. Verify requirements of authorities having jurisdiction.

2.4 CASEWORK, GENERAL
A. Casework Product Standard: Comply with SEFA 8 W, "Laboratory Grade Wood Casework."
B. Flammable Liquid Storage: Where cabinets are indicated for solvent or flammable liquid storage, provide units that are listed and labeled as complying with requirements in NFPA 30 by a testing and inspecting agency acceptable to authorities having jurisdiction.
C. 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.
D. Low-Emitting Materials: Fabricate casework, including countertops, with adhesives and composite wood products containing no urea formaldehyde.

2.5 WOOD CASEWORK
A. Design: Reveal overlay with radiused edges.
   1. Provide 1/8-inch reveals between doors and drawers that are adjacent.
B. Wood Species: To be determined.
C. Cut: Plain sliced/sawn.
D. Matching:
   1. None required; select and arrange components for compatible grain and color.
   2. Provide veneers for each cabinet from a single flitch, book and running matched.
      a. Provide continuous matching of adjacent drawer fronts within each cabinet.
E. Grain Direction:
   1. Vertical on both doors and drawer fronts, with continuous vertical matching.
F. Exposed Materials:
   1. General: Provide materials that are selected and arranged for compatible grain and color. Do not use materials adjacent to one another that are noticeably dissimilar in color, grain, figure, or natural character markings.
   2. Plywood: Hardwood plywood, either veneer core or particleboard core, made without urea formaldehyde with face veneer of species indicated. Grade A exposed faces, at least 1/50 inch thick, and Grade J crossbands. Provide backs of same species as faces.
G. Semiexposed Materials:
   1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects, of same species as exposed solid wood.
   2. Plywood: Hardwood plywood of same species as exposed plywood. Grade B faces and Grade J crossbands. Provide backs of same species as faces.
   3. Provide solid wood or hardwood plywood for semiexposed surfaces unless otherwise indicated.
   4. Metal for Steel Drawer Pans: Cold-rolled, carbon-steel sheet complying with ASTM A 1008/A 1008M; matte finish; suitable for exposed applications.
H. Concealed Materials:
   1. Solid Wood: Any species, with no defects affecting strength or utility.
   3. Particleboard.
   4. MDF.
5. Hardboard.

2.6 WOOD CABINET MATERIALS
A. Maximum Moisture Content for Lumber: 7 percent for hardwood and 12 percent for softwood.
B. Hardwood Plywood: HPVA HP-1, particleboard core except where veneer core is indicated, and made without urea formaldehyde.
C. Particleboard: ANSI A208.1, Grade M-2; made with binder containing no urea formaldehyde.
D. Hardboard: ANSI A135.4, Class 1 Tempered.
E. Edgebanding for Wood-Veneered Construction: Minimum 1/8-inch-thick, solid wood of same species as face veneer.
   1. Select wood edge banding for grain and color compatible with face veneers.
   2. Colors: As selected by Architect from manufacturer's full range.

2.7 AUXILIARY CABINET MATERIALS
A. Acid Storage-Cabinet Lining: 1/4-inch-thick, polyethylene or polypropylene.
B. Glass for Glazed Doors: Clear float glass complying with ASTM C 1036, Type I, Class 1, Quality-Q3; not less than 3.0 mm thick.

2.8 FABRICATION
A. Utility-Space Framing: Steel framing units consisting of two steel slotted channels complying with MFMA-4, not less than 1-5/8 inches square by 0.105-inch nominal thickness, and connected at top and bottom by U-shaped brackets made from 1-1/4-by-1/4-inch steel flat bars. Framing units may be made by welding specified channel material into rectangular frames instead of using U-shaped brackets.
B. Removable Backs: Provide backs that can be removed from within cabinets at utility spaces.
C. 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 adjacent exposed cabinet surfaces unless otherwise indicated.
   1. Provide knee-space panels (modesty panels) at spaces between base cabinets, where cabinets are not installed against a wall or where space is not otherwise closed.
   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.

2.9 LABORATORY CASEWORK SYSTEM
A. Provide casework manufacturer's standard integrated system that includes support framing, suspended modular wood cabinets, filler and closure panels, wall panels, countertops, and fittings needed to assemble system. System includes hardware and fasteners for securing support framing to permanent construction.
   1. Cabinets can be removed and reinstalled without use of special tools for relocation within system.
   2. Base cabinets can be removed without providing temporary support for, or removing, countertops.
   3. Sinks are supported independent of base cabinets.
   4. Support framing has provision for fastening pipe supports at utility space in not more than 1-inch increments.
   5. System includes filler and closure panels to close spaces between support framing, cabinets, shelves, countertops, floors, and walls unless otherwise indicated. Fabricate from same material and with same finish as adjacent exposed cabinet surfaces unless otherwise indicated.
B. Support Framing: Casework manufacturer's standard system consisting of vertical supports and connecting braces and rails as follows:
   1. Cabinets, shelves, and countertops are supported from vertical supports except where floor-supported base cabinets are indicated. Vertical positioning of supported cabinets, shelves, and countertops can be varied in 1-inch increments through full height of supports.
   2. Vertical supports rest on adjustable leveling bases and are secured to floor with metal clips fastened to floor.
   3. Vertical supports are installed with braces and rails, connecting them to each other and to permanent building walls to create a stable, rigid structure with framed utility spaces where indicated.
   4. Vertical supports are braced at floor with cantilevered horizontal leg members where indicated.
C. Undercabinet / shelving Task-Light Fixtures: LED fixtures with switch and heavy-duty cord and plug.
   1. Basis of Design Kewaunee LED task Lighting
   2. Thin profile, white LED strip 9.5mm height by 33mm deep with touch dimmer switch. UL listed 120VAC with 10’ power cord. Includes magnetic mounting strip for mounting to steel shelving and tabs for alternate screw mounting
D. Horizontal mount power wiremold. Located as indicated on drawings.

2.10 WOOD FINISH
A. Preparation: Sand lumber and plywood before assembling. Sand edges of doors, drawer fronts, and molded shapes with profile-edge sander. Sand after assembling for uniform smoothness at least equivalent to that produced by 220-grit sanding and without machine marks, cross sanding, or other surface blemishes.
B. Staining: Remove fibers and dust and apply stain to exposed and semi-exposed surfaces as necessary to match approved Samples. Apply stain in a manner that produces a consistent appearance. Apply wash-coat sealer before applying stain to closed-grain wood species.
   1. Stain Color: As selected by Architect from manufacturer's full range.
C. Chemical-Resistant Finish: Apply laboratory casework manufacturer's standard two-coat, chemical-resistant, transparent finish. Sand and wipe clean between coats. Topcoat(s) may be omitted on concealed surfaces.
   1. Chemical and Physical Resistance of Finish System: Finish complies with acceptance levels of cabinet surface finish tests in SEFA 8 W. Acceptance level for chemical spot test shall be no more than four Level 3 conditions.

2.11 HARDWARE
A. General: Provide laboratory casework manufacturer's standard, commercial-quality, heavy-duty hardware complying with requirements indicated for each type.
B. Butt 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 high or less and three for doors more than 48 inches high.
C. Frameless Concealed Hinges (European Type): BHMA A156.9, Type B01602, 135 degrees of opening, self-closing. Provide two for doors 48 inches high or less and three for doors more than 48 inches high.
D. Hinged Door and Drawer Pulls: Solid-aluminum, stainless-steel, or chrome-plated-brass back-mounted pulls. Provide two pulls for drawers more than 24 inches wide.
   1. Design: Rectangular loop pulls with rounded corners.
   2. Overall Size: 1-1/4 by 4-1/2 inches.
E. Door Catches: Dual, self-aligning, permanent magnet catches. Provide two catches on doors more than 48 inches high.
F. Drawer Slides: Side mounted, epoxy-coated steel, self-closing; designed to prevent rebound when drawers are closed; complying with BHMA A156.9, Type B05091.
   1. Provide Grade 1HD-100 for drawers not more than 6 inches high and 24 inches wide.
   2. Provide Grade 1HD-200; for drawers more than 6 inches high or 24 inches wide.
   3. Standard Duty (Grade 1): Full-extension type, with polymer rollers.
   4. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Full-extension, ball-bearing type.
G. Drawer Slides: Hardwood runners under centers of drawers with polymer guides fastened to backs of drawers.
H. Label Holders: Stainless steel, aluminum, or chrome plated; sized to receive standard label cards approximately 1 by 2 inches, attached with screws or rivets. Provide on all drawers.
I. Locks: Cam type with five-pin tumbler, brass with chrome-plated finish; complying with BHMA A156.11, Type E07281.
   1. Provide a minimum of two keys per lock and two master keys.
   2. Provide where indicated.
   3. Keying: Key locks separately in each aisle.
   4. Master Key System: Key all locks to be operable by master key.
J. Adjustable Shelf Supports: Powder-coated steel shelf rests complying with BHMA A156.9, Type B04013.
K. Adjustable Wall Shelf Supports: Surface-type steel standards and steel shelf brackets, with epoxy powder-coated finish, complying with BHMA A156.9, Type B04102 and Type B04112.

2.12 LABORATORY ACCESSORIES
A. Reagent Shelves: Provide as indicated, fabricated from same material as adjacent countertop unless otherwise indicated.
B. Burette Rods: Aluminum or stainless-steel rods, 1/2 inch in diameter and 18 inches long, threaded on one end to fit tapered plug adapter for flush socket receptacle. Provide with tapered plug adapter and receptacle.
C. Upright Rod Assembly and Metal Crossbar: Aluminum or stainless steel. Two vertical rods and one horizontal crossbar, 3/4 inch in diameter and 36 inches long unless otherwise indicated; two flush socket receptacles and two crossbar clamps. Ends of vertical rods are tapered to fit receptacles; all other rod ends are rounded.

D. Greenlaw Arm Assembly: Aluminum or stainless-steel vertical rod, tapered on one end to fit flush socket receptacle. Adjustable crossbar of hardwood with black, acid-resistant finish, secured to upright with adjustable clamp. Provide with receptacle.

E. Lattice Assembly: Aluminum or stainless-steel, vertical and horizontal rod lattice assembly with 3/4-inch-diameter rods at approximately 12 inches o.c. with two flush socket receptacles for mounting.
1. Size: 48 inches wide by 36 inches high.

F. Pegboards: Polypropylene, epoxy, or phenolic-composite pegboards with removable polypropylene pegs and stainless-steel drip troughs with drain outlet.

2.1 CEILING SERVICE PANELS

A. Ceiling service panels providing a means to mount and connect electrical outlets, data outlets and quick connect service fixtures.

B. Provide services at each panel as shown on the drawings.

C. Provide factory cut-outs for utilities.

D. Provide panels with electrical and data junction boxes factory attached.

E. Electrical outlets, data outlets, and cover plates shall be by Divisions 26 and 27.

F. Provide piped service quick-connect fittings.

G. Material: Utility panel shall be minimum 16-gauge cold rolled steel with finish as specified for metal fabrications.
   a. Color: To be selected by architect from manufacturer’s full color line.

H. Nominal Dimensions:
   1. Size: 24 inches x 24 inches. Exact size of panel shall be coordinated with architectural reflected ceiling plan and the ceiling grid system profile as specified in Division 09 and as submitted.
   2. Height (including junction boxes): 3 inches.

I. Hold-Down Clips: Coordinate with Division 09 contractor to provide a minimum of six hold-down clips at each utility ceiling panel.

J. Provide service identification as shown on drawings.
   1. Engrave identification into stainless-steel panel and fill with black paint.
   2. Service identification to be silk-screened onto painted metal panel. Stick-on labels are not compliant with this requirement.

2.13 WATER AND LABORATORY GAS SERVICE FITTINGS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Broen Inc.; Distributed by Laboratory Enterprises, a Watts Water Technologies company.
   2. Chicago Faucets; a Geberit company.

B. Service Fittings: Provide units that comply with SEFA 7, "Laboratory and Hospital Fixtures - Recommended Practices." Provide fittings complete with washers, locknuts, nipples, and other installation accessories. Include wall and deck flanges, escutcheons, handle extension rods, and similar items.
   1. Provide units that comply with "Vandal-Resistant Faucets and Fixtures" recommendations in SEFA 7.

C. Materials: Fabricated from cast or forged red brass unless otherwise indicated.
   1. Reagent-Grade Water Service Fittings: Polypropylene, PVC, or PVDF for parts in contact with water.

D. Finish: Acid- and solvent-resistant powder coating complying with requirements in SEFA 7 for corrosion-resistant finishes.
   1. Provide chemical-resistant powder coating in laboratory casework manufacturer’s standard metallic brown, aluminum, white, or other color as approved by Architect.

E. Water Valves and Faucets: Provide units complying with ASME A112.18.1, with renewable seats, designed for working pressure up to 80 psig.
   1. Vacuum Breakers: Provide ASSE 1035 vacuum breakers on water fittings with serrated outlets.
   2. Aerators: Provide aerators on water fittings that do not have serrated outlets.

F. Ball Valves: Chrome-plated ball and PTFE seals. Handle requires no more than 5 lbft to operate. Provide units designed for working pressure up to 75 psig, with serrated outlets.
   1. Where ball valves are indicated for fuel-gas use, provide locking safety handles that must be pushed in before being turned on unless otherwise indicated.
G. **Ground-Key Cocks**: Tapered core and handle of one-piece forged brass, ground and lapped, and held in place under constant spring pressure. Provide units designed for working pressure up to 40 psig, with serrated outlets.

H. **Steam Valves**: Stainless-steel seat and PTFE seat disc. Provide units designed for steam working pressure up to 20 psig, with serrated outlets.

I. **Needle Valves**: Provide units with renewable, self-centering, floating cones and renewable seats of stainless steel or Monel metal, with removable serrated outlets.
   1. Provide units designed for working pressure up to 125 psig.

J. **Hand of Fittings**: Furnish right-hand fittings unless fitting designation is followed by "L."

K. **Remote-Control Valves**: Provide needle valves, straight-through or angle type as indicated for fume hoods and where indicated.

L. **Handles**: Provide three- or four-arm, forged-brass handles for valves unless otherwise indicated.
   1. Provide lever-type handles for ground-key cocks. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
   2. Provide lever-type handles for ball valves unless otherwise indicated. Lever handle aligns with outlet when valve is closed and is perpendicular to outlet when valve is fully open.
   3. Provide heat-resistant plastic handles for steam valves.
   4. Provide knurled, molded-plastic handles for needle valves.

M. **Service-Outlet Identification**: Provide color-coded plastic discs with embossed identification, secured to each service-fitting handle to be tamper resistant. Comply with SEFA 7 for colors and embossed identification.

2.14 **ELECTRICAL AND COMMUNICATION SERVICE FITTINGS**

A. **Service Fittings, General**: Provide units complete with metal housings, receptacles, switches, pilot lights, voice and data communication outlets, cover plates, accessories, and gaskets required for mounting on laboratory casework.
   1. Receptacles, switches, pilot lights, cover plates, and accessories are specified in Division 26.
   2. Voice and data communication outlets are specified in Division 27.

2.15 **SPARE FITTINGS**:

A. **Spare fittings**: In addition to those gas service fittings shown in the drawings, provide 8 additional spare units, delivered to the Owner in unopened containers.

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.
   2. Variation of Bottoms of Upper Cabinets from Level: 1/8 inch in 10 feet.
   3. Variation of Faces of Cabinets from a True Plane: 1/8 inch in 10 feet.
   5. Variation in Alignment of Adjacent Door and Drawer Edges: 1/16 inch.

B. **Utility-Space Framing**: Secure to floor with two fasteners at each frame. Fasten to partition framing, wood blocking, or metal reinforcements in partitions and to base cabinets.

C. **Base Cabinets**: Fasten cabinets to utility-space framing, partition framing, wood blocking, or reinforcements in partitions, with fasteners spaced not more than 16 inches o.c. Bolt adjacent cabinets together with joints flush, tight, and uniform.
   1. Where base cabinets are installed away from walls, fasten to floor at toe space at not more than 24 inches o.c. and at sides of cabinets with not less than two fasteners per side.

D. **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 o.c.

E. **Install hardware uniformly and precisely**: Set hinges snug and flat in mortises.
F. 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. Refer to Section 123653 Laboratory Worksurfaces.

3.4 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.

3.5 INSTALLATION OF SERVICE FITTINGS
   A. Comply with requirements in other Sections for installing water and laboratory gas service fittings and electrical devices.
   B. Install fittings according to Shop Drawings, installation requirements in SEFA 2.3, and manufacturer's written instructions. Set bases and flanges of sink- and countertop-mounted fittings in sealant recommended by manufacturer of sink or countertop material. Securely anchor fittings to laboratory casework unless otherwise indicated.

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 plastic or other suitable water-resistant covering. Tape to underside of countertop at a minimum of 48 inches o.c.

3.7 SERVICE-FITTING SCHEDULE
   A. Laboratory Gas Service Fitting
      1. Service: Air, Gas (fuel gas) and Vacuum.
      2. Fitting Type: Turret.
      3. Outlets: Two, at 90 degrees or as required for bench situation.
      4. Outlet Type: Angled.
      5. Valve Type: Needle valve.

END OF SECTION 123553
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SECTION 123554 - METAL LABORATORY CASEWORK

PART 1 - GENERAL

1.1 SECTION INCLUDES
A. Relocation of existing Metal laboratory casework
B. New metal cabinets and cabinet hardware to match existing (currently in room 144 and 148).
C. Laboratory Island Modules
D. Laboratory Sinks.
E. Laboratory Countertops.

1.2 RELATED REQUIREMENTS
A. Section 061053 – Miscellaneous Rough Carpentry for wood blocking for anchoring laboratory casework
B. Divisions 22 and 26 for installing service fittings specified in this Section, including connecting service utilities.

1.3 REFERENCE STANDARDS
B. ASTM A1008/A1008M - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength, Low Alloy, and High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable; 2011
F. SEFA 1.2 - Laboratory Fume Hoods; 2010.
G. SEFA 2.3 - Installation of Scientific Laboratory Furniture and Equipment; 2010.
H. SEFA 3 - Work Surfaces; 2010.
I. SEFA 7 - Laboratory and Hospital Fixtures; 2010.
J. SEFA 8 - Laboratory Casework; 2010.

1.4 SUBMITTALS
A. Product Data: Details of materials, component dimensions and configurations, construction details, joint details, attachments; manufacturer's catalog literature on hardware, accessories, and service fittings, if any.
B. Shop Drawings: Casework locations, large scale plans, elevations, cross sections, rough-in and anchor placement dimensions and tolerances, clearances required, and utility locations, if any.
   1. Indicate locations of hardware.
   2. Indicate locations and types of service fittings.
   3. Indicate locations of blocking and reinforcements required for installing laboratory casework.
   4. Include details of utility spaces showing supports for conduits and piping.
   5. Include details of support framing system.
   6. Include details of exposed conduits, if required, for service fittings.
   7. Indicate locations of and clearances from adjacent walls, doors, windows, other building components, and other laboratory equipment.
   8. Include coordinated dimensions for laboratory equipment specified in other Sections.

1.5 QUALITY ASSURANCE
A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience and has been tested for SEFA 8 compliance.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. Metal Laboratory Casework:
      a. A.T. Villa, Inc.
      b. Mott Manufacturing
2.2 METAL LABORATORY CASEWORK

A. Casework: intent is to match existing. Die-formed metal sheet; each unit self-contained and not dependent on adjacent units or building structure for rigidity; factory-fabricated, -assembled, and -finished.
   2. Sheet Metal: Steel.
      a. Gables, Front and Back Panels, Gusset Plates and Rails: 18 gage thick.
      b. Door Fronts, Drawers, Cabinet Floors, Shelves, Filler Panels and Drawer Dividers: 20 gage thick.
      c. Backing Sheet to Door and Door Fronts: 22 gage thick.
   3. Structural Performance: In addition to the requirements of SEFA 3, 7 and 8, provide components that safely support the following minimum loads, without deformation or damage:
      a. Base Units: 500 pounds per linear foot (744 kg per m) across the cabinet ends.
      b. Drawers: 125 pounds (57 kg).
      c. Hanging Wall Cases: 300 pounds (136 kg).
      d. Shelves: 100 pounds (45 kg).
   4. Corners and Joints: Without gaps or inaccessible spaces or areas where dirt or moisture could accumulate.
   5. Edges and Seams: Smooth. Form counter tops, facing, shelves, and drain boards from continuous sheets.
   6. Shelf Edges: Turn down 1 inch on each side and return 5/8 inch front and back.
   8. Welding: Electric spot weld; grind joints smooth and flush.
   9. Drawers and Doors: Fabricate drawer and door fronts of sandwiched sheets of sheet steel welded together and reinforced for hardware.
      a. Locks as indicated on drawings
   10. Glazing: With gasket and removable stops; minimize rattling and vibration.
   11. Fixture Locations: Cut and drill counter tops, backs, and other components for service outlets and fixtures.
   12. Access Panels: Provide access panels for maintenance of utility service fixtures and fittings and mechanical and electrical components.
   13. Filler Panels: Where cabinets do not fit tight to adjacent construction, provide filler panels of matching construction and finish.
   15. Separation: Use bituminous paint or non-conductive tape to coat metal surfaces in contact with cementitious materials and to separate dissimilar metals.

B. 12" Island Structural Modules:
   1. The Structural Module is the primary support structure for the Adjustable Worksurface Frames, Shelving, and Suspended Casework. It can also be used as a chase and support structure for electrical and plumbing services.
   a. Module uprights are extruded aluminum with a double slotted steel insert for Shelving and Adjustable Worksurfaces on 1" increments. On 84" high modules, the upright is split at either the 36" or 46" height to allow for future removal or relocation of the upper portion.
   2. Upper Carrier: Module frames are manufactured of 16 gauge CRS steel and lock into uprights to form a rigid connection. These frames are designed to accommodate the removable access panels, and are to be provided with electrical cutouts as indicated on the drawings.
      a. Provide height of 84" and lengths of 48".
   3. Adjustable Module Shelving:
      a. Adjustable Module Shelves attaches to the structural module upright, are supported by 11 gauge brackets which mount to the inner slot of the double slotted Support Module Upright. They are adjustable in height on 1" increments.
      b. Shelves are available in depths of 6", 8", 12", 18", and 24". Shelves are to match the Support Module length.
      c. Steel shelves are 16 gauge steel, formed down 1" then returned back and up into a channel formation. Shelves of 12" depth and greater are further reinforced with a 20 gauge hat channel welded to the underside.
   4. Electrical and Data
      a. Flush mount double gang boxes, 2 per each side of the module, power and data in each.
      b. Stainless Steel Face Plate, gray devices, unless electrical documents dictate other color devices are required.

2.3 COUNTERTOPS, TABLE TOPS, SINKS AND DRAINAGE BOARDS

A. Stainless Steel Countertops: Make exposed edges and corners straight and uniformly beveled. Provide front and end overhang of 1 inch (25 mm)
1. Marine edge for containment of spillage.
2. Flat Surface Thickness: 1 inch, nominal.

B. Sinks, General: Provide integral stainless steel sinks in sizes indicated or laboratory casework manufacturer's closest standard size of equal or greater volume, as approved by Architect.
   a. End Outlet

2.4 MATERIALS

A. Stainless Steel sheet: type 316 Stainless no 4 finish
B. Glass: Fully tempered float; ASTM C1036, Type 1, Quality Q3; ASTM C1048, tempered using horizontal tempering and complying with ANSI Z97.1; 4 mm thick minimum; exposed edges ground, and cut or drilled to receive hardware; clear.
C. Cabinet Hardware: Manufacturer's standard styles, exposed components stainless steel.
   1. Finish of Exposed Components: No. 4 finish.
   2. Locks: Lock with 4 pin cylinder and 2 keys per lock.
   3. Shelves:
      a. Shelf Standards and Rests: Vertical chrome steel standards with rubber button fitted steel rests.
      b. Shelf Brackets: Vertical chrome steel standards with chrome steel arms.
4. Swinging Doors:
   a. Hinges: Offset pin.
   b. Catches: Magnetic.
   c. Pulls: Stainless Steel wire pulls, 4 inches wide.
5. Sliding Doors:
   a. Pulls: Recessed steel circular design.
   b. Track Assembly: Nylon track with solid bearing followers.
6. Drawers:
   a. Pulls: Rectangular loop pulls with rounded corners Stainless Steel, 4 inches wide.
   b. Slides: Steel, full extension arms, ball bearings; capacity as recommended by manufacturer for drawer height and width.
D. Electrical Outlet Covers: Stainless steel.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify capacity of support framing and anchors.
B. Verify that service connections are correctly located and of proper characteristics.

3.2 INSTALLATION OF CABINETS

A. 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. Perform installation in accordance with manufacturer's instructions and with SEFA 2.3.
C. Use anchoring devices to suit conditions and substrate materials encountered.
D. Set casework items plumb and square, securely anchored to building structure.
E. Align cabinets to adjoining components, install filler panels where necessary to close gaps; seal joints between cabinets and countertops and adjacent construction.
F. Separate dissimilar metals to prevent galvanic action.
G. Vented Cabinets: Install in strict compliance with manufacturer's written installation instructions.
   1. Install vent kits and connect to exhaust system.
   2. Use only rigid materials for venting. No flexible materials permitted.
   3. Plug vent openings in unvented cabinets with manufacturer's standard closure.
H. Replace units that are damaged, including those that have damaged finishes.

3.3 ADJUSTING

A. Adjust operating parts, including doors, drawers, hardware, and fixtures, to function smoothly.
3.4 CLEANING
   A. Clean all components.

3.5 PROTECTION
   A. Do not permit finished casework to be exposed to continued construction activity.
   B. Repair damage that occurs prior to Substantial Completion, including finishes, using methods prescribed by manufacturer; replace units that cannot be repaired to like-new condition.

END OF SECTION
SECTION 123653 LABORATORY WORKSURFACES

PART 1 - GENERAL

1.1 SUMMARY
A. Section Includes:
   1. Epoxy resin worksurfaces.
   2. Setting materials.
   3. Integral sinks
B. Related Sections:
   1. Section 055000 - Metal Fabrications
   2. Section 061000 - Rough Carpentry
   3. Section 079200 - Joint Sealers
   4. Section 123553 - Wood Laboratory Casework
   5. Section 224000 - Plumbing Fixtures

1.2 REFERENCES
A. ASTM International (ASTM) (www.astm.org):
   2. D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
B. GREENGUARD Environmental Institute (GREENGUARD)(www.greenguard.org):
    1. Indoor Air Quality Certification Program.
F. Scientific Equipment and Furniture Association (SEFA) (www.seflabs.com) 3 - Worksurfaces

1.3 SUBMITTALS
A. Submittals for Review:
   1. Shop Drawings:
      a. Submit plan, section, elevation and perspective drawings necessary to describe and convey layout, profiles, and product components, including edge conditions, joints, fitting and fixture locations, anchorage, accessories, and finish colors.
      b. Verify actual measurements/openings by field measurements before fabrication; show recorded measurements on Shop Drawings.
      c. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.
   2. Product Data: Manufacturer's data sheets on each product to be used, including:
      a. Preparation instructions and recommendations.
      b. Storage and handling requirements and recommendations.
      c. Installation methods.
   3. Samples:
      a. Selection samples: For each finish product specified, submit complete set of color chips representing manufacturer's full range of standard colors.
b. Verification samples: For each finish product specified, submit samples representing actual product color; supplied product color and gloss may vary slightly from supplied samples.

B. Quality Control Submittals:
   1. Test Reports: Certified test reports or recognized evaluation reports showing compliance with specified performance characteristics and physical properties.

C. Closeout Submittals:
   1. Maintenance Data:
      a. Provide maintenance, cleaning, and life cycle information.
      b. Include recommended cleaning materials and procedures, and list of materials detrimental to epoxy resin.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications:
   1. Primary products furnished by single manufacturer with minimum 10 years documented experience in work of this Section.
   2. Products manufactured in ISO 9001 certified facility.

B. Installer Qualifications: Minimum 5 years documented experience in work of this Section.

C. Mockup:
   1. Construct worksurface mockup, 6 feet wide x full depth.
   2. Include worksurface and trim.
   3. Locate where directed by owner.
   4. Approved mockup may remain as part of the Work if review comments are corrected.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Delivery:
   1. Use pallets larger than sheets during transportation.
   2. Package materials to prevent damage during shipping and handling.

B. Storage:
   1. Store products in enclosed area protected from ultraviolet.
   2. Store products in manufacturer's unopened packaging until ready for installation.
   3. Store panels using protective dividers to avoid damage to surfaces.
   4. For horizontal storage, store sheets on pallets of equal or greater size than sheets with protective layer between pallet and sheet and on top of uppermost sheet.
   5. Do not store sheets or fabricated panels vertically.

C. Handling:
   1. If protective film is provided, do not remove until panel has been installed.
   2. Handle sheets to prevent damage.
   3. Remove stickers immediately after installation.

1.6 PROJECT CONDITIONS

A. Do not install products under environmental conditions outside manufacturer's limits.

B. Avoid direct exposure of products to sunlight.

C. Do not use worksurfaces as bench, ladder, or seating.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Subject to compliance with these specifications, acceptable products include, but are not limited to those manufactured and provided by the following companies:
   1. Durcon
   2. Laboratory Tops
   3. Epoxyn Products

B. Color: Black Onyx or as otherwise selected by Architect.

C. Substitutions: Or approved Equal.

2.2 MATERIALS

A. Solid Epoxy Resin:
   1. Sheets cast from modified epoxy resin and non-asbestos inert fillers with 10 percent of filler certified as post-consumer glass by SCS; compounded mixture cured and thermoset specifically from formulation to provide exceptional physical and chemical resistance required in medium to heavy duty laboratory environments.
   2. Sheets monolithic throughout without surface coating application.
3. Certified to NSF/ANSI 51.

4. Physical properties; minimum acceptable physical performance in accordance with SEFA 3 testing procedures:
   a. Density/specific gravity: Tested to ASTM D792; minimum test rating of 134.8 PSF or 2.16 g/cm.
   b. Rockwell hardness: Tested to ASTM D785; minimum M scale rating of 110.
   c. Fire resistance: tested to ASTM D635; classified as self-extinguishing.
   d. Surface burning characteristics: Tested to ASTM E84; flame spread index 7.4 and smoke develop index of 221.2.
   e. Surface burning characteristics in vertical position: Tested to ASTM D3801; maximum flame spread index of 7.4 and smoke developed index of 221.2.
   f. Coefficient of linear thermal expansion: Tested to ASTM D696; rating of 2.46 x 10^-5.
   g. Heat deflection: Tested to ASTM D648; maximum 205 degrees F or 96 degrees C.
   h. Flexural strength: Tested to ASTM D790; minimum rating 14.9 KPSI or 103 Mpa.
   i. Flexural modulus: Tested to ASTM D790; 2,777,501 PSI or 19.2 Gpa.
   j. Water absorption, 24 hours: tested to ASTM D570; maximum 0.008 percent by weight.
   k. Compression strength: Tested to ASTM D695; minimum 38.4 kpsi or 265 Mpa.
   l. Chemical resistance; minimum acceptable chemical resistance performance in accordance with SEFA 8:

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<th>Result</th>
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<tr>
<td>Dioxane</td>
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<tr>
<td>Ethyl Ether</td>
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<tr>
<td>Formaldehyde 37%</td>
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<tr>
<td>Formic Acid 90%</td>
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<tr>
<td>Furfural</td>
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<tr>
<td>Gasoline</td>
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<td>Hydrochloric Acid, 37%</td>
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<tr>
<td>Hydrofluoric Acid 48%</td>
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<td>Hydrogen Peroxide 28%</td>
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<td>Tincture of Iodine</td>
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<tr>
<td>Methyl Ethyl Ketone</td>
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<td>Methylene Chloride</td>
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<td>Mono Chlorobenzene</td>
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<td>Naphthalene</td>
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<tr>
<td>Nitric Acid, 20%</td>
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<td>Nitric Acid, 30%</td>
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<tr>
<td>Nitric Acid, 70%</td>
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<tr>
<td>Phenol 90%</td>
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<tr>
<td>Phosphoric Acid, 85%</td>
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<tr>
<td>Silver Nitrate, Saturated</td>
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<tr>
<td>Sodium Hydroxide, 10%</td>
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</tr>
<tr>
<td>Sodium Hydroxide, 20%</td>
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<td>Sodium Hydroxide, 40%</td>
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### Reagent Tested

<table>
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<tr>
<th>Reagent Tested</th>
<th>Method</th>
<th>Result</th>
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<tbody>
<tr>
<td>Sodium Hydroxide, Flake</td>
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<tr>
<td>Sodium Sulfide, Saturated</td>
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<td>0</td>
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<tr>
<td>Sulfuric Acid, 25%</td>
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<td>Sulfuric Acid, 85%</td>
<td>B</td>
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</tr>
<tr>
<td>Sulfuric Acid, 96%</td>
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<tr>
<td>Sulfuric Acid 85%, and Nitric Acid 70%, equal parts</td>
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<tr>
<td>Toluene</td>
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<td>Trichloroethylene</td>
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<td>Xylene</td>
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</tr>
<tr>
<td>Zinc Chloride, Saturated</td>
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</tbody>
</table>

### Testing Method Descriptions:

**Method A - Volatile chemicals (organic solvents):** Cotton ball saturated with test reagent is placed in one-ounce bottle (20 x 75mm test tube or similar container) with reservoir of liquid above ball. Container is inverted on test material for period of 24 hours at standard temperature 23 degrees C plus or minus 2 degrees C (73 degrees F plus or minus 4 degrees F).

**Method B - Non Volatile Chemicals:** Five drops (1/4 cc) of test reagent are placed on test material surface. Reagent is then covered with watch glass (25 mm) for period of no less than 24 hours at standard temperature of 23 degrees C plus or minus 2 degrees C (73 degrees F plus or minus 4 degrees F).

### Result Definitions:

- **0 - No Effect:** No detectable change in material surface.
- **1 - Good:** Slight detectable change in color or gloss but no change to function or life of worksurface material.
- **2 - Fair:** Slight surface etching or severer staining. Clearly discernible change in color or gloss but no significant impairment of surface life or function.
- **3 - Poor:** Pitting, cratering or erosion of worksurface material; obvious and significant deterioration. Objectionable change in appearance due to surface discoloration.

### 2.3 EPOXY RESIN SINKS:

**A.** Undermount sinks molded from modified thermosetting epoxy resin, specially compounded and oven cured and set with epoxy cement. Color shall match the adjacent countertop. Drop in units will not be acceptable. Physical properties shall be as described for epoxy resin countertops. Cove inside corners and pitch bottom to threaded drain outlet.

1. SK-1: Size 28” long 15” wide 12” deep with end outlet.
2. SK-2: Size 21” long x 17” wide x 10” deep with end outlet
3. Location: All sinks shown in epoxy resin countertops.
4. Drain location: end as indicated above.
5. Tailpiece: Compatible with drain piping. Color to match sink.
6. Color: Match adjacent epoxy resin countertops.
7. Faucet ledge to be at rear of sink with deck mounted horizontal paddle arm style hand controls located 4” to either side of faucet.
8. Deck mounted eyewash units shall be located per manufacturer’s recommendations.

### 2.4 ACCESSORIES

**A.** Installation Materials: Manufacturer's joint adhesive, panel adhesive, and sealants as required to suit project conditions.

### 2.5 FABRICATION

**A.** Fabricated tops and accessories in accordance with manufacturer's recommendations, approved Shop Drawings, and SEFA 8.

**B.** Epoxy Resin Worksurfaces:

1. **Thickness:**
   - a. 3/4 inch (19 mm) unless otherwise indicated.
   - b. Check each sheet at factory for required thickness.
   - c. Maximum variation in thickness: plus or minus 1/16 inch from corner to corner.
2. **Warpage:**
   - a. Inspect tops for warpage prior to fabrication by placing on true flat surface.
b. Maximum allowable warpage: 1/16 inch in 36 inch span or 3/16 inch in 96 inch span.

3. Fabrication:
   a. Shop fabricate in longest practical lengths.
   b. Bond joints with highly chemical resistant cement with properties and color similar to base material.
   c. Provide 1/8 inch drip groove at underside of exposed edges, set back 1/2 inch from face.
   d. Finish exposed edges.

4. Fabricate tops flat with 1/4 inch raised marine edge at epoxy sink locations.

5. Edge treatment: Standard 1/8 inch chamfered edge or as indicated on drawings.

6. Corner treatment: exposed corners shall be eased slightly for safety.

7. Back and end splashes:
   a. Supplied loose for field installation.
   b. Same material and thickness as worksurfaces.
   c. 4 inches high unless otherwise indicated.
   d. Top-mounted end splash where worksurfaces abut adjacent construction and at locations indicated on Drawings.


9. Make joints between two benches level.

10. Locate joints away from sinks and over or near supports.

11. Sink cutouts: As indicated on Drawings for under mount sink.

12. Allowable tolerances:
   a. Square: Plus or minus 1/64 inch for each 12 inches of length.
   b. Location of cutouts and drilled openings: Plus or minus 1/8 inch of design dimension.
   c. Size of cutouts and drilled openings: Plus 1/8 inch or minus 0 inches.

PART 3 - EXECUTION

3.1 EXAMINATION
   A. Do not begin installation until cabinets have been installed.
   B. Confirm that surfaces to receive tops are plumb and level, with maximum deflection of 1/4 inch (6 mm) in 20 feet.

3.2 PREPARATION
   A. Clean surfaces just prior to installation.
   B. Prepare surfaces using methods recommended by manufacturer.

3.3 INSTALLATION
   A. Install in accordance with manufacturer's instructions and approved Shop Drawings.
   B. Install tops plumb and level.
   C. Scribe to adjacent surfaces in accordance with manufacturer's recommendations.
   D. Fasten tops to supporting construction with adhesives appropriate for use with adjoining construction and as recommended by manufacturer.
   E. Form field joints using manufacturer's recommended adhesive. Form joints to be inconspicuous and nonporous.
   F. Install laboratory shelving, laboratory fume hood base, worksurfaces, pegboards, reagent racks using fasteners and adhesive appropriate for use with adjoining construction and as recommended by manufacturer.

3.4 PROTECTION
   A. Protect installed products until completion of Project.
   B. Touch up, repair, or replace damaged products.

END OF SECTION
SECTION 123661 - SOLID SURFACING COUNTERTOPS

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. Solid-surface-material countertops and backsplashes.
      2. Window sills. At all exterior windows.
   B. Related Requirements:
      1. Section 061053 “Miscellaneous Rough Carpentry” for Countertop supports.

1.3 ACTION SUBMITTALS
   A. Product Data: For countertop materials.
   B. Shop Drawings: For countertops and sills. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.
   C. Samples for Verification: For the following products:
      1. Countertop material, 6 inches square.

1.4 PROJECT CONDITIONS
   A. Field Measurements: Verify dimensions of countertops by field measurements before countertop fabrication is complete.

1.5 COORDINATION
   A. Coordinate locations of utilities that will penetrate countertops or backsplashes.

PART 2 - PRODUCTS

2.1 SOLID-SURFACE-MATERIAL
   A. Solid polymer components
      1. Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
   B. Configuration: Unless otherwise indicated on the drawings, provide counters and windowsills with the following style:
      1. Front: 3/4-inch bullnose Radius edge with apron, 2 inches high with 3/8-inch radius.
      3. End Splash: Matching backsplash and end splash.
   C. Countertops: 1/2-inch-thick, solid surface material with front edge built up with same material.
   D. Backsplashes: 1/2-inch-thick, solid surface material.
   E. Fabrication: Fabricate tops and sills in one piece with shop-applied edges and backsplashes unless otherwise indicated. Comply with solid-surface-material manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
      1. Fabricate with loose backsplashes for field assembly.

2.2 MATERIALS
   A. Particleboard: ANSI A208.1.
   B. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.
   C. Solid polymer components: Cast, nonporous, filled polymer, not coated, laminated or of composite construction with through body colors meeting ANSI Z124.3 or ANSI Z124.6, having minimum physical and performance properties specified.
      1. Basis of Design: Manufacturers: Subject to compliance with requirements, provide products by the following or equal as approved by Owner and Architect.
         a. Corian from the DuPont Company.
      2. Alternate products by one of the following may be considered:
         a. Formica Corporation.
         b. LG Chemical, Ltd.
         c. Meganite Inc.
         d. Samsung Chemical USA, Inc.
3. Colors and Patterns:
   a. **SS-1**: Corian Whisper, Matte finish or as otherwise indicated on finish legend on drawings

**PART 3 - EXECUTION**

3.1 INSTALLATION

A. Install countertops and sills level to a tolerance of 1/8 inch in 8 feet.
B. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Pre-drill holes for screws as recommended by manufacturer. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   1. Install backsplashes and endsplashes to comply with manufacturer's written instructions for adhesives, sealers, fabrication, and finishing.
   2. Seal edges of cutouts in particleboard subtops by saturating with varnish.
C. Adhere Sills to substrate after aligning and leveling substrate. Use adhesive in color to match countertop. Form seams to comply with manufacturers written instructions.

END OF SECTION 123661