PROJECT MANUAL FOR:

VARIOUS LOCATIONS – ROOF REPLACEMENTS

PROJECT NO.: CP220471

AT:
UNIVERSITY OF MISSOURI - COLUMBIA
COLUMBIA, MISSOURI

FOR:
THE CURATORS OF THE
UNIVERSITY OF MISSOURI

PREPARED BY:
RMT ROOFING & WATERPROOFING CONSULTANTS
RYAN O'CONNELL
410 SOVEREIGN COURT #18
MANCHESTER, MO 63011
(636) 391-2185

DECEMBER 7, 2021

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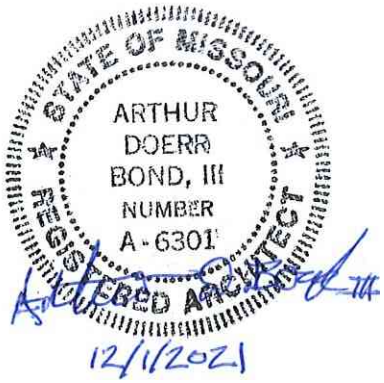
ARCHITECTURAL

The Architects seal on these contract documents has been affixed in accordance with the requirements of Chapter 327, RSMO. In affixing this seal, the Architect takes responsibility for the attached architectural specifications. The Architect hereby disclaims any and all responsibility for project specifications other than these, included in these project documents, they being the responsibility of the other design professionals, whose seals and statements appear herein.

Specification Section 02 8213 and the Hazardous Building Material Survey are technical documents that have been prepared by a qualified third party hazardous materials testing lab. The specification was not prepared under the direct supervision of the architect and therefore is not included as part of the architect's certification.

03 1000	Concrete Forms and Accessories
03 2000	Concrete Reinforcement
03 3000	Cast-In-Place Concrete
03 5100	Gypsum Concrete Roof Deck Repair
05 3150	Steel Deck Repair/Replacement
06 1000	Carpentry Work (For Roofing)
07 5400.1	EPDM Membrane Roofing
07 5400.2	PVC Membrane Roofing
07 5400.4	EPDM Membrane Roofing
07 5400.5	EPDM Membrane Roofing
07 5400.6	EPDM Membrane Roofing
07 5900	Preparation of Re-Roofing
07 6000	Sheet Metal Flashing and Trim



(seal) Signature: Arthur W. Bond III

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END OF SECTION

CAMPUS FACILITIES

General Services Bldg.
Columbia, Missouri 65211
Telephone: (573) 882-3091

ADVERTISEMENT FOR BIDS

Sealed bids for:

VARIOUS LOCATIONS –
ROOF REPLACEMENTS
UNIVERSITY OF MISSOURI
COLUMBIA, MISSOURI
PROJECT NUMBER: CP220471 CONSTRUCTION ESTIMATE $1,042,924 - $1,158,804

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., December 21, 2021 and then immediately opened and publicly read aloud.

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

Questions regarding the scope of work and commercial conditions should be directed to Design Services Project Manager Mark Hoerstkamp at (573) 882-2957 or hoerstkampm@missouri.edu.

A prebid meeting will be held at 8:30 a.m., C.T., December 14, 2021 in the General Services Bldg., Rm 194B, University of Missouri, Columbia, Missouri, followed by a site walk-through. 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 or mucfpmprebidinspectionguides@missouri.edu. A twenty-four-to-forty-eight-hour advance notice is required for all walk-through request. Those on site must follow the University's Show-Me Renewal Guidelines. https://renewal.missouri.edu/safety-expectations/

Information regarding bid results will be available the day following the bid opening by calling (573) 882-1133

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

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

Individuals with special needs as addressed by the Americans with Disabilities Act may contact (573) 882-1133.

Advertisement Date: December 7, 2021

Gary L. Ward
Vice Chancellor for Operations and Chief Operating Officer
University of Missouri

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 Associate Vice Chancellor – Facilities
Room L100, General Services Building
University of Missouri
Columbia, Missouri 65211

1. Bidder, in compliance with invitation for bids for construction work in accordance with Drawings and Specifications prepared by RMT Roofing & Waterproofing Consultants, entitled "Various Locations – Roof Replacements", project number CP220471, dated December 7, 2021 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 remove existing roofing material and underlayment, and replace with new roof for Marx (Melvin H.) Building, Lewis and Clark Halls, Veterinary Medicine East, Trowbridge Center and 417 S. 5th Street; all as indicated on the Drawings and described in these Specifications for sum of: _____ _____DOLLARS ($_____).

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 one hundred ninety-five (195) 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.

5. SUPPLIER DIVERSITY PARTICIPATION GOALS

a. The Contractor shall have as a goal, subcontracting with Minority Business Enterprise (MBE) of ten percent (10%), with Women Business Enterprise (WBE), Disadvantage Business Enterprise (DBE), and/or Veteran Owned Business of ten percent (10%)**;** and with Service Disabled Veteran Owned Business (SDVE) of three percent (3%) 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 (_____%)

WBE, DBE, and/or VETERAN PERCENTAGE PARTICIPATION
_____ percent (_____%)

SDVE 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.

6. BIDDER'S ACKNOWLEDGMENTS

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

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

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

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

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

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

7. 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."

END OF BIDDER'S CERTIFICATE

8. BIDDER'S SIGNATURE

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

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

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

END OF SECTION

UNIVERSITY OF MISSOURI
BIDDER'S STATEMENT OF QUALIFICATIONS

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

1. Company Name_____

   Phone# _____ Fax #:_____

   Address _____

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

_____

_____

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

_____

_____

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

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

12. List banking references.

_____

_____

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

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

Dated at _____ this _____ day of _____ 20____

_____
Name of Organization

_____
Signature

_____
Printed Name

_____
Title of Person Signing

END OF SECTION

UNIVERSITY OF MISSOURI
BIDDER'S STATEMENT OF QUALIFICATIONS FOR ASBESTOS ABATEMENT

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).

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

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.

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

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?

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

_____

_____

_____

_____

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

Yes _____ No _____ If yes, please attach letter.

Signature: _____

Name: _____

Title: _____

Date: _____

APPLICATION FOR WAIVER

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

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

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

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

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

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

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

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

_____

_____

_____

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

_____

_____

_____

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

_____

_____

_____

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

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

Signature_____

Name_____

Title_____

Company_____

Date_____

AFFIDAVIT

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

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

Signature _____

Name _____

Title _____

Date _____

Corporate Seal (where appropriate)

Date _____

State of _____

County of _____

On this _____ day of _____, 19_,

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

_____

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

(Seal)

Notary Public _____

Commission expires _____

AFFIDAVIT FOR AFFIRMATIVE ACTION

State of Missouri)
) ss.
County of)

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

_____

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

My commission expires _____, 19_____.

CERTIFYING SUPPLIER DIVERSITYAGENCIES

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

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

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

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

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

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

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

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

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

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

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

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

Minority Newspapers

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

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

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

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

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

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

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

AFFIDAVIT OF SUPPLIER DIVERSITY PARTICIPATION

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

1. Diverse Firm:_____

   Contact Name: _____

   Address:_____

   Phone No.:_____ E-Mail:_____

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

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

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

   Certification Number:_____

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

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

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

General Contractor:_____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date: _____

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

.

Contractor: _____ Diverse Firm: _____

Signature: _____ Signature: _____

Name: _____ Name: _____

Title: _____ Title: _____

Date: _____ Date:_____

University of Missouri

INFORMATION FOR BIDDERS

Page No.

1. Contract Documents

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

2. Bidder Obligations

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

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

2.3 Failure or omission of any bidder to receive or examine any form, instrument, addendum, or other document, or to visit the site and acquaint themselves with existing conditions, shall in no way relieve them from any obligation with respect to their bid or contract, and no extra compensation will be allowed by reason of 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 somewhere in a university facility.

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

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

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

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

5. Modification and Withdrawal of Bids

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

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

6. Signing of Bids

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

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

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

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

7. Bid Security

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

7.2 Bid security is required as a guarantee that bidder will enter into a written contract and furnish a performance bond within the time and in form as specified in these specifications; and if successful bidder fails to do so, the bid security will be realized upon or retained by the Owner. The apparent low bidder shall notify the Owner in writing within 48 hours (2 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 bid bonds of all other bidders will be destroyed and all other alternative forms of bid bonds will be returned to them within ten (10) days after Owner has determined the two (2) lowest and responsive bids.

8. Bidder's Statement of Qualifications

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

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

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

9. Award of Contract

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

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

10. Contract Execution

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

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

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

11. Contract Security

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

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

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

12. Time of Completion

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

13. Number of Contract Documents

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

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

14. Missouri Products and Missouri Firms

14.1 The Curators of the University of Missouri have adopted a policy which is binding upon all employees and departments of the University of Missouri, and which by contract, shall be binding upon independent contractors and subcontractors with the University of Missouri whereby all other things being equal, and when the same can be secured without additional cost over foreign products, or products of other states, a preference shall be granted in all construction, repair and purchase contracts, to all products, commodities, materials, supplies and articles mined, grown, produced 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. The three percent (3%) goal can be met, and the bonus points obtained, by a qualified SDVE vendor and/or through the use of qualified SDVE subcontractors or suppliers that provide at least three percent (3%) of the total contract value. The submitted bid form must include a minimum of 3% SDVE participation to obtain the three (3) point bonus.

15.2 List of Supplier Diversity Firms

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

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

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

15.3 Supplier Diversity Percentage Goal

The bidder shall have a minimum goal of subcontracting with diverse contractors, subcontractors, and suppliers, the percent of contract price stated in the Supplier Diversity goal paragraph of the Bid for Lump Sum Contract Form.

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15.4 Supplier Diversity Percent Goal Computation

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

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

/DBE goals, a MBE firm bidding as the prime bidder is expected to obtain the required SDVE, and WBE/Veteran/ DBE participation; a WBE or Veteran or DBE firm bidding as the prime bidder is expected to obtain the required MBE and SDVE participation and a SDVE firm bidding as the prime bidder is expected to obtain the required MBE, and WBE/Veteran/ DBE participation.

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

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

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

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

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

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

15.5 Certification by Bidder of Diverse Firms

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

15.5.2 Diverse firms are defined in Article 1 – (Supplier Diversity Definitions) of the General Conditions of the Contract for Construction included in the contract documents, and as those businesses certified as disadvantaged by an approved agency. The bidder is responsible for obtaining information regarding the certification status of a firm. A 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.

University of Missouri

General Conditions

of the

Contract

for

Construction

August 2020 Edition

TABLE OF ARTICLES

ARTICLE 1
GENERAL PROVISIONS

1.1 Basic Definitions

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

1.1.1 Owner

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

1.1.2 Contracting Officer

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

1.1.3 Owner's Representative

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

1.1.4 Architect

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

1.1.5 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 firm must meet Small Business Administration (SBA) size criteria (500 employees or less) and have average annual gross receipts not to exceed $22.41 million. To be considered a DBE/SDB, a small business owned and controlled by socially and/or economically disadvantaged individuals must receive DBE certification from one of the recognized Missouri state agencies to be recognized in this classification.

1.1.9 Work

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

1.1.10 Approved

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

1.1.11 Contract Documents

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

1.1.12 Contract

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

1.1.13 Change Order

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

1.1.14 Substantial Completion

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

1.1.15 Final Completion

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

1.1.16 Supplemental and Special Conditions

The terms "Supplemental Conditions" or "Special Conditions" shall mean the part of the Contract Documents which amend, supplement, delete from, or add to these General Conditions.

1.1.17 Day

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

1.1.18 Knowledge.

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

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

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

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

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

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

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

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

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

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

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

1.2.8 Execution of the Contract by the Contractor is a representation that the Contractor has visited the site, become familiar with local conditions under which the Work is to be performed and correlated personal observations with requirements of the Contract Documents. Contractor represents that it has performed its own investigation and examination of the Work site and its surroundings and satisfied itself before entering into this Contract as to:

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

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

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

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

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

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

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

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

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

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

1.3 Required Provisions Deemed Inserted

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

ARTICLE 2
OWNER

2.1 Information and Services Required of 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 breech of warranty during the applicable warranty period due to defective material or workmanship, the affected part or parts thereof shall be repaired or replaced by the Contractor at no cost to the Owner. Should the Contractor fail or refuse to make the necessary repairs, replacements, and tests when requested by the Owner, the Owner may perform, or cause the necessary work and tests to be performed, at the Contractor's expense, or exercise the Owner's rights under Article 14.

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

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

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

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

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

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

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

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

3.10 Patents

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

3.10.2 If the Contractor uses any design, device, or material covered by letters patent or copyright, he shall provide for such use by suitable agreement with the Owner of such patented or copyrighted design, device, or material. It is mutually agreed and understood, without exception, that the Contract Sum 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 shall relieve Contractor from its obligation to ensure that an "or equal" article, appliance, devise or material strictly complies with the requirements of the Contract Documents. Contractor shall not propose "or equal" items in connection with Shop Drawings or other Submittals, and Contractor acknowledges and agrees that no approvals or action taken by the Architect or Owner's Representative with respect to Shop Drawings or other Submittals shall constitute approval of any "or equal" item or relieve Contractor from its sole and exclusive responsibility. Any changes required in the details and dimensions indicated in the Contract Documents for the incorporation or installation of any "or equal" item supplied by the Contractor shall be properly made and approved by the Architect at the expense of the Contractor. No 'or equal' items will be permitted for components of or extensions to existing systems when, in the opinion of the Architect, the named manufacturer must be provided in order to ensure compatibility with the existing systems, including, but not limited to, mechanical systems, electrical systems, fire alarms, smoke detectors, etc. No action will be taken by the Architect with respect to proposed "or equal" items prior to receipt of bids, unless otherwise noted in the Special Conditions.

3.13 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, samples of finished masonry and field applied paints and finishes shall be located as directed and shall include sample panels built at the site of approximately twenty (20) square feet each.

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

3.15 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 either be returned to the supplier for credit or the appropriate sales or use tax on such excess property or materials shall be reported on a return and paid by such purchasing party not later than the due date of the purchasing party's Missouri sales or use tax return following the month in which it was determined that the materials were not used in the Work.

3.16.4 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 Exemption Certificate. Contractor represents that the Project Tax Exemption Certificate shall be used in accordance with RSMo § 144.062 and the terms of the Project Tax Exemption Certificate. Contractor shall indemnify the Owner for any loss or expense, including but not limited to, reasonable attorneys' fees, arising out of Contractor's use of the Project Tax Exemption Certificate.

3.17 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).

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

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

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

.6 The submission of the updated 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 recision. Claims must be made by written notice. Contractor shall have the responsibility to substantiate Claims.

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

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

4.5 Claims for Concealed or Unknown Conditions

4.5.1 If conditions are encountered at the site which are (1) subsurface or otherwise concealed physical conditions which differ materially from those indicated in the Contract Documents, or (2) unknown physical conditions of an unusual nature, which differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, then notice by the Contractor shall be given to the Owner's Representative promptly before conditions are disturbed, and in no event later than three (3) days after first observance of the conditions. The Owner's Representative will promptly investigate such conditions. If such conditions differ materially, as provided for above and cause an increase or decrease in the Contractor's cost, or time, required for performance of the Work, an equitable adjustment in the Contract sum or Contract Time, or both, shall be made, subject to the provisions and restrictions set for herein. If the Owner's Representative determines that the conditions at the site are not materially different from those indicated in the Contract Documents, and that no change in the terms of the Contract is justified, the Owner's Representative will so notify the Contractor in writing. If the Contractor disputes the finding of the Owner's Representative that no change in the terms of the Contract terms is justified, Contractor shall proceed with the Work, taking whatever steps are necessary to overcome or correct such conditions so that Contractor can proceed in a timely manner. The Contractor may have the right to file a Claim in accordance with the Contract Documents.

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

which the Contractor had the opportunity to make or should have performed in connection with the Project.

4.6 Claim for Additional Cost

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

4.7 Claims for Additional Time

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

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

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

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

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

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

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

4.7.3 A Force Majeure event or circumstance shall not be the basis of a claim by the Contractor seeking an adjustment in the Contract amount for costs or expenses of any type. With the exception of weather delays which are administered under this Article 4, and not withstanding other requirements of the Contract, all Force Majeure events resulting in a delay to the critical path of the project shall be administered as provided in Article 8.

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

4.8 Resolution of Claims and Disputes

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

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

modify the initial Claim, or (3) notify the Owner's Representative that the initial Claim stands.

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

4.9 Administrative Review

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

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

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

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

ARTICLE 5
SUBCONTRACTORS

5.1 Award of Subcontracts

5.1.1 Pursuant to Article 9, the Contractor shall furnish the Owner and the Architect, in writing, with the name, and trade for each Subcontractor and the names of all persons or entities proposed as manufacturers of products, materials and equipment identified in the Contract Documents and where applicable, the name of the installing contractor. The Owner's Representative will reply to the Contractor in writing if the Owner has reasonable objection to any such proposed person or entity. The Contractor shall not contract with a proposed person or entity to whom the Owner has made reasonable and timely objection.

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

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

5.2 Subcontractual Relations

5.2.1 By appropriate agreement, written where legally required for validity, the Contractor shall require each Subcontractor of any tier, to the extent of the Work to be performed by the Subcontractor of any tier, to be bound to

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

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

5.3 Contingent Assignment of Subcontract

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

ARTICLE 6
SEPARATE CONTRACTS AND COOPERATION

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

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

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

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

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

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

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

ARTICLE 7
CHANGES IN THE WORK

7.1 CHANGE ORDERS

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

.1 a change in the Work

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

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

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

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

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

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

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

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

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

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

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

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

.3 Equipment: Breakdown for required equipment shall itemize (at a minimum) delivery / pick-up charge, hourly rate and hours used. Operator hours and rate shall not be included in the equipment breakdown. Contractor must use the most cost effective equipment available in the area and should not exceed the rates listed in the Rental Rate Blue Book for Construction Equipment (Blue Book). Contractor shall submit documentation for the Blue Book to support the rate being requested.

7.2 Construction Change Directive

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

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

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

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

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

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

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

7.3 Overhead and Profit

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

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

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

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

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

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

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

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

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

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

Overhead and Profit

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

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

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

7.4 Extended General Conditions

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

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

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

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

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

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

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

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

7.5 Emergency Work

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

ARTICLE 8
TIME

8.1 Progress and Completion

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

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

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

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

8.2 Delay in Completion

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

8.2.2 All time limits stated in the Contract are of the essence of the Contract. However, if the Contractor is delayed at any time in the progress of the Work by any act or neglect of the Owner or by the Owner's Representative, by changes ordered in the Work, Force Majeure including but not limited to war, armed conflict, riot, civil commotion or disorder, act of terrorism or sabotage; epidemic, pandemic, outbreaks of infectious disease or any other public health crisis, including quarantine or other employee restrictions, compliance with any law or governmental order, rule, regulation or direction, curfew restriction, act of God or natural disaster such as earthquake, volcanic activity, landslide, tidal wave, tsunami, flood, damage or destruction by lightning, drought; explosion, fire, destruction of machines, equipment, prolonged break-down of transport, telecommunication or electric current; general labor disturbance such as but not limited to boycott, strike and lock-out, occupation of factories and premises, or any other causes beyond the Contractor's reasonable control which the Owner's Representative determines may justify delay then, upon submission of the Time Impact Schedule Analysis (TIA) justifying the delay called out in Section 4.7 of these General Conditions, the Contract Time may be extended for a reasonable time to the extent such delay will prevent Contractor from achieving Substantial Completion and/or Final Completion within the Contract Time and if performance of the Work is not, was not or would not have been delayed by any other cause for which the Contractor is not entitled to an extension of the Contract Time under the Contract Documents. It shall be a condition precedent to any adjustment of the Contract Time that Contractor provide the Owner's Representative with written notice of the cause of delay within seven (7) days from the occurrence of the event or condition which caused the claimed delay. If a Force Majeure is approved by the Owner as the basis for a delay claim, an adjustment in the contract time to the extent the Force Majeure impacts the schedule is the only remedy. No increase in the contract sum for any reason shall be allowed due to a Force Majeure.

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

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

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

8.3 Liquidated Damages

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

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

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

ARTICLE 9
PAYMENTS AND COMPLETION

9.1 Commencement, Prosecution, and Completion

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

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

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

.1 Contract

.2 Bond (See Article 11)

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

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

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

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

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

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

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

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

9.2 Contract Sum

9.2.1 The Owner shall compensate Contractor for all Work described herein and in the Contract Documents the Contract Sum set forth in the Contract for Construction, subject to additions and deletions as provided hereunder.

9.3 Schedule of Values

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

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

.1 Enough detail as necessary to adequately evaluate the actual percent complete of any line item on a

monthly basis, as determined by the Owner's Representative.

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

9.4 Applications for Payment

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

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

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

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

No allowance shall be made in the project pay requests for materials not delivered to the site of the work and incorporated into the work, except as noted below. For the purposes of this Article, Offsite is defined as any location not owned or leased by the Owner. Contractor shall submit a list of materials that they are requesting payment for offsite storage within 60 days of Notice 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 tice 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 Contractor and Owner's Representative cannot agree on a revised amount, the Owner's Representative will promptly issue approval for payment for the amount for which the Owner's Representative is able to determine is due Contractor. The Owner's Representative may also decide not to approve payment or, because of subsequently discovered evidence or subsequent observations, may nullify the whole or a part of approval for payment previously issued, to such extent as may be necessary in the Owner's Representative opinion to protect the Owner from loss because of:

.1 defective Work not remedied or damage to completed Work;

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

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

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

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

.6 damage to the Owner or another contractor;

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

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

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

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

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

9.7 Progress Payments

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

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

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

9.7.4 Based on the Schedule of Values submitted by Contractor, Applications for Payment submitted by Contractor shall indicate the actual percentage of completion of each portion of Contractor's Work as of the end of the period covered by the Application for Payment.

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

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

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

9.8 Failure of Payment

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

9.9 Substantial Completion

9.9.1 Substantial Completion is the stage in the progress of the Work as defined in Paragraph 1.1.9 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. When the Work or designated portion thereof is substantially complete, the Owner will issue a Certificate of Substantial Completion. Substantial Completion shall transfer from the Contractor to the Owner responsibilities for security, maintenance, heat, utilities, damage to the Work and insurance. In no event shall Contractor have more than thirty (30) days to complete all items on the Punch List and achieve Final Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion or as agreed otherwise.

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

9.10 Partial Occupancy or Use

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

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

9.11 Final Completion and Final Payment

9.11.1 Upon receipt of written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Owner's Representative and the Architect will promptly make such inspection and, when the Owner's Representative and Architect find the Work acceptable under the Contract Documents and the Contract fully performed, the Owner's Representative will promptly issue a final approval for payment; otherwise, Owner's Representative will return Contractor's Final Application for Payment to Contractor, indicating in writing the reasons for refusing to recommend final payment, in which case Contractor shall make the necessary corrections and resubmit the Application. Submission of a Final Application for Payment shall constitute a further representation that conditions listed in Paragraph 9.11.2 as precedent to the Contractor's being entitled to final payment have been fulfilled. All warranties and guarantees required under or pursuant to the Contract Documents shall be assembled and delivered by the Contractor to the Owner's Representative as part of the final Application for Payment. The final approval for payment will not be issued by the Owner's Representative until all warranties and guarantees have been received and accepted by the Owner.

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

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

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

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

.4 The acceptance by Contractor of its Final Payment, by check or electronic transfer, shall be and operate

as a release of all claims of Contractor against Owner for all things done or furnished or relating to the Work and for every act or alleged neglect of Owner arising out of the Work.

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

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

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

ARTICLE 10
PROTECTION OF PERSONS AND PROPERTY

10.1 Safety Precautions and Programs

10.1.1 The Contractor shall at all times conduct operations under this Contract in a manner to avoid the risk of bodily harm to persons or risk of damage to any property. The Contractor shall promptly take precautions which are necessary and adequate against conditions created during the progress of the Contractor's activities hereunder which involve a risk of bodily harm to persons or a risk of damage to property. The Contractor shall continuously inspect Work, materials, and equipment to discover and determine any such conditions and shall be solely responsible for discovery, determination, and correction of any such conditions. The Contractor shall comply with applicable safety laws, standards, codes, and regulations in the jurisdiction where the Work is being performed, specifically, but without limiting the generality of the foregoing, with rules regulations, and standards adopted pursuant to the Williams-Steiger Occupational Safety and Health Act of 1970 and applicable amendments.

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

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

10.2 Safety Of Persons And Property

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

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

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

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

10.2.2 The Contractor shall give notices and comply with applicable laws, 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.

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

13.6.1 The Contractor shall pay workers employed in the execution of this contract in full each week and not less than the predetermined wage rates and overtime for work of a similar character that have been made a part of this Contract. These rates are determined by the University of Missouri Director of Facilities Planning and Development. The rates are based on wage rates published in the Annual Wage Orders of the Missouri Department of Labor and Industrial Relations (MDLIR). The Contractor is to use MDLIR 8 CSR 30-3.020; .030; .040, .060 in determining the appropriate occupational titles and rates for workers used in the execution of this contract. All determinations and/or interpretations regarding wage rates and classification of workers will be made by the office of the University of Missouri Director of Facilities Planning and Development. The Contractor is responsible for the payment of the aggregate of the Basic Hourly Rate and the Total Fringe Benefits to the workers on the project. Fringe benefit payments may be made to the worker in cash, or irrevocably made by a Contractor or Subcontractor to a trustee or to a third person pursuant to a fund, plan or program, or pursuant to an enforceable commitment, or any combination thereof, to carry out a financially responsible plan or program which was communicated in writing to the workmen affected, for medical or hospital care, pensions on retirement or death, compensation for injuries or illness resulting from occupational activity, or insurance to provide any of the foregoing, for unemployment benefits, life insurance, disability and sickness insurance, accident insurance, for vacation and holiday pay, for defraying costs of apprenticeship or other similar programs, or for other bona fide fringe benefits, but only where the Contractor or Subcontractor is not required by other federal or state law to provide any of the benefits as referenced in §290.210(5) RSMo 1994. Pay for travel, mileage, meals, bonuses, or other expenses are not fringe benefits and cannot be considered part of the workers wage rate. The Contractor shall not make any deductions for food, sleeping accommodations, transportation, use of small tools, uniforms, or anything of any kind or description, unless the Contractor and employee enter into an agreement in writing at the beginning of the worker's term of employment, and such agreement is approved by the Owner. In the event the contract contains more than one wage determination the Contractor shall comply with both.

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

requested, he will abide by any decision made by the Owner regarding underpayment of wages to workers and amounts owed them as well as liquidated damages for underpayment of wages. Falsification of the certified payroll records may result in the debarment of the contractor or subcontractor from future work with the University.

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

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

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

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

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

13.6.8 Contractor acknowledges and recognizes that a material factor in its selection by the Owner is the Contractor's willingness to undertake and comply with the requirements of this Article 13.6. If Contractor fails to comply with the provisions of this Article 13.6, Owner may, in its sole discretion, immediately terminate the Contract upon written notice. The rights and remedies of Owner provided herein shall not be exclusive and are in addition to other rights and remedies provided by law or under this Contract.

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

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

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

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

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

13.7 Records

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

13.8 Codes and Standards

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

.1 ICC International Building Code and reference standards
.2 ICC International Plumbing Code
.3 ICC International Mechanical Code
.4 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 hereby deemed to include a Subcontractor of any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

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

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

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

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

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

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

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

13.10 Certification

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

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

ARTICLE 14
TERMINATION OR SUSPENSION OF THE CONTRACT

14.1 Termination by Owner for Cause

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

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

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

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

.4 disregards laws, ordinances, rules, 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.

SECTION 1.E

SPECIAL CONDITIONS

1. DEFINITIONS

   a. "Drawings"

      Drawings referred to in and accompanying Project Manual consist of Drawings prepared by and bearing name of below defined Architect, bearing Date of December 7, 2021, entitled “Various Locations – Roof Replacements”, project number CP220471.

   b. RMT Roofing & Waterproofing Consultants
      Ryan O’Connell
      410 Sovereign Court #18
      Manchester, MO 63011
      (636) 391-2185

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

2. SPECIAL SCHEDULING REQUIREMENTS

   a. Contractor may begin on-site mobilization prior to approval of shop drawings and materials procurement.

   b. Work shall be continuous with no down time.

   c. Normal working hours are defined as weekdays between the hours of 7:00 AM and 5:00 PM.

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 removal of existing roofing and installation of new roofing system at; Marx (Melvin H.) Building, Lewis and Clark Halls, Veterinary Medicine East, Trowbridge Center and 417 S. 5th Street.

(2) Demolition shall consist of removal of existing roof membrane, coverboard and insulation down to the roof deck as described within the project drawing portion of the contract documents. Some locations have a vapor barrier adhered to concrete deck which shall require removal of loose or deteriorated vapor barrier in entirely.

(3) Architectural work shall consist of installation of new vapor retarder where indicated, installation of fully adhered insulation board, fully adhered coverboard and fully adhered EPDM membrane. Insulation of sheet metal flashing, duct and piping supports as described within the project drawing portion of the contract documents.

4. LOCATION

a. Work shall be performed under this Contract on campus of the University of Missouri – Columbia at the following locations:

(1) Melvin H. Marx Building at 1416 Carrie Franke Dr.
(2) Lewis and Clark Halls at 701 S. 5th Street
(3) Veterinary Medicine East at 825 East Campus Loop
(4) Trowbridge Center at 1024 Ashland Rd
(5) Energy Management at 417 S. 5th Street

5. NUMBER OF CONSTRUCTION DOCUMENTS

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

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

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

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

employees, and representatives that may arise out of or in connection with the use of the electronic files transmitted.

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

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

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

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

6. SUBMITTALS

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

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

c. The Contractor shall submit electronic versions of all required Shop Drawings, material and equipment lists. The Contractor shall upload all Shop Drawings to a secure information sharing website determined by the

Owner notifying the Owner and Consultant that these shop drawings are available for review. Each submittal shall have the General Contractors digital stamp affixed to the first page signifying their review and acceptance. Review comments, approvals, and rejections will be posted on this same site with notification to the contractor. Submittals requiring a professional seal shall be submitted hard copy with a manual seal affixed.

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

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

(2) Reference the accompanying Shop Drawing and Submittal Log at the end of this section (1.E.4) for required submittal information.

d. The Contractor shall submit to the Architect one (1) electronic copy, in PDF form of all required Operating Instructions and Service Manuals with one PDF file per specification division for the Architect's and the Owner's sole use prior to completing 50% of the adjusted contract. Payments beyond 50% of the contract amount may be withheld until all Operating Instructions and Service Manuals are received as referenced in the accompanying Operating Instructions and Service Manual Log at the end of this section (1.E.5).

e. The Contractor shall submit to the Owner's Representative all items referenced in the accompanying Closeout Log (1.E.6) 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 each University Parking lot RP3, WG11, AV2, AV14A and RC9. 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 contractors' 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) 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.

(3) 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.

(4) 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.

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

(6) 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 General Services Building.

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

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

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 ~~is~~ are prohibited from drain disposal. Any product, including contaminated water, being discarded into the storm water or sanitary sewer systems requires written approval from the Owner through a formal "Discharge to Sewer Request" form obtained at Discharge to Sewer Request Form. The contractor should submit the form to the Owner's Representative, not to the Department of Environmental Health and Safety as the form indicates.

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

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

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. Construction Project Fencing:

(1) Project worksite shall be kept continuously protected with, at minimum, a temporary portable fence constructed of woven wire or plastic woven fencing not less than five (5) feet in height and supported by metal tee posts spaced not more than ten (10) feet apart and imbedded in five (5) gallon buckets of concrete or an equivalent method of support. In lieu of five gallon buckets of concrete, metal posts may be driven into ground or asphalt. Fencing shall have reflective devices, such as, tape, ribbon, and/or be painted in a bright fluorescent color. Portions of fence shall be reinstalled when work activities cease and during all non-work periods.

(2) Using existing landmarks, lamp posts, trees or other Owner property for support of fencing is strictly prohibited unless a written waiver is obtained from Owner's Representative.

(3) Use of ribbon, snow fence, chicken wire, rope, and wooden barricades as fencing is prohibited.

(4) Fencing shall be maintained in an "as-installed" condition throughout the life of the project.

(5) The Contractor may use used fencing provided it is in good condition and is satisfactory to the Owner's Representative.

c. Preserving and Protecting Existing Vegetation:

(1) Protection and compensation for damages:

(a) Trees and shrubs within work area designated to remain shall be protected from damage during construction by fencing or armoring as indicated on Drawings or specified herein. Plant protection devices shall be installed before work has begun

and shall be maintained for duration of work unless otherwise directed by Owner's Representative.

(2) Plants within work area designated for removal shall be removed by Contractor.

(3) To prevent compaction of soil over tree roots, vehicles or equipment shall not at any time park or travel over, nor shall any materials be stored within drip line of trees designated to remain.

(4) Owner's Representative will stop work immediately when proper measures are not being employed to protect trees and shrubs. Contractor will be notified to resume work after required protection measures are implemented

(5) Pruning of limbs necessary to repair damage or provide clearance for work shall be done by the MU Landscape Services Department at the direction of the Owner's Representative. Limbs shall be cut off cleanly and cut surfaces treated according to established horticultural standards.

10. SUBSTITUTIONS and EQUALS

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

b. Use of materials, products or equipment other than those named and described in the Contract Documents are substitutions and/or equal. Substitutions and/or equals submitted during the bidding period shall be received by both the Architect and the Owner at least ten calendar days prior to the date for receipt of bids. To be considered, bidder's proposal shall include a complete description of the proposed substitution and/or equal and a comparison of significant qualities of the proposed substitution and/or equal with those specified including drawings, performance and test data, and other information necessary for an evaluation. The Architect's decision on the approval or disapproval of a proposed substitution and/or equal shall be final.

c. If the Architect and Owner approve a proposed substitution prior to receipt of Bids, such approval will be set forth in an Addendum. Bidders shall not rely upon approval made in any other manner.

11. PRE-BID INSPECTION

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

12. ROOF GUARANTEE REQUIREMENT

a. The Contractor shall submit, before issuance of the "Notice to Proceed", a copy of University of Missouri Roofing System No Dollar Limit (NDL) Guarantee, which shall be manually signed by an authorized representative of Manufacturer of each proposed roofing system. Certification shall have original signature.

b. Following final inspection and acceptance of the roofing system(s) by the Owner and the roofing system manufacturer(s), the Contractor shall submit a manually signed standard warranty agreement provided and executed by the roofing system manufacturer for each roofing system provided. Standard warranty agreement(s) shall be of the duration specified in Division 7.

c. University of Missouri three (3) year Contractor's Roofing/Flashing/ Sheetmetal Guarantee shall be signed by the roofing contractor after final inspection and acceptance of each roofing system by Manufacturer and by Owner.

d. The Roofing contractor or subcontractor shall provide the Owner with an Application for a Roof Warranty.

13. 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) Option #1 - Contractor Schedule: Contractor is responsible for the schedule and must comply with the Owner's requirements. See Contractor Schedule Specification included in these documents.

14. COST BREAKOUT FOR OWNER'S ACCOUNTING PURPOSES

a. Contractor will be required to submit the following cost breakout on company letterhead with the bid package.

(1) Cost Break Out #1 (All roofing replacement cost associated to 417 S. 5th Street)

15. 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.

16. GENDER NEUTRAL SIGNAGE

a. All contractor installed signs including signs referenced in General Conditions articles 3.5.3 and 10.2.3 shall be gender neutral in wording.

17. GENERAL REQUIREMENTS FOR CRANE AND HOISTING OPERATIONS

a. All crane and hoisting operations shall be performed in compliance with OSHA 29 CFR 1926. All Operators, riggers, and signal persons must have the proper qualifications and training necessary to perform the intended hoisting activities for this project.

b. Only fully certified and evaluated Operators shall perform equipment operations. Operators in an "Operator in Training" status shall not be used.

c. Submittal requirements:

1. Submit copies of Operator certifications, licenses, and evaluations to the Owners Representative.

2. Submit Rigger and Signal Person qualifications to the Owners Representative.

3. Unless otherwise directed by the Owners Representative, submit a lift plan, and conduct a lift coordination meeting for hoisting or crane operations for any lift greater than 2,000 pounds, or for any multi pick lift. Include protective measures for existing underground utilities, occupied buildings, pedestrian and vehicle pathways, adjacent buildings, and overhead power lines. If the lift is to occur over an occupied building, provide a registered structural engineer's review and verification that the building can resist the impact of a dropped

load for the intended lift. If evacuation of an occupied building is necessary to conduct the lift, the decision for building evacuation or scheduling the lift for off-hours will be determined by the Owner.

18. CONSTRUCTION WASTE MANAGEMENT

a. The goal of Construction Waste Management is to divert construction waste from the sanitary landfill. This shall be accomplished through reuse, recycling and/or salvage of non-hazardous construction and demolition debris to the greatest extent practical. Track and report all efforts related to reuse, recycling and/or salvage of materials from the project (including clean fill material). Report all material types and weights, where material was diverted, type of diversion, documentation (e.g.: waste tickets) of this diversion, and applicable dates. In order to calculate the diversion percentage, total weights of all landfill material (non-hazardous) must also be reported.

This information shall be updated monthly with final submission prior to project substantial Completion. Copies of all applicable receipts, tickets and tracking logs shall be uploaded to the Owner's information sharing website or reported as required by the project manager. Tracking logs shall be reported in tabular form utilizing the MU Construction Waste Management Worksheet.

https://operations.missouri.edu/facilities/contractor-information

END OF SECTION

SECTION 1.E.1

SCHEDULING SPECIFICATION

Option #1

1. GENERAL

a. Time is of the essence for this contract. The time frames spelled out in this contract are essential to the success of this project. The University understands that effective schedule management, in accordance with the General Conditions and these Special Conditions is necessary to insure to that the critical milestone and end dates spelled out in the contract are achieved.

b. Related Documents
Drawings and general provisions of the Contract, including General Conditions' Article 3.17 shall apply to this Section.

c. Stakeholders
A Stakeholder is anyone with a stake in the outcome of the Project, including the University, the University Department utilizing the facility, the Design Professionals, the Contractor and subcontractors.

d. Weather

(1) Contractor acknowledges that there will be days in which work cannot be completed due to the weather, and that a certain number of these lost days are to be expected under normal weather conditions in Missouri.

(2) Rather than speculate as to what comprises "normal" weather at the location of the project, Contractor agrees that it will assume a total of 44 lost days due to weather over the course of a calendar year, and include same in its as planned schedule. For projects of less than a calendar year, lost weather days should be prorated for the months of construction in accordance with the following schedule.

(3) Anticipated weather days for allocation/proration only. For projects lasting 12 months or longer, the 44 days per year plus whatever additional months are included will constitute normal weather.

Jan – 5 days	Feb – 5 days	Mar – 4 days	Apr – 4 days
May – 3 days	Jun – 3 days	Jul – 2 days	Aug – 2 days
Sep – 3 days	Oct – 4 days	Nov – 4 days	Dec – 5 days

2. SCHEDULING PROCESS

a. The intent of this section is to 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 SureTrack or P3, Microsoft Project, Oracle P6, or other standard industry scheduling software, approved by the Owner's Representative.

(2) Schedule Development
Within 2 weeks of the NTP, contractor shall prepare a schedule, preferably in CPM format, but in detailed bar chart format at a minimum, that reflects the contractor's and each subcontractors 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

(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.

k. 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.

l. Total float is herein defined as the measure of leeway in starting or completing an activity without adversely affecting the planned project completion date.

m. 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.

n. Force Majeure Event: Any event that delays the project but is beyond the control and/or contractual responsibility of either party.

o. 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.

p. 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 REQUEST

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, 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.

END SECTION

SECTION 1.E.2

UNIVERSITY OF MISSOURI

ROOFING SYSTEM MANUFACTURER'S NO DOLLAR LIMIT (NDL) GUARANTEE
(Rev 10/2021)

(Manufacturer to complete applicable sections. Submit separate Guarantee form for each building and roofing system prior to issuance of the Notice to Proceed.

Roof System Manufacturer (RSM): _____

Address: _____

City, State, Zip: _____

Guarantee Administrator Telephone: _____

Guarantee Administrator Email: _____

Owner (Campus): _____

Building Name: _____

Address: _____

City, State, Zip: _____

Owner's Project No. and Name: _____

Roof Type: _____

Description of roof area (s):
_____
_____
_____

Description of roof system components:
_____
_____
_____
_____

Guarantee Number: _____

Effective Date: The guarantee period commences on the date of the Roofing Manufacturer's and the Owner's final inspection and acceptance of the roof installation as provided in the contract documents. RSM to re-submit guarantee following final acceptance of the roof by Owner and RSM with the Effective and Expiration Dates entered.

Guarantee Duration: _____

Guarantee Expiration Date: _____

Roofing Contractor (Approved Installer): _____

Address: _____

City, State, Zip: _____

Telephone: _____

Email: _____

Guarantee:
In the event of a leak in the covered roof system prior to the guarantee expiration date, _____ (RSM) guarantees to the University of Missouri that _____ (RSM) will complete the necessary repairs and pay for all materials, labor and related expenses required to restore the roof to a watertight condition, provided such leaks are the result of defects in material, defects in workmanship in installing the roofing system or ordinary wear and tear. RSM further guarantees that permanent repairs shall be completed promptly or, if permanent repairs cannot be completed in a timeframe acceptable to the Owner, then RSM shall make temporary repairs. The University of Missouri will not be responsible for any expenses other than the Owner's incidental coordination resulting from covered repairs. There is no dollar limit on the covered repairs. Leaks caused by materials or components that are not part of the roofing manufacturers system are not covered under this guarantee.

The RSM shall notify the Owner 60 calendar days prior to the expiration of the guarantee period to ensure the Owner is aware of the expiration date.

Owner's Responsibilities:
The Owner shall maintain the roof in a reasonable condition and shall trim vegetative material such that it does not encroach on the roofing system. The Owner shall notify the RSM, or cause the RSM to be notified, in the event of any modification to the roofing system related to building work, structural changes, installation of roof mounted equipment or similar revisions. In the event of a failure to notify the RSM of such modifications, this guarantee shall remain in full force and effect provided RSM required repairs are completed to the affected area. In the event of a leak in the covered roofing system and prior to undertaking any repairs, the Owner shall promptly notify the RSM directly by email. RSM will respond within three working days with a proposed schedule

for inspecting and repairing the roof or providing temporary repairs. If an emergency condition exists as determined by the Owner which requires immediate repair to protect the building, occupants, or contents, Owner is authorized to complete such temporary repairs. The RSM shall reimburse the Owner for the reasonable cost of such repairs only to the extent those repairs are required to protect the building, occupants or contents.

Exclusions:

This guarantee does not cover leaks which occur as a result of the following:

1. Natural disasters including winds in excess of 90 MPH, hail, floods, earthquake, lightning or other extraordinary natural events.
2. Damage by fire.
3. Impacts by foreign objects.
4. Movement, cracking or settlement of the building.
5. Excessive foot traffic on the roofing system.
6. Chemical or solvent damage.
7. Failure by the Owner to maintain the roof in a reasonable manner.
8. Modifications to the roofing system discussed above.

This guarantee shall run concurrently with the Roofing Installer's Three-Year Roofing, Flashing, Sheet Metal Guarantee. The Owner shall have no duty to inspect the roof or commit to RSM inspections as a condition of this Guarantee. No modifications shall be made to this guarantee.

Guarantee Acceptance:

For ROOFING SYSTEM MANUFACTURER:	**For THE CURATORS OF THE UNIVERSITY OF MISSOURI:**
_____	_____
Name	Name
_____	_____
Title	Title
_____	_____
Date	Date

RSM Corporate Seal Affix Here:

SECTION 1.E.3

CONTRACTOR's ROOFING/FLASHING/SHEET METAL GUARANTEE
(Revised 12/94)

WHEREAS _____
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: Curators of the University of Missouri
c/o Associate Vice Chancellor – Facilities
Room L100, General Services Building
University of Missouri
Columbia, Missouri 65211

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:_____

SECTION 1.E.4

SHOP DRAWING AND SUBMITTAL LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	*Description*	*Contractor*	*Discipline Responsible*	*Date Received*	*Date to Consultant*	*Date Returned*	*Comments*
03 1000	Concrete Forms and Accessories – Shop Drawings						
03 2000	Concrete Reinforcement – Shop Drawings						
	Manuf. Certificate						
03 3000	Cast-In-Place Concrete – Product Data						
03 5100	Gypsum Concrete Roof Deck Repair – Product Data						
05 3150	Steel Deck Repair/Replacement – Product Data						
	Shop Drawings						
06 1000	Carpentry Work (For Roofing) – Product Data						
	Shop Drawings						
	Manuf. Certifications						
07 5400.1	EPDM Membrane Roofing – Product Data						
	Shop Drawings						
	Samples						
	Qualification Data						
	Roofing System Manufacturer Certificates						
	Product Test Reports						
	Research/Evaluation Reports						
	Fasteners Withdrawal Resistance Testing						

SECTION 1.E.4

SHOP DRAWING AND SUBMITTAL LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	*Description*	*Contractor*	*Discipline Responsible*	*Date Received*	*Date to Consultant*	*Date Returned*	*Comments*
07 5400.2	PVC Membrane Roofing – Product Data						
	Shop Drawings						
	Samples						
	Qualification Data						
	Roofing System Manufacturer Certificates						
	Product Test Reports						
	Research/Evaluation Reports						
	Fasteners Withdrawal Resistance Testing						
07 5400.4	EPDM Membrane Roofing – Product Data						
	Shop Drawings						
	Samples						
	Qualification Data						
	Roofing System Manufacturer Certificates						
	Product Test Reports						
	Research/Evaluation Reports						
	Fasteners Withdrawal Resistance Testing						

SECTION 1.E.4

SHOP DRAWING AND SUBMITTAL LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	*Description*	*Contractor*	*Discipline Responsible*	*Date Received*	*Date to Consultant*	*Date Returned*	*Comments*
07 5400.5	EPDM Membrane Roofing – Product Data						
	Shop Drawings						
	Samples						
	Qualification Data						
	Roofing System Manufacturer Certificates						
	Product Test Reports						
	Research/Evaluation Reports						
	Fasteners Withdrawal Resistance Testing						
07 5400.6	EPDM Membrane Roofing – Product Data						
	Shop Drawings						
	Samples						
	Qualification Data						
	Roofing System Manufacturer Certificates						
	Product Test Reports						
	Research/Evaluation Reports						
	Fasteners Withdrawal Resistance Testing						

SECTION 1.E.4

SHOP DRAWING AND SUBMITTAL LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	*Description*	*Contractor*	*Discipline Responsible*	*Date Received*	*Date to Consultant*	*Date Returned*	*Comments*
07 5900	Preparation of Re-Roofing – Product Data						
	Fastener Pullout Test Report						
	Demolition and Removal Procedures and Schedule						
07 6000	Sheet Metal Flashing and Trim – Product Data						
	Shop Drawings						
	Samples						
	Manuf. Certificate						
	Qualification Documentation						
07 7000	Non-Penetrating, Rooftop Pipe and Duct Supports						
	Shop Drawings						
	Samples						

SECTION 1.E.5

OPERATING INSTRUCTIONS AND SERVICE MANUAL LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	Description	Catalog Data	Wiring Diagrams	Installation Instructions	Service & Maintenance Instructions	Parts List & Availability	Performance Curves	Startup & Operating Instructions
03 3000	Cast-In-Place Concrete			X				
03 5100	Gypsum Concrete Roof Deck Repair			X				
07 5400.1	EPDM Membrane Roofing				X			
07 5400.2	PVC Membrane Roofing				X			
07 5400.4	EPDM Membrane Roofing				X			
07 5400.5	EPDM Membrane Roofing				X			
07 5400.6	EPDM Membrane Roofing				X			

SECTION 1.E.6

CLOSEOUT LOG

Project: Various Locations – Roof Replacements
Project Number: CP220471
Contractor:

Section	***Description***	***Contractor / Subcontractor***	***Date Rec'd***	***# of Copies***	***CPM Initials***	***Remarks***
GC / 3.11	As-built drawings					
03 2000	Certified Mill Test Report					
07 5400.1	EPDM Membrane Roofing – Warranty Copies					
	Inspection Report					
07 5400.2	PVC Membrane Roofing – Warranty Copies					
	Inspection Report					
07 5400.4	EPDM Membrane Roofing – Warranty Copies					
	Inspection Report					
07 5400.5	EPDM Membrane Roofing – Warranty Copies					
	Inspection Report					
07 5400.6	EPDM Membrane Roofing – Warranty Copies					
	Inspection Report					
07 5900	Preparation of Re-Roofing – Debris Removal Certification					
07 6000	Sheet Metal Flashing and Trim - Warranty					

SECTION 1.F

INDEX OF DRAWINGS

Drawings referred to in and accompanying Project Manual consists of following sheets dated December 7, 2021**.**

Drawing Sheet G001: Cover Sheet

Drawing Sheet A101: Marx (Melvin H.) Building Demolition Plan

Drawing Sheet A102: Marx (Melvin H.) Building Renovation Plan

Drawing Sheet A103: Marx (Melvin H.) Roof Details

Drawing Sheet A201: Lewis and Clark Halls Demolition Plan

Drawing Sheet A202: Lewis and Clark Halls Renovation Plan

Drawing Sheet A203: Lewis and Clark Halls Roof Details

Drawing Sheet A301: Veterinary Medicine East Demolition Plan

Drawing Sheet A302: Veterinary Medicine East Renovation Plan

Drawing Sheet A303: Veterinary Medicine East Roof Details

Drawing Sheet A304: Veterinary Medicine East Roof Details

Drawing Sheet A401: Trowbridge Center Demolition Plan

Drawing Sheet A402: Trowbridge Center Renovation Plan

Drawing Sheet A403: Trowbridge Center Roof Details

Drawing Sheet A404: Trowbridge Center Roof Details

Drawing Sheet A501: 417 S. 5th Street Demolition Plan

Drawing Sheet A502: 417 S. 5th Street Renovation Plan

Drawing Sheet A503: 417 S. 5th Street Roof Details

END OF SECTION

SECTION 1.G

PREVAILING WAGE RATES

1. The prevailing wage rates for Boone County as issued by the Missouri Division of Labor on the following pages.

Missouri
Division of Labor Standards
WAGE AND HOUR SECTION

MICHAEL L. PARSON, Governor

Annual Wage Order No. 28

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
Taylor Burks, Director
Division of Labor Standards

Filed With Secretary of State: **March 10, 2021**

Last Date Objections May Be Filed: **April 8, 2021**

Prepared by Missouri Department of Labor and Industrial Relations

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Asbestos Worker	$53.30
Boilermaker	*$29.89
Bricklayer	$47.96
Carpenter	$45.52
Lather	
Linoleum Layer	
Millwright	
Pile Driver	
Cement Mason	$43.58
Plasterer	
Communications Technician	$51.71
Electrician (Inside Wireman)	$52.90
Electrician Outside Lineman	$74.24
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Elevator Constructor	*$29.89
Glazier	$39.34
Ironworker	$59.74
Laborer	$39.77
General Laborer	
First Semi-Skilled	
Second Semi-Skilled	
Mason	*$29.89
Marble Mason	
Marble Finisher	
Terrazzo Worker	
Terrazzo Finisher	
Tile Setter	
Tile Finisher	
Operating Engineer	$59.21
Group I	
Group II	
Group III	
Group III-A	
Group IV	
Group V	
Painter	$37.48
Plumber	$66.54
Pipe Fitter	
Roofer	$54.20
Sheet Metal Worker	$53.89
Sprinkler Fitter	$55.78
Truck Driver	*$29.89
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

*The Division of Labor Standards received less than 1,000 reportable hours for this occupational title.
Public works contracting minimum wage is established for this occupational title using data provided by Missouri Economic Research and Information Center.
**The Prevailing Hourly Rate includes any applicable fringe benefit amounts for each occupational title.

Heavy Construction Rates for
BOONE County

Section 010

OCCUPATIONAL TITLE	**Prevailing Hourly Rate
Carpenter	$48.97
Millwright	
Pile Driver	
Electrician (Outside Lineman)	$74.24
Lineman Operator	
Lineman - Tree Trimmer	
Groundman	
Groundman - Tree Trimmer	
Laborer	$44.32
General Laborer	
Skilled Laborer	
Operating Engineer	$56.12
Group I	
Group II	
Group III	
Group IV	
Truck Driver	*$29.89
Truck Control Service Driver	
Group I	
Group II	
Group III	
Group IV	

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

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

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

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

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

OVERTIME
and
HOLIDAYS

OVERTIME

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

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

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

HOLIDAYS

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

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

TECHNICAL SPECIFICATIONS - ASBESTOS-CONTAINING MATERIALS REMOVAL AND DISPOSAL

For

CP220471
VARIOUS LOCATIONS
ROOF REPLACEMENTS
417 S. 5TH ST.- ENERGY MANAGEMENT
VET MED EAST

Prepared for

UNIVERSITY OF MISSOURI
Campus Facilities
Columbia, Missouri 65211

Prepared by
UNIVERSITY OF MISSOURI
ENVIRONMENTAL HEALTH AND SAFETY

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 friable and non-friable asbestos containing materials including:

Non-friable asbestos:

417 S. 5TH- Eight hundred seventy (870) square feet of ACM flashing material
Six (6) square feet of hard black caulk

Vet Med East – Seventeen thousand eight hundred twenty four (17,824) square feet of ACM rag felt/asphalt vapor barrier

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), cummintonite-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.

18. Encapsulation - Treatment of asbestos containing materials with an encapsulant.

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 consist 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:

1. Title 29, Part 1910, Section 1001 and Part 1926, Section 1101 of the Code of Federal Regulations.

2. Respiratory Protection, Title 29, Part 1910, Section 134 of the Code of Federal Regulations.

3. Construction Industry, Title 29. Part 1926, of the Code of Federal Regulations.

4. Access to Employee Exposure and Medical Records, Title 29, Part 1910, Section 2 of the Code of Federal Regulations.

5. Hazard Communication, Title 29, Part 1910, Section 1200 of the Code of Federal Regulations.

6. Specifications for Accident Prevention Signs and Tags, Title 29, Part 1910, Section 145 of the Code of Federal Regulations.

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

1. National Emission Standards for Hazardous Air Pollutants (NESHAPS) Title 40, Part 61, Subpart M, Code of Federal Regulations.

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

1. Title 49, Part 172, Section 101 of the Code of Federal Regulations.

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.

UNIVERSITY *of* MISSOURI

ENVIRONMENTAL HEALTH AND SAFETY

ASBESTOS SURVEY
PROJECT CP220471
ROOF REPLACEMENTS – VARIOUS ROOFS
MARX BUILDING, LEWIS HALL, CLARK HALL, VET MED EAST, 417 S. 5TH
10/11/2021

TO: Mark Hoerstkamp
Design Services

FROM: Pete Kohler
Environmental Health and Safety

MU EHS has completed an asbestos survey of various roofs for a re-roofing project of 2022. The list of buildings for re-roof in 2022 is:

1. *Marx Building [EPDM], 1416 Carrie Francke Dr. #37011*
2. *Lewis Hall [pitch roof], 701 S. 5th Str. #37090*
3. *Clark Hall [pitch roof], 703 S. 5th Str. #37091*
4. *Vet Med East [EPDM], 825 East Campus Loop #37099*
5. *Trowbridge Center [EPDM], 1024 Ashland Rd #37137*
6. *417 S. 5th Str. [EPDM] [Energy Management] #37169*
7. *401 Steward [Power Plant Building] #37040*

The survey is limited to material which will be disturbed by the survey request of 9/14/21. Trowbridge Center was surveyed in 2019, and the survey is still correct and current. The specific roof of the Power Plant which was listed for re-roof needed a repair, instead. A complete survey was not conducted.

The asbestos 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 Pete Kohler (MO Asbestos Inspector #10883, expires 11/05/2021). The survey was conducted in September 2021 and the report was completed October 11, 2021.

Samples were analyzed by polarized light micrography (PLM), with an additional step in the preparation of hard-to-analyze samples, like tar, asphalt, or pitch (PLM NOB).

As a result of the survey, asbestos-containing material (ACM) was identified. Each roof that was sampled is discussed below, and positive material is identified.

FIELD OBSERVATIONS

LEWIS HALL

The flat, first-floor roof of Lewis is a pitch roof, with a gravel ballast. The roof consists of pitch felt over perlite over a wood fiber board, (or an ISO foam board in some locations), with a vapor barrier on a concrete deck. Each component of the roof was analyzed separately. None of the materials was found to contain asbestos.

Hard white caulk and silver caulk found on the roof of Lewis were found negative for asbestos, The pitch from the gravel ballast is negative for asbestos.

SAMPLE ID	LOCATION/DESCRIPTION	ANALYSIS
210921-01	Lewis Hall roof over lobby, white caulk at edge	100% non-fibrous
210921-01A	Black sealant on top of white caulk listed above	100% matrix material
210921-02	Lewis Hall Roof Core 2, pitch on gravel ballast	3% glass, 97% matrix material
210921-02A	Core 2, 4 ply pitch felt top sheet	2.5% glass, 97.5% matrix material
210921-02B	Core 2, perlite board	85% cellulose, 10% perlite, 5% non-fibrous
210921-02C	Core 2, wood fiber board	95% cellulose, 5% non-fibrous
210921-02D	Core 2, vapor barrier on concrete deck	100% matrix material
210921-03	Lewis Hall roof over lobby, west side, silver/black caulk	100% matrix material
210921-04	Lewis Hall Roof Core 1, pitch felt top sheet	1.7% glass, 98.3% matrix material

210921-04A	Core 1, backing paper from ISO foam	70% cellulose, 10% glass fibers, 20% non-fibrous
210921-04B	Core 1, vapor barrier from concrete deck	100% matrix material

ASBESTOS SUMMARY

None of the materials found in the roof of Lewis Hall contains asbestos.

CLARK HALL

The flat, first-floor roof of Clark Hall, which is over the north-facing lobby, is similar to the roof of Lewis Hall. It is a pitch roof on a concrete deck. The roof consists of gravel ballast on pitch felt over perlite, on ISO foam with backing paper, with a vapor barrier on a concrete deck. Flashing at the edge of the roof is modified roofing, and has a silver and black coating used as sealer.

Each component was analyzed separately. None of the components of the roof contains asbestos.

At the corner of the concrete wall, (the northeast corner of the tower of Lewis,) a coating has been cracked and separated from the concrete. A sample of this material was collected and analyzed. It contains asbestos.

PLEASE NOTE: This coating is hard, non-friable material, and it is in good condition, except for the small area I found which had crumbled at the corner of a column. With care, the roofing project can be completed without disturbing the ACM.

SAMPLE ID	**LOCATION/DESCRIPTION**	**ANALYSIS**
210921-01	Clark Hall Lobby Roof Core 1, pitch felt top sheet	100% matrix material
210921-01A	Core 1, backing paper on ISO foam	30% cellulose, 5% glass, 65% non-fibrous
210921-01B	Core 1, perlite	90% cellulose, 5% perlite, 5% non-fibrous
210921-01C	Core 1, vapor barrier on concrete deck	100% matrix material
210921-02	Clark Hall flashing at edge, modified roofing	100% matrix material

210921-02B	Silver/black coating on modified flashing	100% matrix material
210921-03	Clark Hall, cracked coating on concrete wall	**2% CHRYSOTILE,** 98% non-fibrous

ASBESTOS SUMMARY

None of the materials found in the roof of Lewis Hall contains asbestos. Coating on the concrete wall adjacent to the project area contains asbestos.

MARX BUILDING

The main roof of the Marx Building is EPDM. The rubber membrane is over tapered EPS foam, that slopes toward the back of the building. There is mopped-on asphalt beneath the ISO foam, but no real vapor barrier. It is on a concrete deck.

The kiln room, at the west end of the building has EPDM over ISO foam on a metal deck. There is no vapor barrier, and no samples were collected here, as none of the materials are suspect.

Over the dock, there is EPDM on a wood fiberboard on EPS foam on a concrete deck.

Across the back of the building is a low roof, facing the kilns, that is EPDM on wood fiber board, on EPS, with a mopped-on asphalt layer, on a concrete deck. There is black lap sealant used, which was sampled and analyzed.
None of the materials found in any of the roofs, contains asbestos.

SAMPLE ID	**LOCATION/DESCRIPTION**	**ANALYSIS**
210921-01	Marx Building, Main roof, Core 1, wood fiber board	95% cellulose, 5% non-fibrous
210921-01A	Core 1, mopped-on asphalt	100% matrix material
210921-02	Marx Building Core 2, wood fiber board	98% cellulose, 2% non-fibrous
210921-03	Marx Building back roof, wood fiber board	95% cellulose, 5% non-fibrous
210921-03A	Back roof, mopped-on asphalt	100% matrix material

210921-04	Black lap sealant	100% matrix material

ASBESTOS SUMMARY

None of the materials found in any of the roofs of Marx Building contains asbestos.

ENERGY MANAGEMENT OFFICES
417 S. 5TH STREET

The roof which is to be replaced is on the west side of the EMO Offices, over the loading docks. The roof is EPDM, over ISO foam with a paper backing, over a plastic vapor barrier with asphalt, on a metal deck. Each component of this roof was analyzed separately. None of the materials contains asbestos.

There is **black caulk,** used as a sealant at pipe penetrations of this roof. **This does contain asbestos.** On the bricks along the east edge of this roof, there is **hard black caulk which contains asbestos**. **Any black caulk found associated with this roof is presumed to be positive for asbestos.**

There are three canopies along the west side of the building. The canopies are over individual docks for incoming freight. The canopies have a pitch roof on a concrete deck. The pitch and the flashing material were sampled and analyzed. **The flashing material is positive for asbestos.**

SAMPLE ID	LOCATION/DESCRIPTION	ANALYSIS
210921-01	417 S. 5th, EMO Offices, West Roof Core 1, backing paper on ISO foam	70% cellulose, 30% non-fibrous
210921-01A	Core 1, plastic vapor barrier w/asphalt on metal deck	100% matrix material
210921-01B	Core 1, ISO foam	100% non-fibrous
210921-02	West roof, Black sealant at pipe penetration	**3.0% CHRYSOTILE,** 97% matrix material
210921-03	West roof, at east wall bricks- hard black caulk	**2% CHRYSOTILE,** 98% non-fibrous

210921-04	Far west canopy over dock bay, pitch top sheet	100% matrix material
210921-04A	Far west canopy- flashing material	**11.3% CHRYSOTILE,** 88.7% matrix material

ASBESTOS SUMMARY

Flashing material on the roofs of the canopies, on the far west side of the Energy Management Offices, over the bays of the loading docks, contains asbestos. Any black caulk on the west roof, over the docks and the warehouse area, is presumed to be positive for asbestos.

VET MED EAST

Several roofs on Vet Med East will be replaced. The first roof is over the long east-west building that looks out at Rollins Road. Using the hatch in Mechanical Room E205, the roof you exit onto is the first roof sampled. This roof is EPDM on ISO foam with a paper backing on a rag felt and asphalt vapor barrier, on top of a concrete deck. **The rag felt vapor barrier contains asbestos.**

On the north parapet of this roof, **silver and black sealant** is present. It **contains asbestos.**

Along the south edge of this roof, the foam product has been replaced with a wood fiber board under the EPDM.

South of this location, up a short, sloped, metal roof, there is another EPDM roof that slopes down to the south. There are two large fans on this roof. This area has EPDM on top of a wood fiber board on EPS foam. There is no vapor barrier here. The deck beneath is metal. No ACM was identified on this roof.

Proceeding south, down a ladder, is the next roof. This is a large roof that has two penthouse mechanical rooms on it. It is EPDM on ISO foam on a rag felt and asphalt vapor barrier on concrete. **The vapor barrier contains asbestos.**

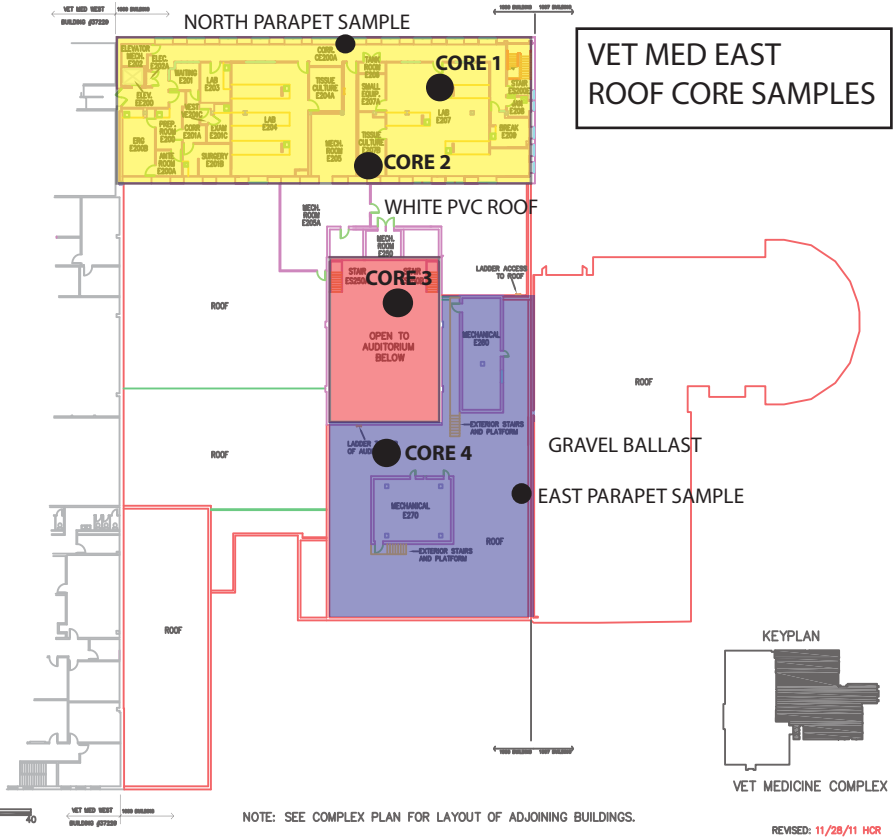
Around the parapet of this roof, there is silver sealant painted on the edge of the metal cap. The **silver sealer contains asbestos.** The silver material is present on the side of the metal but does not seem to have been used across the wide top of the cap.

SAMPLE ID	LOCATION/DESCRIPTION	ANALYSIS
210929-01	Vet Med East Roof Core Sample 1, backing paper form ISO foam	75% cellulose, 2% glass, 23% non-fibrous
210929-01A	Core 1, rag felt/asphalt vapor barrier	**2.9% CHRYSOTILE,** 97.1% matrix material
210929-02	Vet Med East Roof, north parapet- silver/black sealant	**10.6% CHRYSOTILE,** 89.4% matrix material
210929-03	Vet Med East Roof Core Sample 2, south edge, wood fiber board (under EPDM)	90% cellulose, 10% non-fibrous
210929-04	Vet Med East Roof Core Sample 3, Sloped Roof, wood fiber board (under EPDM)	85% cellulose, 15% non-fibrous
210929-05	Vet Med East Roof Core Sample 4, paper backing from ISO foam	60% cellulose, 40% non-fibrous
210929-05A	Core 4, rag felt/asphalt vapor barrier	**43.3% CHRYSOTILE,** 56.7% matrix material
210929-06	Vet Med East Roof, east parapet (on metal cap), silver sealant	**6.8% CHRYSOTILE,** 93.2% matrix material

ASBESTOS SUMMARY

Rag felt and asphalt vapor barrier of the Core 1 roof contains asbestos. Silver and black sealant used on the Core 1 roof contains asbestos. Rag felt and asphalt vapor barrier on the Core 4 roof contains asbestos. Silver sealant around the perimeter of the Core 4 roof contains asbestos.

VET MED EAST ROOF CORE SAMPLES



REVISED: 11/28/11 HCR

CAMPUS FACILITIES
SPACE PLANNING & MANAGEMENT
(573) 882-4506

VETERINARY MEDICINE EAST

LEVEL:	TOUR DATE:	SCALE:
SECOND	03/11/02	NTS
BUILDING NO:	SHEET:	GROSS SQ FT:
37099	3 OF 4	10,548

NORTH

SECTION 03 1000 – CONCRETE FORMS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

A. Work includes, but is not necessarily limited to:
   1. Furnish all labor, materials, equipment, and services necessary or incidental to completion of formwork for cast-in-place concrete, with shoring, bracing, and anchorage; openings for other work; form accessories, and form stripping.

B. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 03 2000 – Concrete Reinforcement.
   2. Section 03 3000 – Cast-in-place Concrete
   3. Section 07 5900 – Preparation for Reroofing

1.02 SUBMITTALS

A. Submittal Procedures: Procedures for submittals
   1. Shop Drawings: Submit formwork and shoring shop drawings; indicate: Pertinent dimensions, openings, methods of construction, types of connections, materials, joint arrangement and details, ties and shores, location of framing, studding and bracing, and temporary supports.
   2. Means of leakage prevention for concrete exposed to view in finished construction.
   3. Sequence and timing of erection and stripping assumed compressive strength at time of stripping, height of lift and height of drop during placement.
   4. Vertical, horizontal and special loads in accordance with ACI 347, Section 2.2 and camber diagrams, if applicable.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 347, ACI 301, and ACI 318.

B. For wood products furnished for Work of this Section, comply with applicable provisions of AF&PA National Design Specifications for Wood Construction.

C. Maintain one copy of each document on site.

D. Design formwork under direct supervision of a professional engineer experienced in design of this work and licensed in the State of Missouri.

1.04 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products

B. Deliver materials to the job site in original, unopened bundles. Materials are to be stored off the ground with one end elevated to provide drainage and are to be protected from the elements with weatherproof tarps ventilated to avoid condensations. Cut plastic wrappers to encourage ventilation. Keep materials dry.

C. Keep all materials clearly identified with all identifying marks legible. Keep all damaged material clearly identified as damaged and stored separately to prevent its inadvertent use.

D. Do not allow installation of damaged or otherwise non-complying material.

E. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.

F. In the event of damage, immediately make all necessary repairs and replacements subject to the approval of, and at no additional cost to the Owner.

G. Roof surfaces shall be protected from damage at all times.

1.05 REFERENCES

A. ACI 117 - Tolerances for Concrete Construction and Materials.

B. ACI 301 - Structural Concrete for Buildings.

C. ACI 318 - Building Code Requirements for Reinforced Concrete.

D. ACI 347 - Recommended Practice For Concrete Formwork.

E. AF&PA - National Design Specifications for Wood Construction.

F. ASME A17.1 - Safety Code for Elevators, Dumbwaiters, Escalators, and Moving Walks

G. ASTM D 1751 - Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Non-Extruding and Resilient Bituminous types).

H. SPIB - 1994 Standard Grading Rules for Southern Pine Lumber (and Supplements).

I. WCLIB Rule No. 17 - Standard Grading and Dressing Rules.

1.06 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.07 COORDINATION

A. Coordinate this Section with other sections of work, which require attachment of components to formwork.

B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Owner Representative.

PART 2 PRODUCTS

2.01 WOOD FORM MATERIALS

A. Form Materials: At Contractor's discretion.

B. Plywood: Douglas Fir or Spruce species; solid one side grade; sound undamaged sheets with clean, true edges.

C. Lumber Forms: Use for edge forms and unexposed finish concrete. Boards shall be 6 inches or 8 inches in width, shiplap or tongue and groove, Standard Grade Douglas Fir, conforming to WCLIB Standard Grading and Dressing Rule No. 17. Surface boards on four sides.

D. Plywood Forms: Use for exposed finish concrete. Forms shall conform to PS-1. Each panel shall carry the grade trademark of the APA/EWA and shall be full size 4-foot by 8-foot panels. Use release agent at exposed finish concrete.
   1. Plywood for surfaces to receive membrane waterproofing shall be a minimum of 5/8-inch thick and shall be APA Exterior grade.
   2. Plywood where Smooth Finish is required shall be HD Overlay Plyform Structural I Exterior grade, minimum of 3/4-inch thick.

2.02 FORMWORK ACCESSORIES

A. Spreaders: Standard, noncorrosive metal form clamp assembly, of type acting as spreaders and leaving no metal within 1 inch of concrete face. No wire ties, wood spreaders or through bolts will be permitted.

B. Form Anchors and Hangers: Anchors and hangers used for exposed concrete shall not leave exposed metal at surface. Hangers supporting forms from structural steel shall be symmetrically arranged on supporting members to minimize twisting or rotation of member. Penetration of structural steel members will not be permitted.

C. Form Release Agent: Colorless mineral oil which will not stain concrete, absorb moisture, or impair natural bonding or color characteristics of coating intended for use on concrete.
   1. Arcal Chemical Corporation, "Arcal-80".
   2. Nox-Crete Company, "Nox-Crete Form Coating".
   3. Industrial Synthetics Company, "Synthex".
   4. Owner Approved Equal.

PART 3 EXECUTION

3.01 EXAMINATION

A. Execution Requirements: Verification of existing conditions before starting work

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Shop Drawings.

D. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

E. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Formwork - General: Sloped surfaces steeper than 1.5 horizontal to 1 vertical should be provided with a top form to hold the shape of the concrete during placement, unless it can be demonstrated that top forms can be omitted. Construct forms to the correct shape and dimensions, mortar-tight, of sufficient strength, and so braced and tied together that movement of workers, equipment, materials, or the placing and vibrating of concrete shall be strong enough to maintain their shape under all imposed loads. Camber where necessary to assure level finished soffits unless otherwise shown on Drawings. Verify horizontal and vertical positions of forms and correct inaccuracies before placing concrete in any form. Complete wedging and bracing before placing concrete.

B. Forms for Smooth Finish Concrete: Use steel, plywood or lined board forms. Clean and smooth plywood and form liners, uniform in size, and free edges and holes from damage. Form lining shall have close-fitting square joints between separate sheets and shall not be sprung into place. Sheets of form lines and plywood shall be full size wherever possible and joints shall be taped to prevent protrusions in concrete. Use special care in forming and stripping wood forms to protect corners and edges. Level and continue all horizontal joints. Wet wood forms at all times until stripping.

C. Framing, Studding and Bracing: Space studs at 16 inches on center maximum for boards and 12 inches on center maximum for plywood. Framing, bracing, centering, and supporting members shall be of adequate size and strength to carry safely, without deflection, all dead and live loads to which forms may be subjected, and shall be spaced sufficiently close to prevent any bulging or sagging of forms. Soffits of all beam forms shall be constructed of material a minimum of 2 inches thick. Distribute bracing loads over base area on which bracing is erected.

D. Erect formwork, shoring, and bracing to achieve design requirements, in accordance with requirements of ACI 301.

E. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.

F. Install void forms in accordance with manufacturer's recommendations.

G. Do not reuse wood formwork more than 3 times for concrete surfaces to be exposed to view. Do not patch formwork.

3.03 APPLICATION – FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.04 FIELD QUALITY CONTROL

A. Quality Control: Field-testing and inspection.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Owner representative after placement of reinforcing steel in the forms, but prior to placing concrete, so that review may be made.

3.05 APPLICATION – FORM RELEASE AGENT

A. Apply form release agent on formwork in accordance with manufacturer's recommendations.

B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

3.06 FORM CLEANING

A. Clean forms as erection proceeds, to remove foreign matter within forms.

B. Clean formed cavities of debris prior to placing concrete.

C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean-out ports.

D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

3.07 FORM REMOVAL

A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads and the removal has been approved by Owner representative.

B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.

C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

D. Forms shall be left in place for not less than the total number of days as specified in ACI 347.

3.08 ERECTION TOLERANCES

A. Construct formwork to maintain tolerances required by ACI 301.

B. Tolerances: Construct formwork so that concrete surfaces shall be within construction tolerances specified in ACI 117.

END OF SECTION 03 1000

SECTION 03 2000 – CONCRETE REINFORCEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Work includes, but is not necessarily limited to:
   1. Furnish all labor, materials, equipment, and services necessary or incidental to completion of formwork for cast-in-place concrete, with shoring, bracing, and anchorage; openings for other work; form accessories, and form stripping.

B. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 03 1000 – Concrete Forms and Accessories
   2. Section 03 3000 – Cast-in-place Concrete
   3. Section 07 5900 – Preparation for Reroofing

1.02 SUBMITTALS

A. Submittal Procedures: Procedures for submittals
   1. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and welded wire fabric, bending and cutting schedules, and supporting and spacing devices.
   2. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
   3. Submit certified copies of mill test report of reinforcement materials analysis.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI SP-66, and ACI 318.

B. Maintain one copy of each document on site.

C. Provide Owner Representative with access to fabrication plant to facilitate review of reinforcement. Provide notification of commencement and duration of shop fabrication in sufficient time to allow review.

D. Detail reinforcement and prepare shop drawings in accordance with ACI 315.

E. Welders' Certificates: Submit manufacturer's certificates, certifying welders employed on Work, verifying AWS qualification within previous 12 months.

1.04 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products

B. Deliver materials to the job site in original, unopened bundles. Materials are to be stored off the ground with one end elevated to provide drainage and are to be protected from the elements with weatherproof tarps ventilated to avoid condensations. Cut plastic wrappers to encourage ventilation. Keep materials dry.

C. Keep all materials clearly identified with all identifying marks legible. Keep all damaged material clearly identified as damaged and stored separately to prevent its inadvertent use.

D. Do not allow installation of damaged or otherwise non-complying material.

E. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.

F. In the event of damage, immediately make all necessary repairs and replacements subject to the approval of, and at no additional cost to the Owner.

G. Roof surfaces shall be protected from damage at all times.

1.05 REFERENCES

A. ACI 301 - Structural Concrete.

B. ACI 318 - Building Code Requirements for Structural Concrete.

C. ACI SP-66 - Detailing Manual.

D. ASTM A 82 - Steel Wire, Plain, for Concrete Reinforcement.

E. ASTM A 184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.

F. ASTM A 497 - Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.

G. ASTM A 615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.

H. ASTM A 617 - Axle-Steel Deformed and Plain Bars for Concrete Reinforcement.

I. ASTM A 641 - Zinc-Coated (Galvanized) Carbon Steel Wire.

J. ASTM A 704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.

K. ASTM A 706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.

L. ASTM A 767 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.

M. ASTM A 775 - Epoxy-Coated Reinforcing Steel Bars.

N. ASTM A 884 - Epoxy-Coated Steel Wire and Welded Wire Fabric for Reinforcement.

O. ASTM A 934 - Epoxy-Coated Prefabricated Reinforcing Bars.

P. ASTM A 996 - Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement.

Q. ASTM D 3963 - Practice for Selection of Coating Specimens for Appearance Measurements.

R. AWS D1.4 - Structural Welding Code - Reinforcing Steel.

S. CRSI - Manual of Practice.

1.06 DESIGN REQUIREMENTS

A. Design, engineer and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

1.07 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.01 REINFORCEMENT

A. Reinforcing Steel: ASTM A 615, 60 ksi yield grade; deformed billet steel bars, unfinished.

B. Reinforcing Steel Plain Bar and Rod Mats: ASTM A 704, ASTM A 615, Grade 60; steel bars or rods, unfinished.

C. Stirrups Steel: ASTM A 82, unfinished.

D. Welded Steel Wire Fabric: ASTM A 497 Deformed Type; in flat sheets; unfinished.

2.02 ACCESSORY MATERIALS

A. Tie Wire: Minimum 16 gage annealed type, epoxy coated.

B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor retarder puncture.

C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Plastic-coated steel type; size and shape as required.

2.03 FABRICATION

A. Fabricate concrete reinforcement in accordance with ACI SP-66, ACI 318 & ASTM A 184.

B. Where applicable, weld reinforcement in accordance with AWS D1.4.

C. Locate reinforcement splices not indicated Drawings, at point of minimum stress. Review location of splices with Owner Representative.

PART 3 EXECUTION

3.01 EXAMINATION

A. Execution Requirements: Verification of existing conditions before starting work

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Shop Drawings.

D. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

E. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 INSTALLATION

A. Place, support and secure reinforcement against displacement. Do not deviate from required position.

B. Do not displace or damage vapor barrier.

C. Accommodate placement of formed openings.

D. Conform to applicable code for concrete cover over reinforcement.

3.03 FIELD QUALITY CONTROL

A. Quality Control: Field-testing and inspection.

B. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

C. Notify Owner representative after placement of reinforcing steel in the forms, but prior to placing concrete, so that review may be made.

END OF SECTION 03 2000

SECTION 03 3000 – CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

A. Work includes, but is not necessarily limited to:
   1. Furnish all labor, materials, equipment, and services necessary or incidental to completion of the cast-in-place concrete; the engineering of the concrete mix; independent concrete inspection and testing; the openings for other work; and the shoring, bracing, anchorage form products and accessories, and form stripping associated with the concrete work.

B. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 03 1000 – Concrete Forms and Accessories
   2. Section 03 2000 – Concrete Reinforcement
   3. Section 07 5900 – Preparation for Reroofing

1.02 SUBMITTALS

A. Submittal Procedures: Procedures for submittals.

B. Product Data: Submit data on joint devices, attachment accessories, and admixtures.

C. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

D. Project Record Documents: Accurately record actual locations of components which are concealed from view.

1.03 QUALITY ASSURANCE

A. Perform Work in accordance with ACI 301, ACI SP-66, and ACI 318.

B. Maintain one copy of each document on site.

C. Acquire cement and aggregate from same source for all Work.

D. Conform to ACI 305R when concreting during hot weather.

E. Conform to ACI 306.1 when concreting during cold weather.

1.04 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products

B. Deliver materials to the job site in original, unopened bundles. Materials are to be stored off the ground with one end elevated to provide drainage and are to be protected from the elements with weatherproof tarps ventilated to avoid condensations. Cut plastic wrappers to encourage ventilation. Keep materials dry.

C. Keep all materials clearly identified with all identifying marks legible. Keep all damaged material clearly identified as damaged and stored separately to prevent its inadvertent use.

D. Do not allow installation of damaged or otherwise non-complying material.

E. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.

F. In the event of damage, immediately make all necessary repairs and replacements subject to the approval of, and at no additional cost to the Owner.

G. Roof surfaces shall be protected from damage at all times.

1.05 PRODUCTS FURNISHED BUT NOT INSTALLED UNDER THIS SECTION

A. Section 03100 - Concrete Forms and Accessories

1.06 REFERENCES

A. ACI 301 - Structural Concrete for Buildings.

B. ACI 302 - Concrete Floor and Slab Construction.

C. ACI 304R - Measuring, Mixing, Transporting and Placing Concrete.

D. ACI 305R - Hot Weather Concreting.

E. ACI 306.1 - Cold Weather Concreting.

F. ACI 308 - Curing Concrete.

G. ACI 318 - Building Code Requirements for Structural Concrete and Commentary.

H. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes, and Tubes.

I. ASTM C 33 - Concrete Aggregates.

J. ASTM C 94 - Ready-Mixed Concrete.

K. ASTM C 150 - Portland Cement.

L. ASTM C 260 - Air Entraining Admixtures for Concrete.

M. ASTM C 494 - Chemicals Admixtures for Concrete.

N. ASTM C 595M - Blended Hydraulic Cements (Metric).

O. ASTM C 618 - Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Portland Cement Concrete.

P. ASTM C 1017 - Chemical Admixtures for Use in Producing Flowing Concrete.

Q. ASTM C 1107 - Packaged Dry, Hydraulic Cement Grout (Nonshrink).

R. ASTM D 994 - Preformed Expansion Joint Filler for Concrete (Bituminous Type).

S. ASTM D 1190 - Concrete Joint Sealer, Hot-Poured Elastic Type.

T. ASTM D 1751 - Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

U. ASTM D 1752 - Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.

1.07 FIELD SAMPLES

A. Coordinate with Section 03 100**0.**

1.08 COORDINATION

A. Coordinate with placement of formwork, formed openings and other Work.

PART 2 PRODUCTS

2.01 CONCRETE MATEARIALS

A. Cement: ASTM C 150, Type I - Normal Portland type.

B. Fine and Coarse Aggregates: ASTM C 33.

C. Water: Clean and not detrimental to concrete.

2.02 ADMIXTURES

A. Air Entrainment: ASTM C 260.

B. Chemical: ASTM C 494, Type A - Water Reducing.

C. Fly Ash: ASTM C 618, Class C.

D. Plasticizing: ASTM C 1017.

2.03 ACCESSORIES

A. Bonding Agent: Polymer resin emulsion.

B. Non-Shrink Grout: ASTM C 1107, Grade A ; premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 2,400 pounds per square inch in 48 hours and 7,000 pounds per square inch in 28 days.

2.04 JOINT DEVICES AND FILLER MATERIALS

A. Joint Filler Type A: Asphalt impregnated fiberboard or felt, 1/4-inch thick; tongue and groove profile.

B. Construction Joint Devices: Integral galvanized steel, formed to tongue and groove profile, with removable top strip exposing sealant trough, knockout holes spaced at 6 inches, ribbed steel spikes with tongue to fit top screed edge.

2.05 CONCRETE MIX

A. Mix concrete in accordance with ACI 301. Deliver concrete in accordance with ASTM C 94.

B. Select proportions for normal weight concrete in accordance with ACI 301 trial mixtures.

C. Select aggregate proportions for light weight concrete in accordance with ASTM C 330, ACI 301 and ACI 318.

D. Use accelerating admixtures in cold weather only when approved. Use of admixtures will not relax cold weather placement requirements.

E. Use calcium chloride only when approved.

F. Use set retarding admixtures during hot weather only when approved.

G. Add air entraining agent to normal weight concrete mix for work exposed to exterior.

H. Provide 3,000 PSI concrete minimum for all Concrete and Flatwork (unless otherwise noted on drawings).

PART 3 EXECUTION

3.01 EXAMINATION

A. Execution Requirements: Verification of existing conditions before starting work

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Verify lines, levels, and centers before proceeding with formwork. Ensure that dimensions agree with Shop Drawings.

D. Verify requirements for concrete cover over reinforcement.

E. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not cause hardship in placing concrete.

3.02 PREPARATION

A. Prepare previously placed concrete by cleaning with steel brush and applying bonding agent.

B. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with non-shrink grout.

3.03 PLACING CONCRETE

A. Place concrete in accordance with ACI 301 and ACI 318.

B. Notify Owner Representative a minimum 24 hours prior to commencement of operations.

C. Ensure reinforcement, inserts, embedded parts, and formed expansion and contraction joints are not disturbed during concrete placement.

D. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

E. Place concrete continuously between predetermined expansion, control, and construction joints.

F. Do not interrupt successive placement; do not permit cold joints to occur.

G. Screed slabs on grade level, maintaining surface flatness of maximum 1/8-inch in 10 feet.

3.04 CONCRETE FINISHING

A. Steel trowel surfaces which are scheduled to be exposed.

3.05 CURING AND PROTECTION

A. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures, and mechanical injury.

B. Maintain concrete with minimal moisture loss at relatively constant temperature for period necessary for hydration of cement and hardening of concrete.

C. Cure surfaces in accordance with ACI 301.

3.06 FIELD QUALITY CONTROL

A. Quality Control: Field-testing and inspection.

B. Contractor to provide independent testing company field inspection and testing. All field inspection and testing will be performed in accordance with ACI 301.

C. Provide free access to Work and communicate with independent testing company.

D. Submit proposed mix design of each class of concrete to inspection and testing firm for review prior to commencement of Work.

E. Tests of cement and aggregates may be performed to ensure conformance with specified requirements.

F. Three concrete test cylinders will be taken for every 75 or less cubic yards of each class of concrete placed.

G. One additional test cylinder will be taken during cold weather concreting, cured on job site under same conditions as concrete it represents.

H. One slump test will be taken for each set of test cylinders taken.

I. One air content test will be made for each set of test cylinders taken.

3.07 PATCHING

A. Allow Owner Representative to review concrete surfaces immediately upon removal of forms.

B. Excessive honeycomb or embedded debris in concrete is not acceptable. Notify Owner Representative upon discovery.

C. Patch imperfections as directed by Owner Architect and/or Engineer.

3.08 DEFECTIVE CONCRETE

A. Defective Concrete: Concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.

B. Repair or replacement of defective concrete will be determined by Owner Representative.

C. Do not patch, fill, touch-up, repair, or replace exposed concrete except upon express direction of Owner Representative for each individual area.

END OF SECTION 03 3000

SECTION 03 5100 –GYPSUM CONCRETE ROOF DECK REPAIR

PART 1 GENERAL

1.01 SUMMARY

A. Work includes, but is not necessarily limited to:
   1. Poured Gypsum Roof Deck Repair including form board, reinforcing mesh, poured gypsum concrete and all other items required for a complete and proper installation.
   2. Gypsum Plank Roof Deck Repair including fabricated gypsum plank, grout and all other items required for a complete and proper installation.

B. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Section 07 5900 – Preparation for Reroofing

1.02 SUBMITTALS

A. Submittal Procedures: Procedures for submittals.

B. Product Data: Provide and Submit Manufacturers Specification Data Sheets for all products including Formboard, Poured Gypsum and Wire Mesh Reinforcement.

C. Manufacturer's Installation Instructions: Submit installation procedures and interface required with adjacent Work.

D. Project Record Documents: Accurately record actual locations of components which are concealed from view.

1.03 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Replacement of damaged or deteriorated gypsum decking:
   1. Basis for Measurement: By square feet
   2. Basis of Payment: Replace Gypsum Deck: Replace any gypsum deck which is deteriorated, damaged or shows signs of water damage, broken formboards, delamination or excessively cracked gypsum with new, poured gypsum decking of the same type, thickness, and cross section to match existing.

1.04 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum three years' experience.

B. Comply with National Roof Deck Contractors Association (NRDCA) Publication NRDCA 500 "Gypsum Roof Deck Replacement Procedures" for all repair work.

C. Maintain one copy of each document on site.

D. Acquire Gypsum Concrete from same source for all Work.

1.05 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products

B. Deliver materials to the job site in original, unopened bundles. Materials are to be stored off the ground with one end elevated to provide drainage and are to be protected from the elements with weatherproof tarps ventilated to avoid condensations. Cut plastic wrappers to encourage ventilation. Keep materials dry.

C. Keep all materials clearly identified with all identifying marks legible. Keep all damaged material clearly identified as damaged and stored separately to prevent its inadvertent use.

D. Do not allow installation of damaged or otherwise non-complying material.

E. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.

F. In the event of damage, immediately make all necessary repairs and replacements subject to the approval of, and at no additional cost to the Owner.

G. Roof surfaces shall be protected from damage at all times.

1.06 REFERENCES

A. Publication NRDCA 500 "Gypsum Roof Deck Replacement Procedures", as published by the National Roof Deck Contractors Association.

B. Design Data – Poured Gypsum Roof Decks (GA 300-73), as published by Gypsum Roof Decks Foundation.

C. ASTM C317 - Specification for Gypsum Concrete

D. ASTM C1396 – Specification for Gypsum Board

1.07 FIELD CONDITIONS

A. Ambient Conditions: Do not install Gypsum products when conditions exceed those stated in the manufacturers printed literature.

1.08 COORDINATION

A. Coordinate with removal and installation of the new roofing system.

PART 2 PRODUCTS

2.01 MATERIALS AND MANUFACTURERS

A. Gypsum Concrete or other lightweight concrete patch material:
   1. Unites States Gypsum; PYROFILL; www.usg.com
   2. Elastizell Canada, Inc.; CELL-PATCH; www.elastizellcanada.com
   3. Siplast; ZONO-PATCH; www.siplast.com

B. Permanent Formboard:
   1. United States Gypsum; SECURERCK Gypsum-Fiber Roof Board 5/8" thick, 6 pound density.
   2. Temple-Inland; GreenGlass Roof Board 5/8" thick.
   3. Georgia-Pacific; DENSDECK Roofboard 5/8" thick.

C. Wire Reinforcement: KEYDECK 2160-2-1619 galvanized wire mesh; www.keystonesteel.com/products/construction.asp

D. Cross-Tees:
   1. Cold-Formed, Fabrication from sheet steel conforming to ASTM A525 or ASTM A568.
   2. Size: 30 mm (1-1/4-inches) by 13 mm (1/2-inch) by 0.6 mm (0.023-inch) thick by 600 mm (24-inches) long.

E. Gypsum Deck Plank:
   1. Fabricated of gypsum board: ASTM C1396.
   2. Nominal Size: full thickness to match existing construction conditions and width to match purlin span. Where possible, length should span two main purlin spans.

3. Factory laminate from two 25 mm (1-inch) thick gypsum panels with top panel edge set back along sub-purlin edge not more than 13 mm (1/2-inch).
4. Edge encased in water-resistant paper.

F. Gypsum Deck Panels: ASTM C1396, Type "X", 16 mm (5/8-inch) thick by 600 mm (24-inches) wide by main purlin span.

G. Grout: Gypsum Concrete: ASTM C317, Class A, (500 psi minimum compressive strength.

H. Substitutions: Substitution Requests.

I. Water: Clean and not detrimental to gypsum concrete.

PART 3 EXECUTION

3.01 EXAMINATION

A. Execution Requirements: Verification of existing conditions before starting work

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Verify sections of deck requiring replacement by visually surveying the underside of deck for sagging or water damaged, stained, or wet formboard. Look for areas of structural damage such as broken form boards, delamination of the formboard, or excessively cracked gypsum concrete. Based on Survey results, mark off the top surface of the roof to denote possible areas of concern.

3.02 PATCHING

A. Remove and replace damaged, cracked, broken, or plank deck damaged beyond repair.

B. Fill with grout and smooth any superficial surface damage to existing gypsum deck.

3.03 REMOVAL OF EXISTING MATERIALS

A. Notify Owner Representative a minimum 24 hours prior to commencement of operations.

B. Maintain records of concrete placement. Record date, location, quantity, air temperature, and test samples taken.

C. When removing the roofing in the marked areas, install minimum 3/4 inch thickness plywood over the marked area. Each 4’x8’ sheet of plywood must span over 3 bulb tee’s to provide a structurally safe walking surface.

D. Protection of In-Place Conditions: Protect all adjacent property scheduled to remain. Replace or repair damaged areas at no cost to owner.

E. Poured Deck:
1. Starting with the wettest or most deteriorated gypsum, remove top surface of the gypsum to expose the wire mesh deck. If any if the wires are rusted through, then the entire area of gypsum (including the mesh, full thickness of gypsum concrete and formboard) must be replaced. Continue removing the surface of gypsum in all directions down to the wire mesh until wire mesh, that has not rusted through, is found.
2. Remove the existing gypsum fill from inside of one complete formboard panel. Cut the wire mesh and remove both the wire mesh and formboard. Leave a minimum 3 inch length of wire mesh next to and along the bulb tee’s to allow tie in to the new mesh after installing the new formboards.

F. Plank Deck
1. Starting with the wettest or most deteriorated gypsum, remove existing grout along bulb tee’s and lift and remove existing plank to be replaced. Continue removing gypsum planks in all directions, as required.
2. Completely remove the existing gypsum plank and existing grout at bulb tee’s in preparation for installation of new planks.

3.04 INSTALLATION

A. Poured Deck:
   1. Replace the existing formboards with new 6 pound density gypsum board sprayed on both sides with a 50/50 bleach / water solution. Install galvanized cross tees at the end of boards that do not fall on joists for support.
   2. Tie new reinforcing mesh into the 3 inch wire mesh at each bulb tee. Place reinforcing mesh with 16 gauge wires at right angles to sub-purlins. Lap mesh ends at least 6 inch but do not lap sides of mesh.
   3. Mix gypsum of concrete patch material in accordance with manufacturers mixing instructions. Use heated water when temperature is below 40 degrees. Install slurry on flanges of bulb tees and cross tees. Keep equipment clean and avoid flash set of gypsum of concrete patch.
   4. Add a 2 inch wide line of slurry across the diagonals of each formboard, After the slurry and diagonal pattern has set, mix additional gypsum or concrete patch material. Slowly pour the wet mix onto the new formboard and screed off to the desired thickness. Maintain a minimum pour of 2 inches above the formboard.
   5. New roof operations may begin as soon as the gypsum has set.

B. Gypsum Plank Deck:
   1. Place plank on lower flanges of sub-purlins or other framing with ends and edges supported.
   2. Stagger joints in adjacent courses.
   3. Support end joints with cross-tees not supported by framing.
   4. Cut plank to fit at ends and framed openings.
   5. Provide continuous 5/8-inch minimum bearing for plank support at deck perimeter, plank ends and openings exceeding 8-inches.
   6. Grout:
      a. Mix gypsum concrete thoroughly using a minimum amount of water to form a thick, pourable consistency.
      b. Fill edge joints to slight excess with single pour at sub-purlins.
      c. Grout end joints on single span system against steel framing.
      d. After initial set, strike of excess to form smooth, flush joint.
      e. Form cant strips and curbs where shown.
      f. Fill joints at roof ridges, hips and valleys.

3.05 PROTECTION

A. Protect installed gypsum deck from subsequent construction operations.

END OF SECTION 03 5100

SECTION 05 3150 - STEEL DECK REPAIR / REPLACEMENT

PART 1 GENERAL

1.01 SUMMARY

A. Work includes, but is not necessarily limited to:
   1. Remove existing steel decking, where deterioration has caused an unsafe environment or where otherwise specified for replacement by roof mounted equipment modifications.
   2. Framed openings up to 10 inches by 10 inches

B. Related Documents: The Contract Documents, Summary of Work, apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other documents.

C. Related Sections:
   1. Division 6 Section "Carpentry (for Roofing)" for wood nailers, cants, curbs, and blocking.
   2. Division 7 Section “Membrane Roofing.”

1.02 REFERENCES

A. American Iron and Steel Institute (AISI):
   1. Specification for the Design of Cold Formed Steel Structural Members

B. American Society for Testing and Materials (ASTM):
   1. ASTM A 611 - Specification for Steel, Sheet, Carbon, Cold Rolled, Structural Quality

C. Steel Deck Institute (SDI):
   1. Design Manual for Composite Decks, Form Decks, Roof Decks, (Publication No. 25).
      a. Code of Recommended Standard Practice
      b. Specifications and Commentary for Steel Roof Deck
   2. SDI Diaphragm Design Manual 1st Edition

D. Steel Structures Painting Council (SSPC):
   1. SSPC-Paint 20 Type II - Zinc Rich Primers - Organic
   2. SSPC-Paint 25 - Red Iron Oxide, Zinc Oxide, Raw Linseed Oil, and Alkyd Primer

1.03 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Replacement of damaged or deteriorated steel decking:
   1. Basis for Measurement: By square feet
   2. Basis of Payment: Replace Metal Deck: Replace any steel deck which is damaged or has scaling or flaking corrosion (rust) with new, mechanically attached decking of the same type, thickness, and cross section to match existing if damaged or corroded area covers an area larger than 24 inches square.

B. The cleaning and coating of the steel decking having surface rust:
   1. Basis for Measurement: By square feet
   2. Basis of Payment: Prime Metal Deck: Steel decking with surface rust shall be cleaned with a stiff wire brush or with rotating steel wheel brush. The steel deck shall be cleaned of all loose rust; then coated with Owner approved rust inhibiting primer. Allow rust inhibitor to dry prior to proceeding with roofing installation.

C. Roof Deck Repair:
   1. Basis for Measurement: By each – unit cost
   2. Basis of Payment: Repair steel decking with deck openings less than 12 inches x 12 inches in size, G-90 galvanized sheet metal may be used for the repair, overlapping the adjacent decking 18 inches on all sides. Steel metal repair shall be fastened to existing steel deck units with side and end lap fasteners spaced 6 inches on center.

D. Roof Deck Repair:
   1. Basis for Measurement: By each – unit cost
   2. Basis of Payment: For openings less than 24 inches x 24 inches in size but greater than 12 inches x 12 inches, a partial steel deck panel (matching the existing steel deck profile and gage) shall be used for the repair, overlapping the adjacent decking 18 inches minimum at the end laps. Fasten the steel deck panel to the existing decking with the end and side laps fasteners spaced 6 inches on center. Should structural members be present; fasten the steel deck panel to the steel structural member as specified in FM 1-29 guidelines - 2.2.13.1.2.3.
   3. Contractor shall provide documentation as outlined in Section 01200 - "Price and Payment Procedures."

E. Roof Deck Securement:
   1. Basis for Measurement: By individual roof area
   2. Basis of Payment: Contractor shall verify the existing steel decking has been secured to the steel bar joist per FM Global Lost Prevention Data Sheet 2.2.13.1.2 – "Roof Deck Securement for Wind Loads" are equal to or last than a FM 1-90 attachment. Should the roofing contractor find the steel decking does not meet the FM Roof Deck Securement Requirements, the cost for installing sufficient FM approved fasteners FM Global Lost Prevention Data Sheet 2.2.13.1.2.

1.03 SUBMITTALS

A. Submittal Procedures: Procedures for submittals
   1. Product Data: Deck profile characteristics and dimensions, structural properties, and finishes
   2. Shop Drawings: Indicate deck plan, support locations, projections, openings and reinforcement, pertinent details, and accessories.

1.04 QUALITY ASSURANCE

A. Qualifications:
   1. Fabricator: Company specializing in performing the work of this section with minimum 5 years documented experience.
   2. Erector: Company specializing in performing the work of this section with minimum 5 years documented experience, certified by AISC Quality Certification Program.
   3. Qualifications of Installers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section. Inn acceptance or rejection of the work, the Owner will make no allowance for the lack of knowledge or skill on the part of the workers.

1.05 SUBMITTALS

A. General: Comply with Submittal Procedures.

1.06 DELIVERY, STORAGE AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products.

B. Deliver materials to the job site in original, unopened bundles. Materials are to be stored off the ground with one end elevated to provide drainage and are to be protected from the elements with weatherproof tarps ventilated to avoid condensations. Cut plastic wrappers to encourage ventilation. Keep materials dry.

C. Keep all materials clearly identified with all identifying marks legible. Keep all damaged material clearly identified as damaged and stored separately to prevent its inadvertent use.

D. Do not allow installation of damaged or otherwise non-complying material.

E. Use all necessary means to protect the materials in this section before, during, and after installation, and to protect the work and materials of all other trades.

F. In the event of damage, immediately make all necessary repairs and replacements subject to the approval of, and at no additional cost to the Owner.

G. Roof surfaces shall be protected from damage at all times.

PART 2 PRODUCTS

2.01 MATERIALS

A. Steel decking shall be manufactured from steel with minimum yield strength of 33 ksi, 22 gage, conforming to ASTM A1008/A1008M for uncoated and painted deck and A653/A653M for galvanized deck.

B. New steel decking shall match existing steel deck profile. Contractor shall field verify existing deck profile.

C. Flat stock steel deck repair material, where required, shall be 18-gage, G-80 galvanized sheet metal.

D. Bearing Plates and Angles: ASTM A 36 steel

E. Rust Inhibitor Primer/Coating:
1. Advanced Protective Products, Rust Destroyer
2. Sherwin-Williams, E41 N1, Kromik Metal Primer
3. Rust-Oleum, #7769, Rusty Metal Primer

F. Touch-Up Primer for Galvanized Surfaces: SSPC 20, Type 1, inorganic

G. Flute Closures: Closed cell foam rubber, 1 inch thick; profiled to fit tight to decking.

H. Closure Strips, Cover Plates, and related Accessories: Fabricated of metal of same type and finish as deck.

I. Screw Fasteners: Self-tapping fasteners for fastening steel decking to structural members.
1. Product Specifications:
   a. Diameter: #12, 1/4
   b. Length: 1-1/4 inch
   c. Thread Form:12-24, 1/4-28
   d. Head Style: #12: 5/16" HWH; 1/4: 5/16" HWH; 1/4: 3/8" HWH
   e. Finish: Climaseal
2. Approvals and Listings
   a. Factory Mutual (J.I. 2 X 9A2 AM), ICBO 3056, ICC - ESR 1976
3. Approved Manufacturer:
   a. OMG Roofing Products - Teks 5 or ICH Traxx/5
   b. Owner Approved Equal

J. Side Lap Fasteners: Self drilling screws for fastening the steel deck side laps and for flat stock metal repair materials.
1. Product Specifications:
   a. Diameter: #12, 1/4
   b. Thread Form :12-24, 1/4-28
   c. Length: 3/4 inch
   d. Head Style: #12: 5/16" HWH; 1/4: 5/16" HWH; 1/4: 3/8" HWH
   e. Finish: Climaseal
2. Approvals and Listings
   a. Factory Mutual (J.I. 2 X 9A2 AM), ICBO 3056, ICC - ESR 1976
3. Approved Manufacturer:
   a. OMG Roofing Products - Stitch Teks 1 or ICH Traxx/1
   b. Owner Approved Equal

2.02 FABRICATION

A. Steel Roof Deck: Minimum 22 gage sheet steel, minimum 33 ksi, 1-1/2 inch high, fluted profile to SDI WR; multiple span; lapped joints. Contractor to verify existing steel decking profile before ordering replacement steel decking. New steel roof deck is to match existing steel deck profile.

B. Fabricate metal decking in accordance with the SDI Design Manual for Composite Decks, Form Decks, Roof Decks, and AISI, to accommodate maximum working stress of 20,000 psi and maximum span deflection of 1/240.

C. For new drains, fabricate roof sump pan of 14 gage sheet steel, flat bottom, sloped sides, recessed 1-1/2 inches below roof deck surface, bearing flange 3 inches wide, sealed watertight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Execution Requirements: Verification of existing conditions before starting work

B. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.

C. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

D. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 STEEL DECK - RUST REPAIR

A. Perform all preparation and cleaning procedures in strict accordance with the paint manufacturer’s recommendations as approved by the Owner’s Representative.

B. Surface rust areas shall be thoroughly wire brushed to remove any loose or foreign materials that would adversely affect adhesion or appearance of applied coatings. Remove oil, grease, dirt, rust, and other foreign substances from the steel decking.

C. Materials Preparation: Carefully mix and prepare rust inhibitor materials in accordance with manufacturer's directions.
   1. Maintain containers used in mixing and application of rust inhibitor in a clean condition, free of foreign materials and residue.
   2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
   3. Use only thinners approved by the paint manufacturer and Owner, and only within recommended limits.

D. Rust Inhibitor Application:
   1. Apply rust inhibitor to all clean surfaces within a four hour period of the cleaning, and prior to deterioration or oxidation of the surface, and in accordance with the manufacturer's recommendations.
   2. Allow sufficient time between successive coats to permit proper drying. Do not recoat until rust inhibitor has dried to where it feels firm and does not deform or feel sticky under moderate thumb pressure.

E. Minimum Coating Thickness: Apply materials at not less than the manufacturer's recommended spreading rate. Provide a total dry film thickness of the rust inhibitor as recommended by the manufacturer for applying the rust inhibitor to a steel decking.

F. Completed Work: Contractor to remove, refinish, or repaint work not in compliance with specified requirements.

3.03 STEEL DECK REPLACEMENT

A. Steel roof deck shall be replaced in full-length sheet to match existing deck layout, unless otherwise stated elsewhere.

B. Erect metal decking and connect to structure in accordance with SDI Design Manual for Composite Decks, Form Decks, and Roof Decks. Coordinate attachment sequence and procedure with placing of units.

C. On steel support members, provide 1-1/2 inch minimum bearing. On masonry support surfaces, provide 3 inch minimum bearing.

D. Align and level deck on supports.

E. Provide fasteners, and side lap connectors of size, spacing, and location as indicated in accordance with SDI Design Manual for Roof Decks and per manufacturer's written instructions.

F. Space FM Approved deck fasteners a maximum of 12 in. (305 mm) on center (every other rib) at all supports in the field of the roof.

G. Space FM Approved deck fasteners a maximum of 6 in. (152 mm) on center (every rib) at all supports in the roof's corners and perimeters.

H. Secure the steel deck to supporting members at each deck side lap.

I. For overlap-type side laps, ensure securement penetrates all deck panels at the laps. Do not weld side laps on 20 gage steel decking. (0.0359 in., 0.91 mm) or thinner deck.

J. For a Class 1-90, side laps shall be fastened together, not exceeding 36 inches on center in the field, and 30 inches on center in the perimeters and corners center-to-center between each side lap fastener, or side lap fastener and support.

K. Fasten the deck to the structural members at each side lap, regardless of resultant fastener spacing. For overlap-style side laps, ensure fasteners penetrate all deck panels at the laps. For interlocking-style side laps, install one fastener on each side of the lap. End laps shall be a minimum of 2 inches.

L. Ensure the fasteners do not penetrate any conduit or miscellaneous piping located at bottom of the decking.

3.04 STEEL DECKING REPAIR

A. For openings less than 12 inches x 12 inches in size, G-90 galvanized sheet metal may be used for the repair, overlapping the adjacent decking 18 inches on all sides. Steel metal repair shall be fastened to existing steel deck units with side lap fasteners spaced 6 inches on center.

B. For openings less than 24 inches x 24 inches in size but greater than 12 inches x 12 inches, a partial steel deck panel (matching the existing steel deck profile and gage) shall be used for the repair, overlapping the adjacent decking 18 inches minimum at the end laps. Fasten the steel deck panel to the existing decking with the end and side laps fasteners spaced 6 inches on center. Should structural members are present; fasten the steel deck panel to the steel structural member as specified in FM 1-29 guidelines - 2.2.13.1.2.

C. Install 6 inch wide sheet steel cover plates where deck changes direction. Fasten in place 12 inches on center maximum. Install sheet steel closures and angle flashings to close openings between deck and walls, columns, and openings.

3.05 CLEANING

A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.

B. Upon completion of painting, clean paint spattered surfaces. Remove spattered paint by washing and scraping, using care not to scratch or damage adjacent finished surfaces.

3.06 FIELD QUALITY CONTROL

A. Quality Control: Field-testing and inspection.

B. Inspection:
   1. Inspect metal decking for evidence of rust or damage.
   2. Inspect all securement fasteners over entire roof area for size and spacing.
   3. Inspect all side lap fasteners over entire roof area for type, size, and spacing of side lap fasteners.

END OF SECTION 05 3100

SECTION 06 1000 - CARPENTRY WORK (For Roofing)

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Roof curbs and cants; concealed wood blocking, with hardware and attachment accessories.

B. Preservative Treated Wood (PTW).

C. Refer to schedule at end of Section.

1.02 REFERENCES

A. American Lumber Standards Committee (ALSC): National Design Specification for Wood Construction.

B. American Wood Preservers Association (AWPA): AWPA Book of Standards.

C. Product Standard of NBS (PS):
   1. PS 1 - Construction and Industrial Plywood
   2. PS 20 - American Softwood Lumber Standard

1.03 QUALITY ASSURANCE

A. Rough Carpentry Lumber: Visible grade stamp of agency certified by National Forest Products Association (NFPA).

B. Preservative Treatment: Confirm to applicable requirements of AWPA.

1.04 UNIT PRICE - MEASUREMENT AND PAYMENT

A. Replacement of damaged or deteriorated perimeter and / or parapet wall wood blocking:
   1. Basis for Measurement: By linear foot
   2. Basis of Payment: Includes labor for the installation of new wood blocking, new wood blocking fasteners and associated accessories; and removal and disposal of existing materials.

1.05 SUBMITTALS

A. Product List: Submit list of proposed Products and manufactures, including all items specified in Part 2 -- Products or otherwise required by the Work.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, finish, accessories, and locations to a minimum scale of 1-½ inch to one foot.

C. Manufacturer's Certifications: Submit certification that preservative wood treatment is in accordance with applicable requirements and that preservative formulation/treater warrants PTW material for intended use.

PART 2 - PRODUCTS

2.01 ROUGH CARPENTRY MATERIALS

A. Timber, General: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; provide certificate of inspection from an accredited Agency for selected material.

1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2-inches or less in thickness.
2. Provide lumber with 15 percent moisture content at time of dressing and shipment for, sizes 2-inches or more in thickness.

B. Dimensioned Lumber: Graded in accordance with established grading rules; grade and species as follows:
1. Concealed Boards: WWPA standard grade, any species, or SPIB No. 3 grade Southern Pine.
2. Lumber for Miscellaneous Uses: Standard grade unless otherwise indicated.
3. Plywood: PS 1; select sheathing grade or APA rated 5/8-inch minimum thickness, CD-X, or better in sheathing.

C. Nails, Spikes, and Staples: Galvanized; size and type to suit application.

D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Medium carbon steel, hot dipped galvanized; sized to suit application.

E. Anchors: Toggle bot type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolts or power activated type for anchorage to steel.

2.02 PRESERVATIVE TREATED WOOD (PTW)

A. Shop Preservative (Pressure Treatment Type): AWPA C2 and C9.

B. Wood for Above-Ground Contact Use: AWPB LP-2.

C. Shop pressure treat and provide identification on preservative treated materials, including all wood blocking, cants, and plywood.

D. Dry all PTW after treatment to the following maximum moisture content:
1. Plywood: 15 percent.
2. Lumber: 19 percent.

2.03 SOURCE QUALITY CONTROL

A. Factory marked each piece of lumber with type, grade, mill, and grading agency.

B. Nominal sizes are indicated. Provide actual sizes as required by PS 20.

C. Provide dressed lumber, sized four sides.

PART 3 - EXECUTION

3.01 EXAMINATION AND PREPARATION

A. Verify that surfaces are ready to receive work and field measurements are as shown on shop drawings.

B. Verify mechanical, electrical, and building items affecting work of this Section are placed and ready to receive this Work.

C. Before installation, prime paint surfaces of items or assemblies to be in contact with cementitious materials.

3.02 INSTALLATION

A. Discard units or material with defects that might impair quality of work and units that are too small to use in fabricating work with minimum joints.

B. Set carpentry work accurately to required levels and lines, with members plumb and true and accurately cut and fitted.

C. Securely attach carpentry work to substrate to anchoring and fastening as shown and as required by recognized standards. Use common wire nails, except as otherwise indicated. Select fasteners of size that will not penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners with splitting wood; pre-drill as required.

D. Install components with fasteners suited to materials.
   1. Nailable Surfaces: Galvanized compatible nails, sized as follows:
      a. ¾ and 1-inch materials: 8d nails.
      b. 1-1/2 or 2 inch materials: 16d nails.
   2. Hollow Masonry Walls: Toggle Bolts.
   3. Solid Masonry: Rawl Zamac pin drive.
   4. Steel Members: Bolts or Power actuated Hilti pins.
   5. Maximum Spacing: 12-inches on center, unless noted otherwise.
   6. Top of Hollow Masonry Wall: Set 12-inch minimum J-bolts in fully set bed of concrete; minimum 18-inches on center.

E. Remove all bent or deformed nails from finished work and dispose of.

3.03 CLEANING

A. Pick up spilled carpentry products, unused nails, and fasteners daily.

3.04 PROTECTION

A. Protective Walkways - Traffic Area Protection: Install full sheets of ¾-inch exterior grade plywood and minimum ½-inch wood fiber insulation to those areas of new roof surface to be trafficked by personal and wheeled vehicles.

3.05 SITE TREATMENT OF CARPENTRY

A. Treat site-saw cut ends. Allow preservative to cure prior to erecting materials.

3.06 SCHEDULE

A. Rough Carpentry Work:
   1. Miscellaneous blocking and canting for single-ply roofing systems and related flashings and sheet metal.
   2. Blocking and canting for roof mounted mechanical items.

END OF SECTION 06 1000

SECTION 07 5400.1 –EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
1. Adhered EPDM sheet roofing
2. Polyisocyanurate Insulation
3. Cover board
4. Walkway pads

B. **SCOPE OF WORK: SECTIONS 1, 3 & 4:** The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity on a daily basis. Over the cleaned and prepared concrete decking substrate, prime the deck substrate and install manufactures approved (SA) self-adhered vapor barrier; with FM 1-105 FM ribbon pattern fully adhere the base layer of 1.5" polyisocyanurate insulation followed by the installation of ¼" per foot tapered polyisocyanurate insulation adhered with low rise foam over the base layer of 1.5" polyisocyanurate, installation of a 1/2" HD polyisocyanurate cover board adhered with low rise foam, installation of ½" plywood at all door access, stairs and ladder egresses followed by the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. All flashing membranes, prefabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl sealant or tape at all attachment points of the surface mounted counterflashing. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty (20) Year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

C. **SCOPE OF WORK: SECTION 2:** Over the cleaned and prepared metal decking substrate, prime the deck substrate and install manufactures approved (SA) self-adhered vapor barrier; with FM 1-105 FM fastening pattern mechanically fasten the base layer of 1.5" polyisocyanurate insulation, installation of a 1/2" HD polyisocyanurate cover board adhered with low rise foam with FM 1-105 ribbon method over the base layer of 1.5" polyisocyanurate, installation of ½" plywood at all door access, stairs and ladder egresses followed by the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. All flashing membranes, prefabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl sealant or tape at all attachment points of the surface mounted counterflashing. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty (20) Year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

1.03 DEFINITIONS

A. ASTM E108, Class "A".

B. UL 790, Class "A".

1.04 REFERENCES

A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. Single-Ply Roofing Institute (SPRI): Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes

C. National Roofing Contractors Association (NRCA): Current Roofing and Waterproofing Manual

D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Current SMACNA Technical Manuals.

E. Code of Federal Regulations, (CFR) including:
1. CFR Title 29, Part 1910 "Occupational Safety and Health Standards."
2. CFR Title 29, Part 1926 "Safety and Health Regulations for Construction."

F. Underwriters Laboratories (UL):
1. Roof Materials and Systems Directory. 2012.
2. UL 790: Tests for Fire Resistance of Roof Covering Materials: 1983.

G. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) FOR EPDM MEMBRANE:
1. .060" (Black) Non-Reinforced
2. ASTM D 412
3. ASTM D 624
4. ASTM D 573

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing system manufacturer based on testing and field experience.

C. Roofing System Design: Comply with SPRI "Wind Design Guide for Adhered Single Ply Roofing Systems" for the following ground roughness exposure, classification of building and system design:
1. Surface Roughness Category: Exposure B
2. Classification of Building: Category II
3. Wind uplift Design: 90 mph @ 3 second gust
4. System 1 Design: Adhered Single Ply Membrane Roofing

D. Underwriters Laboratories Inc. (UL):
1. UL RMSD – 2009 Roofing Materials and Systems Directory
2. UL 790 – 2009 Fire Resistance of Roofing Coverings Materials
3. Exterior Fire Exposure Classification: Class A, ASTM E 108, for application and slopes shown.

1.06 ACTION SUBMITTALS

A. Product Data: Submit latest edition of roofing system manufacturer's roofing and base flashing specifications including list of materials proposed for use, installation procedures, and roofing system manufacturer's Product Safety Data Sheets.

B. Product Safety Data Sheets: Installer shall review all product data safety data sheet chemical names prior to submitting to University of Missouri.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.

3. Roof plan showing orientation of concrete deck and orientation of membrane roofing.
4. Insulation ribbon methods for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: Physical samples are not necessary.
1. Sheet roofing, of color specified.
2. Roof insulation.
3. Cover board.
4. Metal termination bars.
5. Battens.
6. Six batten fasteners of each type, length, and finish.
7. Walkway pads or rolls.
8. Safety yellow perimeter tape.

1.07 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and roofing system manufacturer.

B. Roofing system manufacturer Certificates: Signed by roofing system manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by roofing system manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

E. Single Ply Roofing Institute (SPRI) - Fasteners Withdrawal Resistance Testing:
1. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
2. Prior to starting the project, provide a copy of the Fasteners Withdrawal Resistance Testing to roofing system manufacturer’s technical department.

F. Warranty:
1. Provide sample copy of 20-year (NDL) Full System roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
2. Provide sample of copy 5-year Installer’s workmanship warranty stating obligations, remedies, limitations, and exclusions of warranty.

G. Inspection Report: Copy of roofing system roofing system manufacturer's final inspection report of completed roofing installation.

1.08 CLOSE OUT SUBMITTALS

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

1.09 QUALITY ASSURANCE

A. Roofing System Manufacturer Qualifications: A qualified roofing system manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications:
1. A qualified firm that is approved, authorized, or licensed by membrane roofing system roofing system manufacturer to install roofing system manufacturer's product and that is eligible to receive roofing system manufacturer's special warranty.
2. Prior to submitting a roofing proposal, Installer must be approval by Owner’s representative.

C. Roofing system manufacturer's membrane shall meet the following characteristics:
   1. Protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt.
   2. Membrane Thickness: Membrane roofing system manufacturer is to verify that the membrane thickness is of the membrane thickness specified ASTM D412 nominal thickness of +/- 10 percent will not be acceptable for measurement of membrane thickness.

D. Source Limitations: Obtain components including roof insulation, fasteners, and accessories for membrane roofing system from same roofing system manufacturer as membrane roofing.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Pre-installation Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 10 working days before conference.
   1. Meet with Owner's Representative/General Contractor, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including roofing system manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

G. At no cost to University of Missouri, roofing system manufacturer's technical representative shall perform:
   1. Manufacturer's Quality Control Inspection: The Manufacturer's Technical Representative shall review the on-going work on the first day of the roofing production and a minimum of one (1) in-progress inspection every 10 working days. The Roof system manufacturer Technical Representative shall:
      a. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
      b. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
      c. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.
   2. Final Roof Inspection: Contractor is to arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of the roofing project.
      a. All defects noted non-compliance with the specifications, or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri and Roof system manufacturer.
      b. The roofing contractor is to forward a copy of Final Inspection Report to the University of Missouri On-site Representative within two days after date inspection(s) is performed.

H. Installer's Responsibility: Any failure by the Owner Representative or roofing system manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these specifications of work in progress or completed work shall not relieve the Installer, or reduce, or in any way limit, his responsibility of full performance of work required of the Installer under these specifications.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with roofing system manufacturer's name, product brand name, and type, date of manufacture, and directions for storing and mixing with other components. Deliver materials in sufficient quantity to allow work to proceed without interruption.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within temperature range required by roofing system manufacturer.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Store and protect materials, including roofing insulation from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store all materials in a dry location. Use pallets to support all materials from roof deck. Distribute the load to stay within live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work. Comply with roofing system 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.

1.11 PROJECT CONDITIONS

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

B. The EPDM adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   3. The wall/deck intersection permits air entry into the wall flashing area.

C. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

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

E. Protection:
   1. Provide special protection and avoid traffic on completed areas of membrane installation.
   2. Restore to original condition or replace work or materials damaged during handling of roof materials.
   3. Take precautions as required to protect adjacent work and structures.

F. Emergency Equipment and Materials: Maintain onsite equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the Installer shall provide the labor necessary to monitor the situation to maintain a watertight condition.

G. Protection:
   1. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent Roofing areas.
   2. The Installer shall provide a suitable temporary protective surface for all roofing areas which will receive construction traffic or construction of equipment during all phases of the roofing project.
   3. During the course of installation of the membrane roofing systems, should there be any damage created by other construction trades to the new or to existing roofing membrane and/or roofing system, the Installer is to immediately notify the Owner's Representative and membrane roofing system manufacturer. All damages are to be repaired according to the membrane roofing system manufacturer's or Owner's representative's recommendations. The "party" responsible for the roofing damages shall bear the total cost for the repairs or for the replacement of existing or new roofing system.

H. Restrictions:
1. Comply with Owner's General and Safety Requirements on use of site.
2. Smoking and Tobacco products are prohibited on all roof areas and on the campus grounds.
3. Provide and maintain sanitary facilities for employees.
4. Maintain facility and all utility services in a functional condition.

1.12 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights of the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Installer under requirements of the Contract Documents.

B. Roofing System Manufacturer's Warranty: Submit a written warranty, without monetary limitation, with all available options, including flashing endorsement, roofing system manufacturer's roof insulation and roofing system manufacturer's accessories, signed by roofing system roofing system manufacturer's agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
1. Twenty (20) Year Full System Warranty (no ponding/standing water exclusions accepted). Warranty shall be non-prorated and cover basic wind speeds up to 60 mph.
2. "Early Bird" warranties are not to be issued, as they will not be accepted by Owner.
3. The specified roofing system manufacturer's warranty will be issued only upon final acceptance by the roofing system manufacturer's technical department and the Owner's Representative's final approval.
4. Request for final payment and issuance of the specified Roofing system manufacturer's warranty will be issued to the Installer's after successful completion and Owner's Representative's final approval and acceptance of the entire roof system installation.

C. Installer's Warranty: Submit roofing Installer's workmanship warranty, on a notarized written warranty form, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, cover board, roof insulation, fasteners, adhesives, sealants, and associated sheet metal, for the following warranty period:
1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM MANUFACTURER

A. The components of the roof system are to be products of a single roofing system manufacturer or approved by the Roof system manufacturer, whose products meet or exceed the project specifications, have manufactured, and installed the roofing materials and systems of the type specified for a minimum of twenty (20) years, and who maintains a single source responsibility for the total roofing system.

B. Roofing system manufacturers: The components of the roofing system are to be products of a single roofing system manufacturer as required to provide the specified system warranty. Subject to compliance with requirements, provide roofing products from:
1. Versico incorporated, Akron OH
2. Carlisle Roof System, Akron OH
3. Firestone Roof system, Carmel IN
4. Owner approved manufactures.

2.02 EPDM MEMBRANE

A. EPDM Membrane: a uniform, flexible sheet formed from ethylene propylene diene monomer, ASTM D 412, of the following Classification – Type and Grade, Membrane Thickness, UL Classification, and Membrane Exposed Face Color.
1. Classification: Type II, Grade I.
2. Membrane Thickness: 60 mils, +/- 2.0 mils.
3. UL Class: A.
4. Membrane: Exposed Face Color: Black

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system roofing system manufacturer for intended use and compatible with membrane roofing materials.
   1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdictions.

B. Membrane flashing and Flashing Accessories: As recommended by the roofing system manufacturer's printed instructions for sheet flashing of same material, mil thickness and color as sheet membrane.

C. Asphalt Resistance Membrane Flashing: Roof system manufacturer's SA vapor barrier. The asphalt resistance membrane flashing can be adhered directly to asphalt-contaminated surfaces. The asphalt resistant membrane can be installed over the field membrane to act as a protection layer membrane in conditions where oil and grease could develop from roof-top equipment.

D. Insulation Fasteners: Roofing system manufacturer approved corrosion resistant steel #12 "fasteners," screws of the appropriate size and type for roof membrane and insulation attachment. A #12 corrosion-resistant fastener is used with plates to attach insulation boards to steel roof decks. Fasteners for the insulation shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

E. Insulation Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 3-inch round plates, "plates," of the appropriate size and type for the securement of the insulation to approved substrates. Securement plates for the insulation shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

F. Membrane Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 2-inch round plates, "discs," for the securement of the membrane to the steel roof decks. Securement plates for the membrane shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

G. Membrane Securement Screw: Roofing system manufacturer approved corrosion resistant steel, "#15screws" of the appropriate size and type for roof membrane securement. A #15, heavy-duty, corrosion-resistant fastener used with "discs" and "termination bar" to attach Roof system manufacturer's roof membrane to steel roof decks. Fasteners for the membrane shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

H. Membrane Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, Standard bonding adhesive, used to attach membrane to the horizontal or near-horizontal substrate. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

I. Membrane Flashing Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, used to attach the flashing membrane to the substrate, either horizontally or vertically. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

J. Metal Termination Bar: a heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. "reglet" has a 2-1/4-inch (57 mm) deep profile and is provided in 10 foot (3 m) lengths.

K. Membrane Securement Bar: is a 1-inch-wide aluminum alloy bar used with to clamp the membrane to the roof deck along walls, curbs, and certain vertical to horizontal changes in the roofing system. Termination bar is supplied in bundles of 25 pieces. Each termination bar is 10 feet long.

L. Sealants: Owner approved sealant shall be used to seal penetrations through the membrane system and at miscellaneous sealant applications that are exposed to roof systems components.

M. Safety Warning Membrane: A highly visible product to draw attention to an unprotected roof perimeter and potentially hazardous area. The safety warning membrane is designed for use on a membrane roof. The EPDM safety warning membrane shall be a yellow in color, 60 mils in thickness, 4 inches wide, and 100 feet in length.

N. Prefabricated Pipe Flashing: prefabricated vent pipe flashing made from 0.060 inch (60 mil/1.5 mm) thick membrane.

O. Prefabricated Corner Flashing: prefabricated universals corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are adhered/quick applied to membrane base flashings.

P. Aluminum: ASTM B 209-86, alloy and temper - 3003-H14, 0.040 inch thick aluminum sheet, mill finish with formed drip edge.

Q. Mineral Wool-Fiber Fire-Resistant Insulation: Semi-rigid mineral-wool-fiber batt insulation; Type IVA per ASTM C 612; not less than 144 psf (6.9 kPa) compressive strength per ASTM C 165; less than 0.05 percent moisture absorption per ASTM C 1104; complying with ASTM E 136; and with the following surface-burning characteristics per ASTM E 84:
   1. Flame Spread: 0.
   2. Smoke Developed: 0
   3. Manufacturers: Subject to compliance with requirements, available products include the following:
      a. Basis of Design: Roxul Safe; Roxul Inc.

R. Other miscellaneous materials shall be of the "best grade" available and to be approved in writing by the roofing system manufacturer for the specific application.

2.04 INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements, selected from roofing system manufacturer's standard sizes and of thickness indicated.

B. Polyisocyanurate board insulation: Closed cell polyisocyanurate foam with black glass reinforced mat laminated to faces, complying with ASTM 1289-03, Type 2, Class 2, Grade 2

C. Insulation Requirements:
   1. **Roof Area 1,3 & 4**: Install 1.5" base layer poly Iso adhered with low rise foam to self-adhered vapor barrier. Adhere ¼"-12" tapered poly Iso with ½" HD cover board adhered with low rise foam in FM 1-105 ribbon method.
   2. **Roof Area 2:** Install 1.5" base layer poly Iso mechanically fastened with FM 1-105 fastening pattern to self-adhered vapor barrier. Adhere ½" HD cover board with low rise foam in FM 1-105 ribbon method.

D. Roof and Tapered Insulation: rigid polyisocyanurate foam insulation composed of a closed cell polyisocyanurate foam core laminated to a felt or glass fiber mat facer on both major surfaces. The insulation shall have the following characteristics:
   1. Dimensional Stability (length and width) per ASTM D 2185: <2%.
   2. Compressive Strength (10% Deformation) per ASTM D 1621: 20 psi.
   3. Product Density per ASTM D 1622: Nominal 2.0 pcf.
   4. Flame Spread per ASTM E84 (Full 10 min. Test): 20-50*
   5. The insulation board is to have a minimum conditioned thermal value per inch of an LTTR Value of 6.00 as determined by ASTM C 1303 and C 518.
   6. The insulation board shall have a minimum compressive strength of 20 psi and a dimensional stability of -2% linear changes, maximum seven (7) days.

E. Tapered Polyisocyanurate Insulation Shapes: Preformed insulated shapes for saddles, crickets, tapered edge strips, sumps, and other insulation shapes where indicated or where required for sloping to drain. Fabricate to slopes indicated. Saddles, Crickets, Edge Strips, and Other Shapes:
   1. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48) unless otherwise indicated.
   2. Crickets between Roof Drains: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24) unless otherwise indicated.
   3. Sumps for Roof Drains, measuring 4 feet x 4 feet; size to be modified when drains are located next to parapet wall.
   4. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48). Provide a minimum insulation thickness at the roof drain or roof scupper of 2.0 inches.

5. Saddle Behind (Upslope) from Curbs Measuring 18 inches and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).
6. Saddle Behind (Upslope) from Round Penetrations Measuring 12 inches in diameter and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).

2.05 COVER BOARD

A. High density polyisocyanurate cover board: Closed cell polyisocyanurate foam with coated glass matt facer laminated to both faces, complying with the following additional characteristics:
1. Thickness: 0.5 inches.
2. Size: 48 inches by 48 inches, nominal.
3. R-Value (LTTR):
   a. 0.5 inches, R-Value: 2.5, minimum.
4. Compressive Strength: 120 psi.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 8.3 percent post-industrial, average.

2.06 INSULATION AND COVER BOARD ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation roofing system manufacturer for intended use and compatible with membrane material.

2.07 DUAL COMPONENT POLYURETHANE ADHESIVE

A. General: Provide a dual component polyurethane adhesive that is intended for the attachment of polyisocyanurate insulation to various substrates. The dual component polyurethane adhesive must have approvals from the insulation and roofing system manufacturer for adhering the polyisocyanurate insulation to approved substrates, multiple layers of polyisocyanurate insulation, and cover boards. Consult adhesive roofing system manufacturer on current acceptable substrates to apply dual component polyurethane adhesive to various substrates.

B. Dual component polyurethane adhesive: The low-slope dual component polyurethane adhesive shall have the following minimum properties:
1. Density ASTM D-1622: Free Rise, 3.2 lb./cf.
2. Compressive Strength ASTM D-1621: Parallel, 38 psi @ 6% deflection.
3. Tensile Strength ASTM D-1623: 35 psi
4. Water Absorption ASTM D-2843: 5.1%
5. Closed Cell Content ASTM D-6226: 90% min.
6. R-Value ASTM C-518 3.8/inch (new)
7. VOC Content ASTM D-2369 <5 g/l (1&2 combined)
8. Weight/Gallon: Part A Component 10.32 lbs. Part B Component 8.54 lbs.

C. Approved Roofing system manufacturer and Product:
1. OMG Roofing Products, “OlyBond 500® SpotShot.”
2. Roof system manufacturer, “OM Board Adhesive.”
3. Approved equal as approved by Owner or Roof Consultant

2.08 VAPOR RETARDER ON CONCRETE/METAL DECKS

A. Self-Adhered (SA) - 32 mil (0.8 mm) self-adhesive vapor barrier that can also serve as temporary roof protection. Self-Adhered is available in rolls 44.9 inches x 133.8 feet (1.14 x 40.8 m).

B. SA Primer - A polymer emulsion water-based primer designed to improve the adhesion of SA vapor retarder on concrete and METAL roof decks or plywood walls. Application temperature must be 41°F (5°C) and above. The coverage rate will range from 163 - 400 ft2/gal (4 - 9.8 m²/L) for non-porous surfaces to 82 - 135 ft2/gal (2 - 3.3 m²/L) for porous surfaces. The VOC content is 3 g/L.

2.09 RELATED MATERIALS

A. Timber, General: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; provide certificate of inspection from an accredited Agency for selected material.
   1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2-inches or less in thickness.
   2. Provide lumber with 15 percent moisture content at time of dressing and shipment for, sizes 2-inches or more in thickness.

B. Dimensioned Lumber: Graded in accordance with established grading rules; grade and species as follows:
   1. Concealed Boards: WWPA standard grade, any species, or SPIB No. 3 grade Southern Pine.
   2. Lumber for Miscellaneous Uses: Standard grade unless otherwise indicated.
   3. Plywood: PS 1; select sheathing grade or APA rated 5/8-inch minimum thickness, CD-X, or better in sheathing.

2.10 MISCELLANEOUS FASTENERS AND ANCHORS

A. General: All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approve for such use by the fastener roofing system manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm), stainless steel, and to be approved for such use by the fastener roofing system manufacturer.

2.11 PROTECTION PADS

A. Protection Pads: "- factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, as supplied Roof system manufacturer. Color of protection pads shall be black. Protection pads to be used under all wood support blocking, equipment supports, pipe steel supports, and under downspout splash blocking.

2.12 ROOF WALKWAYS

A. Walkway: factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, approximately 2" thick, as supplied Roof system manufacturer.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect entire roof area to be roofed for acceptability. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting installation and performance of the roofing system:
   1. Verify that roof openings and penetrations are in place, and curbs are set and braced, and that the roof drains and drain lines are properly clamped into position and are in a 100% functional condition.
   2. Verify that primary drain bodies are at proper elevations for construction of sump at slopes indicated.
   3. Verify that secondary overflow drain bodies are at proper elevations for construction, without sumps, at level of roof surface.

B. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011, revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. Verify that structural use panels, sheathing, and similar wood products are securely anchored to substrates, and that surfaces of panels and sheathing are without irregularities which could interfere with proper membrane and flashing installation.

D. Visually inspect cast-in-place reinforced concrete roof deck for the following:
   1. Evidence of impaired deck structural capacity or integrity.
   2. Exposed concrete reinforcing.
   3. Presence of corrosion.
   4. Spalling or loss of concrete cover.
   5. Presence of foreign materials.
   6. Efflorescence.
   7. Ridges or uneven conditions in concrete deck.
   8. Holes, voids, or gaps in concrete deck.
   9. Accumulations of moisture.

E. Other conditions that would prevent proper application of roofing or that would prevent membrane roofing manufacturer's approval of substrate, components, or system.

F. Verify that roofing systems can be installed with positive drainage of minimum slopes indicated at all areas of roof, without ponding after 24 hours.

G. Verify that roofing as completed will discharge to internal roof drains without ponding or inadvertent discharge through secondary roof drains.

H. Verify that final installed curb heights for flashing are a minimum of 8-inches (200 mm) measured above finished roof membrane.

I. Verify piping and conduit penetrations of roof are made individually, separated by a minimum of 12 inches (300 mm) from each other and from restraining surfaces or other obstructions.

J. Verify locations of interior electrical conduits, piping, ducts, and similar items in close proximity to underside of steel roof decking, to avoid striking with fasteners.

K. Verify that deck and other substrates are dry, free of debris, excess, and foreign materials.

L. Verify substrates and surfaces to receive flashings are dry, clean, and free of sharp or penetrating projections or other irregularities.

M. Proceeding: Proceed with installation only after unsatisfactory conditions have been corrected.

N. Do not commence work until decking and substrates are in full compliance with roof system manufacturer's requirements, deck and substrate conditions are sound, and positive fall to drainage points are achieved.

O. Commencement: Commencement of work indicates acceptance of conditions and responsibility for all corrections.

3.02 PREPARATION

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

B. The Installer will be entirely responsible for the complete removal of all dirt, debris, moisture from the roof's substrate, i.e., steel decking, concrete decking, before the installation of the roofing system. The roof's substrate must be 100% completely dry before applying the spray-in-foam insulation or before the installation of the specified roofing insulation.

C. Cleaning: Clean substrate including metal decking flutes of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

D. Debris, water, moisture, or foreign materials found in flutes of steel roof decking is not permitted; remove and replace roofing installed above flutes found to contain foreign materials.

E. Cleaning, repair or replacement of damaged items, as a result of roofing related materials entering the facility, shall be solely at the roofing contractor's expense.

F. Broom clean cover board immediately prior to membrane roofing application.

G. Promptly remove debris each day; do not stockpile debris or allow waste to accumulate on steel decking, insulation, or roofing under construction.

H. Containment: Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction at the end of the workday or when rain is forecast. Remove roof-drain plugs when no work is taking place or when rain is forecast.

I. Mask off adjoining surfaces not receiving roofing membrane materials to prevent spillage or over spray affecting other construction.

J. Fill all gaps and voids between substrate components that are wider than 1/4 inch. Fill all gaps with same materials as the substrate.

K. Seal around along perimeters, along equipment curbs, around pipes, around conduits, and any other roof penetrations with vapor barrier.

L. Base Vertical Flashings: Coordinate roof insulation thickness with adjacent base flashing height, to maintain not less than 8-inch (203 mm) flashing height. Adjust base vertical flashing height including substrates and changes in exterior wall materials to maintain minimum height.

M. Proceed with roofing work only when weather conditions permit work to proceed in accordance with manufacturer's requirements and recommendations.

3.03 WOOD NAILER INSTALLATION

A. All Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center, if necessary, to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Division 06 1000 for acceptable fasteners for wood product attachments.

B. Wood Nailer thickness shall be as required to match the insulation and cover board height (thickness) to allow a smooth transition.

C. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any roof system manufacturer product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

D. New wood nailers and/or plywood sheeting shall meet the performance criteria in Division 06 1000.

3.04 VAPOR-RETARDER / AIR BARRIER INSTALLATION

A. Deck to be as clean as possible. Ensure the decking is in good condition. If decking is wet allow sufficient amount of time for the moisture to dry. If the contractor cannot remove the asphalt roof membrane from the deck, please remove any loose or deteriorated material, prime existing substrate and install vapor barrier: **No torches to be used to dry deck of moisture!**

B. Install Self-Adhered over a SA Primer. In concrete applications allow concrete to cure for at least 7 days. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32°F (0°C) and above. The use of a primer is required on the following substrates: wood, concrete, lightweight concrete, gypsum boards and decks, and DensDeck Prime® boards.

C. Begin application at the bottom of the slope. Unroll Self-Adhered onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 in. (75 mm) lengthwise following the reference line and by 6 in. (150 mm) at each end. Stagger end laps by at least 12 in. (300 mm). Tool vapor barrier up all penetrations and or perimeters and seal. Vapor barrier to be installed as if the VB was a temp roof. Do not immediately remove the silicone release sheet.

D. Once aligned, peel back a portion of the silicone release sheet and press the membrane onto the substrate for initial adherence. Hold Self- Adhered tight and peel back the release sheet by pulling diagonally.

E. Use a 75 lb. (34 kg) roller to press Self-Adhered down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

3.05 INSULATION BOARD INSTALLATION

A. General Criteria:
1. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged insulation boards are to be replaced with new insulation boards.
3. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified roofing insulation or during the time of applying the dual component polyurethane adhesive.
4. Construct sumps at primary roof drains using tapered insulation to slope indicated. Install nailers or blocking as required to secure drain body assembly to roof deck.
    a. Unless otherwise indicated, construct sumps to consistent and uniform slope of 1/4 per 12 inches (1:48) to provide a smooth transition from the roof surface to the drain. Do not introduce steeper or shallower slopes within sump.
    b. Use tapered insulation to form a square sump. Unless indicated otherwise, construct sump measuring 4 foot by 4 foot at primary roof drains.
    c. Adjust primary roof drain assemblies to proper elevation for sump.
    d. Install tapered insulation so edges do not restrict flow of water.
    e. Do not create circular depressions around primary roof drains at bottoms of sumps.
5. **Do not install sumps at secondary overflow roof drains.**
    a. Adjust secondary roof drain assemblies to proper elevation of final roofing membrane.
    b. Do not create circular depressions around secondary roof drains.
6. Where conditions required drain modifications to match specified insulation thickness, roofing contractor will be responsible for the cost of readjusting the primary roof drain bowl and associated plumbing to match the "finished" insulation thickness. University of Missouri will not permit the circular depressions, nor the cutting or shaving the insulation to slope the insulation to the edge of the drain bowl.
7. University of Missouri will not permit loose boards under foot. Contractor is expected to use adequate weight during the application of the insulation boards. Boards in access of 1/8" deflection will not be permitted.
8. Roofing system manufacturer's technical representative shall be on the jobsite during the first initial day of installation of the roofing system.

B. Installation of additional "flat stock" and tapered polyisocyanurate insulation:
1. The "flat stock" and / or tapered polyisocyanurate insulation panels shall be laid transverse to the proceeding layer of insulation, with joints staggered at least 1/3 of overall length from those of the proceeding layer of the "flat stock" insulation.
2. The "flat stock" and / or tapered polyisocyanurate insulation boards shall be adhered to top layer of "flat stock" insulation with the dual component polyurethane adhesive. The dual component polyurethane adhesive shall be dispensed ¾ inch wide and 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area where the tapered crickets or saddles are to be installed, the number of ribbons per unit width or area over the field rate by:

a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).

3. After allowing dual component polyurethane adhesive to rise ¾ inch to 1 inch, lay insulation board in to position and walk into place. After walking into place, the insulation board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also "weight down" the insulation board to ensure proper adhesive to the top layer of insulation.
4. University of Missouri will not accept any un-adhered or loose insulation boards. After installation of the insulation board, if the insulation board is not properly adhered to the proceeding layer, the Installer will be held responsible for replacing the unacceptable installed insulation board. All cost related, i.e., replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed insulation board will be at no cost to the Owner.

3.06 COVER BOARD INSTALLATION

A. General Criteria:
1. Fasten the specified cover board according to requirements of the roofing system manufacturer's written instructions.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged cover boards are to be replaced with new cover boards.
3. Consult roofing system manufacturer on current acceptable substrates and rates for applying the low-rise urethane adhesives. The surface of substrate shall be inspected prior to installation of the cover board.
4. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified cover board or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
5. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.
6. Install a single layer of cover board over the specified polyisocyanurate insulation.
7. The cover board sheeting shall be laid transverse to the top layer of the insulation board, with joints staggered at least 1/3 of overall length from those of the insulation layer.
8. The cover board shall be neatly cut to fit within 1/4 inch (6 mm) of nailers, penetrations, and projections.
9. Fill all gaps exceeding 1/4 inch (6 mm) with spray-in-place foam insulation.
10. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
11. Do not install more cover board than can be covered with the specified roofing system by the end of the day, or onset of inclement weather.

B. Attachment of Cover Board:
1. Apply the dual component polyurethane adhesive at the manufacturer's written instructions for adhering the specified cover board to the specified polyisocyanurate insulation.
2. The dual component polyurethane adhesive shall be dispensed in 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area, the number of ribbons per unit width or area over the field rate by:
   a. **70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).**
   b. **160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center).**
3. After allowing low rise urethane foam to rise ¾ inch to 1 inch, lay cover board in to position and walk into place. After walking into place, the cover board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also use "weights" to ensure the cover board is completely adhered to the top layer of the polyisocyanurate insulation. There shall not be any elevation change or raise of the corners or sides of the cover board as compared to the sides of the adjacent cover board sides. The cover board shall lay flat, or level as compared to the edges of the adjacent cover board.

4. **After installation of the cover board, should the cover board have more than 1/8-inch deviation or rise to the adjacent cover board, the Installer will be held responsible for replacing the unacceptable installed cover board. All cost related, i.e., replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed cover board will be at no cost to the Owner. The replacement of the unacceptable cover boards shall be completed prior to the installation of the membrane.**

3.07 EPDM MEMBRANE INSTALLATION

A. General: Install in strict accordance with roofing system manufacturer's latest published requirements, instructions, specifications, details, and approved shop drawings.

B. Install EPDM membrane per roofing system manufacturer's requirements to obtain roofing system manufacturer Twenty (20)-year Full System (NDL) warranty.

C. Install in strict accordance with roofing system manufacturer's latest published instructions.

D. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.

E. Coordinate with Owner representative to shut down air-intake equipment in the vicinity of the Work. Roofing Contractor shall cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors located in the mechanical ductwork.

F. The EPDM membrane is to be adhered with roofing system manufacturer's approved adhesive. Membrane overlaps shall be shingled with the flow of water where possible. Tacking of the EPDM membrane side laps for purposes of temporary restraint during installation is not permitted.

G. Layout: Layout roofing membrane to minimize number of seams. Avoid seams through roof primary roof drain sumps or through secondary roof drain locations.
   1. Position membrane straight and square to building.

3.08 ADHERED EPDM ROOFING MEMBRANE INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Adhere membrane on all roof areas using largest sheet practical for job conditions. Avoid wrinkling or stretching the membrane. Unroll sheet and allow relaxing for a minimum of 30 minutes.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically fasten roofing membrane securely at terminations, penetrations, angle changes and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, tape side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges to verify seam strength.
   2. Apply lap sealant to seal all edges of flashing membrane and T-Patches.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

I. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

J. Mechanically fasten membrane securely at all vertical to horizontal transitions, at points of terminations, and at the perimeter of roof to meet Manufacturer's Technical Department's requirements for properly securing the specified roofing system.

K. Spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with drain clamping ring.

L. Securement Around Perimeter and Rooftop Penetrations
1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, roofing system manufacturer's fasteners and termination bar or discs shall be installed. Fasteners, disc, and termination bar shall be installed accord to the roofing system manufacturer's instructions. Fasteners shall be installed using the fastener roofing system manufacturer's recommended fastening tools with depth locators.
2. EPDM membrane flashings shall extend a minimum of 3 inches past the securement bar or plates and shall be adhered onto the EPDM membrane.

M. Field-seam according to Section 3.07, "Seam Installation."

N. Excessive Repairs: Excessive repairs to membrane, or to membrane seams are not permitted. Remove and replace membrane in entire area affected, and as directed by University of Missouri representative.

Note:
1. **The Installer shall employ all means necessary to assure that the installation of all field and flashing membranes are free of loose (un-adhered) areas and wrinkles. The Owner's Representative(s) reserves the right to require that all preventable loose and /or wrinkled field membrane and membrane flashings to be repaired to the satisfaction of the Owner's Representative. In the event that the Installer determines that loose and /or wrinkled membrane or membrane flashing is unavoidable in a specific area(s), the onsite Owner's Representative must be notified immediately for a determination of acceptability.**
2. **Contractor is to ensure during the time of installing the membrane field and membrane flashing sheet, there are no entrapment of debris under the membrane.**

3.09 MEMBRANE FLASHING INSTALLATION

A. General: All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Approval shall only be for specific locations on specific dates. Membrane flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.

B. Manufacturers required adhesive to be used to adhere the EPDM membrane flashing to acceptable wall and equipment curb substrates. No bitumen shall be in contact with the EPDM membrane. If bitumen exists **install Cav Grip primer or equal over existing bitumen**.

C. Manufacturers Adhesive for Membrane Flashings:
1. Over the properly installed and prepared flashing substrate, the adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
2. No adhesive shall be applied in seam areas that are to be adhered. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by techniques.
3. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut, and corners applied. Where applicable, roofing system manufacturer's prefabricated corners shall be used.
4. The membrane flashing shall be completely adhered to the substrate with no unadhered areas.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and roofing system manufacturer's technical department.

E. Vertical Surfaces Taller than 24 Inches (760 mm): Where vertical distance of flashing membrane exceeds 24 inches in height, in addition to terminations at base flashings, mechanically fasten fully adhered flashing membrane with additional termination bar installed horizontally at not greater than 30 inches (760 mm) on center vertically to top of flashing membrane.
   1. Install membrane cover strip of standard sheet at last 8 inch (0.23 m) in width of same material, type, reinforcement.
   2. Install baton bar and cover strip using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars and installation of coversheet for area under construction.

F. Flashing Termination: Terminate all vertical flashing membrane surfaces horizontally and vertically with mechanically fastened termination bars and sheet metal flashings/counterflashings. Mechanically fasten flashing membrane securely using mechanical fasteners specifically designed and sized for fastening specified membrane flashing and termination bars into substrate.
   1. Fasten baton bar/termination bar with fasteners not greater than 6 inches (152 mm) on center for length of bar, with fasteners within 3 inches (76 mm) of ends, or closer as required by manufacturer. Fasten into nailer or other substantial backing located behind point of base or curb termination.
   2. Uniformly fasten, seat, and compress termination bar into top of fully adhered flashing membrane.
   3. Install sealants continuously across surface of termination, including terminations covered with sheet metal flashing and counterflashing.
   4. Install termination bars using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars for area under construction.
   5. At termination of vertical and wall sheet flashings not under copings, install termination bar at vertical and wall membrane flashings with metal surface mounted one- or two- piece counterflashing assemblies, as is required for condition. Install as indicated in Drawings, or if not shown in Drawings or otherwise indicated, as required to produce continuous closure of membrane with termination bar and metal flashing, regardless of abutting materials overlap.
   6. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for requirements for counterflashings and other metal fabrications.

G. Primary Roof Drains: Install membrane into sump and extend into line of depressed sump at roof drain. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside sump in direction of water flow and drainage; backwater laps and seams are not permitted in or around sumps or drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with water cut off mastic in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   3. Install membrane to comply with other requirements indicated for roofing membrane.
   4. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
   5. Securely tighten clamping rings to provide constant pressure on water cut off mastic.
   6. Install new metal strainers to complete primary roof drains.

H. Secondary Overflow Roof Drains: Install membrane to extend into line of roof drain at roof surface. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside drain in direction of water flow and drainage; backwater laps and seams are not permitted in roof membrane around or under drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Do not set secondary roof drain body below roof surface. **Do not construct roof sumps at secondary overflow roof drains.**
   3. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with sealant in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   4. Install membrane to comply with other requirements indicated for roofing membrane.

5. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
6. Securely tighten clamping rings to provide constant pressure on sealant.
7. Install new metal strainers to complete secondary roof drains.

I. High- or Elevated- Temperature Vent Flashings: Install prefabricated or field-formed membrane flashings to comply with manufacturer's written requirements and recommendations and as indicated. Field form flashings from sheet flashing membrane designed for and suited to condition.
1. Install stainless steel metal base fabricated metal flashing sleeves prior to installing flashings.
2. Install fire-resistant mineral-wool-fiber insulation between metal flashing sleeve and high- or elevated-temperature outside vent surfaces.
3. Select proper diameter prefabricated flashing to properly fit penetration and roof conditions.
4. Secure deck membrane around metal base sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments. Secure top of membrane flashing to top of sleeve penetration.
5. Secure deck membrane around sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments.
6. Install flashings to produce a minimum of 8-inch (200 mm) flashing height.
7. Lap base of flashings atop roof membrane at least 4 inches (100 mm). Hot-air seams at roofing membrane lap.
8. Place prefabricated flashing in place tight to horizontal deck membrane; ensure flange lays flat to deck membrane.
9. base of prefabricated flashing continuously to deck membrane.
10. Where required by manufacturer, heat upper part of prefabricated flashing to temperature required by manufacturer; avoid overheating.
11. Clamp top of flashing at vent with stainless steel clamping ring.
12. Install stainless steel metal umbrella cap flashing, holding close to membrane base flashing.

J. Only an area, which can be completely covered in the same day's operations, shall be flashed.

K. Daily test lap edges with probe to verify seam continuity of all membrane flashings.

L. Complete all membrane flashing and metal details on a daily basis. No temporary flashings shall be allowed with the prior written approval of the Owner’s Representative and roofing system manufacturer. If any water can enter under the completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

M. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

N. Installer is to ensure there are no wrinkles and “fish-mouths” in the membrane flashing and in the overlap seams.

O. Excessive Repairs: Excessive repairs to seams or flashings are not permitted. Remove and replace membrane, and if required the roofing components, in entire area affected as directed by University of Missouri representative.

3.10 PERIMETER AND METAL BASE FLASHINGS

A. General: All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner’s Representative and the roofing system manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer’s expense.

B. Sheet metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. All Kynar coated perimeter metal edging shall be fabricated and install per current SMACNA requirements.

D. Secure the Kynar coated metal over the field membrane and the "Multi-Purpose Sealing Tape." Fastened the sheet metal with approved stainless-steel nails or another acceptable fastener. Fasteners shall be fastened 4 inches on center and staggered 4 inches on center.

E. An 8 inch minimum wide strip of the 60 mil membrane flashing shall be adhered to the 4 inch wide flange of the sheet metal and to the field membrane. Check all coverstrip with a rounded screwdriver. Re-work any inconsistencies.

3.11 WALKWAY INSTALLATION

A. Installer is to install walkway in the areas as indicated on roof plans. Installer is responsible for verification of the total linear footage of the required walkway installation. The minimum length of the walkway, installed at any one location, shall be four (4') feet.

B. Install the walkway to roofing system manufacturer's written instructions.
1. Clean all dirt and debris from the deck membrane in areas where the walkway will be installed.
2. Important: Check all deck membrane s with a rounded screwdriver prior to installation of walkway. Re-adhere any inconsistencies before walkway installation.
3. Install walkway in the indicated roof areas.
4. Installer should adhere the walkway to the field membrane.

3.12 PROTECTION PAD INSTALLATION

A. General: Install protection pad under exposed wood blocking and under equipment supports.

B. The installation of the protection pad:
1. Clean all dirt and debris from the deck membrane in areas where the protection pad will be installed.
2. Important: In areas where protection pads are to be installed, Installer is to probe all field membrane seams laps with a rounded screwdriver prior to installation of the protection pad. Re-adhere any inconsistencies before protection pad installation.
3. Cut the protection pad 4 inches (4") wider than the dimensions of the wood blocking or equipment and piping support.
4. Adhere the entire perimeters of the protection pad to the field membrane sheet.
5. Probe all protection pad seam s with a rounded screwdriver. Re-adhere any inconsistencies found in the protection pad seams.
6. Center the wood blocking or equipment or pipe support over the protection pad.

3.13 HIGHLY VIISBLE MEMBRANE INSTALLATION

A. General Requirements: Provide and install a highly visible membrane product; designed to draw attention to an unprotected roof perimeter and potentially hazardous area that do not comply with University of Missouri safety guidelines.

B. Installation of yellow, 4 inch wide, cover strip:
1. Installer and University of Missouri Representative shall verify unprotected roof perimeters and potentially hazardous areas on the referenced project's roof area(s).
2. The yellow cover strip shall be installed not less than 6 feet 6 inches (2 meters) from unprotected roof perimeters and potentially hazardous areas.
3. Before installing the yellow membrane 4-inch-wide cover strip, the Installer shall have Roof system manufacturer Technical Representative to verify permanence of all deck membrane with a rounded screwdriver. Repair any inconsistencies of the membrane seams before yellow membrane installation.
4. The roofing membrane shall be properly cleaned prior to install the "yellow membrane 4-inch-wide cover strip." Failure to properly clean the membrane will result in less than satisfactory adhesion of the yellow membrane.
5. Peel and stick the yellow cover strip to installed and inspected roofing membrane.
6. Installer shall take care to avoid trapping air under the yellow membrane.
7. After adhering the yellow cover strip, the Installer shall verify permanence of all yellow cover strip. Repair any inconsistencies of the yellow cover strip installation.

3.14 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the Installer shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner's representative prior to starting the roofing project. Proceeding with the roofing project indicates the Installer's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the Installer's expense.

C. The Installer shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation to maintain a 100% watertight and to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs during the installation of the roofing system, the Installer shall install temporary watertight and hermetic terminations across the installed Roof system manufacturer roofing system. The Roof system manufacturer roofing system shall be 100% impermeable to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the Installer shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather-related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly completed Roof system manufacturer Roofing System, the affected roof area(s) shall be removed and replaced at the Installer's expense.

3.15 FIELD QUALITY CONTROL

A. Quality Control of Seams:
   1. The Installer shall designate a Quality Control Supervisor to daily check all seams for continuity by using a rounded screwdriver.
   2. On-site evaluation of completed seams shall be made by the Installer at locations as directed by the Owner's Representative or roofing system manufacturer's technical representative.
   3. All membrane seams, both field and flashings, shall be adhered and probed on a daily basis. NO EXCEPTIONS.

B. Roofing system manufacturer's technical representative: Installer shall arrange to have the system manufacturer's technical representative on site of the first day of installation of the roofing system. The Technical Representative shall note:
   1. Conduct a site inspection on the first day of production.
   2. Communicate with the University of Missouri project manager each inspection, i.e., meet with the University of Missouri designated project manager before entering work area.
   3. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
   4. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion of the roofing project.

1. All defects noted non-compliance with the roofing specifications and details, or the recommendations of roofing system manufacturer representative should be itemized in a punch list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and roofing system manufacturer technical representative.
2. Ensure the roofing contractor has received a copy of Final Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the Final Inspection Report.

3.16 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from, not limited to the following items: dirt, grease, rust stains, roofing asphalt, scuff marks, abrasions, adhesive spills, sealant spills, membrane cuts, and any physical damages to the installed Roof system manufacturer roofing system during the construction period.

B. Upon completion of the Work, dispose of, away from the Site, all debris, trash, containers, fasteners, roofing remnants and scraps.

C. **The completed "Roof" shall be washed with water and University of Missouri approved cleaner to remove all dirt, stains, adhesive and sealant spills, and any residue from roof membrane.**

3.17 ACCEPTANCE

A. Prior to demobilization from the site, the roofing system manufacturer's project manager, University of Missouri's representative(s), roofing system manufacturer's designated field technical representative and Installer's project manager, production crew superintendent, and project's roofing foreman shall review the completed work.

B. Installer and University of Missouri representative shall inspect the completed roofing system for any uneven cover boards, loose or improperly attached insulation or cover boards, ponding of water, un-adhered membrane and membrane flashing, membrane damage, dirt, rust stains, roofing asphalt, grease, scuff marks, cuts, abrasions, adhesive spills, and sealant spills.

C. All defects noted noncompliance with the project's bid documents will be itemized in a punch list. Any non-compliance item shall be removed and/or repaired immediately by the Installer to the satisfaction of the University of Missouri representative, and to roofing system manufacturer.

D. The noted deficiencies shall be repaired or replaced to a condition free of damage and deterioration at the time of Substantial Completion Acceptance by University of Missouri's representative, and / or to accordance of the University of Missouri project contract documents.

E. All warranties as required for the project of this specification shall be submitted for approval prior to final payment by University of Missouri.

END OF SECTION 07 5400.1

SECTION 07 5400.2 –PVC MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Supplementary Conditions apply to this Section.

1.02 SUMMARY

A. This Section includes the following:
   1. Adhered PVC sheet roofing
   2. Polyisocyanurate Insulation
   3. Cover board
   4. Walkway pads

B. **SCOPE OF WORK – Lewis Hall:** Remove existing roof system down to the existing concrete roof deck. Furnish and install a self-adhered vapor barrier over the surface of a primed and prepared concrete roof deck. Installation of 2" base layer polyisocyanurate insulation adhered with FM 1-105 ribbon method to the underlying vapor barrier. Installation of one ½" HD polyisocyanurate cover board layer adhered with low rise foam with FM 1-105 ribbon method, staggered 12" minimum. It is the responsibility of the contractor to ensure drain height. The installation of butyl sealant or tape at all attachment points of the surface mounted counterflashing. Installation of ½" plywood at all roof accesses, stairs and ladder egresses. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The new roof system shall consist of a heat welded Single-Ply, Thermo-Plastic, fully adhered 60mil PVC membrane system, separate piece PVC membrane flashing installation, and allied metal component installation. 24 ga. Kynar coated premanufactured metal fascia detail at perimeter edge, 24 ga. counter flashings. Installation of new drain flashings and related components. Installation of new through wall scuppers even with drain lines on exterior perimeter of the roof area. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed PVC roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

C. **SCOPE OF WORK – Clark Hall:** Remove existing roof system down to the existing concrete roof deck. Furnish and install a self-adhered vapor barrier over the surface of a primed and prepared concrete roof deck. Installation of 1.5" base layer polyisocyanurate insulation adhered with FM 1-105 ribbon method to the underlying vapor barrier. Installation of 1/4" in 12" tapered polyisocyanurate insulation layer and one ½" HD polyisocyanurate cover board layer adhered with low rise foam with FM 1-105 ribbon method, staggered 12" minimum. It is the responsibility of the contractor to ensure drain height. Installation of ½" plywood at all roof accesses and ladder egresses. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The new roof system shall consist of a heat welded Single-Ply, Thermo-Plastic, fully adhered 60mil PVC membrane system, separate piece PVC membrane flashing installation, and allied metal component installation. 24 ga. Kynar coated premanufactured metal fascia detail at perimeter edge, 24 ga. counter flashings. The installation of butyl caulk or tape at all attachment points of the surface mounted counterflashing. Installation of new drain flashings and related components. Installation of new through wall scuppers even with drain lines on exterior perimeter of the roof area. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed PVC roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

D. Related Sections include the following:
   1. Division 3, Section for "Concrete Decks"
   2. Division 6, Section "Rough Carpentry for Roofing"
   3. Division 7, Section "Sheet Metal Flashing and Trim"
   4. Division 7, Section "Caulking and Sealants"

1.03 DEFINITIONS

A. PVC: Polyvinyl-Chloride.

B. Installer: Roofing Contractor.

C. Roofing Terminology: Refer to ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definition of terms related to roofing work in this Section.

1.04 REFERENCES

A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. Single-Ply Roofing Institute (SPRI): Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes

C. National Installers Association (NIA): Current Roofing and Waterproofing Manual

D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Current SMACNA Technical Manuals.

E. Code of Federal Regulations, (CFR) including:
   1. CFR Title 29, Part 1910 "Occupational Safety and Health Standards."
   2. CFR Title 29, Part 1926 "Safety and Health Regulations for Construction."

F. Underwriters Laboratories (UL):
   1. Roof Materials and Systems Directory. 2012.
   2. UL 790: Tests for Fire Resistance of Roof Covering Materials: 1983.

G. American Society for Testing and Materials (ASTM)
   1. ASTM D 570 – 1981 (R 1988) Water Absorption of Plastics
   2. ASTM D 638 – 1991 Tensile Properties of Plastics
   3. ASTM D 751 – 1989 Coated Fabrics
   4. ASTM D 882 – 1991 Tensile Properties of Thin Plastic Sheeting
   5. ASTM D 1004 – 1990 Initial Tear Resistance of Plastic Film and Sheeting
   6. ASTM D 1204 – 1984 Linear Dimensional Changes of Non-rigid PVC Sheeting or Film at Elevated Temperature
   7. ASTM D 2136 – 1984 (R 1989) Coated Fabrics – Low-Temperature Bend Test
   8. ASTM D 2565 – 1982 Operating Xenon Arc-Type Light Exposure Apparatus With and Without Water for Exposure of Plastics
   9. ASTM D 3045 – 1974 (1984) Heat Aging of Plastics Without Load
   10. ASTM D 4434 – 1987 Poly (Vinyl Chloride) Sheet Roofing
   11. ASTM E 108 – 1991 (Rev. A) Fire Tests of Roof Coatings
   12. ASTM G 21 – 1990 Determining Resistance of Synthetic Polymeric Materials to Fungi
   13. ASTM G 53 – 1991 Operating Light – and Water-Exposure Apparatus (Fluorescent UV-Condensation Type) for Exposure of Nonmetallic Materials

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing system manufacturer based on testing and field experience.

C. Roofing System Design: Comply with SPRI "Wind Design Guide for Adhered Single Ply Roofing Systems" for the following ground roughness exposure, classification of building and system design:
1. Surface Roughness Category: Exposure B
2. Classification of Building: Category II
3. Wind uplift Design: 105 mph @ 3 second gust
4. System 1 Design: Adhered Single Ply Membrane Roofing

D. Underwriters Laboratories Inc. (UL):
1. UL RMSD – 2009 Roofing Materials and Systems Directory
2. UL 790 – 2009 Fire Resistance of Roofing Coverings Materials
3. Exterior Fire Exposure Classification: Class A, ASTM E 108, for application and slopes shown

1.06 ACTION SUBMITTALS

A. Product Data: Submit latest edition of roofing system manufacturer's roofing and base flashing specifications including list of materials proposed for use, installation procedures, and roofing system manufacturer's Product Safety Data Sheets.

B. Product Safety Data Sheets: Installer shall review all product data safety data sheet chemical names prior to submitting to University of Missouri.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Verification: For the following products:
1. Sheet roofing, of color specified.
2. Roof insulation.
3. Cover board.
4. Metal termination bars.
5. Battens.
6. Insulation fasteners of each type, length, and finish.
7. Membrane fasteners of each type, length, and finish.
8. Fasteners of each type, length, and finish.
9. Walkway pads or rolls.

1.07 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and roofing system manufacturer.

B. Installer: Provide copy of roofing system manufacturer's training certificate for each roofing mechanic permit to use the hot air welding equipment.

C. Roofing system manufacturer Certificates: Signed by roofing system manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by roofing system manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

E. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

F. Single Ply Roofing Institute (SPRI) - Fasteners Withdrawal Resistance Testing:
   1. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
   2. Prior to starting the project, provide a copy of the Fasteners Withdrawal Resistance Testing to roofing system manufacturer's technical department.

G. Warranty:
   1. Provide sample copy of 20-year (NDL) Full System roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
   2. Provide sample of copy 5-year Installer's workmanship warranty stating obligations, remedies, limitations, and exclusions of warranty.

H. Inspection Report: Copy of roofing system roofing system manufacturer's final inspection report of completed roofing installation.

1.08 CLOSE OUT SUBMITTALS

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

1.09 QUALITY ASSURANCE

A. Roofing System Manufacturer Qualifications: A qualified roofing system manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications:
   1. A qualified firm that is approved, authorized, or licensed by membrane roofing system roofing system manufacturer to install roofing system manufacturer's product and that is eligible to receive roofing system manufacturer's special warranty.
   2. Installer must have a current status of "Elite" or "Alliance" with the roofing system manufacturer.
   3. Prior to submitting a roofing proposal, Installer must be approval by Owner's representative.

C. Roofing system manufacturer's membrane shall meet the following characteristics:
   1. Protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt.
   2. Membrane Thickness: Membrane roofing system manufacturer is to verify that the membrane thickness is of the membrane thickness specified (see 2.02, A, 2). ASTM D751 or D638 nominal thickness of +/- 10 percent will not be acceptable for measurement of membrane thickness.

D. Source Limitations: Obtain components including roof insulation, fasteners, and accessories for membrane roofing system from same roofing system manufacturer as membrane roofing.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Pre-installation Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 10 working days before conference.
   1. Meet with Owner's Representative/General Contractor, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including roofing system manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.

4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
5. Review structural loading limitations of roof deck during and after roofing.
6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. At no cost to University of Missouri, roofing system manufacturer's technical representative shall perform:
   1. Manufacturer's Quality Control Inspection: The Manufacturer's Technical Representative shall review the on-going work on the first day of the roofing production and a minimum of one (1) in-progress inspection every 10 working days. The Technical Representative shall:
      a. Communicate with the University of Missouri project manager each inspection, i.e., meet with the University of Missouri designated project manager before entering work area.
      b. Note all defects noted non-compliance with the specifications or the recommendations of the thermoplastic manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and RMT.
      c. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.
   2. Final Roof Inspection: Contractor is to arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of the roofing project.
      a. All defects noted non-compliance with the specifications, or the recommendations of the thermoplastic manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri and RMT.
      b. The roofing contractor is to forward a copy of Final Inspection Report to RMT within two days after date inspection(s) is performed.

H. Installer's Responsibility: Any failure by the Owner Representative or roofing system manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these specifications of work in progress or completed work shall not relieve the Installer, or reduce, or in any way limit, his responsibility of full performance of work required of the Installer under these specifications.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with roofing system manufacturer's name, product brand name, and type, date of manufacture, and directions for storing and mixing with other components. Deliver materials in sufficient quantity to allow work to proceed without interruption.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within temperature range required by roofing system manufacturer.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Store and protect materials, including roofing insulation from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store all materials in a dry location. Use pallets to support all materials from roof deck. Distribute the load to stay within live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work. Comply with roofing system manufacturer's written instructions for handling, storing, and protecting during installation. All roof system related materials must be covered with a secured tarp once they are stored on University of Missouri property.

D. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

1.11 PROJECT CONDITIONS

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

B. The PVC adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   3. The wall/deck intersection permits air entry into the wall flashing area.

C. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

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

E. Protection:
   1. Provide special protection and avoid traffic on completed areas of membrane installation.
   2. Restore to original condition or replace work or materials damaged during handling of roof materials.
   3. Take precautions as required to protect adjacent work and structures.

F. Emergency Equipment and Materials: Maintain onsite equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the Installer shall provide the labor necessary to monitor the situation to maintain a watertight condition.

G. Protection:
   1. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent Roofing areas.
   2. The Installer shall provide a suitable temporary protective surface for all roofing areas which will receive construction traffic or construction of equipment during all phases of the roofing project.
   3. During the course of installation of the membrane roofing systems, should there be any damage created by other construction trades to the new or to existing roofing membrane and/or roofing system, the Installer is to immediately notify the Owner's Representative and membrane roofing system manufacturer. All damages are to be repaired according to the membrane roofing system manufacturer's or Owner's representative's recommendations. The "party" responsible for the roofing damages shall bear the total cost for the repairs or for the replacement of existing or new roofing system.

H. Restrictions:
   1. Comply with Owner's General and Safety Requirements on use of site.
   2. Smoking and Tobacco products are prohibited on all roof areas and on the campus grounds.
   3. Provide and maintain sanitary facilities for employees.
   4. Maintain facility and all utility services in a functional condition.

1.12 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights of the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Installer under requirements of the Contract Documents.

B. Roofing System Manufacturer's Warranty: Submit a written warranty, without monetary limitation, with all available options, including flashing endorsement, roofing system manufacturer's roof insulation and roofing system manufacturer's accessories, signed by roofing system roofing system manufacturer's agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
   1. Twenty (20) Year Full System Warranty (no ponding/standing water exclusions accepted). Warranty shall be non-prorated and cover basic wind speeds up to 60 mph.
   2. "Early Bird" warranties are not to be issued, as they will not be accepted by Owner.
   3. The specified roofing system manufacturer's warranty will be issued only upon final acceptance by the roofing system manufacturer's ttechnical department and the Owner's Representative's final approval.
   4. Request for final payment and issuance of the specified Roofing system manufacturer's warranty will be issued to the Installer's after successful completion and Owner's Representative's final approval and acceptance of the entire roof system installation.

C. Installer's Warranty: Submit roofing Installer's workmanship warranty, on a notarized written warranty form, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, cover board, roof insulation, fasteners, adhesives, sealants, and associated sheet metal, for the following warranty period:
   1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM MANUFACTURER

A. The components of the roof system are to be products of a single roofing system manufacturer or approved by the Manufacturers, whose products meet or exceed the project specifications, have manufactured, and installed the roofing materials and systems of the type specified for a minimum of twenty (20) years, and who maintains a single source responsibility for the total roofing system.

B. Roofing system manufacturers: The components of the roofing system are to be products of a single roofing system manufacturer as required to provide the specified system warranty. Subject to compliance with requirements, provide roofing products from:
   1. Sika Manufacturers, Canton, MA.
   2. Versico, Carlisle, PA

2.02 PVC MEMBRANE

A. PVC Membrane: a uniform, flexible sheet formed from polyvinyl chloride, complying with **ASTM D 4434-87**, of the following Classification – Type and Grade, Membrane Thickness, UL Classification, and Membrane Exposed Face Color.
   1. Classification: Type II, Grade I.
   2. Membrane Thickness: 60 mils, +/- 2.0 mils.
   3. UL Class: A.
   4. Membrane: Exposed Face Color: White

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system roofing system manufacturer for intended use and compatible with membrane roofing materials.
   1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdictions.

B. Membrane flashing and Flashing Accessories: As recommended by the roofing system manufacturer's printed instructions for reinforced sheet flashing of same material, mil thickness and color as sheet membrane.

C. Asphalt Resistance Membrane Flashing: 60 mil, flashing membrane is a formulated for direct exposure to the weather and is produced with a fiberglass mat reinforcement for dimensional stability. The asphalt resistance membrane flashing can be adhered directly to asphalt-contaminated surfaces. The asphalt resistant membrane can be installed over the field membrane to act as a protection layer membrane in conditions where oil and grease could develop from roof-top equipment.

D. Membrane Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, used to attach membrane to the horizontal or near-horizontal substrate. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

E. Membrane Flashing Bonding Adhesive: Roofing system manufacturer's approved contact adhesive used to attach the flashing membrane to the substrate, either horizontally or vertically. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

F. Metal Termination Bar: a heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Termination Bar is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. Reglet has a 2-1/4-inch (57 mm) deep profile and is provided in 10-foot (3 m) lengths.

G. Membrane Securement Bar: is a 1-inch-wide aluminum alloy bar used with #15 to clamp the membrane to the roof deck along walls, curbs, and certain vertical to horizontal changes in the roofing system.

H. Sealants: Owner approved sealant shall be used to seal penetrations through the membrane system and at miscellaneous sealant applications that are exposed to roof systems components.

I. Sealing Tape: "Multi-Purpose Tape," a high-performance sealant tape with superior surface tack that remains elastic and is designed to bond the PVC membrane and a variety of metals. "Multi-Purpose" sealing tape strip is used to seal the metal roof edge of buildings reducing air infiltration into the roof assembly, behind the membrane flashing at termination details, and to seal the overlaps of the air/vapor retarder membrane.

J. Safety Warning Membrane: A highly visible product to draw attention to an unprotected roof perimeter and potentially hazardous area. The safety warning membrane is designed for use on a membrane roof. The PVC safety warning membrane shall be a yellow in color, 60 mils in thickness, 4 inches wide, and 100 feet in length.

K. Prefabricated Pipe Flashing prefabricated vent pipe flashing made from 0.060 inch (60 mil/1.5 mm) thick membrane.

L. Prefabricated Corner Flashing: corners, prefabricated universals corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are heat-weldable to membrane or base flashings.

M. Membrane Coated Metal: a PVC-coated, heat-weldable sheet metal capable of being formed into a variety of shapes and profiles. Is a 24-gauge, galvanized metal sheet with a 20 mil (0.5 mm) unsupported Manufacturers membrane laminated on one side.

N. Mineral Wool-Fiber Fire-Resistant Insulation: Semi-rigid mineral-wool-fiber batt insulation; Type IVA per ASTM C 612; not less than 144 psf (6.9 kPa) compressive strength per ASTM C 165; less than 0.05 percent moisture absorption per ASTM C 1104; complying with ASTM E 136; and with the following surface-burning characteristics per ASTM E 84:
   1. Flame Spread: 0.
   2. Smoke Developed: 0
   3. Manufacturers: Subject to compliance with requirements, available products include the following:
      a. Basis of Design: Roxul Safe; Roxul Inc.

2.04 INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements, selected from roofing system manufacturer's standard sizes and of thickness indicated.

B. Polyisocyanurate Board Insulation: Type II, Class 2 Grade 2 – Closed cell polyisocyanurate foam fiberglass reinforced mat laminated to faces, complying with the following additional characteristic.

1. **Lewis Hall- 2" Poly Iso. ½" HD Poly Iso.**
2. **Clark Hall- 1.5" Poly Iso. ¼"in 12" taper. ½" HD Poly Iso.**

C. Roof and Tapered Insulation: rigid polyisocyanurate foam insulation composed of a closed cell polyisocyanurate foam core laminated to a felt or glass fiber mat facer on both major surfaces. The insulation shall have the following characteristics:
1. Dimensional Stability (length and width) per ASTM D 2185: <2%.
2. Compressive Strength (10% Deformation) per ASTM D 1621: 20 psi.
3. Product Density per ASTM D 1622: Nominal 2.0 pcf.
4. Flame Spread per ASTM E84 (Full 10 min. Test): 20-50*
5. The insulation board is to have a minimum conditioned thermal value per inch of an LTTR Value of 6.00 as determined by ASTM C 1303 and C 518.
6. The insulation board shall have a minimum compressive strength of 20 psi and a dimensional stability of -2% linear changes, maximum seven (7) days.

D. Tapered Polyisocyanurate Insulation Shapes: Preformed insulated shapes for saddles, crickets, tapered edge strips, sumps, and other insulation shapes where indicated or where required for sloping to drain. Fabricate to slopes indicated. Saddles, Crickets, Edge Strips, and Other Shapes:
1. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48) unless otherwise indicated.
2. Crickets between Roof Drains: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24) unless otherwise indicated.
3. Sumps for Roof Drains, measuring 8 feet x 8 feet; size to be modified when drains are located next to parapet wall: Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48). Provide a minimum insulation thickness at the roof drain or roof scupper of 3.0 inches.
4. Saddle Behind (Upslope) from Curbs Measuring 18 inches and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).
5. Saddle Behind (Upslope) from Round Penetrations Measuring 12 inches in diameter and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).

E. Approved Roofing system manufacturer and Product:
1. Sika Sarnafil
2. Versico

2.05 COVER BOARD

A. High density polyisocyanurate cover board: Closed cell polyisocyanurate foam with paper matt facer laminated to both faces, complying with the following additional characteristics:
1. Thickness: 0.5 inches.
2. Size: 48 inches by 48 inches, nominal.
3. R-Value (LTTR):
   a. 0.5 inches, R-Value: 2.5, minimum.
4. Compressive Strength: 100 psi.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 8.3 percent post-industrial, average.

2.06 INSULATION AND COVER BOARD ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation roofing system manufacturer for intended use and compatible with membrane material.

2.07 DUAL COMPONENT POLYURETHANE ADHESIVE

A. General: Provide a dual component polyurethane adhesive that is intended for the attachment of polyisocyanurate insulation to various substrates. The dual component polyurethane adhesive must have approvals from the insulation and roofing system manufacturer for adhering the polyisocyanurate insulation to approved substrates, multiple layers of polyisocyanurate insulation, and cover boards. Consult adhesive roofing system manufacturer on current acceptable substrates to apply dual component polyurethane adhesive to various substrates.

B. Dual component polyurethane adhesive: The low-slope dual component polyurethane adhesive shall have the following minimum properties:
   1. Density ASTM D-1622: Free Rise, 3.2 lb./cf.
   2. Compressive Strength ASTM D-1621: Parallel, 38 psi @ 6% deflection.
   3. Tensile Strength ASTM D-1623: 35 psi
   4. Water Absorption ASTM D-2843: 5.1%
   5. Closed Cell Content ASTM D-6226: 90% min.
   6. R-Value ASTM C-518 3.8/inch (new)
   7. VOC Content ASTM D-2369 <5 g/l (1&2 combined)
   8. Weight/Gallon: Part A Component 10.32 lbs. Part B Component 8.54 lbs.

C. Approved Roofing system manufacturer and Product:
   1. OMG Roofing Products, "OlyBond 500® SpotShot."

2.08 VAPOR RETARDER/AIR BARRIER

A. SA - 32 mil (0.8 mm) self-adhesive vapor barrier that can also serve as temporary roof protection. Self-Adhered is available in rolls 44.9 inches x 133.8 feet (1.14 x 40.8 m).

B. SA Primer WB - A polymer emulsion water-based primer designed to improve the adhesion of SA vapor retarder on concrete roof decks or plywood walls. Application temperature must be 41°F (5°C) and above. The coverage rate will range from 163 - 400 ft2/gal (4 - 9.8 m²/L) for non-porous surfaces to 82 - 135 ft2/gal (2 - 3.3 m²/L) for porous surfaces. The VOC content is 3 g/L.

2.09 RELATED MATERIALS

A. Timber, General: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; provide certificate of inspection from an accredited Agency for selected material.
   1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2-inches or less in thickness.
   2. Provide lumber with 15 percent moisture content at time of dressing and shipment for, sizes 2-inches or more in thickness.

B. Dimensioned Lumber: Graded in accordance with established grading rules; grade and species as follows:
   1. Concealed Boards: WWPA standard grade, any species, or SPIB No. 3 grade Southern Pine.
   2. Lumber for Miscellaneous Uses: Standard grade unless otherwise indicated.
   3. Plywood: PS 1; select sheathing grade or APA rated 5/8-inch minimum thickness, CD-X, or better in sheathing.

2.10 MISCELLANEOUS FASTENERS AND ANCHORS

A. General: All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approve for such use by the fastener roofing system manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm), stainless steel, and to be approved for such use by the fastener roofing system manufacturer.

2.11 PROTECTION PADS

A. Protection Pads: Manufacturers- factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, approximately 96-mil in thickness, as supplied by the Manufacturers. Protection pads to be used under all wood support blocking, equipment supports, pipe steel supports, and under downspout splash blocking.

2.12 ROOF WALKWAYS

A. Walkway: Factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, approximately 9/16 inch (14 mm) in thickness, as supplied Manufacturers.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect entire roof area to be roofed for acceptability. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting installation and performance of the roofing system:
   1. Verify that roof openings and penetrations are in place, and curbs are set and braced, and that the roof drains and drain lines are properly clamped into position and are in a 100% functional condition.
   2. Verify that primary drain bodies are at proper elevations for construction of sump at slopes indicated.
   3. Verify that secondary overflow drain bodies are at proper elevations for construction, without sumps, at level of roof surface.

B. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011, revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. Verify that structural use panels, sheathing, and similar wood products are securely anchored to substrates, and that surfaces of panels and sheathing are without irregularities which could interfere with proper membrane and flashing installation.

D. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 03 Section "Concrete Decking."

E. Verify that steel deck is securely fastened with no projecting fasteners and no adjacent units in exceed 1/16 inch (1.6 mm) or more out of plane measured to adjoining deck.

F. Verify that installed steel roof decking complies with required slopes indicated, that no holes, ridges, voids, uneven or misaligned surfaces or conditions, gaps, or other irregularities exist, and deck and substrates are smooth and free of sharp edges.

G. Visually inspect cast-in-place reinforced concrete roof deck for the following:
   1. Evidence of impaired deck structural capacity or integrity.
   2. Exposed concrete reinforcing.
   3. Presence of corrosion.
   4. Spalling or loss of concrete cover.

5. Presence of foreign materials.
6. Efflorescence.
7. Ridges or uneven conditions in concrete deck.
8. Holes, voids, or gaps in concrete deck.
9. Accumulations of moisture.

H. Other conditions that would prevent proper application of roofing or that would prevent membrane roofing manufacturer's approval of substrate, components, or system.

I. Verify that roofing systems can be installed with positive drainage of minimum slopes indicated at all areas of roof, without ponding after 24 hours.

J. Verify that roofing as completed will discharge to internal roof drains without ponding or inadvertent discharge through secondary roof drains.

K. Verify that final installed curb heights for flashing are a minimum of 8-inches (200 mm) measured above finished roof membrane.

L. Verify piping and conduit penetrations of roof are made individually, separated by a minimum of 12 inches (300 mm) from each other and from restraining surfaces or other obstructions.

M. Verify locations of interior electrical conduits, piping, ducts, and similar items in close proximity to underside of steel roof decking, to avoid striking with fasteners.

N. Verify that deck and other substrates are dry, free of debris, excess, and foreign materials.

O. Verify substrates and surfaces to receive flashings are dry, clean, and free of sharp or penetrating projections or other irregularities.

P. Proceeding: Proceed with installation only after unsatisfactory conditions have been corrected.

Q. Do not commence work until decking and substrates are in full compliance with roof system manufacturer's requirements, deck and substrate conditions are sound, and positive fall to drainage points are achieved.

R. Commencement: Commencement of work indicates acceptance of conditions and responsibility for all corrections.

3.02 PREPARATION

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

B. The Installer will be entirely responsible for the complete removal of all dirt, debris, moisture from the roof's substrate, i.e., steel decking, concrete decking, before the installation of the roofing system. The roof's substrate must be 100% completely dry before applying the spray-in-foam insulation or before the installation of the specified roofing insulation.

C. Cleaning: Clean substrate including metal decking flutes of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

D. Debris, water, moisture, or foreign materials found in flutes of steel roof decking is not permitted; remove and replace roofing installed above flutes found to contain foreign materials.

E. Cleaning, repair or replacement of damaged items, as a result of roofing related materials entering the facility, shall be solely at the roofing contractor's expense.

F. Broom clean cover board immediately prior to membrane roofing application.

G. Promptly remove debris each day; do not stockpile debris or allow waste to accumulate on steel decking, insulation, or roofing under construction.

H. Containment: Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction at the end of the workday or when rain is forecast. Remove roof-drain plugs when no work is taking place or when rain is forecast.

I. Mask off adjoining surfaces not receiving roofing membrane materials to prevent spillage or over spray affecting other construction.

J. Fill all gaps and voids between substrate components that are wider than 1/4 inch. Fill all gaps with same materials as the substrate.

K. Seal around along perimeters, along equipment curbs, around pipes, around conduits, and any other roof penetrations for a distance of 2 minimum inches wide and 6 inches onto the bottom rib of steel decking with the specified spray in place foam insulation.

L. Base Vertical Flashings: Coordinate roof insulation thickness with adjacent base flashing height, to maintain not less than 8-inch (203 mm) flashing height. Adjust base vertical flashing height including substrates and changes in exterior wall materials to maintain minimum height.

M. Proceed with roofing work only when weather conditions permit work to proceed in accordance with manufacturer's requirements and recommendations.

3.03 WOOD NAILER INSTALLATION

A. All Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Division 06 1000 for acceptable fasteners for wood product attachments.

B. Wood Nailer thickness shall be as required to match the insulation and cover board height (thickness) to allow a smooth transition.

C. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any thermoplastic product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

D. New wood nailers and/or plywood sheeting shall meet the performance criteria in Division 06 1000.

3.04 VAPOR-RETARDER / AIR BARRIER INSTALLATION

A. Install vapor retarder/air barrier in a single layer under base layer insulation, side and end lapping each sheet a minimum of 2 inches (50 mm) and 6 inches (150 mm), respectively.

B. Clean surfaces to receive vapor barrier. Continuously seal seams and side and end laps.

C. Terminations: Completely seal vapor retarder at terminations, obstructions, and penetrations to prevent air movement into membrane roofing system.

1. Turn up vapor barrier at openings, penetrations, curbs, and bases of parapets, corners, and other vertical and other transitions a minimum of 2-inches (50 mm), maximum 3-inches (75 mm). Overlap onto vertical surface, unless otherwise indicated or required.
2. Cut vapor barrier and patch at curbs, openings or penetrations, folding flaps onto vertical flange or surfaces.
3. Clean surfaces to receive vapor barrier. Seal and secure all terminations, upturned edges, penetrations, base termination, and interruptions with tape.

E. Repair damaged or abraded areas of vapor-barrier/air barrier to seal and secure.

3.05 INSULATION BOARD INSTALLATION

A. General Criteria:
1. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged insulation boards are to be replaced with new insulation boards.
3. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified roofing insulation or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
4. Construct sumps at primary roof drains using tapered insulation to slope indicated. Install nailers or blocking as required to secure drain body assembly to roof deck.
   a. Unless otherwise indicated, construct sumps to consistent and uniform slope of 1/4 per 12 inches (1:48) to provide a smooth transition from the roof surface to the drain. Do not introduce steeper or shallower slopes within sump.
   b. Use tapered insulation to form a square sump. Unless indicated otherwise, construct sump measuring 8 feet by 8 feet (2.4 m by 2.4 m) at primary roof drains.
   c. Adjust primary roof drain assemblies to proper elevation for sump.
   d. Install tapered insulation so edges do not restrict flow of water.
   e. Do not create circular depressions around primary roof drains at bottoms of sumps.
5. Do not install sumps at secondary overflow roof drains.
   a. Adjust secondary roof drain assemblies to proper elevation of final roofing membrane.
   b. Do not create circular depressions around secondary roof drains.
6. Where conditions required drain modifications to match specified insulation thickness, roofing contractor will be responsible for the cost of readjusting the primary roof drain bowl and associated plumbing to match the “finished” insulation thickness. University of Missouri will not permit the circular depressions, nor the cutting or shaving the insulation in order to slope the insulation to the edge of the drain bowl.
7. Roofing system manufacturer’s technical representative shall be on the jobsite during the first initial day of installation of the roofing system.

B. Attachment of the Polyisocyanurate Insulation on an approved decking:
1. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.5 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 16 inches in each direction.
2. Over the top of the first layer of insulation, the second layer of insulation board shall be lay transverse to the direction of the first layer of insulation. Stagger end joints of boards a minimum of 1/3 of overall length.
3. The base layer of the specified polyisocyanurate insulation shall be adhered per a FM 1-105 ribbon pattern. The specified insulation board shall be adhered to the vapor barrier with manufacturer approved 2-part adhesive. The polyisocyanurate insulation adhesive shall be a minimum of 12” ribbons for the field of the roof, increasing the number of adhesive ribbons along the perimeter by 50% and increasing the number of ribbons by 100% in the corners of the roof.
4. Install eight (8’) feet x eight (8’) feet tapered insulation at each primary roof drain or supper. The tapered insulation shall be mitered at the corners to provide a smooth and tapered transition into the roof drains and scuppers.
5. Installer shall ensure the “flat stock” and tapered insulation has been installed to where there will not be any ponding of water anywhere on the roofing system (roof area) after 24 hours of rainfall. Any ponding of water after 24 hours will not be acceptable to the Owner and shall be corrected by the Installer at no charge to the Owner.

C. Installation of additional “flat stock” and tapered polyisocyanurate insulation:
   1. The “flat stock” and / or tapered polyisocyanurate insulation panels shall be laid transverse to the proceeding layer of insulation, with joints staggered at least 1/3 of overall length from those of the proceeding layer of the “flat stock” insulation.
   2. The “flat stock” and / or tapered polyisocyanurate insulation boards shall be adhered to top layer of “flat stock” insulation with the dual component polyurethane adhesive. The dual component polyurethane adhesive shall be dispensed ¾ inch wide and 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area where the tapered crickets or saddles are to be installed, the number of ribbons per unit width or area over the field rate by:
      a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
      b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
   3. After allowing dual component polyurethane adhesive to rise ¾ inch to 1 inch, lay insulation board in to position and walk into place. After walking into place, the insulation board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also “weight down” the insulation board to ensure proper adhesive to the top layer of insulation.
   4. University of Missouri will not accept any un-adhered or loose insulation boards. After installation of the insulation board, should the insulation board is not properly adhered to the proceeding layer, the Installer will held responsible for replacing the unacceptable installed insulation board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed insulation board will be at no cost to the Owner.

3.06 COVER BOARD INSTALLATION

A. General Criteria:
   1. Fasten the specified cover board according to requirements of the roofing system manufacturer’s written instructions.
   2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged cover boards are to be replaced with new cover boards.
   3. Consult roofing system manufacturer on current acceptable substrates and rates for applying the low-rise urethane adhesives. The surface of substrate shall be inspected prior to installation of the cover board.
   4. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified cover board or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
   5. Roofing system manufacturer’s technical representative must be on the jobsite during the first initial day of installation of the roofing system.
   6. Install a single layer of cover board over the specified polyisocyanurate insulation.
   7. The cover board sheeting shall be laid transverse to the top layer of the insulation board, with joints staggered at least 1/3 of overall length from those of the insulation layer.
   8. The cover board shall be neatly cut to fit within 1/4 inch (6 mm) of nailers, penetrations, and projections.
   9. Fill all gaps exceeding 1/4 inch (6 mm) with spray-in-place foam insulation.
   10. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
   11. Do not install more cover board than can be covered with the specified roofing system by the end of the day, or onset of inclement weather.

B. Attachment of Cover Board:
   1. Apply the dual component polyurethane adhesive at the manufacturer’s written instructions for adhering the specified cover board to the specified polyisocyanurate insulation.
   2. The dual component polyurethane adhesive shall be dispensed in 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area, the number of ribbons per unit width or area over the field rate by:
      a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).

b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).

3. After allowing low rise urethane foam to rise ¾ inch to 1 inch, lay cover board in to position and walk into place. After walking into place, the cover board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also use "weights" to ensure the cover board is completely adhered to the top layer of the polyisocyanurate insulation. There shall not be any elevation change or raise of the corners or sides of the cover board as compared to the sides of the adjacent cover board sides. The cover board shall lay flat or level as compared to the edges of the adjacent cover board.
4. After installation of the cover board, should the cover board have more than 1/8-inch deviation or rise to the adjacent cover board, the Installer will be held responsible for replacing the unacceptable installed cover board. All cost related, i.e., replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed cover board will be at no cost to the Owner. The replacement of the unacceptable cover boards shall be completed prior to the installation of the membrane.

3.07 PVC MEMBRANE INSTALLATION

A. General: Install in strict accordance with roofing system manufacturer's latest published requirements, instructions, specifications, details, and approved shop drawings.

B. Install PVC membrane per roofing system manufacturer's requirements in order to obtain roofing system manufacturer Twenty (20)-year Full System (NDL) warranty.

C. Install in strict accordance with roofing system manufacturer's latest published instructions.

D. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.

E. Coordinate with Owner representative to shut down air-intake equipment in the vicinity of the Work. Roofing Contractor shall cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors located in the mechanical ductwork.

F. The PVC membrane is to be adhered with roofing system manufacturer's approved adhesive. Membrane overlaps shall be shingled with the flow of water where possible. Tack welding of the PVC membrane side laps for purposes of temporary restraint during installation is not permitted.

G. Layout: Layout roofing membrane to minimize number of seams. Avoid seams through roof primary roof drain sumps or through secondary roof drain locations.
   1. Position membrane straight and square to building.

H. Installation of PVC membrane:
   1. The PVC membrane shall be adhered to the specified cover board substrate with Manufacturer's membrane adhesive. – Prior to adhering the membrane, the cover board substrate shall be completely clean of all debris, i.e., gypsum dust, dual component adhesive residue, etc.
   2. The adhesive is roller-applied, using a using solvent-resistant ¾ inch (19 mm) nap paint rollers. Installer is to consult Roofing System Manufacturer's Technical Department for the proper application.
   3. The adhesive shall be applied in smooth, even coating with no gaps, globs, puddles or similar inconsistencies.
   4. After installing the PVC membrane, the PVC membrane shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions.
   5. Installer is to ensure there are no wrinkles in the membrane. There shall not be any wrinkles or "fish mouths" in the membrane overlap seams.

I. The means of application and the quantities of the membrane adhesive to be used shall be per the roofing system manufacturer's recommendations. Consult roofing system manufacturer on proper application rates for adhering the membrane to the acceptable substrates.

J. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

K. Mechanically fasten membrane securely at all vertical to horizontal transitions, at points of terminations, and at the perimeter of roof in order to meet Manufacturer's Technical Department's requirements for properly securing the specified roofing system.

L. Spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with drain clamping ring.

M. Securement Around Perimeter and Rooftop Penetrations
1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, roofing system manufacturer's fasteners and baton bar or termination discs shall be installed. Fasteners, disc, and baton bar shall be installed accord to the roofing system manufacturer's instructions. Fasteners shall be installed using the fastener roofing system manufacturer's recommended fastening tools with depth locators.
2. PVC membrane flashings shall extend a minimum of 3 inches past the securement bar or plates and shall be hot air welded to the PVC membrane.

N. Field-seam according to Section 3.07, "Seam Installation."

O. Excessive Repairs: Excessive repairs to membrane, or to membrane seams are not permitted. Remove and replace membrane in entire area affected, and as directed by University of Missouri representative.

Note:
1. **The Installer shall employ all means necessary to assure that the installation of all field and flashing membranes are free of loose (un-adhered) areas and wrinkles. The Owner's Representative(s) reserves the right to require that all preventable loose and /or wrinkled field membrane and membrane flashings to be repaired to the satisfaction of the Owner's Representative. If the Installer determines that loose and /or wrinkled membrane or membrane flashing is unavoidable in a specific area(s), the onsite Owner's Representative must be notified immediately for a determination of acceptability.**
2. **Contractor is to ensure during the time of installing the membrane field and membrane flashing sheet, there are no entrapment of debris under the membrane.**

3.08 SEAM INSTALLATION

A. General:
1. All seams shall be hot air welded. Seam overlaps should be 3 inches (75 mm) wide when automatic machine-welding and 4 inches (100 mm) wide when hand-welding, except for certain details.
2. The Installer shall provide and use Automatic Welding Equipment, for machine welding the specified PVC membrane. All mechanics intending to use the automatic welding equipment shall have successfully completed a training course provided by a Roofing system manufacturer's Technical Representative prior to welding.
3. All membrane to be welded shall be clean and dry.

B. Hand-Welding:
1. Hand-welded seams shall be completed in two stages. Hot-air welding equipment shall be allowed to warm up for at least one minute prior to welding.
2. The back edge of the seam shall be welded with a narrow but continuous weld to prevent loss of hot air during the final welding.
3. The nozzle shall be inserted into the seam at a 45-degree angle to the edge of the membrane. Once the proper welding temperature has been reached and the membrane begins to "flow," the hand roller is positioned perpendicular to the nozzle and pressed lightly. For straight seams, the 1½-inch (40-mm) wide nozzle is recommended for use. For corners and compound connections, the ¾ inch (20 mm) wide nozzle shall be used.

C. Machine Welding:
   1. Machine welded seams are achieved using Manufacturer's recommendations. When using the hot air welding equipment, Installer shall follow manufacturer's instructions on proper operation of the hot air welding machine.
   2. All applicable building local codes for electric supply, grounding and over current protection shall be observed. A dedicated portable generator is recommended for machine welding. No other equipment shall be operated off the generator during the time of machine welding.
   3. Metal tracks may be used over the field membrane and under the machine welder to minimize or eliminate wrinkles along the seam. **AIR POCKETS OR VOIDS ALONG THE SEAM ARE NOT ALLOWED BY OWNER.**

3.09 MEMBRANE FLASHING INSTALLATION

A. General: All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Approval shall only be for specific locations on specific dates. Membrane flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.

B. Manufacturer's adhesive to be used to adhere the PVC membrane flashing to acceptable wall and equipment curb substrates. No bitumen shall be in contact with the PVC membrane. If bitumen exists, then the roofing system manufacturer's asphalt resistant membrane shall be use for the membrane flashing.

C. Adhesive for Membrane Flashings:
   1. Over the properly installed and prepared flashing substrate, the adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
   2. No adhesive shall be applied in seam areas that are to be welded. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques.
   3. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and hot air welded into place. Where applicable, roofing system manufacturer's prefabricated corners shall be used.
   4. The membrane flashing shall be completed adhered to the substrate with no unadhered areas.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and roofing system manufacturer's technical department.

E. Vertical Surfaces Taller Than 30 Inches (760 mm): Where vertical distance of flashing membrane exceeds 30 inches (760 mm) in height, in addition to terminations at base flashings, mechanically fasten fully adhered flashing membrane with additional termination bar installed horizontally at not greater than 30 inches (760 mm) on center vertically to top of flashing membrane.
   1. Install membrane cover strip of standard sheet at last 8 inch (0.23 m) in width of same material, type, reinforcement, and color as roofing membrane over termination bars and hot-air weld seams.
   2. Install termination bar and cover strip using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars and installation of coversheet for area under construction.

F. Flashing Termination: Terminate all vertical flashing membrane surfaces horizontally and vertically with mechanically fastened termination bars and sheet metal flashings/counterflashings. Mechanically fasten flashing membrane securely using mechanical fasteners specifically designed and sized for fastening specified membrane flashing and termination bars into substrate.
   1. Fasten termination bar with fasteners not greater than 6 inches (152 mm) on center for length of bar, with fasteners within 3 inches (76 mm) of ends, or closer as required by manufacturer. Fasten into nailer or other substantial backing located behind point of base or curb termination.
   2. Uniformly fasten, seat, and compress the termination bar into top of fully adhered flashing membrane.

3. Install sealants continuously across surface of termination, including terminations covered with sheet metal flashing and counterflashing.
4. Install termination bars using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars for area under construction.
5. At termination of vertical and wall sheet flashings not under copings, install termination bar at vertical and wall membrane flashings with metal surface mounted one- or two- piece counterflashing assemblies, as is required for condition. Install as indicated in Drawings or if not shown in Drawings or otherwise indicated, as required to produce continuous closure of membrane with termination bar and metal flashing, regardless of abutting materials overlap.
6. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for requirements for counterflashings and other metal fabrications.

G. Primary Roof Drains: Install membrane into sump and extend into line of depressed sump at roof drain. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside sump in direction of water flow and drainage; backwater laps and seams are not permitted in or around sumps or drains.
1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
2. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with water cut off mastic in accordance with manufacturer's recommendations.
   a. Apply sealant in strict compliance with manufacturer's requirements.
3. Install membrane to comply with other requirements indicated for roofing membrane.
4. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
5. Securely tighten clamping rings to provide constant pressure on water cut off mastic.
6. Install new metal strainers to complete primary roof drains.

H. Secondary Overflow Roof Drains: Install membrane to extend into line of roof drain at roof surface. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside drain in direction of water flow and drainage; backwater laps and seams are not permitted in roof membrane around or under drains.
1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
2. Do not set secondary roof drain body below roof surface. Do not construct roof sumps at secondary overflow roof drains.
3. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with sealant in accordance with manufacturer's recommendations.
   a. Apply sealant in strict compliance with manufacturer's requirements.
4. Install membrane to comply with other requirements indicated for roofing membrane.
5. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
6. Securely tighten clamping rings to provide constant pressure on sealant.
7. Install new metal strainers to complete secondary roof drains.

I. High- or Elevated- Temperature Vent Flashings: Install prefabricated or field-formed membrane flashings to comply with manufacturer's written requirements and recommendations and as indicated. Field form flashings from sheet flashing membrane designed for and suited to condition.
1. Install stainless steel metal base fabricated metal flashing sleeves prior to installing flashings.
2. Install fire-resistant mineral-wool-fiber insulation between metal flashing sleeve and high- or elevated-temperature outside vent surfaces.
3. Select proper diameter prefabricated flashing to properly fit penetration and roof conditions.
4. Secure deck membrane around metal base sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments. Secure top of membrane flashing to top of sleeve penetration.
5. Secure deck membrane around sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments.
6. Install flashings to produce a minimum of 8-inch (200 mm) flashing height.
7. Lap base of flashings atop roof membrane at least 4 inches (100 mm). Hot-air weld seams at roofing membrane lap.

8. Place prefabricated flashing in place tight to horizontal deck membrane; ensure flange lays flat to deck membrane.
9. Weld base of prefabricated flashing continuously to deck membrane.
10. Where required by manufacturer, heat upper part of prefabricated flashing to temperature required by manufacturer; avoid overheating.
11. Clamp top of flashing at vent with stainless steel clamping ring.
12. Install stainless steel metal umbrella cap flashing, holding close to membrane base flashing.

J. Only an area, which can be completely covered in the same day's operations, shall be flashed.

K. Daily test lap edges with probe to verify seam weld continuity of all membrane flashings.

L. Complete all membrane flashing and metal details on a daily basis. No temporary flashings shall be allowed with the prior written approval of the Owner's Representative and roofing system manufacturer. If any water is allowed to enter under the completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

M. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

N. Installer is to ensure there are no wrinkles and "fish-mouths" in the membrane flashing and in the overlap seams.

O. Excessive Repairs: Excessive repairs to seams or flashings are not permitted. Remove and replace membrane, and if required the roofing components, in entire area affected as directed by University of Missouri representative.

3.10 PERIMETER AND METAL BASE FLASHINGS

A. General: All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

B. Sheet metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. All Kynar coated perimeter metal edging shall be fabricated and install per current SMACNA requirements.

D. Secure the Kynar coated metal over the field membrane and the "Multi-Purpose Sealing Tape." Fastened the sheet metal with approved stainless-steel nails or another acceptable fastener. Fasteners shall be fastened 4 inches on center and staggered 4 inches on center.

E. An 8 inch minimum wide strip of the 60 mil membrane flashing shall be adhered to the 4 inch wide flange of the sheet metal and to the field membrane. Check all coverstrip with a rounded screwdriver. Re-work any inconsistencies.

3.11 WALKWAY INSTALLATION

A. Installer is to install walkway in the areas as indicated on roof plans. Installer is responsible for verification of the total linear footage of the required walkway installation. The minimum length of the walkway, installed at any one location, shall be four (4') feet.

B. Install the walkway to roofing system manufacturer's written instructions.
1. Clean all dirt and debris from the deck membrane in areas where the walkway will be installed.
2. Important: Check all deck membrane welds with a rounded screwdriver prior to installation of walkway. Re-weld any inconsistencies before walkway installation.
3. Install walkway in the indicated roof areas.

4. Installer shall not hot air weld the walkway to the field membrane.

3.12 PROTECTION PAD INSTALLATION

A. General: Install protection pad under exposed wood blocking and under equipment supports.

B. The installation of the protection pad:
1. Clean all dirt and debris from the deck membrane in areas where the protection pad will be installed.
2. Important: In areas where protection pads are to be installed, Installer is to probe all field membrane seams welds with a rounded screwdriver prior to installation of the protection pad. Re-weld any inconsistencies before protection pad installation.
3. Cut the protection pad 4 inches (4") wider than the dimensions of the wood blocking or equipment and piping support.
4. Hot air weld the entire perimeters of the protection pad to the field membrane sheet.
5. Probe all protection pad seam welds with a rounded screwdriver. Re-weld any inconsistencies found in the protection pad seams.
6. Center the wood blocking or equipment or pipe support over the protection pad.

3.13 MEMBRANE PROTECTION LAYER INSTALLATION

A. Before the installation of protection layer membrane, the Installer shall:
1. In the areas where the protection layer will be installed, the field membrane shall be cleaned of all dirt and debris.
2. It is important to have Technical Inspector to probe all seam welds with a rounded screwdriver prior to installation of protection layer membrane. Re-weld any inconsistencies before protection layer membrane installation.
3. Measure a distance of 6 feet from the base of the equipment curb and on each side of the equipment curb. Place chalk lines on deck sheet to indicate location of protection layer membrane. Mark areas, a minimum 4 inches wide, to where no adhesive will be applied; no adhesive shall be applied area of hot air welding seams.
4. The adhesive is roller-applied, using a using solvent-resistant ¾ inch (19 mm) nap paint rollers, to both the protection layer membrane and the PVC field membrane in the following manner:
    a. Apply approximately ½ gallon per 100 square feet of the manufacturer's adhesive to the field sheet and allow to dry completely.
    b. After the PVC sheet adhesive has dried completely, apply adhesive to the **top (white) side** of the membrane, and allow to become tacking (producing strings) when touch with a dry finger. The adhesive shall not be permitted to dry completely.
    c. The protection layer membrane is then place on the substrate (mating adhesive surfaces).
    d. The protection layer membrane shall be rolled firmly into place with a water-filled, foam-covered lawn roller by frequently rolling in two or more directions.
    e. Installer is to ensure there are no wrinkles in the protection layer membrane.
5. All panels of protection layer membrane shall be applied in the same manner, overlapping the edges of the panels as required by welding techniques around the equipment curb.
6. Hot air weld the protection layer perimeter side and end laps to the PVC field sheet.
7. Check all protection layer seam welds with a rounded screwdriver. Re-weld any inconsistencies found in the protection layer seams.

3.14 HIGHLY VIISBLE MEMBRANE INSTALLATION

A. General Requirements: Provide and install a highly visible membrane product; designed to draw attention to an unprotected roof perimeter and potentially hazardous area that do not comply with University of Missouri safety guidelines.

B. Installation of yellow, 4 inch wide, cover strip:
1. Installer and University of Missouri Representative shall verify unprotected roof perimeters and potentially hazardous areas on the referenced project's roof area(s).

2. The yellow cover strip shall be installed not less than 6 feet 6 inches (2 meters) from unprotected roof perimeters and potentially hazardous areas.
3. Before installing the yellow membrane 4-inch-wide cover strip, the Installer shall have Manufacturers Technical Representative to verify permanence of all deck membrane welds with a rounded screwdriver. Repair any inconsistencies of the membrane seams before yellow membrane installation.
4. The roofing membrane shall be properly cleaned prior to install the "yellow membrane 4-inch-wide cover strip." Failure to properly clean the membrane will result in less than satisfactory hot air welding of the yellow membrane.
5. Hot air weld the yellow cover strip to installed and inspected roofing membrane.
6. Installer shall take care to avoid trapping air under the yellow membrane.
7. After hot air welding the yellow cover strip, the Installer shall verify permanence of all yellow cover strip welds with a rounded screwdriver. Repair any inconsistencies of the yellow cover strip installation.

3.15 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the Installer shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner's representative prior to starting the roofing project. Proceeding with the roofing project indicates the Installer's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the Installer's expense.

C. The Installer shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation in order to maintain a 100% watertight and to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs during the installation of the roofing system, the Installer shall install temporary watertight and hermetic terminations across the installed Manufacturers roofing system. The Manufacturers roofing system shall be 100% impermeable in order to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the Installer shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather-related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly completed Roofing System, the affected roof area(s) shall be removed and replaced at the Installer's expense.

3.16 FIELD QUALITY CONTROL

A. Quality Control of Welded Seams:
   1. The Installer shall designate a Quality Control Supervisor to daily check all welded seams for continuity by using a rounded screwdriver.
   2. On-site evaluation of welded seams shall be made by the Installer at locations as directed by the Owner's Representative or roofing system manufacturer's technical representative.
   3. Correct welds display failure from shearing of the membrane prior to separation of the weld.
   4. Repair cold welds, tears, voids, and wrinkles in the over lapped seams of the roofing membrane and membrane flashing which do not meet manufacturer's requirements for a quality seam weld.

5. Each test cut shall be patched by the Installer at no extra cost to the Owner or to roofing systems manufacturer.
6. All membrane seams, both field and flashings, shall be hot air welded and probed on a daily basis. NO EXCEPTIONS.

B. Roofing system manufacturer's technical representative: Installer shall arrange to have the system manufacturer's technical representative on site of the first day of installation of the roofing system. The Technical Representative shall note:
1. Conduct a site inspection on the first day of production.
2. Communicate with the University of Missouri project manager each inspection, i.e., meet with the University of Missouri designated project manager before entering work area.
3. Note all defects noted non-compliance with the specifications or the recommendations of the thermoplastic manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Manufacturer's representative.
4. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion of the roofing project.
1. All defects noted non-compliance with the roofing specifications and details or the recommendations of roofing system manufacturer representative should be itemized in a punch list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and roofing system manufacturer technical representative.
2. Ensure the roofing contractor has received a copy of Final Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the Final Inspection Report.

3.17 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from, not limited to the following items: dirt, grease, rust stains, roofing asphalt, scuff marks, abrasions, adhesive spills, sealant spills, membrane cuts, and any physical damages to the installed Manufacturers roofing system during the construction period.

B. Upon completion of the Work, dispose of, away from the Site, all debris, trash, containers, fasteners, roofing remnants and scraps.

C. **The completed "Roof" shall be washed with water and University of Missouri approved cleaner to remove all dirt, stains, adhesive and sealant spills, and any residue from roof membrane.**

3.18 ACCEPTANCE

A. Prior to demobilization from the site, the roofing system manufacturer's project manager, University of Missouri's representative(s), roofing system manufacturer's designated field technical representative and Installer's project manager, production crew superintendent, and project's roofing foreman shall review the completed work.

B. Installer and University of Missouri representative shall inspect the completed roofing system for any uneven cover boards, loose or improperly attached insulation or cover boards, ponding of water, un-adhered membrane and membrane flashing, membrane damage, dirt, rust stains, roofing asphalt, grease, scuff marks, cuts, abrasions, adhesive spills, and sealant spills.

C. All defects noted noncompliance with the project's bid documents will be itemized in a punch list. Any non-compliance item shall be removed and/or repaired immediately by the Installer to the satisfaction of the University of Missouri representative, and to roofing system manufacturer.

D. The noted deficiencies shall be repaired or replaced to a condition free of damage and deterioration at the time of Substantial Completion Acceptance by University of Missouri's representative, and / or to accordance of the University of Missouri project contract documents.

E. All warranties as required for the project of this specification shall be submitted for approval prior to final payment by University of Missouri.

END OF SECTION 07 5400.6

SECTION 07 5400.4 –EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
1. Adhered EPDM sheet roofing
2. Polyisocyanurate Insulation
3. Cover board
4. Walkway pads

B. **SCOPE OF WORK: SECTIONS 1 & 3,** The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity on a daily basis. Remove contents of roof system down to the concrete substrate; prime concrete deck substrate and install manufactures approved (SA) self-adhered vapor barrior; with FM 1-105 FM ribbon pattern apply the base layer of 1.5" polyisocyanurate insulation followed by an additional layer of 1.5" polyisocyanurate insulation with a FM 1-105 pattern adhered with low rise foam, 1/2" HD polyisocyanurate cover board, Installation of 4' tapered panels at all roof perimeters to facilitate slope off the wall perimeter in leu of HD polyisocyanurate cover board, installation of ½" plywood at all roof accesses, ladder egresses and stairs in leu of cover board followed by the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. All flashing membranes, pre-fabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl caulk or tape at all attachment points of the surface mounted counterflashing. Installation of new roof screens throughout. Installation of new through wall scuppers even with drain lines on exterior perimeter of the roof area. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

SECTIONS 1 & 3: RAG FELT AND ASPHALT VAPOR BARRIER CONTAINS ASBESTOS. SILVER AND BLACK SEALANT CONTAINS ASBESTOS. REFERENCE SECTION 02080 – ASBESTOS ABATEMENT.

C. **SCOPE OF WORK: SECTION 2**, The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity daily. Over the cleaned and prepared steel decking substrate, install manufactures SA vapor barrier to primed metal deck. Mechanically fasten first layer of 2.0" polyisocyanurate insulation with FM 1-105 fastening pattern followed by an additional layer of 2.0" polyisocyanurate insulation adhered with low rise foam over the mechanically fastened base layer of polyisocyanurate, installation of 1/2" HD polyisocyanurate cover board, installation of ½" plywood at all roof accesses, ladder egresses and stairs in leu of cover board and the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. Installation of larger through wall scupper at current scupper location. Installation of yellow warning line at perimeter of roof area on all unprotected edges.

1.03 DEFINITIONS

A. ASTM E108, Class "A".

B. UL 790, Class "A".

1.04 REFERENCES

A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. Single-Ply Roofing Institute (SPRI): Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes

C. National Roofing Contractors Association (NRCA): Current Roofing and Waterproofing Manual

D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Current SMACNA Technical Manuals.

E. Code of Federal Regulations, (CFR) including:
   1. CFR Title 29, Part 1910 "Occupational Safety and Health Standards."
   2. CFR Title 29, Part 1926 "Safety and Health Regulations for Construction."

F. Underwriters Laboratories (UL):
   1. Roof Materials and Systems Directory. 2012.
   2. UL 790: Tests for Fire Resistance of Roof Covering Materials: 1983.

G. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) FOR EPDM MEMBRANE:
   1. .060" (Black) Non Reinforced
   2. ASTM D 412
   3. ASTM D 624
   4. ASTM D 573

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing system manufacturer based on testing and field experience.

C. Roofing System Design: Comply with SPRI "Wind Design Guide for Adhered Single Ply Roofing Systems" for the following ground roughness exposure, classification of building and system design:
   1. Surface Roughness Category: Exposure B
   2. Classification of Building: Category II
   3. Wind uplift Design: 90 mph @ 3 second gust
   4. System 1 Design: Adhered Single Ply Membrane Roofing

D. Underwriters Laboratories Inc. (UL):
   1. UL RMSD – 2009 Roofing Materials and Systems Directory
   2. UL 790 – 2009 Fire Resistance of Roofing Coverings Materials
   3. Exterior Fire Exposure Classification: Class A, ASTM E 108, for application and slopes shown

1.06 ACTION SUBMITTALS

A. Product Data: Submit latest edition of roofing system manufacturer's roofing and base flashing specifications including list of materials proposed for use, installation procedures, and roofing system manufacturer's Product Safety Data Sheets.

B. Product Safety Data Sheets: Installer shall review all product data safety data sheet chemical names prior to submitting to University of Missouri.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
   1. Base flashings and membrane terminations.
   2. Tapered insulation, including slopes.
   3. Roof plan showing orientation of concrete deck and orientation of membrane roofing.
   4. Insulation ribbon methods for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: Physical samples are not necessary.
   1. Sheet roofing, of color specified.
   2. Roof insulation.
   3. Cover board.
   4. Metal termination bars.
   5. Battens.
   6. Six batten fasteners of each type, length, and finish.
   7. Walkway pads or rolls.
   8. Safety yellow perimeter tape.

1.07 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and roofing system manufacturer.

B. Roofing system manufacturer Certificates: Signed by roofing system manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
   1. Submit evidence of compliance with performance requirements.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by roofing system manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

D. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

E. Single Ply Roofing Institute (SPRI) - Fasteners Withdrawal Resistance Testing:
   1. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
   2. Prior to starting the project, provide a copy of the Fasteners Withdrawal Resistance Testing to roofing system manufacturer’s technical department.

F. Warranty:
   1. Provide sample copy of 20-year (NDL) Full System roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
   2. Provide sample of copy 5-year Installer’s workmanship warranty stating obligations, remedies, limitations, and exclusions of warranty.

G. Inspection Report: Copy of roofing system roofing system manufacturer's final inspection report of completed roofing installation.

1.08 CLOSE OUT SUBMITTALS

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

1.09 QUALITY ASSURANCE

A. Roofing System Manufacturer Qualifications: A qualified roofing system manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications:
   1. A qualified firm that is approved, authorized, or licensed by membrane roofing system roofing system manufacturer to install roofing system manufacturer's product and that is eligible to receive roofing system manufacturer's special warranty.

2. Prior to submitting a roofing proposal, Installer must be approval by Owner's representative.

C. Roofing system manufacturer's membrane shall meet the following characteristics:
   1. Protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt.
   2. Membrane Thickness: Membrane roofing system manufacturer is to verify that the membrane thickness is of the membrane thickness specified ASTM D412 nominal thickness of +/- 10 percent will not be acceptable for measurement of membrane thickness.

D. Source Limitations: Obtain components including roof insulation, fasteners, and accessories for membrane roofing system from same roofing system manufacturer as membrane roofing.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Pre-installation Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 10 working days before conference.
   1. Meet with Owner's Representative/General Contractor, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including roofing system manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

G. At no cost to University of Missouri, roofing system manufacturer's technical representative shall perform:
   1. Manufacturer's Quality Control Inspection: The Manufacturer's Technical Representative shall review the on-going work on the first day of the roofing production and a minimum of one (1) in-progress inspection every 10 working days. The Roof system manufacturer Technical Representative shall:
      a. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
      b. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
      c. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.
   2. Final Roof Inspection: Contractor is to arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of the roofing project.
      a. All defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri and Roof system manufacturer.
      b. The roofing contractor is to forward a copy of Final Inspection Report to the University of Missouri On-site Representative within two days after date inspection(s) is performed.

H. Installer's Responsibility: Any failure by the Owner Representative or roofing system manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these specifications of work in progress or completed work shall not relieve the Installer, or reduce, or in any way limit, his responsibility of full performance of work required of the Installer under these specifications.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with roofing system manufacturer's name, product brand name, and type, date of manufacture, and directions for storing and mixing with other components. Deliver materials in sufficient quantity to allow work to proceed without interruption.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within temperature range required by roofing system manufacturer.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Store and protect materials, including roofing insulation from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store all materials in a dry location. Use pallets to support all materials from roof deck. Distribute the load to stay within live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work. Comply with roofing system 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.

1.11 PROJECT CONDITIONS

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

B. The EPDM adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   3. The wall/deck intersection permits air entry into the wall flashing area.

C. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

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

E. Protection:
   1. Provide special protection and avoid traffic on completed areas of membrane installation.
   2. Restore to original condition or replace work or materials damaged during handling of roof materials.
   3. Take precautions as required to protect adjacent work and structures.

F. Emergency Equipment and Materials: Maintain onsite equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the Installer shall provide the labor necessary to monitor the situation to maintain a watertight condition.

G. Protection:
   1. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent Roofing areas.
   2. The Installer shall provide a suitable temporary protective surface for all roofing areas which will receive construction traffic or construction of equipment during all phases of the roofing project.
   3. During the course of installation of the membrane roofing systems, should there be any damage created by other construction trades to the new or to existing roofing membrane and/or roofing system, the Installer is to immediately notify the Owner's Representative and membrane roofing system manufacturer. All damages are to be repaired according to the membrane roofing system manufacturer's or Owner's representative's recommendations. The "party" responsible for the roofing damages shall bear the total cost for the repairs or for the replacement of existing or new roofing system.

H. Restrictions:
1. Comply with Owner's General and Safety Requirements on use of site.
2. Smoking and Tobacco products are prohibited on all roof areas and on the campus grounds.
3. Provide and maintain sanitary facilities for employees.
4. Maintain facility and all utility services in a functional condition.

1.12 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights of the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Installer under requirements of the Contract Documents.

B. Roofing System Manufacturer's Warranty: Submit a written warranty, without monetary limitation, with all available options, including flashing endorsement, roofing system manufacturer's roof insulation and roofing system manufacturer's accessories, signed by roofing system roofing system manufacturer's agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
1. Twenty (20) Year Full System Warranty (no ponding/standing water exclusions accepted). Warranty shall be non-prorated and cover basic wind speeds up to 60 mph.
2. "Early Bird" warranties are not to be issued, as they will not be accepted by Owner.
3. The specified roofing system manufacturer's warranty will be issued only upon final acceptance by the roofing system manufacturer's ttechnical department and the Owner's Representative's final approval.
4. Request for final payment and issuance of the specified Roofing system manufacturer's warranty will be issued to the Installer's after successful completion and Owner's Representative's final approval and acceptance of the entire roof system installation.

C. Installer's Warranty: Submit roofing Installer's workmanship warranty, on a notarized written warranty form, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, cover board, roof insulation, fasteners, adhesives, sealants, and associated sheet metal, for the following warranty period:
1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM MANUFACTURER

A. The components of the roof system are to be products of a single roofing system manufacturer or approved by the Roof system manufacturer, whose products meet or exceed the project specifications, have manufactured and installed the roofing materials and systems of the type specified for a minimum of twenty (20) years, and who maintains a single source responsibility for the total roofing system.

B. Roofing system manufacturers: The components of the roofing system are to be products of a single roofing system manufacturer as required to provide the specified system warranty. Subject to compliance with requirements, provide roofing products from:
1. Versico incorporated, Akron OH
2. Firestone Roof system, Carmel IN.
3. Owner approved manufacturers.

2.02 EPDM MEMBRANE

A. EPDM Membrane: a uniform, flexible sheet formed from ethylene propylene diene monomer, ASTM D 412, of the following Classification – Type and Grade, Membrane Thickness, UL Classification, and Membrane Exposed Face Color.
1. Classification: Type II, Grade I.
2. Membrane Thickness: 60 mils, +/- 2.0 mils.
3. UL Class: A.
4. Membrane: Exposed Face Color: Black

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system roofing system manufacturer for intended use and compatible with membrane roofing materials.
   1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdictions.

B. Membrane flashing and Flashing Accessories: As recommended by the roofing system manufacturer's printed instructions for sheet flashing of same material, mil thickness and color as sheet membrane.

C. Asphalt Resistance Membrane Flashing: Roof system manufacturer's SA vapor barrier. The asphalt resistance membrane flashing can be adhered directly to asphalt-contaminated surfaces. The asphalt resistant membrane can be installed over the field membrane to act as a protection layer membrane in conditions where oil and grease could develop from roof-top equipment.

D. Insulation Fasteners: Roofing system manufacturer approved corrosion resistant steel #12 "fasteners," screws of the appropriate size and type for roof membrane and insulation attachment. A #12 corrosion-resistant fastener is used with plates to attach insulation boards to steel roof decks. Fasteners for the insulation shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

E. Insulation Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 3 inch round plates, "plates," of the appropriate size and type for the securement of the insulation to approved substrates. Securement plates for the insulation shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

F. Membrane Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 2 inch round plates, "discs," for the securement of the membrane to the steel roof decks. Securement plates for the membrane shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

G. Membrane Securement Screw: Roofing system manufacturer approved corrosion resistant steel, "#15screws" of the appropriate size and type for roof membrane securement. A #15, heavy-duty, corrosion-resistant fastener used with "discs" and "termination bar" to attach Roof system manufacturer's roof membrane to steel roof decks. Fasteners for the membrane shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

H. Membrane Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, Standard bonding adhesive, used to attach membrane to the horizontal or near-horizontal substrate. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

I. Membrane Flashing Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, used to attach the flashing membrane to the substrate, either horizontally or vertically. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

J. Metal Termination Bar: a heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. "reglet" has a 2-1/4 inch (57 mm) deep profile and is provided in 10 foot (3 m) lengths.

K. Membrane Securement Bar: is a 1 inch wide aluminum alloy bar used with to clamp the membrane to the roof deck along walls, curbs, and certain vertical to horizontal changes in the roofing system. Termination bar is supplied in bundles of 25 pieces. Each termination bar is 10 feet long.

L. Sealants: Owner approved sealant shall be used to seal penetrations through the membrane system and at miscellaneous sealant applications that are exposed to roof systems components.

M. Safety Warning Membrane: A highly visible product to draw attention to an unprotected roof perimeters and potentially hazardous areas. The safety warning membrane is designed for use on a membrane roof. The EPDM safety warning membrane shall be a yellow in color, 60 mils in thickness, 4 inches wide, and 100 feet in length.

N. Pre-Fabricated Pipe Flashing: prefabricated vent pipe flashing made from 0.060 inch (60 mil/1.5 mm) thick membrane.

O. Pre-Fabricated Corner Flashing: prefabricated universals corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are adhered/quick applied to membrane base flashings.

P. Aluminum: ASTM B 209-86, alloy and temper - 3003-H14, 0.040 inch thick aluminum sheet, mill finish with formed drip edge.

Q. Mineral Wool-Fiber Fire-Resistant Insulation: Semi-rigid mineral-wool-fiber batt insulation; Type IVA per ASTM C 612; not less than 144 psf (6.9 kPa) compressive strength per ASTM C 165; less than 0.05 percent moisture absorption per ASTM C 1104; complying with ASTM E 136; and with the following surface-burning characteristics per ASTM E 84:
1. Flame Spread: 0.
2. Smoke Developed: 0
3. Manufacturers: Subject to compliance with requirements, available products include the following:
   a. Basis of Design: Roxul Safe; Roxul Inc.

R. Other miscellaneous materials shall be of the "best grade" available and to be approved in writing by the roofing system manufacturer for the specific application.

2.04 INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements, selected from roofing system manufacturer's standard sizes and of thickness indicated.

B. Polyisocyanurate Board Insulation: Type II, Class 2 Grade 2 – Closed cell polyisocyanurate foam fiberglass reinforced mat laminated to faces, complying with the following additional characteristic.

Roof 1 & 3- 1.5" Poly Iso. ½" HD Poly Iso. 4' Tapered panels.
Roof 2- 2.0" Poly Iso.

C. Roof and Tapered Insulation: rigid polyisocyanurate foam insulation composed of a closed cell polyisocyanurate foam core laminated to a felt or glass fiber mat facer on both major surfaces. The insulation shall have the following characteristics:
1. Dimensional Stability (length and width) per ASTM D 2185: <2%.
2. Compressive Strength (10% Deformation) per ASTM D 1621: 20 psi.
3. Product Density per ASTM D 1622: Nominal 2.0 pcf.
4. Flame Spread per ASTM E84 (Full 10 min. Test): 20-50*
5. The insulation board is to have a minimum conditioned thermal value per inch of an LTTR Value of 6.00 as determined by ASTM C 1303 and C 518.
6. The insulation board shall have a minimum compressive strength of 20 psi and a dimensional stability of -2% linear changes, maximum seven (7) days.

D. Insulation Requirements:
1. **Roof Section 1**: ¼" per foot tapered poly Iso low rise foamed to vapor barrior followed by ½" HD cover board adhered with low rise foam)

E. Tapered Polyisocyanurate Insulation Shapes: Preformed insulated shapes for saddles, crickets, tapered edge strips, sumps, and other insulation shapes where indicated or where required for sloping to drain. Fabricate to slopes indicated. Saddles, Crickets, Edge Strips, and Other Shapes:
1. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48) unless otherwise indicated.
2. Crickets between Roof Drains: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24) unless otherwise indicated.
3. Sumps for Roof Drains, measuring 4 feet x 4 feet; size to be modified when drains are located next to parapet wall: a. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48). Provide a minimum insulation thickness at the roof drain or roof scupper of 2.0 inches.
4. Saddle Behind (Upslope) from Curbs Measuring 18 inches and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).

5. Saddle Behind (Upslope) from Round Penetrations Measuring 12 inches in diameter and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).

F. Approved Roofing system manufacturer and Product:
1. Roof system manufacturer.

2.05 COVER BOARD

A. High density polyisocyanurate cover board: Closed cell polyisocyanurate foam with coated glass matt facer laminated to both faces, complying with the following additional characteristics:
1. Thickness: 0.5 inches.
2. Size: 48 inches by 48 inches, nominal.
3. R-Value (LTTR):
   a. 0.5 inches, R-Value: 2.5, minimum.
4. Compressive Strength: 120 psi.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 8.3 percent post-industrial, average.

2.06 INSULATION AND COVER BOARD ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation roofing system manufacturer for intended use and compatible with membrane material.

2.07 DUAL COMPONENT POLYURETHANE ADHESIVE

A. General: Provide a dual component polyurethane adhesive that is intended for the attachment of polyisocyanurate insulation to various substrates. The dual component polyurethane adhesive has to have approvals from the insulation and roofing system manufacturer for adhering the polyisocyanurate insulation to approved substrates, multiple layers of polyisocyanurate insulation, and cover boards. Consult adhesive roofing system manufacturer on current acceptable substrates to apply dual component polyurethane adhesive to various substrates.

B. Dual component polyurethane adhesive: The low-slope dual component polyurethane adhesive shall have the following minimum properties:
1. Density ASTM D-1622: Free Rise, 3.2 lb./cf.
2. Compressive Strength ASTM D-1621: Parallel, 38 psi @ 6% deflection.
3. Tensile Strength ASTM D-1623: 35 psi
4. Water Absorption ASTM D-2843: 5.1%
5. Closed Cell Content ASTM D-6226: 90% min.
6. R-Value ASTM C-518 3.8/inch (new)
7. VOC Content ASTM D-2369 <5 g/l (1&2 combined)
8. Weight/Gallon: Part A Component 10.32 lbs. Part B Component 8.54 lbs.

C. Approved Roofing system manufacturer and Product:
1. OMG Roofing Products, “OlyBond 500® SpotShot.”
2. Roof system manufacturer, “OM Board Adhesive.”

2.08 VAPOR RETARDER ON CONCRETE DECKS

A. SA - 32 mil (0.8 mm) self-adhesive vapor barrier that can also serve as temporary roof protection. Self-Adhered is available in rolls 44.9 inches x 133.8 feet (1.14 x 40.8 m).

B. SA Primer - A polymer emulsion water-based primer designed to improve the adhesion of SA vapor retarder on concrete roof decks or plywood walls. Application temperature must be 41°F (5°C) and above. The coverage rate will range from 163 - 400 ft2/gal (4 - 9.8 m²/L) for non-porous surfaces to 82 - 135 ft2/gal (2 - 3.3 m²/L) for porous surfaces. The VOC content is 3 g/L.

2.09 RELATED MATERIALS

A. Timber, General: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; provide certificate of inspection from an accredited Agency for selected material.
   1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2-inches or less in thickness.
   2. Provide lumber with 15 percent moisture content at time of dressing and shipment for, sizes 2-inches or more in thickness.

B. Dimensioned Lumber: Graded in accordance with established grading rules; grade and species as follows:
   1. Concealed Boards: WWPA standard grade, any species, or SPIB No. 3 grade Southern Pine.
   2. Lumber for Miscellaneous Uses: Standard grade unless otherwise indicated.
   3. Plywood: PS 1; select sheathing grade or APA rated 5/8-inch minimum thickness, CD-X, or better in sheathing.

2.10 MISCELLANEOUS FASTENERS AND ANCHORS

A. General: All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approve for such use by the fastener roofing system manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm), stainless steel, and to be approved for such use by the fastener roofing system manufacturer.

2.11 PROTECTION PADS

A. Protection Pads: "- factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, as supplied Roof system manufacturer. Color of protection pads shall be black. Protection pads to be used under all wood support blocking, equipment supports, pipe steel supports, and under downspout splash blocking.

2.12 ROOF WALKWAYS

A. Walkway: factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, approximately 2" thick, as supplied Roof system manufacturer.

2.13 DRAINS

A. Zurn Standard - Black Iron/Cast Iron bowl and components.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect entire roof area to be roofed for acceptability. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting installation and performance of the roofing system:
   1. Verify that roof openings and penetrations are in place, and curbs are set and braced, and that the roof drains and drain lines are properly clamped into position and are in a 100% functional condition.
   2. Verify that primary drain bodies are at proper elevations for construction of sump at slopes indicated.
   3. Verify that secondary overflow drain bodies are at proper elevations for construction, without sumps, at level of roof surface.

B. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. Verify that structural use panels, sheathing, and similar wood products are securely anchored to substrates, and that surfaces of panels and sheathing are without irregularities which could interfere with proper membrane and flashing installation.

D. Visually inspect cast-in-place reinforced concrete roof deck for the following:
1. Evidence of impaired deck structural capacity or integrity.
2. Exposed concrete reinforcing.
3. Presence of corrosion.
4. Spalling or loss of concrete cover.
5. Presence of foreign materials.
6. Efflorescence.
7. Ridges or uneven conditions in concrete deck.
8. Holes, voids, or gaps in concrete deck.
9. Accumulations of moisture.

E. Other conditions that would prevent proper application of roofing or that would prevent membrane roofing manufacturer's approval of substrate, components, or system.

F. Verify that roofing systems can be installed with positive drainage of minimum slopes indicated at all areas of roof, without ponding after 24 hours.

G. Verify that roofing as completed will discharge to internal roof drains without ponding or inadvertent discharge through secondary roof drains.

H. Verify that final installed curb heights for flashing are a minimum of 8-inches (200 mm) measured above finished roof membrane.

I. Verify piping and conduit penetrations of roof are made individually, separated by a minimum of 12 inches (300 mm) from each other and from restraining surfaces or other obstructions.

J. Verify locations of interior electrical conduits, piping, ducts, and similar items in close proximity to underside of steel roof decking, to avoid striking with fasteners.

K. Verify that deck and other substrates are dry, free of debris, excess, and foreign materials.

L. Verify substrates and surfaces to receive flashings are dry, clean, and free of sharp or penetrating projections or other irregularities.

M. Proceeding: Proceed with installation only after unsatisfactory conditions have been corrected.

N. Do not commence work until decking and substrates are in full compliance with roof system manufacturer's requirements, deck and substrate conditions are sound, and positive fall to drainage points are achieved.

O. Commencement: Commencement of work indicates acceptance of conditions and responsibility for all corrections.

3.02 PREPARATION

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

B. The Installer will be entirely responsible for the complete removal of all dirt, debris, moisture from the roof's substrate, i.e. steel decking, concrete decking, before the installation of the roofing system. The roof's substrate must be 100% completely dry before applying the spray-in-foam insulation or before the installation of the specified roofing insulation.

C. Cleaning: Clean substrate including metal decking flutes of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

D. Debris, water, moisture, or foreign materials found in flutes of steel roof decking is not permitted; remove and replace roofing installed above flutes found to contain foreign materials.

E. Cleaning, repair or replacement of damaged items, as a result of roofing related materials entering the facility, shall be solely at the roofing contractor's expense.

F. Broom clean cover board immediately prior to membrane roofing application.

G. Promptly remove debris each day; do not stockpile debris or allow waste to accumulate on steel decking, insulation, or roofing under construction.

H. Containment: Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction at the end of the workday or when rain is forecast. Remove roof-drain plugs when no work is taking place or when rain is forecast.

I. Mask off adjoining surfaces not receiving roofing membrane materials to prevent spillage or over spray affecting other construction.

J. Fill all gaps and voids between substrate components that are wider than 1/4 inch. Fill all gaps with same materials as the substrate.

K. Seal around along perimeters, along equipment curbs, around pipes, around conduits, and any other roof penetrations with vapor barrier.

L. Base Vertical Flashings: Coordinate roof insulation thickness with adjacent base flashing height, to maintain not less than 8-inch (203 mm) flashing height. Adjust base vertical flashing height including substrates and changes in exterior wall materials to maintain minimum height.

M. Proceed with roofing work only when weather conditions permit work to proceed in accordance with manufacturer's requirements and recommendations.

3.03 WOOD NAILER INSTALLATION

A. All Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Section 06 1000 for acceptable fasteners for wood product attachments.

B. Wood Nailer thickness shall be as required to match the insulation and cover board height (thickness) to allow a smooth transition.

C. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any roof system manufacturer product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

D. New wood nailers and/or plywood sheeting shall meet the performance criteria in Section 06 1000.

3.04 VAPOR-RETARDER / AIR BARRIER INSTALLATION

A. Deck to be as clean as possible. Ensure the concrete is in good condition. If concrete deck is wet allow sufficient amount of time for the moisture to dry. If the contractor cannot remove the asphalt roof membrane from the concrete deck, please remove any loose or deteriorated material, prime existing substrate and install vapor barrier: **No torches to be used to dry deck of moisture!**

B. Install Self-Adhered over a SA Primer. In concrete applications allow concrete to cure for at least 7 days. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32°F (0°C) and above. The use of a primer is required on the following substrates: wood, concrete, lightweight concrete, gypsum boards and decks, and DensDeck Prime® boards.

C. Begin application at the bottom of the slope. Unroll Self-Adhered onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 in. (75 mm) lengthwise following the reference line and by 6 in. (150 mm) at each end. Stagger end laps by at least 12 in. (300 mm). Tool vapor barrier up all penetrations and or perimeters and seal. Vapor barrier to be installed as if the VB was a temp roof. Do not immediately remove the silicone release sheet.

D. Once aligned, peel back a portion of the silicone release sheet and press the membrane onto the substrate for initial adherence. Hold Self- Adhered tight and peel back the release sheet by pulling diagonally.

E. Use a 75 lb. (34 kg) roller to press Self-Adhered down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

3.05 INSULATION BOARD INSTALLATION

A. General Criteria:
1. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged insulation boards are to be replaced with new insulation boards.
3. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified roofing insulation or during the time of applying the dual component polyurethane adhesive.
4. Construct sumps at primary roof drains using tapered insulation to slope indicated. Install nailers or blocking as required to secure drain body assembly to roof deck.
    a. Unless otherwise indicated, construct sumps to consistent and uniform slope of 1/4 per 12 inches (1:48) to provide a smooth transition from the roof surface to the drain. Do not introduce steeper or shallower slopes within sump.
    b. Use tapered insulation to form a square sump. Unless indicated otherwise, construct sump measuring 4 foot by 4 foot at primary roof drains.
    c. Adjust primary roof drain assemblies to proper elevation for sump.
    d. Install tapered insulation so edges do not restrict flow of water.
    e. Do not create circular depressions around primary roof drains at bottoms of sumps.
5. **Do not install sumps at secondary overflow roof drains.**
    a. Adjust secondary roof drain assemblies to proper elevation of final roofing membrane.
    b. Do not create circular depressions around secondary roof drains.
6. Where conditions required drain modifications to match specified insulation thickness, roofing contractor will be responsible for the cost of readjusting the primary roof drain bowl and associated plumbing to match the "finished" insulation thickness. University of Missouri will not permit the circular depressions, nor the cutting or shaving the insulation to slope the insulation to the edge of the drain bowl.
7. University of Missouri will not permit loose boards under foot. Contractor is expected to use adequate weight during the application of the insulation boards. Boards in access of 1/8" deflection will not be permitted.
8. Roofing system manufacturer's technical representative shall be on the jobsite during the first initial day of installation of the roofing system.

B. Attachment of the Polyisocyanurate Insulation on the steel decking over the entrance canopy if the deck is metal:
1. Install one layer of SA vapor barrier to the top flange of the steel deck prior to installing the first layer of polyisocyanurate board insulation.
2. Install insulation under area of roofing to achieve required thickness. Where overall insulation thickness is 2.6 inches or greater, install two or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 16 inches in each direction.

3. The first layer of the insulation edges shall be supported on the top rib of the steel deck. The insulation board shall be lay transverse to the direction of the steel decking ribs. Insulation boards edges shall be as close as practical to the center of the rib, with a minimum of 1½-(1.5) inches bearing on the rib. Stagger end joints of boards a minimum of 1/3 of overall length.
4. Over the top of the first layer of insulation, the second layer of insulation board shall be lay transverse to the direction of the first layer of insulation. Stagger end joints of boards a minimum of 1/3 of overall length.
5. The second layer of the specified polyisocyanurate insulation shall be fastened to the steel decking per an approved fastening pattern. The specified insulation board shall be fastened to the steel decking with manufacturer approved metal insulation plates and #12 fasteners. The polyisocyanurate insulation fastener density shall install a minimum of 1 fastener every 2 square feet for the field of the roof: increasing the numbers of fasteners and insulation plates for the perimeter by 50% and increasing the number of fasteners and insulation plates by 100% in the corners of the roof.
6. The "metal fasteners" are to have a minimum 3/4-inch and a maximum 1- inch penetration through the steel decking. All fasteners should be fastened only through the top rib of the steel decking**. <u>No insulation or securement fasteners are to penetrate the bottom flute of the steel decking. Roofing Contractor shall use fastener tools with a depth locator and torque-limiting attachment to ensure proper securement of the fasteners.</u>**
7. Install eight (8') feet x eight (8') feet tapered insulation at each primary roof drain or supper. The tapered insulation shall be mitered at the corners to provide a smooth and tapered transition into the roof drains and scuppers.
8. Roofing Contractor shall ensure the "flat stock" and tapered insulation has been installed to where there will not be any ponding of water anywhere on the roofing system (roof area) after 24 hours of rainfall. Any ponding of water after 24 hours will not be acceptable to the Owner and shall be corrected by the Roofing Contractor at no charge to the Owner.

C. Installation of additional "flat stock" and tapered polyisocyanurate insulation:
1. The "flat stock" and / or tapered polyisocyanurate insulation panels shall be laid transverse to the proceeding layer of insulation, with joints staggered at least 1/3 of overall length from those of the proceeding layer of the "flat stock" insulation.
2. The "flat stock" and / or tapered polyisocyanurate insulation boards shall be adhered to top layer of "flat stock" insulation with the dual component polyurethane adhesive. The dual component polyurethane adhesive shall be dispensed ¾ inch wide and 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area where the tapered crickets or saddles are to be installed, the number of ribbons per unit width or area over the field rate by:
    a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
    b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing dual component polyurethane adhesive to rise ¾ inch to 1 inch, lay insulation board in to position and walk into place. After walking into place, the insulation board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also "weight down" the insulation board to ensure proper adhesive to the top layer of insulation.
4. University of Missouri will not accept any un-adhered or loose insulation boards. After installation of the insulation board, if the insulation board is not properly adhered to the proceeding layer, the Installer will be held responsible for replacing the unacceptable installed insulation board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed insulation board will be at no cost to the Owner.

3.06 COVER BOARD INSTALLATION

A. General Criteria:
1. Fasten the specified cover board according to requirements of the roofing system manufacturer's written instructions.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged cover boards are to be replaced with new cover boards.
3. Consult roofing system manufacturer on current acceptable substrates and rates for applying the low-rise urethane adhesives. The surface of substrate shall be inspected prior to installation of the cover board.

4. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified cover board or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
5. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.
6. Install a single layer of cover board over the specified polyisocyanurate insulation.
7. The cover board sheeting shall be laid transverse to the top layer of the insulation board, with joints staggered at least 1/3 of overall length from those of the insulation layer.
8. The cover board shall be neatly cut to fit within 1/4 inch (6 mm) of nailers, penetrations, and projections.
9. Fill all gaps exceeding 1/4 inch (6 mm) with spray-in-place foam insulation.
10. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
11. Do not install more cover board than can be covered with the specified roofing system by the end of the day, or onset of inclement weather.

B. Attachment of Cover Board:
1. Apply the dual component polyurethane adhesive at the manufacturer's written instructions for adhering the specified cover board to the specified polyisocyanurate insulation.
2. The dual component polyurethane adhesive shall be dispensed in 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area, the number of ribbons per unit width or area over the field rate by:
   a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
   b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing low rise urethane foam to rise ¾ inch to 1 inch, lay cover board in to position and walk into place. After walking into place, the cover board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also use "weights" to ensure the cover board is completely adhered to the top layer of the polyisocyanurate insulation. There shall not be any elevation change or raise of the corners or sides of the cover board as compared to the sides of the adjacent cover board sides. The cover board shall lay flat, or level as compared to the edges of the adjacent cover board.
4. **After installation of the cover board, should the cover board have more than 1/8-inch deviation or rise to the adjacent cover board, the Installer will be held responsible for replacing the unacceptable installed cover board. All cost related, i.e., replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed cover board will be at no cost to the Owner. The replacement of the unacceptable cover boards shall be completed prior to the installation of the membrane.**

3.07 EPDM MEMBRANE INSTALLATION

A. General: Install in strict accordance with roofing system manufacturer's latest published requirements, instructions, specifications, details, and approved shop drawings.

B. Install EPDM membrane per roofing system manufacturer's requirements in order to obtain roofing system manufacturer Twenty (20)-year Full System (NDL) warranty.

C. Install in strict accordance with roofing system manufacturer's latest published instructions.

D. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.

E. Coordinate with Owner representative to shut down air-intake equipment in the vicinity of the Work. Roofing Contractor shall cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors located in the mechanical ductwork.

F. The EPDM membrane is to be adhered with roofing system manufacturer's approved adhesive. Membrane overlaps shall be shingled with the flow of water where possible. Tacking of the EPDM membrane side laps for purposes of temporary restraint during installation is not permitted.

G. Layout: Layout roofing membrane to minimize number of seams. Avoid seams through roof primary roof drain sumps or through secondary roof drain locations.
   1. Position membrane straight and square to building.

3.08 ADHERED EPDM ROOFING MEMBRANE INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Adhere membrane on all roof areas using largest sheet practical for job conditions. Avoid wrinkling or stretching the membrane. Unroll sheet and allow relaxing for a minimum of 30 minutes.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically fasten roofing membrane securely at terminations, penetrations, angle changes and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, tape side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges to verify seam strength.
   2. Apply lap sealant to seal all edges of flashing membrane and T-Patches.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

I. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

J. Mechanically fasten membrane securely at all vertical to horizontal transitions, at points of terminations, and at the perimeter of roof to meet Manufacturer's Technical Department's requirements for properly securing the specified roofing system.

K. Spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with drain clamping ring.

L. Securement Around Perimeter and Rooftop Penetrations
   1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, roofing system manufacturer's fasteners and termination bar or discs shall be installed. Fasteners, disc, and termination bar shall be installed accord to the roofing system manufacturer's instructions. Fasteners shall be installed using the fastener roofing system manufacturer's recommended fastening tools with depth locators.
   2. EPDM membrane flashings shall extend a minimum of 3 inches past the securement bar or plates and shall be adhered onto the EPDM membrane.

M. Field-seam according to Section 3.07, "Seam Installation."

N. Excessive Repairs: Excessive repairs to membrane, or to membrane seams are not permitted. Remove and replace membrane in entire area affected, and as directed by University of Missouri representative.
   Note:
   1. **The Installer shall employ all means necessary to assure that the installation of all field and flashing membranes are free of loose (un-adhered) areas and wrinkles. The Owner's Representative(s) reserves the right to require that all preventable loose and /or wrinkled field membrane and membrane flashings to be repaired to the satisfaction of the Owner's Representative. In the event that the Installer**

determines that loose and /or wrinkled membrane or membrane flashing is unavoidable in a specific area(s), the onsite Owner's Representative must be notified immediately for a determination of acceptability.

2. **Contractor is to ensure during the time of installing the membrane field and membrane flashing sheet, there are no entrapment of debris under the membrane.**

3.09 MEMBRANE FLASHING INSTALLATION

A. General: All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Approval shall only be for specific locations on specific dates. Membrane flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.

B. Manufacturers required adhesive to be used to adhere the EPDM membrane flashing to acceptable wall and equipment curb substrates. No bitumen shall be in contact with the EPDM membrane. If bitumen exists **install Cav Grip primer or equal over existing bitumen**.

C. Manufacturers Adhesive for Membrane Flashings:
1. Over the properly installed and prepared flashing substrate, the adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
2. No adhesive shall be applied in seam areas that are to be adhered. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by techniques.
3. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and corners applied. Where applicable, roofing system manufacturer's prefabricated corners shall be used.
4. The membrane flashing shall be completely adhered to the substrate with no unadhered areas.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and roofing system manufacturer's technical department.

E. Vertical Surfaces Taller than 24 Inches (760 mm): Where vertical distance of flashing membrane exceeds 24 inches in height, in addition to terminations at base flashings, mechanically fasten fully adhered flashing membrane with additional termination bar installed horizontally at not greater than 30 inches (760 mm) on center vertically to top of flashing membrane.
1. Install membrane cover strip of standard sheet at last 8 inch (0.23 m) in width of same material, type, reinforcement.
2. Install baton bar and cover strip using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars and installation of coversheet for area under construction.

F. Flashing Termination: Terminate all vertical flashing membrane surfaces horizontally and vertically with mechanically fastened termination bars and sheet metal flashings/counterflashings. Mechanically fasten flashing membrane securely using mechanical fasteners specifically designed and sized for fastening specified membrane flashing and termination bars into substrate.
1. Fasten baton bar/termination bar with fasteners not greater than 6 inches (152 mm) on center for length of bar, with fasteners within 3 inches (76 mm) of ends, or closer as required by manufacturer. Fasten into nailer or other substantial backing located behind point of base or curb termination
2. Uniformly fasten, seat, and compress termination bar into top of fully adhered flashing membrane.
3. Install sealants continuously across surface of termination, including terminations covered with sheet metal flashing and counterflashing.
4. Install termination bars using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars for area under construction.
5. At termination of vertical and wall sheet flashings not under copings, install termination bar at vertical and wall membrane flashings with metal surface mounted one- or two- piece counterflashing assemblies, as is required for condition. Install as indicated in Drawings, or if not shown in Drawings or otherwise indicated, as required to produce continuous closure of membrane with termination bar and metal flashing, regardless of abutting materials overlap.

6. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for requirements for counterflashings and other metal fabrications.

G. Primary Roof Drains: Install membrane into sump and extend into line of depressed sump at roof drain. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside sump in direction of water flow and drainage; backwater laps and seams are not permitted in or around sumps or drains.
1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
2. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with water cut off mastic in accordance with manufacturer's recommendations.
   a. Apply sealant in strict compliance with manufacturer's requirements.
3. Install membrane to comply with other requirements indicated for roofing membrane.
4. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
5. Securely tighten clamping rings to provide constant pressure on water cut off mastic.
6. Install new metal strainers to complete primary roof drains.

H. Secondary Overflow Roof Drains: Install membrane to extend into line of roof drain at roof surface. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside drain in direction of water flow and drainage; backwater laps and seams are not permitted in roof membrane around or under drains.
1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
2. Do not set secondary roof drain body below roof surface. **Do not construct roof sumps at secondary overflow roof drains.**
3. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with sealant in accordance with manufacturer's recommendations.
   a. Apply sealant in strict compliance with manufacturer's requirements.
4. Install membrane to comply with other requirements indicated for roofing membrane.
5. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
6. Securely tighten clamping rings to provide constant pressure on sealant.
7. Install new metal strainers to complete secondary roof drains.

I. High- or Elevated- Temperature Vent Flashings: Install prefabricated or field-formed membrane flashings to comply with manufacturer's written requirements and recommendations and as indicated. Field form flashings from sheet flashing membrane designed for and suited to condition.
1. Install stainless steel metal base fabricated metal flashing sleeves prior to installing flashings.
2. Install fire-resistant mineral-wool-fiber insulation between metal flashing sleeve and high- or elevated-temperature outside vent surfaces.
3. Select proper diameter prefabricated flashing to properly fit penetration and roof conditions.
4. Secure deck membrane around metal base sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments. Secure top of membrane flashing to top of sleeve penetration.
5. Secure deck membrane around sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments.
6. Install flashings to produce a minimum of 8-inch (200 mm) flashing height.
7. Lap base of flashings atop roof membrane at least 4 inches (100 mm). Hot-air seams at roofing membrane lap.
8. Place prefabricated flashing in place tight to horizontal deck membrane; ensure flange lays flat to deck membrane.
9. base of prefabricated flashing continuously to deck membrane.
10. Where required by manufacturer, heat upper part of prefabricated flashing to temperature required by manufacturer; avoid overheating.
11. Clamp top of flashing at vent with stainless steel clamping ring.
12. Install stainless steel metal umbrella cap flashing, holding close to membrane base flashing.

J. Only an area, which can be completely covered in the same day's operations, shall be flashed.

K. Daily test lap edges with probe to verify seam continuity of all membrane flashings.

L. Complete all membrane flashing and metal details on a daily basis. No temporary flashings shall be allowed with the prior written approval of the Owner's Representative and roofing system manufacturer. If any water is allowed to enter under the completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

M. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

N. Installer is to ensure there are no wrinkles and "fish-mouths" in the membrane flashing and in the overlap seams.

O. Excessive Repairs: Excessive repairs to seams or flashings are not permitted. Remove and replace membrane, and if required the roofing components, in entire area affected as directed by University of Missouri representative.

3.10 PERIMETER AND METAL BASE FLASHINGS

A. General: All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

B. Sheet metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. All Kynar coated perimeter metal edging shall be fabricated and install per current SMACNA requirements.

D. Secure the Kynar coated metal over the field membrane and the "Multi-Purpose Sealing Tape." Fastened the sheet metal with approved stainless-steel nails or other acceptable fastener. Fasteners shall be fastened 4 inches on center and staggered 4 inches on center.

E. An 8 inch minimum wide strip of the 60 mil membrane flashing shall be adhered to the 4 inch wide flange of the sheet metal and to the field membrane. Check all coverstrip with a rounded screwdriver. Re-work any inconsistencies.

3.11 WALKWAY INSTALLATION

A. Installer is to install walkway in the areas as indicated on roof plans. Installer is responsible for verification of the total linear footage of the required walkway installation. The minimum length of the walkway, installed at any one location, shall be four (4') feet.

B. Install the walkway to roofing system manufacturer's written instructions.
1. Clean all dirt and debris from the deck membrane in areas where the walkway will be installed.
2. Important: Check all deck membrane s with a rounded screwdriver prior to installation of walkway. Re-adhere any inconsistencies before walkway installation.
3. Install walkway in the indicated roof areas.
4. Installer should adhere the walkway to the field membrane.

3.12 PROTECTION PAD INSTALLATION

A. General: Install protection pad under exposed wood blocking and under equipment supports.

B. The installation of the protection pad:
1. Clean all dirt and debris from the deck membrane in areas where the protection pad will be installed.
2. Important: In areas where protection pads are to be installed, Installer is to probe all field membrane seams laps with a rounded screwdriver prior to installation of the protection pad. Re-adhere any inconsistencies before protection pad installation.
3. Cut the protection pad 4 inches (4") wider than the dimensions of the wood blocking or equipment and piping support.
4. Adhere the entire perimeters of the protection pad to the field membrane sheet.

5. Probe all protection pad seam s with a rounded screwdriver. Re-adhere any inconsistencies found in the protection pad seams.
6. Center the wood blocking or equipment or pipe support over the protection pad.

3.13 HIGHLY VIISBLE MEMBRANE INSTALLATION

A. General Requirements: Provide and install a highly visible membrane product; designed to draw attention to an unprotected roof perimeters and potentially hazardous areas that do not comply with University of Missouri safety guidelines.

B. Installation of yellow, 4 inch wide, cover strip:
1. Installer and University of Missouri Representative shall verify unprotected roof perimeters and potentially hazardous areas on the referenced project's roof area(s).
2. The yellow cover strip shall be installed not less than 6 feet 6 inches (2 meters) from unprotected roof perimeters and potentially hazardous areas.
3. Before installing the yellow membrane 4-inch-wide cover strip, the Installer shall have Roof system manufacturer Technical Representative to verify permanence of all deck membrane with a rounded screwdriver. Repair any inconsistencies of the membrane seams before yellow membrane installation.
4. The roofing membrane shall be properly cleaned prior to install the "yellow membrane 4-inch-wide cover strip." Failure to properly clean the membrane will result in less than satisfactory adhesion of the yellow membrane.
5. Peel and stick the yellow cover strip to installed and inspected roofing membrane.
6. Installer shall take care to avoid trapping air under the yellow membrane.
7. After adhering the yellow cover strip, the Installer shall verify permanence of all yellow cover strip. Repair any inconsistencies of the yellow cover strip installation.

3.14 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the Installer shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner's representative prior to starting the roofing project. Proceeding with the roofing project indicates the Installer's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the Installer's expense.

C. The Installer shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation in order to maintain a 100% watertight and to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs during the installation of the roofing system, the Installer shall install temporary watertight and hermetic terminations across the installed Roof system manufacturer roofing system. The Roof system manufacturer roofing system shall be 100% impermeable in order to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the Installer shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather-related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly completed Roof system manufacturer Roofing System, the affected roof area(s) shall be removed and replaced at the Installer's expense.

3.15 FIELD QUALITY CONTROL

A. Quality Control of Seams:
   1. The Installer shall designate a Quality Control Supervisor to daily check all seams for continuity by using a rounded screwdriver.
   2. On-site evaluation of completed seams shall be made by the Installer at locations as directed by the Owner's Representative or roofing system manufacturer's technical representative.
   3. All membrane seams, both field and flashings, shall be adhered and probed on a daily basis. NO EXCEPTIONS.

B. Roofing system manufacturer's technical representative: Installer shall arrange to have the system manufacturer's technical representative on site of the first day of installation of the roofing system. The Technical Representative shall note:
   1. Conduct a site inspection on the first day of production.
   2. Communicate with the University of Missouri project manager each inspection, i.e., meet with the University of Missouri designated project manager before entering work area.
   3. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
   4. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion of the roofing project.
   1. All defects noted non-compliance with the roofing specifications and details, or the recommendations of roofing system manufacturer representative should be itemized in a punch list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and roofing system manufacturer technical representative.
   2. Ensure the roofing contractor has received a copy of Final Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the Final Inspection Report.

3.16 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from, not limited to the following items: dirt, grease, rust stains, roofing asphalt, scuff marks, abrasions, adhesive spills, sealant spills, membrane cuts, and any physical damages to the installed Roof system manufacturer roofing system during the construction period.

B. Upon completion of the Work, dispose of, away from the Site, all debris, trash, containers, fasteners, roofing remnants and scraps.

C. **The completed "Roof" shall be washed with water and University of Missouri approved cleaner to remove all dirt, stains, adhesive and sealant spills, and any residue from roof membrane.**

3.17 ACCEPTANCE

A. Prior to demobilization from the site, the roofing system manufacturer's project manager, University of Missouri's representative(s), roofing system manufacturer's designated field technical representative and Installer's project manager, production crew superintendent, and project's roofing foreman shall review the completed work.

B. Installer and University of Missouri representative shall inspect the completed roofing system for any uneven cover boards, loose or improperly attached insulation or cover boards, ponding of water, un-adhered membrane and membrane flashing, membrane damage, dirt, rust stains, roofing asphalt, grease, scuff marks, cuts, abrasions, adhesive spills, and sealant spills.

C. All defects noted noncompliance with the project's bid documents will be itemized in a punch list. Any non-compliance item shall be removed and/or repaired immediately by the Installer to the satisfaction of the University of Missouri representative, and to roofing system manufacturer.

D. The noted deficiencies shall be repaired or replaced to a condition free of damage and deterioration at the time of Substantial Completion Acceptance by University of Missouri's representative, and / or to accordance of the University of Missouri project contract documents.

E. All warranties as required for the project of this specification shall be submitted for approval prior to final payment by University of Missouri.

END OF SECTION 07 5400.4

SECTION 07 5400.5 –EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
1. Adhered EPDM sheet roofing
2. Polyisocyanurate Insulation
3. Cover board
4. Walkway pads

B. **Trowbridge Roof Sections 2 & 3: Scope of Work.** The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity on a daily basis. Over the cleaned and prepared, manufacturers approved primed roof deck substrate, installation of a self-adhered vapor barrier followed by the specified 2.0" poly iso insulation flat stock, and ¼" per foot tapered polyisocyanurate insulation, 1/2" HD polyisocyanurate cover board to meet FM 1-105 uplift criteria.

C. **Trowbridge Roof Section 4: Scope of Work.** Over the cleaned and prepared Tectum decking substrate, installation of a vented base sheet mechanically fastened with olylok impacting fasteners in accordance with FM 1-105 requirements to the tectum deck. Installation of manufacturers vapor barrier primer over the installed base sheet followed by the installation of manufactures SA vapor barrier over a broomed clean base sheet. Installation of base layer 1.5" polyisocyanurate with low rise foam FM 1-105 ribbon method. Installation of 1/2" HD polyisocyanurate cover board in low rise foam to meet FM 1-105.

D. **Trowbridge Roof Section 5: Scope of Work.** Remove existing EPDM from internal gutter system. Please leave roughly 6" of the existing EPDM from the counter flashing down in order to install new EPDM behind the existing EPDM. Installation of a self-adhered vapor barrier to the plywood deck within the internal gutter system. Installation of 1/2" HD polyisocyanurate cover board in low rise foam. Strip in existing flashing detail with 6" peel and stick as per details. Installation of new 24gage Kynar coated coping to encapsulate internal gutter system.

E. Installation of ½" plywood at all roof accesses and ladder egresses. Installation of exterior grade ½" plywood on all perimeter walls with mason anchors and approved caulk. All flashing membranes, pre-fabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl caulk or tape at all attachment points of the surface mounted counterflashing. Installation of 2 new through wall scuppers as identified on drawing placement. Removal of existing chain link fence with the installation a of new powder coated aluminum fence on perimeter as identified in the drawings. Installation of new skylights. Installation of high-profile expansion joint. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

F. Related Sections include the following:
1. Division 6, Section "Rough Carpentry for Roofing"
2. Division 7, Section "Sheet Metal Flashing and Trim"
3. Division 7, Section "Caulking and Sealants"
4. Division 7, Section "Non-Penetrating Rooftop Supports"

1.03 DEFINITIONS

A. ASTM E108, Class "A".

B. UL 790, Class "A".

1.04 REFERENCES

A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. Single-Ply Roofing Institute (SPRI): Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes

C. National Roofing Contractors Association (NRCA): Current Roofing and Waterproofing Manual

D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Current SMACNA Technical Manuals.

E. Code of Federal Regulations, (CFR) including:
1. CFR Title 29, Part 1910 "Occupational Safety and Health Standards."
2. CFR Title 29, Part 1926 "Safety and Health Regulations for Construction."

F. Factory Mutual Global (FM), including:
1. "Approval Standard for Roof Perimeter Flashing" Class Number 4435.
2. "Approval Standard for Class 1 Roof Covers" Class Number 4470.
3. Property Loss Prevention Data Sheet 1-0 "Safeguards During Construction, Alteration, and Demolition."
4. Property Loss Prevention Data Sheet 1-7 "Wind Forces on Buildings and Other Structures."
5. Property Loss Prevention Data Sheet 1-9 "Roof Anchorage."
6. Property Loss Prevention Data Sheet 1-28 "Wind Design."
7. Property Loss Prevention Data Sheet 1-29 "Roof Deck Securement and Above Roof Components."
8. Property Loss Prevention Data Sheet 1-28R/1-29R "Roof Systems Reference Document".
9. Property Loss Prevention Data Sheet 1-34 "Hail Damage."
10. Property Loss Prevention Data Sheet 1-49 "Perimeter Flashing."
11. Property Loss Prevention Data Sheet 1-52, "Field Uplift Tests."

G. Underwriters Laboratories (UL):
1. Roof Materials and Systems Directory. 2012.
2. UL 790: Tests for Fire Resistance of Roof Covering Materials: 1983.

H. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) FOR EPDM MEMBRANE:
1. .060" (Black) Non Reinforced
2. ASTM D 412
3. ASTM D 624
4. ASTM D 573

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacturer, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing system manufacturer based on testing and field experience.

C. Roofing System Design: Comply with SPRI "Wind Design Guide for Adhered Single Ply Roofing Systems" for the following ground roughness exposure, classification of building and system design:
1. Surface Roughness Category: Exposure B

2. Classification of Building: Category II
3. Wind uplift Design: 90 mph @ 3second gust
4. System 1 Design: Adhered Single Ply Membrane Roofing

D. Underwriters Laboratories Inc. (UL):
1. UL RMSD – 2009 Roofing Materials and Systems Directory
2. UL 790 – 2009 Fire Resistance of Roofing Coverings Materials
3. Exterior Fire Exposure Classification: Class A, ASTM E 108, for application and slopes shown

1.06 ACTION SUBMITTALS

A. Product Data: Submit latest edition of roofing system manufacturer's roofing and base flashing specifications including list of materials proposed for use, installation procedures, and roofing system manufacturer's Product Safety Data Sheets.

B. Product Safety Data Sheets: Installer shall review all product data safety data sheet chemical names prior to submitting to University of Missouri.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: Physical samples are <u>not</u> necessary.
1. Sheet roofing, of color specified.
2. Roof insulation.
3. Cover board.
4. Metal termination bars.
5. Battens.
6. Six insulation fasteners of each type, length, and finish.
7. Six membrane fasteners of each type, length, and finish.
8. Six batten fasteners of each type, length, and finish.
9. Walkway pads or rolls.

1.07 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and roofing system manufacturer.

B. Installer: Provide copy of roofing system manufacturer's training certificate for each roofing mechanic.

C. Roofing system manufacturer Certificates: Signed by roofing system manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by roofing system manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

E. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

F. Single Ply Roofing Institute (SPRI) - Fasteners Withdrawal Resistance Testing:
1. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
2. Prior to starting the project, provide a copy of the Fasteners Withdrawal Resistance Testing to roofing system manufacturer's technical department.

G. Warranty:
   1. Provide sample copy of 20-year (NDL) Full System roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
   2. Provide sample of copy 5-year Installer's workmanship warranty stating obligations, remedies, limitations, and exclusions of warranty.

H. Inspection Report: Copy of roofing system roofing system manufacturer's final inspection report of completed roofing installation.

1.08 CLOSE OUT SUBMITTALS

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

1.09 QUALITY ASSURANCE

A. Roofing System Manufacturer Qualifications: A qualified roofing system manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications:
   1. A qualified firm that is approved, authorized, or licensed by membrane roofing system roofing system manufacturer to install roofing system manufacturer's product and that is eligible to receive roofing system manufacturer's special warranty.
   2. Prior to submitting a roofing proposal, Installer must be approval by Owner's representative.

C. Roofing system manufacturer's membrane shall meet the following characteristics:
   1. Protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt.
   2. Membrane Thickness: Membrane roofing system manufacturer is to verify that the membrane thickness is of the membrane thickness specified ASTM D412 nominal thickness of +/- 10 percent will not be acceptable for measurement of membrane thickness.

D. Source Limitations: Obtain components including roof insulation, fasteners, and accessories for membrane roofing system from same roofing system manufacturer as membrane roofing.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Pre-installation Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 10 working days before conference.
   1. Meet with Owner's Representative/General Contractor, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including roofing system manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.
   6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
   7. Review governing regulations and requirements for insurance and certificates if applicable.
   8. Review temporary protection requirements for roofing system during and after installation.
   9. Review roof observation and repair procedures after roofing installation.

G. At no cost to University of Missouri, roofing system manufacturer's technical representative shall perform:
   1. Manufacturer's Quality Control Inspection: The Manufacturer's Technical Representative shall review the on-going work on the first day of the roofing production and a minimum of one (1) in-progress inspection every 10 working days. The Roof system manufacturer Technical Representative shall:
      a. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
      b. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
      c. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.
   2. Final Roof Inspection: Contractor is to arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of the roofing project.
      a. All defects noted non-compliance with the specifications, or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri and Roof system manufacturer.
      b. The roofing contractor is to forward a copy of Final Inspection Report to the University of Missouri On-site Representative within two days after date inspection(s) is performed.

H. Installer's Responsibility: Any failure by the Owner Representative or roofing system manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these specifications of work in progress or completed work shall not relieve the Installer, or reduce, or in any way limit, his responsibility of full performance of work required of the Installer under these specifications.

1.10 TRANSPORATION AND PRODUCT DELIVERY REQUIREMENTS

A. Transport and handle Products in accordance with manufacturer's instructions, using means and methods that will prevent damage, deterioration, and loss, including theft.

B. Schedule Product delivery to minimize long-term storage at Project site and prevent overcrowding of construction spaces.

C. Coordinate Product delivery with installation schedule to assure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft, and other losses.

D. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with roofing system manufacturer's name, product brand name, and type, date of manufacturer, and directions for handling, storing, unpacking, protecting, installing and mixing with other components. Deliver materials in sufficient quantity to allow work to proceed without interruption

E. Promptly inspect shipments to ensure that Products comply with project requirements, quantities are correct, Products are undamaged, and properly protected.
   1. For exterior storage of Products, place Product on sloped supports, above ground.

F. Provide equipment and personnel to handle Products by methods to prevent soiling, disfigurement, or damage.

1.11 PRODUCT STORAGE AND HANDLING REQUIREMENTS

A. Store and protect Products in accordance with manufacturers' published instructions, with seals and labels intact and legible. Comply with roofing system manufacturer's written instructions for handling, storing, and protecting during installation.

B. Store and protect materials, including roofing insulation from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Use pallets to support all materials from roof deck. Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck. Distribute the load to stay within live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work.

C. Store all materials in a dry location. Cover Products subject to deterioration with impervious sheet covering. Provide ventilation to avoid condensation or potential degradation of Product.

D. Provide equipment and personnel to store Products by methods to prevent soiling, disfigurement, or damage. All Products are to be stored above the roof or ground surface a minimum of 4 inches on approved supports, i.e. wood pallets.

E. Arrange storage of Products to permit access for inspection by roofing contractor and UNIVERSITY OF MISSOURI Representatives. Periodically inspect to verify Products are undamaged and are maintained in acceptable condition to protect the product from soiling or moisture. Any damaged or wet product will be marked "not to be used" and removed from the UNIVERSITY OF MISSOURI facility.

1.12 PROJECT CONDITIONS

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

B. The EPDM adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.
   3. The wall/deck intersection permits air entry into the wall flashing area.

C. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

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

E. Protection:
   1. Provide special protection and avoid traffic on completed areas of membrane installation.
   2. Restore to original condition or replace work or materials damaged during handling of roof materials.
   3. Take precautions as required to protect adjacent work and structures.

F. Emergency Equipment and Materials: Maintain onsite equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the Installer shall provide the labor necessary to monitor the situation to maintain a watertight condition.

G. Protection:
   1. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent Roofing areas.
   2. The Installer shall provide a suitable temporary protective surface for all roofing areas which will receive construction traffic or construction of equipment during all phases of the roofing project.
   3. During the course of installation of the membrane roofing systems, should there be any damage created by other construction trades to the new or to existing roofing membrane and/or roofing system, the Installer is to immediately notify the Owner's Representative and membrane roofing system manufacturer. All damages are to be repaired according to the membrane roofing system manufacturer's or Owner's representative's recommendations. The "party" responsible for the roofing damages shall bear the total cost for the repairs or for the replacement of existing or new roofing system.

H. Restrictions:
   1. Comply with Owner's General and Safety Requirements on use of site.
   2. Smoking and Tobacco products are prohibited on all roof areas and on the campus grounds.
   3. Provide and maintain sanitary facilities for employees.
   4. Maintain facility and all utility services in a functional condition.

1.13 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights of the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Installer under requirements of the Contract Documents.

B. Roofing System Manufacturer's Warranty: Submit a written warranty, without monetary limitation, with all available options, including flashing endorsement, roofing system manufacturer's roof insulation and roofing system manufacturer's accessories, signed by roofing system roofing system manufacturer's agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
   1. Twenty (20) Year Full System Warranty (no ponding/standing water exclusions accepted). Warranty shall be non-prorated and cover basic wind speeds up to 60 mph.
   2. "Early Bird" warranties are not to be issued, as they will not be accepted by Owner.
   3. The specified roofing system manufacturer's warranty will be issued only upon final acceptance by the roofing system manufacturer's ttechnical department and the Owner's Representative's final approval.
   4. Request for final payment and issuance of the specified Roofing system manufacturer's warranty will be issued to the Installer's after successful completion and Owner's Representative's final approval and acceptance of the entire roof system installation.

C. Installer's Warranty: Submit roofing Installer's workmanship warranty, on a notarized written warranty form, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, cover board, roof insulation, fasteners, adhesives, sealants, and associated sheet metal, for the following warranty period:
   1. Warranty Period: Three (3) years from date of Substantial Completion. Refer to University of Missouri Roofing and Sheet Metal Guarantee form in Division 1 near the beginning of this manual.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM MANUFACTURERR

A. The components of the roof system are to be products of a single roofing system manufacturer or approved by the Roof system manufacturer, whose products meet or exceed the project specifications, have manufactured and installed the roofing materials and systems of the type specified for a minimum of twenty (20) years, and who maintains a single source responsibility for the total roofing system.

B. Roofing system manufacturers: The components of the roofing system are to be products of a single roofing system manufacturer as required to provide the specified system warranty. Subject to compliance with requirements, provide roofing products from:
   1. Versico Incorporated, Akron OH
   2. Carlisle Roof System, Akron OH
   3. Firestone Roof system, Carmel IN.
   4. Owner approved manufacturers.

2.02 EPDM MEMBRANE

A. EPDM Membrane: a uniform, flexible sheet formed from Ethylene Propylene Diene Monomer, complying with ASTM D 412, of the following Classification – Type and Grade, Membrane Thickness, UL Classification, and Membrane Exposed Face Color.
   1. Classification: Type II, Grade I.
   2. Membrane Thickness: 60 mils, +/- 2.0 mils.
   3. UL Class: A.
   4. Membrane: Exposed Face Color: Black

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system roofing system manufacturer for intended use and compatible with membrane roofing materials.
   1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdictions.

B. Membrane flashing and Flashing Accessories: As recommended by the roofing system manufacturer's printed instructions for sheet flashing of same material, mil thickness and color as sheet membrane.

C. Insulation Fasteners: Roofing system manufacturer approved corrosion resistant steel #12 “fasteners,” screws of the appropriate size and type for roof membrane and insulation attachment. A #12 corrosion-resistant fastener is used with plates to attach insulation boards to steel roof decks. Fasteners for the insulation shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

D. Insulation Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 3 inch round plates, “plates,” of the appropriate size and type for the securement of the insulation to approved substrates. Securement plates for the insulation shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

E. Membrane Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 2 inch round plates, “discs,” for the securement of the membrane to the steel roof decks. Securement plates for the membrane shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

F. Membrane Securement Screw: Roofing system manufacturer approved corrosion resistant steel, “#15screws” of the appropriate size and type for roof membrane securement. A #15, heavy-duty, corrosion-resistant fastener used with “discs” and “termination bar” to attach Roof system manufacturer’s roof membrane to steel roof decks. Fasteners for the membrane shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

G. Membrane Bonding Adhesive: Roofing system manufacturer’s approved contact adhesive, Standard bonding adhesive, used to attach membrane to the horizontal or near-horizontal substrate. Application rates are to be as recommended by roofing system manufacturer’s printed instructions.

H. Membrane Flashing Bonding Adhesive: Roofing system manufacturer’s approved contact adhesive, used to attach the flashing membrane to the substrate, either horizontally or vertically. Application rates are to be as recommended by roofing system manufacturer’s printed instructions.

I. Metal Termination Bar: a heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. “reglet” has a 2-1/4 inch (57 mm) deep profile, and is provided in 10 foot (3 m) lengths.

J. Membrane Securement Bar: is a 1 inch wide aluminum alloy bar used with to clamp the membrane to the roof deck along walls, curbs, and certain vertical to horizontal changes in the roofing system. Termination bar is supplied in bundles of 25 pieces. Each termination bar is 10 feet long.

K. Sealants: Owner approved sealant shall be used to seal penetrations through the membrane system and at miscellaneous sealant applications that are exposed to roof systems components.

L. Safety Warning Membrane: A highly visible product to draw attention to an unprotected roof perimeters and potentially hazardous area. The safety warning membrane is designed for use on a membrane roof. The EPDM safety warning membrane shall be a yellow in color, 60 mils in thickness, 4 inches wide, and 100 feet in length.

M. Pre-Fabricated Pipe Flashing: prefabricated vent pipe flashing made from 0.060 inch (60 mil/1.5 mm) thick membrane.

N. Pre-Fabricated Corner Flashing: prefabricated universals corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are adhered/quick applied to membrane base flashings.

O. Aluminum: ASTM B 209-86, alloy and temper - 3003-H14, 0.040 inch thick aluminum sheet, mill finish with formed drip edge.

P. Mineral Wool-Fiber Fire-Resistant Insulation: Semi-rigid mineral-wool-fiber batt insulation; Type IVA per ASTM C 612; not less than 144 psf (6.9 kPa) compressive strength per ASTM C 165; less than 0.05 percent moisture absorption per ASTM C 1104; complying with ASTM E 136; and with the following surface-burning characteristics per ASTM E 84:

1. Flame Spread: 0.
2. Smoke Developed: 0
3. Manufacturers: Subject to compliance with requirements, available products include the following:
   a. Basis of Design: Roxul Safe; Roxul Inc.

Q. Other miscellaneous materials shall be of the "best grade" available and to be approved in writing by the roofing system manufacturer for the specific application.

2.04 INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements, selected from roofing system manufacturer's standard sizes and of thickness indicated.

B. Polyisocyanurate board insulation: Closed cell polyisocyanurate foam with fiberglass reinforced mat laminated to faces complying with ASTM 1289-03, Type 2, Class 2, Grade 2

C. Insulation Requirements:
1. Trowbridge Roof Sections 2, 3, 4: 2.0" polyisocyanurate base layer low rise foamed to VB followed by ¼" per foot tapered polyisocyanurate low rise foamed to base layer followed by ½" HD cover board adhered with low rise foam).

D. Tapered Polyisocyanurate Insulation Shapes: Preformed insulated shapes for saddles, crickets, tapered edge strips, sumps, and other insulation shapes where indicated or where required for sloping to drain. Fabricate to slopes indicated. Saddles, Crickets, Edge Strips, and Other Shapes:
1. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48) unless otherwise indicated.
2. Crickets between Roof Drains: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24) unless otherwise indicated.
3. Sumps for Roof Drains, measuring 4 feet x 4 feet; size to be modified when drains are located next to parapet wall: 4. Tapered insulation boards fabricated to slope of 1/4-inch per 12 inches (1:48). Provide a minimum insulation thickness at the roof drain or roof scupper of 2.0 inches.
4. Saddle Behind (Upslope) from Curbs Measuring 18 inches and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).
5. Saddle Behind (Upslope) from Round Penetrations Measuring 12 inches in diameter and greater: Tapered insulation boards fabricated to slope of 1/2-inch per 12 inches (1:24).

E. Approved Roofing system manufacturer and Product:
1. Versico Incorporated, Akron OH
2. Firestone Roof system, Carmel IN.
3. Owner approved manufacturers.

2.05 COVER BOARD

A. High density polyisocyanurate cover board: Closed cell polyisocyanurate foam with coated glass matt facer laminated to both faces, complying with the following additional characteristics:
1. Thickness: 0.5 inches.
2. Size: 48 inches by 48 inches, nominal.
3. R-Value (LTTR):
   a. 0.5 inches, R-Value: 2.5, minimum.
4. Compressive Strength: 100 psi.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 8.3 percent post-industrial, average.

2.06 INSULATION AND COVER BOARD ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation roofing system manufacturer for intended use and compatible with membrane material.

2.07 DUAL COMPONENT POLYURETHANE ADHESIVE

A. General: Provide a dual component polyurethane adhesive that is intended for the attachment of polyisocyanurate insulation to various substrates. The dual component polyurethane adhesive has to have approvals from the insulation and roofing system manufacturer for adhering the polyisocyanurate insulation to approved substrates, multiple layers of polyisocyanurate insulation, and cover boards. Consult adhesive roofing system manufacturer on current acceptable substrates to apply dual component polyurethane adhesive to various substrates.

B. Dual component polyurethane adhesive: The low-slope dual component polyurethane adhesive shall have the following minimum properties:
1. Density ASTM D-1622: Free Rise, 3.2 lb./cf.
2. Compressive Strength ASTM D-1621: Parallel, 38 psi @ 6% deflection.
3. Tensile Strength ASTM D-1623: 35 psi
4. Water Absorption ASTM D-2843: 5.1%
5. Closed Cell Content ASTM D-6226: 90% min.
6. R-Value ASTM C-518 3.8/inch (new)
7. VOC Content ASTM D-2369 <5 g/l (1&2 combined)
8. Weight/Gallon: Part A Component 10.32 lbs. Part B Component 8.54 lbs.

C. Approved Roofing system manufacturer and Product:
1. OMG Roofing Products, "OlyBond 500® SpotShot."
2. Roof system manufacturer, "OM Board Adhesive."

2.08 VAPOR RETARDER ON CONCRETE DECKS

A. SA - 32 mil (0.8 mm) self-adhesive vapor barrier that can also serve as temporary roof protection. Self-Adhered is available in rolls 44.9 inches x 133.8 feet (1.14 x 40.8 m).

B. SA Primer WB - A polymer emulsion water based primer designed to improve the adhesion of SA vapor retarder on concrete roof decks or plywood walls. Application temperature must be 41°F (5°C) and above. The coverage rate will range from 163 - 400 ft2/gal (4 - 9.8 m²/L) for non-porous surfaces to 82 - 135 ft2/gal (2 - 3.3 m²/L) for porous surfaces. The VOC content is 3 g/L.

2.09 SKYLIGHTS

A. General: Provide metal-framed skylights capable of withstanding loads and thermal and structural movements indicated without failure. Failure includes the following:
1. Deflection exceeding specified limits.
2. Thermal stresses transferred to the building structure.
3. Skylight framing members transferring stresses, including those caused by thermal and structural movement, to glazing.
4. Weakening of fasteners, attachments, and other components.

B. Deflection Limits: As follows:
1. Deflection of the entire length of framing members in direction normal to glazing plane is limited to 1/175 of clear span.

C. Lateral Support: Compression flanges 75% of flexural members requiring lateral be laterally braced by cross members with minimum depths equal to flexural member depth and by anchors to the building structure. Glazing material does not provide lateral support.

D. Structural Loads: Provide metal-framed skylights, including anchorage, capable of withstanding the effects of the following design loads when supporting full dead loads:
1. Roof Loads
   a. Concentrated Load: 250 lbs. applied to framing members at location that produces the most severe stress or deflection.

E. Structural Performance: Provide metal-framed skylights, including anchorage, capable of withstanding pressures indicated without material and deflection failures and permanent deformation of structural members exceeding 0.2 percent of span when tested according to ASTM E 330.

F. Air Infiltration: Provide metal-framed skylights with maximum air leakage of 0.06 cfm/sq. ft. (0.03 L/s per sq. m) of surface when tested according to ASTM E 283 at a minimum static-air-pressure differential of 6.24lb/sq. ft. (300 Pa).

G. Water Penetration: Provide metal-framed skylights that do not evidence water penetration when tested according to ASTM E 331 at a minimum differential static pressure of 20 percent of positive design wind pressure, but not less than 15 lb/sq. ft. (718 Pa).

H. Thermal Movement: Provide metal-framed skylights that allow for thermal movements resulting from the following maximum change (range) in ambient temperatures by preventing buckling, sealant failure, and other detrimental effects.
1. Temperature Change (Range): 100 degrees F.20

2.10 BASE SHEET ON TECTUM DECKS; OVER EXISITING VAPOR BARRIER (TROWBRIDGE AREA-4)

A. Channel Venting Base 90 – 120 mil, installed shingle fashion, lapped four (4) inches on side laps and 6” at end laps.

2.11 MISCELLANEOUS FASTENERS AND ANCHORS (TROWBRIDGE)

A. General: All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approve for such use by the fastener roofing system manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm), stainless steel, and to be approved for such use by the fastener roofing system manufacturer.

B. Base sheet to tectum roof deck decks:
1. Oly-Lok Fasteners
2. 1.8” long
3. 3" metal stress plate

2.12 PROTECTION PADS

A. Protection Pads: “- factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, as supplied Roof system manufacturer. Color of protection pads shall be black. Protection pads to be used under all wood support blocking, equipment supports, pipe steel supports, and under downspout splash blocking.

2.13 ROOF WALKWAYS

A. Walkway: factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, approximately 2” thick, as supplied Roof system manufacturer.

2.14 POWDER COATED FENCING

A. INDUSTRIAL
1. Horizontal spacing-1 5/8”x 1 5/8”
2. Side walls-1.00”
3. Top walls-.070”
4. Internal- 8 metal support
5. Pickets-1x1x.062
6. Spacing-4”
7. Height-8’

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect entire roof area to be roofed for acceptability. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting installation and performance of the roofing system:
   1. Verify that roof openings and penetrations are in place, and curbs are set and braced, and that the roof drains and drain lines are properly clamped into position and are in a 100% functional condition.
   2. Verify that primary drain bodies are at proper elevations for construction of sump at slopes indicated.
   3. Verify that secondary overflow drain bodies are at proper elevations for construction, without sumps, at level of roof surface.

B. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. Verify that structural use panels, sheathing, and similar wood products are securely anchored to substrates, and that surfaces of panels and sheathing are without irregularities which could interfere with proper membrane and flashing installation.

D. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

E. Verify that steel deck is securely fastened with no projecting fasteners and no adjacent units in exceed 1/16 inch (1.6 mm) or more out of plane measured to adjoining deck.

F. Verify that installed steel roof decking complies with required slopes indicated, that no holes, ridges, voids, uneven or misaligned surfaces or conditions, gaps, or other irregularities exist, and deck and substrates are smooth and free of sharp edges.

G. Visually inspect cast-in-place reinforced concrete roof deck for the following:
   1. Evidence of impaired deck structural capacity or integrity.
   2. Exposed concrete reinforcing.
   3. Presence of corrosion.
   4. Spalling or loss of concrete cover.
   5. Presence of foreign materials.
   6. Efflorescence.
   7. Ridges or uneven conditions in concrete deck.
   8. Holes, voids, or gaps in concrete deck.
   9. Accumulations of moisture.

H. Other conditions that would prevent proper application of roofing or that would prevent membrane roofing manufacturer’s approval of substrate, components, or system.

I. Verify that roofing systems can be installed with positive drainage of minimum slopes indicated at all areas of roof, without ponding after 24 hours.

J. Verify that roofing as completed will discharge to internal roof drains without ponding or inadvertent discharge through secondary roof drains.

K. Verify that final installed curb heights for flashing are a minimum of 8-inches (200 mm) measured above finished roof membrane.

L. Verify piping and conduit penetrations of roof are made individually, separated by a minimum of 12 inches (300 mm) from each other and from restraining surfaces or other obstructions.

M. Verify locations of interior electrical conduits, piping, ducts, and similar items in close proximity to underside of steel roof decking, to avoid striking with fasteners.

N. Verify that deck and other substrates are dry, free of debris, excess, and foreign materials.

O. Verify substrates and surfaces to receive flashings are dry, clean, and free of sharp or penetrating projections or other irregularities.

P. Proceeding: Proceed with installation only after unsatisfactory conditions have been corrected.

Q. Do not commence work until decking and substrates are in full compliance with roof system manufacturer's requirements, deck and substrate conditions are sound, and positive fall to drainage points are achieved.

R. Commencement: Commencement of work indicates acceptance of conditions and responsibility for all corrections.

3.02 PREPARATION

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

B. The Installer will be entirely responsible for the complete removal of all dirt, debris, moisture from the roof's substrate, i.e. steel decking, concrete decking, before the installation of the roofing system. The roof's substrate must be 100% completely dry before applying the spray-in-foam insulation or before the installation of the specified roofing insulation.

C. Cleaning: Clean substrate including metal decking flutes of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

D. Debris, water, moisture, or foreign materials found in flutes of steel roof decking is not permitted; remove and replace roofing installed above flutes found to contain foreign materials.

E. Cleaning, repair or replacement of damaged items, as a result of roofing related materials entering the facility, shall be solely at the roofing contractor's expense.

F. Broom clean cover board immediately prior to membrane roofing application.

G. Promptly remove debris each day; do not stockpile debris or allow waste to accumulate on steel decking, insulation, or roofing under construction.

H. Containment: Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction at the end of the workday or when rain is forecast. Remove roof-drain plugs when no work is taking place or when rain is forecast.

I. Mask off adjoining surfaces not receiving roofing membrane materials to prevent spillage or over spray affecting other construction.

J. Fill all gaps and voids between substrate components that are wider than 1/4 inch. Fill all gaps with same materials as the substrate.

K. Seal around along perimeters, along equipment curbs, around pipes, around conduits, and any other roof penetrations with vapor barrier.

L. Base Vertical Flashings: Coordinate roof insulation thickness with adjacent base flashing height, to maintain not less than 8-inch (203 mm) flashing height. Adjust base vertical flashing height including substrates and changes in exterior wall materials to maintain minimum height.

M. Proceed with roofing work only when weather conditions permit work to proceed in accordance with manufacturer's requirements and recommendations.

3.03 WOOD NAILER INSTALLATION

A. All Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Division 06 1000 for acceptable fasteners for wood product attachments.

B. Wood Nailer thickness shall be as required to match the insulation and cover board height (thickness) to allow a smooth transition.

C. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any roof system manufacturer product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

D. New wood nailers and/or plywood sheeting shall meet the performance criteria in Division 06 1000.

3.04 VAPOR-RETARDER / AIR BARRIER INSTALLATION

A. Deck to be as clean as possible. Ensure the concrete is in good condition. If concrete deck is wet allow sufficient amount of time for the moisture to dry. If the contractor cannot remove the asphalt roof membrane from the concrete deck, please remove any loose or deteriorated material, prime existing substrate and install vapor barrier: **No torches to be used to dry deck of moisture!**

B. Install Self-Adhered over a SA Primer WB. In concrete applications allow concrete to cure for at least 7 days. Do not install when it is raining, snowing, or on wet/humid surfaces. Install in temperatures 32°F (0°C) and above. The use of a primer is required on the following substrates: wood, concrete, lightweight concrete, gypsum boards and decks, and DensDeck Prime® boards.

C. Begin application at the bottom of the slope. Unroll Self-Adhered onto the substrate without adhering for alignment. Overlap each preceding sheet by 3 in. (75 mm) lengthwise following the reference line and by 6 in. (150 mm) at each end. Stagger end laps by at least 12 in. (300 mm). Tool vapor barrier up all penetrations and or perimeters and seal. Vapor barrier to be installed as if the VB was a temp roof. Do not immediately remove the silicone release sheet.

D. Once aligned, peel back a portion of the silicone release sheet and press the membrane onto the substrate for initial adherence. Hold Self- Adhered tight and peel back the release sheet by pulling diagonally.

E. Use a 75 lb. (34 kg) roller to press Self-Adhered down into the substrate including the laps. Finish by aligning the edge of the roller with the lower end of the side laps and rolling up the membrane. Do not cut the membrane to remove air bubbles trapped under the laps. Squeeze out air bubbles by pushing the roller to the edge of the laps.

3.05 INSULATION BOARD INSTALLATION

A. General Criteria:
   1. Coordinate installing membrane roofing system components so insulation is not exposed to precipitation or left exposed at the end of the workday.
   2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged insulation boards are to be replaced with new insulation boards.
   3. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified roofing insulation or during the time of applying the dual component polyurethane adhesive.
   4. Construct sumps at primary roof drains using tapered insulation to slope indicated. Install nailers or blocking as required to secure drain body assembly to roof deck.

a. Unless otherwise indicated, construct sumps to consistent and uniform slope of 1/4 per 12 inches (1:48) to provide a smooth transition from the roof surface to the drain. Do not introduce steeper or shallower slopes within sump.
b. Use tapered insulation to form a square sump. Unless indicated otherwise, construct sump measuring 4 foot by 4 foot at primary roof drains.
c. Adjust primary roof drain assemblies to proper elevation for sump.
d. Install tapered insulation so edges do not restrict flow of water.
e. Do not create circular depressions around primary roof drains at bottoms of sumps.

5. **Do not install sumps at secondary overflow roof drains.**
   a. Adjust secondary roof drain assemblies to proper elevation of final roofing membrane.
   b. Do not create circular depressions around secondary roof drains.
6. Where conditions required drain modifications to match specified insulation thickness, roofing contractor will be responsible for the cost of readjusting the primary roof drain bowl and associated plumbing to match the "finished" insulation thickness. University of Missouri will not permit the circular depressions, nor the cutting or shaving the insulation in order to slope the insulation to the edge of the drain bowl.
7. Roofing system manufacturer's technical representative shall be on the jobsite during the first initial day of installation of the roofing system.

B. Installation of additional "flat stock" and tapered polyisocyanurate insulation:
1. The "flat stock" and / or tapered polyisocyanurate insulation panels shall be laid transverse to the proceeding layer of insulation, with joints staggered at least 1/3 of overall length from those of the proceeding layer of the "flat stock" insulation.
2. The "flat stock" and / or tapered polyisocyanurate insulation boards shall be adhered to top layer of "flat stock" insulation with the dual component polyurethane adhesive. The dual component polyurethane adhesive shall be dispensed ¾ inch wide and 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area where the tapered crickets or saddles are to be installed, the number of ribbons per unit width or area over the field rate by:
   a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
   b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing dual component polyurethane adhesive to rise ¾ inch to 1 inch, lay insulation board in to position and walk into place. After walking into place, the insulation board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also "weight down" the insulation board to ensure proper adhesive to the top layer of insulation.
4. University of Missouri will not accept any un-adhered or loose insulation boards. After installation of the insulation board, should the insulation board is not properly adhered to the proceeding layer, the Installer will held responsible for replacing the unacceptable installed insulation board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed insulation board will be at no cost to the Owner.

3.06 COVER BOARD INSTALLATION

A. General Criteria:
1. Fasten the specified cover board according to requirements of the roofing system manufacturer's written instructions.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged cover boards are to be replaced with new cover boards.
3. Consult roofing system manufacturer on current acceptable substrates and rates for applying the low-rise urethane adhesives. The surface of substrate shall be inspected prior to installation of the cover board.
4. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified cover board or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
5. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.
6. Install a single layer of cover board over the specified polyisocyanurate insulation.
7. The cover board sheeting shall be laid transverse to the top layer of the insulation board, with joints staggered at least 1/3 of overall length from those of the insulation layer.

8. The cover board shall be neatly cut to fit within 1/4 inch (6 mm) of nailers, penetrations, and projections.
9. Fill all gaps exceeding 1/4 inch (6 mm) with spray-in-place foam insulation.
10. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
11. Do not install more cover board than can be covered with the specified roofing system by the end of the day, or onset of inclement weather.

B. Attachment of Cover Board:
1. Apply the dual component polyurethane adhesive at the manufacturer's written instructions for adhering the specified cover board to the specified polyisocyanurate insulation.
2. The dual component polyurethane adhesive shall be dispensed in 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area, the number of ribbons per unit width or area over the field rate by:
   a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
   b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing low rise urethane foam to rise ¾ inch to 1 inch, lay cover board in to position and walk into place. After walking into place, the cover board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also use "weights" to ensure the cover board is completely adhered to the top layer of the polyisocyanurate insulation. There shall not be any elevation change or raise of the corners or sides of the cover board as compared to the sides of the adjacent cover board sides. The cover board shall lay flat or level as compared to the edges of the adjacent cover board.
4. After installation of the cover board, should the cover board have more than 1/8 inch deviation or rise to the adjacent cover board, the Installer will held responsible for replacing the unacceptable installed cover board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed cover board will be at no cost to the Owner. The replacement of the unacceptable cover boards shall be completed prior to the installation of the membrane.

3.07 EPDM MEMBRANE INSTALLATION

A. General: Install in strict accordance with roofing system manufacturer's latest published requirements, instructions, specifications, details, and approved shop drawings.

B. Install EPDM membrane per roofing system manufacturer's requirements in order to obtain roofing system manufacturer Twenty (20)-year Full System (NDL) warranty.

C. Install in strict accordance with roofing system manufacturer's latest published instructions.

D. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.

E. Coordinate with Owner representative to shut down air-intake equipment in the vicinity of the Work. Roofing Contractor shall cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors located in the mechanical ductwork.

F. The EPDM membrane is to be adhered with roofing system manufacturer's approved adhesive. Membrane overlaps shall be shingled with the flow of water where possible. Tacking EPDM membrane side laps for purposes of temporary restraint during installation is not permitted.

G. Layout: Layout roofing membrane to minimize number of seams. Avoid seams through roof primary roof drain sumps or through secondary roof drain locations. Position membrane straight and square to building.

3.08 ADHERED EPDM ROOFING MEMBRANE INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Adhere membrane on all roof areas using largest sheet practical for job conditions. Avoid wrinkling or stretching the membrane. Unroll sheet and allow relaxing for a minimum of 30 minutes.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically fasten roofing membrane securely at terminations, penetrations, angle changes and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, tape side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges to verify seam strength.
   2. Apply lap sealant to seal all edges of flashing membrane and T-Patches.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

I. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

J. Mechanically fasten membrane securely at all vertical to horizontal transitions, at points of terminations, and at the perimeter of roof in order to meet Manufacturer's Technical Department's requirements for properly securing the specified roofing system.

K. Spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with drain clamping ring.

L. Securement Around Perimeter and Rooftop Penetrations
   1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, roofing system manufacturer's fasteners and termination bar or discs shall be installed. Fasteners, disc, and termination bar shall be installed accord to the roofing system manufacturer's instructions. Fasteners shall be installed using the fastener roofing system manufacturer's recommended fastening tools with depth locators.
   2. EPDM membrane flashings shall extend a minimum of 3 inches past the securement bar or plates and shall be adhered onto the EPDM membrane.

M. Field-seam according to Section 3.07, "Seam Installation."

N. Excessive Repairs: Excessive repairs to membrane, or to membrane seams are not permitted. Remove and replace membrane in entire area affected, and as directed by University of Missouri representative.

Note:

1. **The Installer shall employ all means necessary to assure that the installation of all field and flashing membranes are free of loose (un-adhered) areas and wrinkles. The Owner's Representative(s) reserves the right to require that all preventable loose and /or wrinkled field membrane and membrane flashings to be repaired to the satisfaction of the Owner's Representative. In the event that the Installer determines that loose and /or wrinkled membrane or membrane flashing is unavoidable in a specific area(s), the onsite Owner's Representative must be notified immediately for a determination of acceptability.**
2. **Contractor is to ensure during the time of installing the membrane field and membrane flashing sheet, there are no entrapment of debris under the membrane.**

1.09 MEMBRANE FLASHING INSTALLATION

A. General: All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Approval shall only be for specific locations on specific dates. Membrane flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.

B. Manufacturers required adhesive to be used to adhere the EPDM membrane flashing to acceptable wall and equipment curb substrates. No bitumen shall be in contact with the EPDM membrane. If bitumen exists **install Cav Grip primer or equal over existing bitumen**.

C. Manufacturer's Adhesive for Membrane Flashings:
   1. Over the properly installed and prepared flashing substrate, the adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
   2. No adhesive shall be applied in seam areas that are to be adhered. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required.
   3. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and corners applied. Where applicable, roofing system manufacturer's pre-fabricated corners shall be used.
   4. The membrane flashing shall be completely adhered to the substrate with no unadhered areas.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and roofing system manufacturer's technical department.

E. Vertical Surfaces Taller than 24 Inches (760 mm): Where vertical distance of flashing membrane exceeds 24 inches in height, in addition to terminations at base flashings, mechanically fasten fully adhered flashing membrane with additional termination bar installed horizontally at not greater than 30 inches (760 mm) on center vertically to top of flashing membrane.
   1. Install membrane cover strip of standard sheet at least 8 inch (0.23 m) in width of same material, type, reinforcement.
   2. Install baton bar and cover strip using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars and installation of coversheet for area under construction.

F. Flashing Termination: Terminate all vertical flashing membrane surfaces horizontally and vertically with mechanically fastened termination bars and sheet metal flashings/counterflashings. Mechanically fasten flashing membrane securely using mechanical fasteners specifically designed and sized for fastening specified membrane flashing and termination bars into substrate.
   1. Fasten baton bar/termination bar with fasteners not greater than 6 inches (152 mm) on center for length of bar, with fasteners within 3 inches (76 mm) of ends, or closer as required by manufacturer. Fasten into nailer or other substantial backing located behind point of base or curb termination
   2. Uniformly fasten, seat, and compress termination bar into top of fully adhered flashing membrane.
   3. Install sealants continuously across surface of termination, including terminations covered with sheet metal flashing and counterflashing.
   4. Install termination bars using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars for area under construction.
   5. At termination of vertical and wall sheet flashings not under copings, install termination bar at vertical and wall membrane flashings with metal surface mounted one- or two- piece counterflashing assemblies, as is required for condition. Install as indicated in Drawings or if not shown in Drawings or otherwise indicated, as required to produce continuous closure of membrane with termination bar and metal flashing, regardless of abutting materials overlap.
   6. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for requirements for counterflashings and other metal fabrications.

G. Primary Roof Drains: Install membrane into sump and extend into line of depressed sump at roof drain. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside sump in direction of water flow and drainage; backwater laps and seams are not permitted in or around sumps or drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with water cut off mastic in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   3. Install membrane to comply with other requirements indicated for roofing membrane.
   4. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
   5. Securely tighten clamping rings to provide constant pressure on water cut off mastic.
   6. Install new metal strainers to complete primary roof drains.

H. Secondary Overflow Roof Drains: Install membrane to extend into line of roof drain at roof surface. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside drain in direction of water flow and drainage; backwater laps and seams are not permitted in roof membrane around or under drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Do not set secondary roof drain body below roof surface. **Do not construct roof sumps at secondary overflow roof drains.**
   3. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with sealant in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   4. Install membrane to comply with other requirements indicated for roofing membrane.
   5. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
   6. Securely tighten clamping rings to provide constant pressure on sealant.
   7. Install new metal strainers to complete secondary roof drains.

I. High- or Elevated- Temperature Vent Flashings: Install prefabricated or field-formed membrane flashings to comply with manufacturer's written requirements and recommendations and as indicated. Field form flashings from sheet flashing membrane designed for and suited to condition.
   1. Install stainless steel metal base fabricated metal flashing sleeves prior to installing flashings.
   2. Install fire-resistant mineral-wool-fiber insulation between metal flashing sleeve and high- or elevated-temperature outside vent surfaces.
   3. Select proper diameter prefabricated flashing to properly fit penetration and roof conditions.
   4. Secure deck membrane around metal base sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments. Secure top of membrane flashing to top of sleeve penetration.
   5. Secure deck membrane around sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments.
   6. Install flashings to produce a minimum of 8-inch (200 mm) flashing height.
   7. Lap base of flashings atop roof membrane at least 4 inches (100 mm). Adhere seams at roofing membrane lap.
   8. Place prefabricated flashing in place tight to horizontal deck membrane; ensure flange lays flat to deck membrane.
   9. Adhere base of prefabricated flashing continuously to deck membrane.
   10. Where required by manufacturer, heat upper part of prefabricated flashing to temperature required by manufacturer; avoid overheating.
   11. Clamp top of flashing at vent with stainless steel clamping ring.
   12. Install stainless steel metal umbrella cap flashing, holding close to membrane base flashing.

J. Only an area, which can be completely covered in the same day's operations, shall be flashed.

K. Daily test lap edges with probe to verify seam continuity of all membrane flashings.

L. Complete all membrane flashing and metal details on a daily basis. No temporary flashings shall be allowed with the prior written approval of the Owner's Representative and roofing system manufacturer. If any water is allowed to enter under the completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

M. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

N. Installer is to ensure there are no wrinkles and "fish-mouths" in the membrane flashing and in the overlap seams.

O. Excessive Repairs: Excessive repairs to seams or flashings are not permitted. Remove and replace membrane, and if required the roofing components, in entire area affected as directed by University of Missouri representative.

1.10 PERIMETER AND METAL BASE FLASHINGS

A. General: All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

B. Sheet metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. All Kynar coated perimeter metal edging shall be fabricated and install per current SMACNA requirements.

D. Secure the Kynar coated metal over the field membrane and the "Multi-Purpose Sealing Tape." Fastened the sheet metal with approved stainless steel nails or other acceptable fastener. Fasteners shall be fastened 4 inches on center and staggered 4 inches on center.

E. An 8 inch minimum wide strip of the 60 mil membrane flashing shall be adhered to the 4 inch wide flange of the sheet metal and to the field membrane. Check all coverstrip with a rounded screwdriver. Re-work any inconsistencies.

3.11 WALKWAY INSTALLATION

A. Installer is to install walkway in the areas as indicated on roof plans. Installer is responsible for verification of the total linear footage of the required walkway installation. The minimum length of the walkway, installed at any one location, shall be four (4') feet.

B. Install the walkway to roofing system manufacturer's written instructions.
1. Clean all dirt and debris from the deck membrane in areas where the walkway will be installed.
2. Important: Check all deck membrane with a rounded screwdriver prior to installation of walkway. Re-adhere any inconsistencies before walkway installation.
3. Install walkway in the indicated roof areas.
4. Installer should adhere the walkway to the field membrane.

3.12 PROTECTION PAD INSTALLATION

A. General: Install protection pad under exposed wood blocking and under equipment supports.

B. The installation of the protection pad:
1. Clean all dirt and debris from the deck membrane in areas where the protection pad will be installed.
2. Important: In areas where protection pads are to be installed, Installer is to probe all field membrane seams laps with a rounded screwdriver prior to installation of the protection pad. Re-adhere any inconsistencies before protection pad installation.
3. Cut the protection pad 4 inches (4") wider than the dimensions of the wood blocking or equipment and piping support.
4. Adhere the entire perimeters of the protection pad to the field membrane sheet.

5. Probe all protection pad seams with a rounded screwdriver. Re-adhere any inconsistencies found in the protection pad seams.
6. Center the wood blocking or equipment or pipe support over the protection pad.

3.13 HIGHLY VIISBLE MEMBRANE INSTALLATION

A. General Requirements: Provide and install a highly visible membrane product; designed to draw attention to an unprotected roof perimeters and potentially hazardous area that do not comply with University of Missouri safety guidelines.

B. Installation of yellow, 4 inch wide, cover strip:
1. Installer and University of Missouri Representative shall verify unprotected roof perimeters and potentially hazardous areas on the referenced project's roof area(s).
2. The yellow cover strip shall be installed not less than 6 feet 6 inches (2 meters) from unprotected roof perimeters and potentially hazardous areas.
3. Before installing the yellow membrane 4 inch wide cover strip, the Installer shall have Roof system manufacturer Technical Representative to verify permanence of all deck membrane with a rounded screwdriver. Repair any inconsistencies of the membrane seams before yellow membrane installation.
4. The roofing membrane shall be properly cleaned prior to install the "yellow membrane 4 inch wide cover strip." Failure to properly clean the membrane will result in less than satisfactory adhesion of the yellow membrane.
5. Peel and stick the yellow cover strip to installed and inspected roofing membrane.
6. Installer shall take care to avoid trapping air under the yellow membrane.
7. After adhering the yellow cover strip, the Installer shall verify permanence of all yellow cover strips with a rounded screwdriver. Repair any inconsistencies of the yellow cover strip installation.

3.14 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the Installer shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner's representative prior to starting the roofing project. Proceeding with the roofing project indicates the Installer's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the Installer's expense.

C. The Installer shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation in order to maintain a 100% watertight and to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs during the installation of the roofing system, the Installer shall install temporary watertight and hermetic terminations across the installed Roof system manufacturer roofing system. The Roof system manufacturer roofing system shall be 100% impermeable in order to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the Installer shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly-completed Roof system manufacturer Roofing System, the affected roof area(s) shall be removed and replaced at the Installer's expense.

3.15 FIELD QUALITY CONTROL

A. Quality Control of Seams:
   1. The Installer shall designate a Quality Control Supervisor to daily check all seams for continuity by using a rounded screwdriver.
   2. On-site evaluation of seams shall be made by the Installer at locations as directed by the Owner's Representative or roofing system manufacturer's technical representative.
   3. All membrane seams, both field and flashings, shall be adhered and probed on a daily basis. NO EXCEPTIONS.

B. Roofing system manufacturer's technical representative: Installer shall arrange to have the system manufacturer's technical representative on site of the first day of installation of the roofing system. The Technical Representative shall note:
   1. Conduct a site inspection on the first day of production.
   2. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
   3. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
   4. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion of the roofing project.
   1. All defects noted non-compliance with the roofing specifications and details or the recommendations of roofing system manufacturer representative should be itemized in a punch list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and roofing system manufacturer technical representative.
   2. Ensure the roofing contractor has received a copy of Final Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the Final Inspection Report.

3.16 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from, not limited to the following items: dirt, grease, rust stains, roofing asphalt, scuff marks, abrasions, adhesive spills, sealant spills, membrane cuts, and any physical damages to the installed roofing system during the construction period.

B. Cleaning During Construction:
   1. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly environment on a daily basis.
   2. Remove all debris from the decking prior to installation of the roofing system.
   3. Collect and remove waste materials, debris, and rubbish from Work site on a daily basis.

C. Final Cleaning:
   1. Comply with manufacturer's published instructions for cleaning Product.
   2. Complete following cleaning operations before requesting Owner's Representative's inspection for Substantial Completion.
      a. Clean Project Site, yard and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste materials, litter and foreign substances. Sweep paved areas broom clean. Remove pert-chemical spills, stains and other foreign deposits. Rake grounds that are neither planted nor paved, to a smooth even-textured surface.
      b. Remove tools, construction equipment, machinery and surplus material from Project Site.
      c. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films and similar foreign substances associated with the roofing project. Avoid disturbing natural weathering of exterior surfaces.
      d. Remove debris and surface dust from limited access spaces, including roofs, plenums, equipment vaults, attics, and similar spaces.

e. Remove labels that are not permanent labels.
f. Touch-up and otherwise repair and restore marred exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored, or that show evidence of repair or restoration. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
g. Wipe surfaces of mechanical and electrical equipment, and other similar equipment.
h. At completion of the roofing system, the contractor shall wash the roof to remove all dirt and roofing containments from the membrane.
i. Leave Project clean and ready for occupancy.

3. Remove temporary protection and facilities installed during construction to protect previously completed installations during remainder of construction.
4. Comply with governing regulations and safety standards for cleaning operations. Remove waste materials from Project Site and dispose of in accordance with requirements of local authorities having jurisdiction.

D. **The completed "Roof" shall be washed with water and University of Missouri approved cleaner to remove all dirt, stains, adhesive and sealant spills, and any residue from roof membrane.**

3.17 ACCEPTANCE

A. Prior to demobilization from the site, the roofing system manufacturer's project manager, University of Missouri's representative(s), roofing system manufacturer's designated field technical representative and Installer's project manager, production crew superintendent, and project's roofing foreman shall review the completed work.

B. Installer and University of Missouri representative shall inspect the completed roofing system for any uneven cover boards, loose or improperly attached insulation or cover boards, ponding of water, un-adhered membrane and membrane flashing, membrane damage, dirt, rust stains, roofing asphalt, grease, scuff marks, cuts, abrasions, adhesive spills, and sealant spills.

C. All defects noted noncompliance with the project's bid documents will be itemized in a punch list. Any non-compliance item shall be removed and/or repaired immediately by the Installer to the satisfaction of the University of Missouri representative, and to roofing system manufacturer.

D. The noted deficiencies shall be repaired or replaced to a condition free of damage and deterioration at the time of Substantial Completion Acceptance by University of Missouri's representative, and / or to accordance of the University of Missouri project contract documents.

E. All warranties as required for the project of this specification shall be submitted for approval prior to final payment by University of Missouri.

END OF SECTION 07 5400.5

SECTION 07 5400.6 –EPDM MEMBRANE ROOFING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. This Section includes the following:
1. Adhered EPDM sheet roofing
2. Polyisocyanurate Insulation
3. Cover board
4. Walkway pads

B. **SCOPE OF WORK ROOF SECTION #1**: The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity on a daily basis. Over the cleaned and prepared steel decking substrate installation of a self-adhered vapor barrier followed by a base layer of 2" polyisocyanurate mechanically fastened with FM 1-105 pattern (Minimum 16 Fasteners per 4x8). Adhere 2.0" layer polyisocyanurate with FM 1-105 ribbon method to underlying base layer fallowed by 1/2" HD polyisocyanurate cover board adhered with low rise foam in a FM 1-105 ribbon method, and the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. All sheet metal will be fabricated with Stainless-Steel as required for the power plant. All flashing membranes, pre-fabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl sealant or tape at all attachment points of the surface mounted counterflashing. Installation of ½" plywood at all roof accesses, stairs and ladder egresses. Installation of yellow warning line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

B. **SCOPE OF WORK ROOF SECTION #2**: The scope of work includes the minimizing of the intrusion of dust and debris, created by the process of the installation of the new EPDM Roofing System. The phased installation of the new roof system will be installed in such a manner as to maintain a watertight integrity on a daily basis. Over the cleaned and prepared roof deck substrate, Installation of 1/8" thick sheet steel, fastened to concrete deck, to span the existing openings in an effort of enclosing separate roof sections. Over the manufacturers approved primed roof deck substrate, installation of a self-adhered vapor barrier followed by 1/8" per foot tapered polyisocyanurate insulation adhered with low rise foam in FM 1-105 method, The tapered insulation will be designed to facilitate the middle of the roof area as being the high slope while creating slope to each gutter end. Installation of 1/2" HD polyisocyanurate cover board with low rise foam in FM 1-105 method, and the roofing system manufacturer's 60 mil EPDM membrane shall be installed in order to meet the project's roofing design guidelines. Installation of structural bracing in a manner to support steel decking between distribution roof sections. All flashing membranes, prefabricated metal, and sheet metal will be installed in accordance with roofing system manufacturer's recommendations. The installation of butyl sealant or tape at all attachment points of the surface mounted counterflashing. Installation of new 26 ga. 5" Stainless-Steel gutters on each end followed by the installation of manufacturers suggested yellow waring line at perimeter of roof area on all unprotected edges. The completed EPDM roof system and roofing system manufacturer's supplied accessories shall be installed in such a manner so that the roofing system manufacturer's Twenty- (20) year Full Systems (NDL) Warranty can be issued upon successful completion of the roofing project.

C. **FLASHING MATERIAL ON SECTION 2 AND ON FAR WEST SIDE OVER BAYS OF LOADING DOCKS ON SECTON 1 CONTAINS ASBESTOS. ANY BLACK CAULK IS PRESUMED TO CONTAIN ACRM. REFERENCE SECTION 02 0800 ASBESTOS ABATEMENT.**

D. Related Sections include the following:
   1. Division 5, Section for “Metal Deck”
   2. Division 6, Section “Rough Carpentry for Roofing”
   3. Division 7, Section “Sheet Metal Flashing and Trim”
   4. Division 7, Section “Caulking and Sealants”
   5. Division 7, Section “Non-Penetrating Rooftop Supports”

1.03 DEFINITIONS

A. ASTM E108, Class "A".

B. UL 790, Class "A".

1.04 REFERENCES

A. American Society of Civil Engineers (ASCE): ASCE 7 - Minimum Design Loads for Buildings and Other Structures.

B. Single-Ply Roofing Institute (SPRI): Application Guidelines and Wind Design Guidelines for Various Single Ply Membranes

C. National Installers Association (NRCA): Current Roofing and Waterproofing Manual

D. Sheet Metal and Air Conditioning Contractor’s National Association (SMACNA): Current SMACNA Technical Manuals.

E. Code of Federal Regulations, (CFR) including:
   1. CFR Title 29, Part 1910 "Occupational Safety and Health Standards."
   2. CFR Title 29, Part 1926 "Safety and Health Regulations for Construction."

F. Factory Mutual Global (FM), including:
   1. "Approval Standard for Roof Perimeter Flashing" Class Number 4435.
   2. Deck Construction" Class Number 4451.
   3. "Approval Standard for Class 1 Roof Covers" Class Number 4470.
   4. Property Loss Prevention Data Sheet 1-0 "Safeguards During Construction, Alteration, and Demolition."
   5. Property Loss Prevention Data Sheet 1-7 "Wind Forces on Buildings and Other Structures."
   6. Property Loss Prevention Data Sheet 1-9 "Roof Anchorage."
   7. Property Loss Prevention Data Sheet 1-28 "Wind Design."
   8. Property Loss Prevention Data Sheet 1-29 "Roof Deck Securement and Above Roof Components."
   9. Property Loss Prevention Data Sheet 1-28R/1-29R "Roof Systems Reference Document".
   10. Property Loss Prevention Data Sheet 1-34 "Hail Damage."
   11. Property Loss Prevention Data Sheet 1-49 "Perimeter Flashing."
   12. Property Loss Prevention Data Sheet 1-52, "Field Uplift Tests."

G. Underwriters Laboratories (UL):
   1. Roof Materials and Systems Directory. 2021.
   2. UL 790: Tests for Fire Resistance of Roof Covering Materials: 2009.

H. AMERICAN SOCIETY FOR TESTING AND MATERIALS (ASTM) FOR EPDM MEMBRANE:
   1. .060” (Black) Non-Reinforced
   2. ASTM D 412
   3. ASTM D 624
   4. ASTM D 573

1.05 PERFORMANCE REQUIREMENTS

A. General Performance: Installed membrane roofing and base flashings shall withstand specified uplift pressures, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Membrane roofing and base flashings shall remain watertight.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by membrane roofing system manufacturer based on testing and field experience.

C. Roofing System Design: Comply with SPRI "Wind Design Guide for Adhered Single Ply Roofing Systems" for the following ground roughness exposure, classification of building and system design:
1. Surface Roughness Category: Exposure B
2. Classification of Building: Category II
3. Wind uplift Design: 90 mph @ 3second gust
4. System 1 Design: Adhered Single Ply Membrane Roofing

D. Underwriters Laboratories Inc. (UL):
1. UL RMSD – 2021 Roofing Materials and Systems Directory
2. UL 790 – 2009 Fire Resistance of Roofing Coverings Materials
3. Exterior Fire Exposure Classification: Class A, ASTM E 108, for application and slopes shown

1.06 ACTION SUBMITTALS

A. Product Data: Submit latest edition of roofing system manufacturer's roofing and base flashing specifications including list of materials proposed for use, installation procedures, and roofing system manufacturer's Product Safety Data Sheets.

B. Product Safety Data Sheets: Installer shall review all product data safety data sheet chemical names prior to submitting to University of Missouri.

C. Shop Drawings: For roofing system. Include plans, elevations, sections, details, and attachments to other work.
1. Base flashings and membrane terminations.
2. Tapered insulation, including slopes.
3. Roof plan showing orientation of steel roof deck and orientation of membrane roofing.
4. Insulation fastening patterns for corner, perimeter, and field-of-roof locations.

D. Samples for Verification: Physical samples are not necessary.
1. Sheet roofing, of color specified.
2. Roof insulation.
3. Cover board.
4. Metal termination bars.
5. Battens.
6. Six insulation fasteners of each type, length, and finish.
7. Six membrane fasteners of each type, length, and finish.
8. Six batten fasteners of each type, length, and finish.
9. Walkway pads or rolls.

1.07 INFORMATION SUBMITTALS

A. Qualification Data: For qualified Installer and roofing system manufacturer.

B. Installer: Provide copy of roofing system manufacturer's training certificate for each roofing mechanic permit to use the hot air welding equipment.

C. Roofing system manufacturer Certificates: Signed by roofing system manufacturer certifying that roofing system complies with requirements specified in "Performance Requirements" Article.
1. Submit evidence of compliance with performance requirements.

D. Product Test Reports: Based on evaluation of comprehensive tests performed by roofing system manufacturer and witnessed by a qualified testing agency, for components of membrane roofing system.

E. Research/Evaluation Reports: For components of membrane roofing system, from the ICC-ES.

F. Single Ply Roofing Institute (SPRI) - Fasteners Withdrawal Resistance Testing:
   1. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.
   2. Prior to starting the project, provide a copy of the Fasteners Withdrawal Resistance Testing to roofing system manufacturer's technical department.

G. Warranty:
   1. Provide sample copy of 20-year (NDL) Full System roofing system manufacturer's warranty stating obligations, remedies, limitations, and exclusions of warranty.
   2. Provide sample of copy 5-year Installer's workmanship warranty stating obligations, remedies, limitations, and exclusions of warranty.

H. Inspection Report: Copy of roofing system roofing system manufacturer's final inspection report of completed roofing installation.

1.08 CLOSE OUT SUBMITTALS

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

1.09 QUALITY ASSURANCE

A. Roofing System Manufacturer Qualifications: A qualified roofing system manufacturer that is UL listed for membrane roofing system identical to that used for this Project.

B. Installer Qualifications:
   1. A qualified firm that is approved, authorized, or licensed by membrane roofing system roofing system manufacturer to install roofing system manufacturer's product and that is eligible to receive roofing system manufacturer's special warranty.
   2. Prior to submitting a roofing proposal, Installer must be approval by Owner's representative.

C. Roofing system manufacturer's membrane shall meet the following characteristics:
   1. Protective membrane surface coating to resist accumulation of air borne contaminants such as dust and dirt.
   2. Membrane Thickness: Membrane roofing system manufacturer is to verify that the membrane thickness is of the membrane thickness specified ASTM D412 nominal thickness of +/- 10 percent will not be acceptable for measurement of membrane thickness.

D. Source Limitations: Obtain components including roof insulation, fasteners, and accessories for membrane roofing system from same roofing system manufacturer as membrane roofing.

E. Exterior Fire-Test Exposure: ASTM E 108, Class A; for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

F. Pre-installation Conference: Before installing roofing system, conduct conference at Project site. Notify participants at least 10 working days before conference.
   1. Meet with Owner's Representative/General Contractor, Owner's insurer if applicable, testing and inspecting agency representative, roofing Installer, roofing system roofing system manufacturer's representative, deck Installer, and installers whose work interfaces with or affects roofing, including installers of roof accessories and roof-mounted equipment.
   2. Review methods and procedures related to roofing installation, including roofing system manufacturer's written instructions.
   3. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
   4. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
   5. Review structural loading limitations of roof deck during and after roofing.

6. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction that will affect roofing system.
7. Review governing regulations and requirements for insurance and certificates if applicable.
8. Review temporary protection requirements for roofing system during and after installation.
9. Review roof observation and repair procedures after roofing installation.

G. At no cost to University of Missouri, roofing system manufacturer's technical representative shall perform:
   1. Manufacturer's Quality Control Inspection: The Manufacturer's Technical Representative shall review the on-going work on the first day of the roofing production and a minimum of one (1) in-progress inspection every 10 working days. The Roof system manufacturer Technical Representative shall:
      a. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
      b. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
      c. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.
   2. Final Roof Inspection: Contractor is to arrange for roofing system manufacturer's technical personnel to inspect roofing installation on completion of the roofing project.
      a. All defects noted non-compliance with the specifications, or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri and Roof system manufacturer.
      b. The roofing contractor is to forward a copy of Final Inspection Report to the University of Missouri On-site Representative within two days after date inspection(s) is performed.

H. Installer's Responsibility: Any failure by the Owner Representative or roofing system manufacturer's Representative to detect, pinpoint, or object to any defect or noncompliance of these specifications of work in progress or completed work shall not relieve the Installer, or reduce, or in any way limit, his responsibility of full performance of work required of the Installer under these specifications.

1.10 DELIVERY, STORAGE AND HANDLING

A. Deliver roofing materials to Project site in original containers with seals unbroken and labeled with roofing system manufacturer's name, product brand name, and type, date of manufacture, and directions for storing and mixing with other components. Deliver materials in sufficient quantity to allow work to proceed without interruption.

B. Store liquid materials in their original undamaged containers in a clean, dry, protected location and within temperature range required by roofing system manufacturer.
   1. Discard and legally dispose of liquid material that cannot be applied within its stated shelf life.

C. Store and protect materials, including roofing insulation from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Store all materials in a dry location. Use pallets to support all materials from roof deck. Distribute the load to stay within live load limits of the roof construction. Remove unused materials from the roof at the end of each day's work. Comply with roofing system 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.

1.11 PROJECT CONDITIONS

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

B. The EPDM adhered membrane shall not be installed under the following conditions without consulting manufacturer for precautionary steps:
   1. The roof assembly permits interior air to pressurize the membrane underside.
   2. Any exterior wall has 10% or more of the surface area comprised of opening doors or windows.

3. The wall/deck intersection permits air entry into the wall flashing area.

C. Protective wear shall be worn when using solvents or adhesives or as required by job conditions.

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

E. Protection:
1. Provide special protection and avoid traffic on completed areas of membrane installation.
2. Restore to original condition or replace work or materials damaged during handling of roof materials.
3. Take precautions as required to protect adjacent work and structures.

F. Emergency Equipment and Materials: Maintain onsite equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the Installer shall provide the labor necessary to monitor the situation to maintain a watertight condition.

G. Protection:
1. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent Roofing areas.
2. The Installer shall provide a suitable temporary protective surface for all roofing areas which will receive construction traffic or construction of equipment during all phases of the roofing project.
3. During the course of installation of the membrane roofing systems, should there be any damage created by other construction trades to the new or to existing roofing membrane and/or roofing system, the Installer is to immediately notify the Owner's Representative and membrane roofing system manufacturer. All damages are to be repaired according to the membrane roofing system manufacturer's or Owner's representative's recommendations. The "party" responsible for the roofing damages shall bear the total cost for the repairs or for the replacement of existing or new roofing system.

H. Restrictions:
1. Comply with Owner's General and Safety Requirements on use of site.
2. Smoking and Tobacco products are prohibited on all roof areas and on the campus grounds.
3. Provide and maintain sanitary facilities for employees.
4. Maintain facility and all utility services in a functional condition.

1.12 WARRANTY

A. General Warranty: The warranties specified in this Article shall not deprive the Owner of other rights of the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Installer under requirements of the Contract Documents.

B. Roofing System Manufacturer's Warranty: Submit a written warranty, without monetary limitation, with all available options, including flashing endorsement, roofing system manufacturer's roof insulation and roofing system manufacturer's accessories, signed by roofing system roofing system manufacturer's agreeing to promptly repair leaks resulting from defects in materials or workmanship for the following warranty period:
1. Twenty (20) Year Full System Warranty (no ponding/standing water exclusions accepted). Warranty shall be non-prorated and cover basic wind speeds up to 60 mph.
2. "Early Bird" warranties are not to be issued, as they will not be accepted by Owner.
3. The specified roofing system manufacturer's warranty will be issued only upon final acceptance by the roofing system manufacturer's ttechnical department and the Owner's Representative's final approval.
4. Request for final payment and issuance of the specified Roofing system manufacturer's warranty will be issued to the Installer's after successful completion and Owner's Representative's final approval and acceptance of the entire roof system installation.

C. Installer's Warranty: Submit roofing Installer's workmanship warranty, on a notarized written warranty form, signed by Installer, covering Work of this Section, including membrane roofing, sheet flashing, cover board, roof insulation, fasteners, adhesives, sealants, and associated sheet metal, for the following warranty period:

1. Warranty Period: Three (3) years from date of Substantial Completion.

PART 2 - PRODUCTS

2.01 ROOFING SYSTEM MANUFACTURER

A. The components of the roof system are to be products of a single roofing system manufacturer or approved by the Roof system manufacturer, whose products meet or exceed the project specifications, have manufactured, and installed the roofing materials and systems of the type specified for a minimum of twenty (20) years, and who maintains a single source responsibility for the total roofing system.

B. Roofing system manufacturers: The components of the roofing system are to be products of a single roofing system manufacturer as required to provide the specified system warranty. Subject to compliance with requirements, provide roofing products from:
1. Versico Incorporated, Akron OH
2. Firestone Roof System, Carmel IN
3. Owner approved manufacturers.

2.02 EPDM MEMBRANE

A. EPDM Membrane: a uniform, flexible sheet formed from ethylene propylene diene monomer, ASTM D 412, of the following Classification – Type and Grade, Membrane Thickness, UL Classification, and Membrane Exposed Face Color.
1. Classification: Type II, Grade I.
2. Membrane Thickness: 60 mils, +/- 2.0 mils.
3. UL Class: A.
4. Membrane: Exposed Face Color: Black

2.03 AUXILIARY MATERIALS

A. General: Furnish auxiliary materials recommended by roofing system roofing system manufacturer for intended use and compatible with membrane roofing materials.
1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdictions.

B. Membrane flashing and Flashing Accessories: As recommended by the roofing system manufacturer's printed instructions for sheet flashing of same material, mil thickness and color as sheet membrane.

C. Asphalt Resistance Membrane Flashing: Roof system manufacturer’s SA vapor barrier. The asphalt resistance membrane flashing can be adhered directly to asphalt-contaminated surfaces. The asphalt resistant membrane can be installed over the field membrane to act as a protection layer membrane in conditions where oil and grease could develop from roof-top equipment.

D. Insulation Fasteners: Roofing system manufacturer approved corrosion resistant steel #12 “fasteners,” screws of the appropriate size and type for roof membrane and insulation attachment. A #12 corrosion-resistant fastener is used with plates to attach insulation boards to steel roof decks. Fasteners for the insulation shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

E. Insulation Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 3-inch round plates, “plates,” of the appropriate size and type for the securement of the insulation to approved substrates. Securement plates for the insulation shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

F. Membrane Securement Plates: Roofing system manufacturer approved corrosion resistant steel, 2-inch round plates, “discs,” for the securement of the membrane to the steel roof decks. Securement plates for the membrane shall be supplied and installed as recommended by the roofing system manufacturer’s printed instructions.

G. Membrane Securement Screw: Roofing system manufacturer approved corrosion resistant steel, "#15screws" of the appropriate size and type for roof membrane securement. A #15, heavy-duty, corrosion-resistant fastener used with "discs" and "termination bar" to attach Roof system manufacturer's roof membrane to steel roof decks. Fasteners for the membrane shall be supplied and installed as recommended by the roofing system manufacturer's printed instructions.

H. Membrane Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, Standard bonding adhesive, used to attach membrane to the horizontal or near-horizontal substrate. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

I. Membrane Flashing Bonding Adhesive: Roofing system manufacturer's approved contact adhesive, used to attach the flashing membrane to the substrate, either horizontally or vertically. Application rates are to be as recommended by roofing system manufacturer's printed instructions.

J. Metal Termination Bar: a heavy-duty, extruded aluminum flashing termination reglet used at walls and large curbs. Reglet is produced from 6063-T5, 0.10 inch to 0.12 inch (2.5 mm to 3.0 mm) thick extruded aluminum. "reglet" has a 2-1/4 inch (57 mm) deep profile and is provided in 10 foot (3 m) lengths.

K. Membrane Securement Bar: is a 1 inch wide aluminum alloy bar used with to clamp the membrane to the roof deck along walls, curbs, and certain vertical to horizontal changes in the roofing system. Termination bar is supplied in bundles of 25 pieces. Each termination bar is 10 feet long.

L. Sealants: Owner approved sealant shall be used to seal penetrations through the membrane system and at miscellaneous sealant applications that are exposed to roof systems components.

M. Safety Warning Membrane: A highly visible product to draw attention to an unprotected roof perimeters and potential hazardous area. The safety warning membrane is designed for use on a membrane roof. The EPDM safety warning membrane shall be a yellow in color, 60 mils in thickness, 4 inches wide, and 100 feet in length.

N. Pre-Fabricated Pipe Flashing: prefabricated vent pipe flashing made from 0.060 inch (60 mil/1.5 mm) thick membrane.

O. Pre-Fabricated Corner Flashing: prefabricated universals corners made of 0.060 inch (60 mil/1.5 mm) thick membrane that are adhered/quick applied to membrane base flashings.

P. Aluminum: ASTM B 209-86, alloy and temper - 3003-H14, 0.040 inch thick aluminum sheet, mill finish with formed drip edge.

Q. Mineral Wool-Fiber Fire-Resistant Insulation: Semi-rigid mineral-wool-fiber batt insulation; Type IVA per ASTM C 612; not less than 144 psf (6.9 kPa) compressive strength per ASTM C 165; less than 0.05 percent moisture absorption per ASTM C 1104; complying with ASTM E 136; and with the following surface-burning characteristics per ASTM E 84:
   1. Flame Spread: 0.
   2. Smoke Developed: 0
   3. Manufacturers: Subject to compliance with requirements, available products include the following:
      a. Basis of Design: Roxul Safe; Roxul Inc.

R. Other miscellaneous materials shall be of the "best grade" available and to be approved in writing by the roofing system manufacturer for the specific application.

S. 1/8" minimum thickness sheet steel, epoxy coated on bottom side for installation on concrete deck canopies. Secure with fasteners to concrete deck.

2.04 INSULATION

A. General: Provide preformed roof insulation boards that comply with requirements, selected from roofing system manufacturer's standard sizes and of thickness indicated.

B. Polyisocyanurate board insulation: Closed cell polyisocyanurate foam with fiberglass reinforced mat laminated to faces, complying with ASTM 1289-03, Type 2, Class 2, Grade 2

C. Insulation Requirements - **Roof Area 1:**
1. 2.0" polyisocyanurate board mechanically attached per FM 1-105 wind uplift requirements (Minimum 16 Fasteners per 4x8).
2. Adhere 1 layer of 2.0" polyisocyanurate board with low rise foam adhesive
3. Adhere 1 layer of ½" HD polyisocyanurate with low rise foam adhesive.

D. Insulation Requirements - **Roof Area 2**:
1. 1/8" per foot tapered insulation low rise foamed to vapor barrier with FM 1-105 ribbon method
2. Adhere 1 layer of ½" HD polyisocyanurate with low rise foam adhesive in FM 1-105 ribbon method.

E. Roof and Tapered Insulation: rigid polyisocyanurate foam insulation composed of a closed cell polyisocyanurate foam core laminated to a felt or glass fiber mat facer on both major surfaces. The insulation shall have the following characteristics:
1. Dimensional Stability (length and width) per ASTM D 2185: <2%.
2. Compressive Strength (10% Deformation) per ASTM D 1621: 20 psi.
3. Product Density per ASTM D 1622: Nominal 2.0 pcf.
4. Flame Spread per ASTM E84 (Full 10 min. Test): 20-50*
5. The insulation board is to have a minimum conditioned thermal value per inch of an LTTR Value of 6.00 as determined by ASTM C 1303 and C 518.
6. The insulation board shall have a minimum compressive strength of 20 psi and a dimensional stability of -2% linear changes, maximum seven (7) days.

E. Approved Roofing system manufacturer and Product:
1. Roof system manufacturer.

2.05 COVER BOARD

A. High density polyisocyanurate cover board: Closed cell polyisocyanurate foam with coated glass matt facer laminated to both faces, complying with the following additional characteristics:
1. Thickness: 0.5 inches.
2. Size: 48 inches by 48 inches, nominal.
3. R-Value (LTTR):
   a. 0.5 inches, R-Value: 2.5, minimum.
4. Compressive Strength: 100 psi.
5. Ozone Depletion Potential: Zero; made without CFC or HCFC blowing agents.
6. Recycled Content: 8.3 percent post-industrial, average.

2.06 INSULATION AND COVER BOARD ACCESSORIES

A. General: Furnish roof insulation accessories recommended by insulation roofing system manufacturer for intended use and compatible with membrane material.

2.07 DUAL COMPONENT POLYURETHANE ADHESIVE

A. General: Provide a dual component polyurethane adhesive that is intended for the attachment of polyisocyanurate insulation to various substrates. The dual component polyurethane adhesive has to have approvals from the insulation and roofing system manufacturer for adhering the polyisocyanurate insulation to approved substrates, multiple layers of polyisocyanurate insulation, and cover boards. Consult adhesive roofing system manufacturer on current acceptable substrates to apply dual component polyurethane adhesive to various substrates.

B. Dual component polyurethane adhesive: The low-slope dual component polyurethane adhesive shall have the following minimum properties:
1. Density ASTM D-1622: Free Rise, 3.2 lb./cf.
2. Compressive Strength ASTM D-1621: Parallel, 38 psi @ 6% deflection.
3. Tensile Strength ASTM D-1623: 35 psi

4. Water Absorption ASTM D-2843: 5.1%
5. Closed Cell Content ASTM D-6226: 90% min.
6. R-Value ASTM C-518 3.8/inch (new)
7. VOC Content ASTM D-2369 <5 g/l (1&2 combined)
8. Weight/Gallon: Part A Component 10.32 lbs. Part B Component 8.54 lbs.

C. Approved Roofing system manufacturer and Product:
1. OMG Roofing Products, "OlyBond 500® SpotShot."
2. Roof system manufacturer, "OM Board Adhesive."

2.08 VAPOR RETARDER ON ROOF DECKS (AREA-1)

A. Vapor barrier
1. 32 Mil self-adhered vapor barrier over primed and prepared concrete deck.

2.09 RELATED MATERIALS

A. Timber, General: Hand select material at factory from lumber of species and grade indicated below for compliance with "Appearance" grade requirements of ALSC National Grading Rule; provide certificate of inspection from an accredited Agency for selected material.
1. Provide seasoned lumber with 19 percent moisture content at time of dressing and shipment, for sizes 2-inches or less in thickness.
2. Provide lumber with 15 percent moisture content at time of dressing and shipment for, sizes 2-inches or more in thickness.

B. Dimensioned Lumber: Graded in accordance with established grading rules; grade and species as follows:
1. Concealed Boards: WWPA standard grade, any species, or SPIB No. 3 grade Southern Pine.
2. Lumber for Miscellaneous Uses: Standard grade unless otherwise indicated.
3. Plywood: PS 1; select sheathing grade or APA rated 5/8-inch minimum thickness, CD-X, or better in sheathing.

2.10 MISCELLANEOUS FASTENERS AND ANCHORS

A. General: All fasteners, anchors, nails, straps, bars, etc. shall be post-galvanized steel, aluminum, or stainless steel. Mixing metal types and methods of contact shall be assembled in such a manner as to avoid galvanic corrosion. Fasteners for attachment of metal to masonry shall be expansion type fasteners with stainless steel pins. All concrete fasteners and anchors shall have a minimum embedment of 1¼ inch (32 mm) and shall be approve for such use by the fastener roofing system manufacturer. All miscellaneous wood fasteners and anchors used for flashings shall have a minimum embedment of 1 inch (25 mm), stainless steel, and to be approved for such use by the fastener roofing system manufacturer.

2.11 PROTECTION PADS

A. Protection Pads: "- factory-formed, nonporous, heavy-duty, slip resisting, surface-textured protection pads, as supplied Roof system manufacturer. Color of protection pads shall be black. Protection pads to be used under all wood support blocking, equipment supports, pipe steel supports, and under downspout splash blocking.

PART 3 - EXECUTION

3.01 INSPECTION

A. Inspect entire roof area to be roofed for acceptability. Examine substrates, areas, and conditions for compliance with the following requirements and other conditions affecting installation and performance of the roofing system:
1. Verify that roof openings and penetrations are in place, and curbs are set and braced, and that the roof drains and drain lines are properly clamped into position and are in a 100% functional condition.
2. Verify that primary drain bodies are at proper elevations for construction of sump at slopes indicated.
3. Verify that secondary overflow drain bodies are at proper elevations for construction, without sumps, at level of roof surface.

B. The Installer shall conduct fastener pullout tests in accordance with the August 11, 2011 revision of the ANSI/SPRI FX-1 - American National Standard – Standard Field Test Procedure for Determining the Withdrawal Resistance of Roofing Fasteners.

C. Verify that structural use panels, sheathing, and similar wood products are securely anchored to substrates, and that surfaces of panels and sheathing are without irregularities which could interfere with proper membrane and flashing installation.

D. Verify that surface plane flatness and fastening of steel roof deck complies with requirements in Division 05 Section "Steel Decking."

E. Verify that steel deck is securely fastened with no projecting fasteners and no adjacent units in exceed 1/16 inch (1.6 mm) or more out of plane measured to adjoining deck.

F. Verify that installed steel roof decking complies with required slopes indicated, that no holes, ridges, voids, uneven or misaligned surfaces or conditions, gaps, or other irregularities exist, and deck and substrates are smooth and free of sharp edges.

G. Visually inspect cast-in-place reinforced concrete roof deck for the following:
   1. Evidence of impaired deck structural capacity or integrity.
   2. Exposed concrete reinforcing.
   3. Presence of corrosion.
   4. Spalling or loss of concrete cover.
   5. Presence of foreign materials.
   6. Efflorescence.
   7. Ridges or uneven conditions in concrete deck.
   8. Holes, voids, or gaps in concrete deck.
   9. Accumulations of moisture.

H. Other conditions that would prevent proper application of roofing or that would prevent membrane roofing manufacturer's approval of substrate, components, or system.

I. Verify that roofing systems can be installed with positive drainage of minimum slopes indicated at all areas of roof, without ponding after 24 hours.

J. Verify that roofing as completed will discharge to internal roof drains without ponding or inadvertent discharge through secondary roof drains.

K. Verify that final installed curb heights for flashing are a minimum of 8-inches (200 mm) measured above finished roof membrane.

L. Verify piping and conduit penetrations of roof are made individually, separated by a minimum of 12 inches (300 mm) from each other and from restraining surfaces or other obstructions.

M. Verify locations of interior electrical conduits, piping, ducts, and similar items in close proximity to underside of steel roof decking, to avoid striking with fasteners.

N. Verify that deck and other substrates are dry, free of debris, excess, and foreign materials.

O. Verify substrates and surfaces to receive flashings are dry, clean, and free of sharp or penetrating projections or other irregularities.

P. Proceeding: Proceed with installation only after unsatisfactory conditions have been corrected.

Q. Do not commence work until decking and substrates are in full compliance with roof system manufacturer's requirements, deck and substrate conditions are sound, and positive fall to drainage points are achieved.

R. Commencement: Commencement of work indicates acceptance of conditions and responsibility for all corrections.

3.02 PREPARATION

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

B. The Installer will be entirely responsible for the complete removal of all dirt, debris, moisture from the roof's substrate, i.e. steel decking, concrete decking, before the installation of the roofing system. The roof's substrate must be 100% completely dry before applying the spray-in-foam insulation or before the installation of the specified roofing insulation.

C. Cleaning: Clean substrate including metal decking flutes of dust, debris, moisture, and other substances detrimental to roofing installation according to roofing system manufacturer's written instructions. Remove sharp projections.

D. Debris, water, moisture, or foreign materials found in flutes of steel roof decking is not permitted; remove and replace roofing installed above flutes found to contain foreign materials.

E. Cleaning, repair or replacement of damaged items, as a result of roofing related materials entering the facility, shall be solely at the roofing contractor's expense.

F. Broom clean cover board immediately prior to membrane roofing application.

G. Promptly remove debris each day; do not stockpile debris or allow waste to accumulate on steel decking, insulation, or roofing under construction.

H. Containment: Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction at the end of the workday or when rain is forecast. Remove roof-drain plugs when no work is taking place or when rain is forecast.

I. Mask off adjoining surfaces not receiving roofing membrane materials to prevent spillage or over spray affecting other construction.

J. Fill all gaps and voids between substrate components that are wider than 1/4 inch. Fill all gaps with same materials as the substrate.

K. Seal around along perimeters, along equipment curbs, around pipes, around conduits, and any other roof penetrations with vapor barrier.

L. Base Vertical Flashings: Coordinate roof insulation thickness with adjacent base flashing height, to maintain not less than 8-inch (203 mm) flashing height. Adjust base vertical flashing height including substrates and changes in exterior wall materials to maintain minimum height.

M. Proceed with roofing work only when weather conditions permit work to proceed in accordance with manufacturer's requirements and recommendations.

N. Place 1/8" minimum sheet steel over openings between concrete canopy sections. Extend a minimum of 12" onto each canopy section. Secure sheet steel to concrete canopies 12" o.c.

3.03 WOOD NAILER INSTALLATION

A. All Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newtons/lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. Wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Division 06 1000 for acceptable fasteners for wood product attachments.

B. Wood Nailer thickness shall be as required to match the insulation and cover board height (thickness) to allow a smooth transition.

C. Stainless steel, corrosion resistant, fasteners are required when mechanically attaching any roof system manufacturer product to wood nailers and wood products treated with ACQ (Alkaline copper Quaternary). When ACQ treated wood is used on steel roof decks or with metal edge detailing, a separation layer must be placed between the metal and ACQ treated wood.

D. New wood nailers and/or plywood sheeting shall meet the performance criteria in Division 06 1000.

3.04 INSULATION BOARD INSTALLATION

A. General Criteria:
1. Coordinate installing membrane roofing system components, so insulation is not exposed to precipitation or left exposed at the end of the workday.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged insulation boards are to be replaced with new insulation boards.
3. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified roofing insulation or during the time of applying the dual component polyurethane adhesive.
4. Construct sumps at primary roof drains using tapered insulation to slope indicated. Install nailers or blocking as required to secure drain body assembly to roof deck.
   a. Unless otherwise indicated, construct sumps to consistent and uniform slope of 1/4 per 12 inches (1:48) to provide a smooth transition from the roof surface to the drain. Do not introduce steeper or shallower slopes within sump.
   b. Use tapered insulation to form a square sump. Unless indicated otherwise, construct sump measuring 4 foot by 4 foot at primary roof drains.
   c. Adjust primary roof drain assemblies to proper elevation for sump.
   d. Install tapered insulation so edges do not restrict flow of water.
   e. Do not create circular depressions around primary roof drains at bottoms of sumps.
5. **Do not install sumps at secondary overflow roof drains.**
   a. Adjust secondary roof drain assemblies to proper elevation of final roofing membrane.
   b. Do not create circular depressions around secondary roof drains.
6. Where conditions required drain modifications to match specified insulation thickness, roofing contractor will be responsible for the cost of readjusting the primary roof drain bowl and associated plumbing to match the "finished" insulation thickness. University of Missouri will not permit the circular depressions, nor the cutting or shaving the insulation in order to slope the insulation to the edge of the drain bowl.
7. Roofing system manufacturer's technical representative shall be on the jobsite during the first initial day of installation of the roofing system.

B. Installation of additional "flat stock" and tapered polyisocyanurate insulation:
1. The "flat stock" and / or tapered polyisocyanurate insulation panels shall be laid transverse to the proceeding layer of insulation, with joints staggered at least 1/3 of overall length from those of the proceeding layer of the "flat stock" insulation.
2. The "flat stock" and / or tapered polyisocyanurate insulation boards shall be adhered to top layer of "flat stock" insulation with the dual component polyurethane adhesive. The dual component polyurethane adhesive shall be dispensed ¾ inch wide and 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area where the tapered crickets or saddles are to be installed, the number of ribbons per unit width or area over the field rate by:
   a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
   b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing dual component polyurethane adhesive to rise ¾ inch to 1 inch, lay insulation board in to position and walk into place. After walking into place, the insulation board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also "weight down" the insulation board to ensure proper adhesive to the top layer of insulation.

4. University of Missouri will not accept any un-adhered or loose insulation boards. After installation of the insulation board, should the insulation board not be properly adhered to the proceeding layer, the Installer will be held responsible for replacing the unacceptable installed insulation board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed insulation board will be at no cost to the Owner.

3.05 COVER BOARD INSTALLATION

A. General Criteria:
1. Fasten the specified cover board according to requirements of the roofing system manufacturer's written instructions.
2. Wet, broken, warped, or bent insulation boards are not acceptable. Any damaged cover boards are to be replaced with new cover boards.
3. Consult roofing system manufacturer on current acceptable substrates and rates for applying the low-rise urethane adhesives. The surface of substrate shall be inspected prior to installation of the cover board.
4. The substrate surface must be free of debris, dirt, grease, oil, ice, snow, frost, standing water, and must be 100% completely dry prior to the installation of the specified cover board or during the time of applying the dual component polyurethane adhesive and the spray- in-place foam.
5. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.
6. Install a single layer of cover board over the specified polyisocyanurate insulation.
7. The cover board sheeting shall be laid transverse to the top layer of the insulation board, with joints staggered at least 1/3 of overall length from those of the insulation layer.
8. The cover board shall be neatly cut to fit within 1/4 inch (6 mm) of nailers, penetrations, and projections.
9. Fill all gaps exceeding 1/4 inch (6 mm) with spray-in-place foam insulation.
10. Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.
11. Do not install more cover board than can be covered with the specified roofing system by the end of the day, or onset of inclement weather.

B. Attachment of Cover Board:
1. Apply the dual component polyurethane adhesive at the manufacturer's written instructions for adhering the specified cover board to the specified polyisocyanurate insulation.
2. The dual component polyurethane adhesive shall be dispensed in 12 inches on center bands in the field of the roof. In the corners and perimeters of the roof area, the number of ribbons per unit width or area over the field rate by:
   a. 70% in the perimeter - resulting in a maximum on center spacing equal to 60% of the field spacing (field ribbons at 12" on center, the perimeter spacing shall be 7" on center).
   b. 160% in the corner - resulting in a maximum on center spacing equal to 40% of the field spacing (field ribbons at 12" on center, the corner spacing shall be 4.8" on center.).
3. After allowing low rise urethane foam to rise ¾ inch to 1 inch, lay cover board in to position and walk into place. After walking into place, the cover board shall be pressed firmly into the adhesive layer with using an approved weighted roller by frequent rolling in two or more directions. Contractor shall also use "weights" to ensure the cover board is completely adhered to the top layer of the polyisocyanurate insulation. There shall not be any elevation change or raise of the corners or sides of the cover board as compared to the sides of the adjacent cover board sides. The cover board shall lay flat or level as compared to the edges of the adjacent cover board.
4. After installation of the cover board, should the cover board have more than 1/8-inch deviation or rise to the adjacent cover board, the Installer will held responsible for replacing the unacceptable installed cover board. All cost related, i.e. replacement of specified insulation, cover board, membrane, etc., to the replacement of the unacceptable installed cover board will be at no cost to the Owner. The replacement of the unacceptable cover boards shall be completed prior to the installation of the membrane.

3.06 EPDM MEMBRANE INSTALLATION

A. General: Install in strict accordance with roofing system manufacturer's latest published requirements, instructions, specifications, details, and approved shop drawings.

B. Install EPDM membrane per roofing system manufacturer's requirements in order to obtain roofing system manufacturer Twenty (20)-year Full System (NDL) warranty.

C. Install in strict accordance with roofing system manufacturer's latest published instructions.

D. Roofing system manufacturer's technical representative must be on the jobsite during the first initial day of installation of the roofing system.

E. Coordinate with Owner representative to shut down air-intake equipment in the vicinity of the Work. Roofing Contractor shall cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or activate smoke detectors located in the mechanical ductwork.

F. The EPDM membrane is to be adhered with roofing system manufacturer's approved adhesive. Membrane overlaps shall be shingled with the flow of water where possible. Tacking of the EPDM membrane side laps for purposes of temporary restraint during installation is not permitted.

G. Layout: Layout roofing membrane to minimize number of seams. Avoid seams through roof primary roof drain sumps or through secondary roof drain locations.
   1. Position membrane straight and square to building.

3.08 ADHERED EPDM ROOFING MEMBRANE INSTALLATION

A. Install EPDM sheet over area to receive roofing according to roofing system manufacturer's written instructions. Adhere membrane on all roof areas using largest sheet practical for job conditions. Avoid wrinkling or stretching the membrane. Unroll sheet and allow relaxing for a minimum of 30 minutes.

B. Start installation of roofing membrane in presence of membrane roofing system manufacturer's technical personnel.

C. Accurately align roofing membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps.

D. Bonding Adhesive: Apply bonding adhesive to substrate and underside of roofing membrane at rate required by manufacturer and allow to partially dry before installing roofing membrane. Do not apply bonding adhesive to splice area of roofing membrane.

E. Mechanically fasten roofing membrane securely at terminations, penetrations, angle changes and perimeter of roofing.

F. Apply roofing membrane with side laps shingled with slope of roof deck where possible.

G. Seams: Clean seam areas, overlap roofing membrane, tape side and end laps of roofing membrane according to manufacturer's written instructions to ensure a watertight seam installation.
   1. Test lap edges to verify seam strength.
   2. Apply lap sealant to seal all edges of flashing membrane and T-Patches.
   3. Repair tears, voids, and lapped seams in roofing membrane that do not meet requirements.

H. Spread sealant or mastic bed over deck drain flange at deck drains and securely seal roofing membrane in place with clamping ring.

I. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

J. Mechanically fasten membrane securely at all vertical to horizontal transitions, at points of terminations, and at the perimeter of roof in order to meet Manufacturer's Technical Department's requirements for properly securing the specified roofing system.

K. Spread sealant bed over deck drain flange at deck drains and securely seal roofing membrane in place with drain clamping ring.

L. Securement Around Perimeter and Rooftop Penetrations
   1. Around all perimeters, at the base of walls, drains, curbs, vent pipes, or any other roof penetrations, roofing system manufacturer's fasteners and termination bar or discs shall be installed. Fasteners, disc, and termination bar shall be installed accord to the roofing system manufacturer's instructions. Fasteners shall be installed using the fastener roofing system manufacturer's recommended fastening tools with depth locators.
   2. EPDM membrane flashings shall extend a minimum of 3 inches past the securement bar or plates and shall be adhered onto the EPDM membrane.

M. Field-seam according to Section 3.07, "Seam Installation."

N. Excessive Repairs: Excessive repairs to membrane, or to membrane seams are not permitted. Remove and replace membrane in entire area affected, and as directed by University of Missouri representative.

Note:
1. **The Installer shall employ all means necessary to assure that the installation of all field and flashing membranes are free of loose (un-adhered) areas and wrinkles. The Owner's Representative(s) reserves the right to require that all preventable loose and /or wrinkled field membrane and membrane flashings to be repaired to the satisfaction of the Owner's Representative. In the event that the Installer determines that loose and /or wrinkled membrane or membrane flashing is unavoidable in a specific area(s), the onsite Owner's Representative must be notified immediately for a determination of acceptability.**
2. **Contractor is to ensure during the time of installing the membrane field and membrane flashing sheet, there are no entrapment of debris under the membrane.**

3.09 MEMBRANE FLASHING INSTALLATION

A. General: All membrane flashings shall be installed concurrently with the roof membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Approval shall only be for specific locations on specific dates. Membrane flashing shall be adhered to compatible, dry, smooth, and solvent-resistant surfaces.

B. Manufacturers required adhesive to be used to adhere the EPDM membrane flashing to acceptable wall and equipment curb substrates. No bitumen shall be in contact with the EPDM membrane. If bitumen exists **install Cav Grip primer or equal over existing bitumen**.

C. Manufacturers Adhesive for Membrane Flashings:
   1. Over the properly installed and prepared flashing substrate, the adhesive shall be applied according to instructions found on the Product Data Sheet. The adhesive shall be applied in smooth, even coats with no gaps, globs, or similar inconsistencies. Only an area that can be completely covered in the same day's operations shall be flashed. The bonded sheet shall be pressed firmly in place with a hand roller.
   2. No adhesive shall be applied in seam areas that are to be adhered. All panels of membrane shall be applied in the same manner, overlapping the edges of the panels as required by techniques.
   3. All flashing membranes shall be consistently adhered to substrates. All interior and exterior corners and miters shall be cut and corners applied. Where applicable, roofing system manufacturer's pre-fabricated corners shall be used.
   4. The membrane flashing shall be completely adhered to the substrate with no unadhered areas.

D. All flashings shall extend a minimum of 8 inches (0.2 m) above roofing level unless otherwise accepted in writing by the Owner's Representative and roofing system manufacturer's technical department.

E. Vertical Surfaces Taller than 24 Inches (760 mm): Where vertical distance of flashing membrane exceeds 24 inches in height, in addition to terminations at base flashings, mechanically fasten fully adhered flashing membrane with additional termination bar installed horizontally at not greater than 30 inches (760 mm) on center vertically to top of flashing membrane.
   1. Install membrane cover strip of standard sheet at last 8 inch (0.23 m) in width of same material, type, reinforcement.
   2. Install baton bar and cover strip using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars and installation of coversheet for area under construction.

F. Flashing Termination: Terminate all vertical flashing membrane surfaces horizontally and vertically with mechanically fastened termination bars and sheet metal flashings/counterflashings. Mechanically fasten flashing membrane securely using mechanical fasteners specifically designed and sized for fastening specified membrane flashing and termination bars into substrate.
   1. Fasten baton bar/termination bar with fasteners not greater than 6 inches (152 mm) on center for length of bar, with fasteners within 3 inches (76 mm) of ends, or closer as required by manufacturer. Fasten into nailer or other substantial backing located behind point of base or curb termination
   2. Uniformly fasten, seat, and compress termination bar into top of fully adhered flashing membrane.
   3. Install sealants continuously across surface of termination, including terminations covered with sheet metal flashing and counterflashing.
   4. Install termination bars using mechanical fasteners as roofing progresses. Do not proceed with roofing without full attachment of termination bars for area under construction.
   5. At termination of vertical and wall sheet flashings not under copings, install termination bar at vertical and wall membrane flashings with metal surface mounted one- or two- piece counterflashing assemblies, as is required for condition. Install as indicated in Drawings, or if not shown in Drawings or otherwise indicated, as required to produce continuous closure of membrane with termination bar and metal flashing, regardless of abutting materials overlap.
   6. Refer to Division 07 Section "Sheet Metal Flashing and Trim" for requirements for counterflashings and other metal fabrications.

G. Primary Roof Drains: Install membrane into sump and extend into line of depressed sump at roof drain. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside sump in direction of water flow and drainage; backwater laps and seams are not permitted in or around sumps or drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with water cut off mastic in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   3. Install membrane to comply with other requirements indicated for roofing membrane.
   4. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
   5. Securely tighten clamping rings to provide constant pressure on water cut off mastic.
   6. Install new metal strainers to complete primary roof drains.

H. Secondary Overflow Roof Drains: Install membrane to extend into line of roof drain at roof surface. Install membrane free of wrinkles or surface irregularities. Shingle seams around and outside drain in direction of water flow and drainage; backwater laps and seams are not permitted in roof membrane around or under drains.
   1. Cut membrane to fit roof drain piping inlet; do not allow membrane to restrict opening size.
   2. Do not set secondary roof drain body below roof surface. **Do not construct roof sumps at secondary overflow roof drains.**
   3. Spread sealant over roof drain deck flange and securely seal roofing membrane in place with clamping ring. Seal between membrane and drain base with sealant in accordance with manufacturer's recommendations.
      a. Apply sealant in strict compliance with manufacturer's requirements.
   4. Install membrane to comply with other requirements indicated for roofing membrane.
   5. Remove and replace any steel fasteners and washers in clamping ring. Install clamping ring using stainless steel fasteners and washers.
   6. Securely tighten clamping rings to provide constant pressure on sealant.
   7. Install new metal strainers to complete secondary roof drains.

I. High- or Elevated- Temperature Vent Flashings: Install prefabricated or field-formed membrane flashings to comply with manufacturer's written requirements and recommendations and as indicated. Field form flashings from sheet flashing membrane designed for and suited to condition.
   1. Install stainless steel metal base fabricated metal flashing sleeves prior to installing flashings.
   2. Install fire-resistant mineral-wool-fiber insulation between metal flashing sleeve and high- or elevated-temperature outside vent surfaces.
   3. Select proper diameter prefabricated flashing to properly fit penetration and roof conditions.

4. Secure deck membrane around metal base sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments. Secure top of membrane flashing to top of sleeve penetration.
5. Secure deck membrane around sleeve penetration to comply with manufacturer's requirements. Secure close to penetration so prefabricated flashing will cover attachments.
6. Install flashings to produce a minimum of 8-inch (200 mm) flashing height.
7. Lap base of flashings atop roof membrane at least 4 inches (100 mm). Hot-air seams at roofing membrane lap.
8. Place prefabricated flashing in place tight to horizontal deck membrane; ensure flange lays flat to deck membrane.
9. base of prefabricated flashing continuously to deck membrane.
10. Where required by manufacturer, heat upper part of prefabricated flashing to temperature required by manufacturer; avoid overheating.
11. Clamp top of flashing at vent with stainless steel clamping ring.
12. Install stainless steel metal umbrella cap flashing, holding close to membrane base flashing.

J. Only an area, which can be completely covered in the same day's operations, shall be flashed.

K. Daily test lap edges with probe to verify seam continuity of all membrane flashings.

L. Complete all membrane flashing and metal details on a daily basis. No temporary flashings shall be allowed with the prior written approval of the Owner's Representative and roofing system manufacturer. If any water is allowed to enter under the completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

M. **USE CAUTION TO ENSURE ADHESIVE FUMES ARE NOT DRAWN INTO THE BUILDING.**

N. Installer is to ensure there are no wrinkles and "fish-mouths" in the membrane flashing and in the overlap seams.

O. Excessive Repairs: Excessive repairs to seams or flashings are not permitted. Remove and replace membrane, and if required the roofing components, in entire area affected as directed by University of Missouri representative.

3.10 PERIMETER AND METAL BASE FLASHINGS

A. General: All flashings shall be installed concurrently with the roofing membrane as the job progresses. No temporary flashings shall be allowed without the prior written approval of the Owner's Representative and the roofing system manufacturer. Acceptance shall only be for specific locations on specific dates. If any water is allowed to enter under the newly completed roofing due to incomplete flashings, the affected area shall be removed and replaced at the Installer's expense.

B. Sheet metal shall be installed to provide adequate resistance to bending and allow for normal thermal expansion and contraction.

C. All Kynar coated perimeter metal edging shall be fabricated and install per current SMACNA requirements.

D. Secure the Kynar coated metal over the field membrane and the "Multi-Purpose Sealing Tape." Fastened the sheet metal with approved stainless-steel nails or other acceptable fastener. Fasteners shall be fastened 4 inches on center and staggered 4 inches on center.

E. An 8 inch minimum wide strip of the 60 mil membrane flashing shall be adhered to the 4 inch wide flange of the sheet metal and to the field membrane. Check all coverstrip with a rounded screwdriver. Re-work any inconsistencies.

F. Install 5" x 5" 24 ga. Kynar coated gutter box detail on each end of the canopies. Secure to wood nailer 6" o.c. in two rows staggered.

3.11 WALKWAY INSTALLATION

A. Installer is to install walkway in the areas as indicated on roof plans. Installer is responsible for verification of the total linear footage of the required walkway installation. The minimum length of the walkway, installed at any one location, shall be four (4') feet.

B. Install the walkway to roofing system manufacturer's written instructions.
   1. Clean all dirt and debris from the deck membrane in areas where the walkway will be installed.
   2. Important: Check all deck membrane s with a rounded screwdriver prior to installation of walkway. Re-adhere any inconsistencies before walkway installation.
   3. Install walkway in the indicated roof areas.
   4. Installer should adhere the walkway to the field membrane.

3.12 PROTECTION PAD INSTALLATION

A. General: Install protection pad under exposed wood blocking and under equipment supports.

B. The installation of the protection pad:
   1. Clean all dirt and debris from the deck membrane in areas where the protection pad will be installed.
   2. Important: In areas where protection pads are to be installed, Installer is to probe all field membrane seams laps with a rounded screwdriver prior to installation of the protection pad. Re-adhere any inconsistencies before protection pad installation.
   3. Cut the protection pad 4 inches (4") wider than the dimensions of the wood blocking or equipment and piping support.
   4. Adhere the entire perimeters of the protection pad to the field membrane sheet.
   5. Probe all protection pad seam s with a rounded screwdriver. Re-adhere any inconsistencies found in the protection pad seams.
   6. Center the wood blocking or equipment or pipe support over the protection pad.

3.13 HIGHLY VIISBLE MEMBRANE INSTALLATION

A. General Requirements: Provide and install a highly visible membrane product; designed to draw attention to unprotected roof perimeters and potentially hazardous areas that do not comply with University of Missouri safety guidelines.

B. Installation of yellow, 4 inch wide, cover strip:
   1. Installer and University of Missouri Representative shall verify unprotected roof perimeters and potentially hazardous areas on the referenced project's roof area(s).
   2. The yellow cover strip shall be installed not less than 6 feet 6 inches (2 meters) from unprotected roof perimeters and potentially hazardous areas.
   3. Before installing the yellow membrane 4 inch wide cover strip, the Installer shall have Roof system manufacturer Technical Representative to verify permanence of all deck membrane with a rounded screwdriver. Repair any inconsistencies of the membrane seams before yellow membrane installation.
   4. The roofing membrane shall be properly cleaned prior to install the "yellow membrane 4 inch wide cover strip." Failure to properly clean the membrane will result in less than satisfactory adhesion of the yellow membrane.
   5. Peel and stick the yellow cover strip to installed and inspected roofing membrane.
   6. Installer shall take care to avoid trapping air under the yellow membrane.
   7. After adhering the yellow cover strip, the Installer shall verify permanence of all yellow cover strip. Repair any inconsistencies of the yellow cover strip installation.

3.14 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the Installer shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner's representative prior to starting the roofing project. Proceeding with the roofing project indicates the Installer's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the Installer shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the Installer's expense.

C. The Installer shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation in order to maintain a 100% watertight and to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs during the installation of the roofing system, the Installer shall install temporary watertight and hermetic terminations across the installed Roof system manufacturer roofing system. The Roof system manufacturer roofing system shall be 100% impermeable in order to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the Installer shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly-completed Roof system manufacturer Roofing System, the affected roof area(s) shall be removed and replaced at the Installer's expense.

3.15 FIELD QUALITY CONTROL

A. Quality Control of Seams:
   1. The Installer shall designate a Quality Control Supervisor to daily check all seams for continuity by using a rounded screwdriver.
   2. On-site evaluation of completed seams shall be made by the Installer at locations as directed by the Owner's Representative or roofing system manufacturer's technical representative.
   3. All membrane seams, both field and flashings, shall be adhered and probed on a daily basis. NO EXCEPTIONS.

B. Roofing system manufacturer's technical representative: Installer shall arrange to have the system manufacturer's technical representative on site of the first day of installation of the roofing system. The Technical Representative shall note:
   1. Conduct a site inspection on the first day of production.
   4. Communicate with the University of Missouri project manager each inspection, i.e. meet with the University of Missouri designated project manager before entering work area.
   5. Note all defects noted non-compliance with the specifications or the recommendations of the roof system manufacturer should be itemized in a punch list. These items must be corrected immediately by the contractor to the satisfaction of the University of Missouri representative and Roof system manufacturer.
   6. Ensure the roofing contractor has received a copy of each In-Progress Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the In-Progress Inspection Report.

C. Final Roof Inspection: Arrange for roofing system manufacturer's technical representative to inspect roofing installation on completion of the roofing project.
   1. All defects noted non-compliance with the roofing specifications and details or the recommendations of roofing system manufacturer representative should be itemized in a punch list. These items must be corrected immediately by the Installer to the satisfaction of the Owner's Representative and roofing system manufacturer technical representative.
   2. Ensure the roofing contractor has received a copy of Final Inspection Report within two days of the inspection. The roofing contractor is to forward the University of Missouri On-site Representative a copy of the Final Inspection Report.

3.16 PROTECTING AND CLEANING

A. Protect sheet membrane roofing from, not limited to the following items: dirt, grease, rust stains, roofing asphalt, scuff marks, abrasions, adhesive spills, sealant spills, membrane cuts, and any physical damages to the installed Roof system manufacturer roofing system during the construction period.

B. Upon completion of the Work, dispose of, away from the Site, all debris, trash, containers, fasteners, roofing remnants and scraps.

C. **The completed "Roof" shall be washed with water and University of Missouri approved cleaner to remove all dirt, stains, adhesive and sealant spills, and any residue from roof membrane.**

3.17 ACCEPTANCE

A. Prior to demobilization from the site, the roofing system manufacturer's project manager, University of Missouri's representative(s), roofing system manufacturer's designated field technical representative and Installer's project manager, production crew superintendent, and project's roofing foreman shall review the completed work.

B. Installer and University of Missouri representative shall inspect the completed roofing system for any uneven cover boards, loose or improperly attached insulation or cover boards, ponding of water, un-adhered membrane and membrane flashing, membrane damage, dirt, rust stains, roofing asphalt, grease, scuff marks, cuts, abrasions, adhesive spills, and sealant spills.

C. All defects noted noncompliance with the project's bid documents will be itemized in a punch list. Any non-compliance item shall be removed and/or repaired immediately by the Installer to the satisfaction of the University of Missouri representative, and to roofing system manufacturer.

D. The noted deficiencies shall be repaired or replaced to a condition free of damage and deterioration at the time of Substantial Completion Acceptance by University of Missouri's representative, and / or to accordance of the University of Missouri project contract documents.

E. All warranties as required for the project of this specification shall be submitted for approval prior to final payment by University of Missouri.

END OF SECTION 07 5400.6

SECTION 07 5900 – PREPARATION OF RE-ROOFING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Fastener Pullout Testing: Provide fastener pullout testing in each roof area for each type of roof deck in accordance with SPRI – Standard Pullout Test Procedure.

B. The removal of the existing roofing system down to the existing roof's substrate, i.e. concrete or steel decking.

C. The coordination with the electrical / mechanical contractor for the removal of any unused equipment / penetrations or deck accessories prior to initial roof replacement.

D. The coordination with the electrical / mechanical contractor for raising any rooftop appurtenances, i.e. refrigeration piping supports, where it is required to achieve minimum recommended heights and clearances for the new roofing system.

E. Replacement of any deteriorated steel decking.

F. Application of a rust inhibitor coating to rusting steel decking.

G. The coordination with the electrical contractor for the lightning protection system.

H. Temporary roofing tie-ins and water stops.

I. Quality Control

1.02 DEFINITIONS

A. Division 1 – General Requirements

B. Section 06 1000 – Carpentry Work

C. Section 07 5400 – Thermoplastic Membrane Roofing System

D. Section 07 6000 – Flashing and Sheet Metal: Requirements for sheet metal components

1.03 UNIT PRICE – MEASUREMENT AND PAYMENT

A. Replacement of damaged or deteriorated steel decking:
   1. Basis for Measurement: By square foot
   2. Basis of Payment: Replace Metal Deck: Replace any deck which is damaged or has scaling corrosion with new, mechanically attached steel decking of the same type, thickness, and cross section to match existing if damaged or corroded area covers an area larger than 2 square feet.

B. The cleaning and coating of the steel decking having rust or corrosion:
   1. Basis for Measurement: By square foot
   2. Basis of Payment: Prime Metal Deck: Power clean the metal decking with rotating steel brush roller or approved means of removing rust from the steel decking. Apply to the metal decking an approved rust inhibiting primer. Allow to primer to dry prior to proceeding with roofing installation.

1.04 REFERENCES

A. Single Ply Roofing Institute (SPRI): Standard Pullout Test Procedure.

1.05 SUBMITTALS

A. Submit under provisions Submittals.

B. Product List: Submit list of proposed Products and manufacturers, including all items specified in Part 2 – Products or otherwise required by the Work.

C. Product Data: Provide date for each required product indicating characteristics, performance criteria, mixing and preparation requirements, limitations, and Material Safety Data Sheets (MSDS).

D. Fastener Pullout Testing: Provide fastener pullout testing in each roof area for each type of roof deck in accordance with SPRI – Standard Pullout Test Procedure.

E. Demolition and Removal Procedures and Schedule: Outline all work tasks and schedule them, showing clearly when each area is to be performed. Coordinate with Owner and other contractors to avoid impact to Owner's occupancy.

F. Project Record Documents: Indicate extent of work installed, actual locations of appurtenances and items that will be hidden from view at completion of work.

G. Debris Removal Certification: Provide certified documentation indicated all project related debris has been disposal in an approved and legal landfill.

1.06 PRE-INSTALLATION CONFERENCE

A. Convene 10 days prior to commencing work of this Section.

1.07 COORDINATION AND PROTECTION

A. Provide, erect, and maintain temporary barriers and security devices.

B. Roofing contractor is to verify all field measurements for the referenced roof areas.

C. Do not close or obstruct roadways or sidewalks without permits.

D. Conduct demolition to minimize interference with adjacent roofing and siding, roof mounted equipment, and roof deck and structure to remain.

E. When building exceeds one-story or fifteen feet in height, or when debris must be discharged adjacent to windows, pedestrian, or vehicular traffic, or where the conditions dictate extra precautions, provide enclosed trash chute from rooftop to trash containers.

F. Conduct operations with minimum interference to public or private thoroughfares. Always maintain required egress (exit way) and access.

G. Provide protective measures, including all OSHA and Owner safety requirements, in and around the work area, and in all and around the building prior to beginning the project.

H. At any time, no open flames, torches, or any type of equipment which creates an "open flame" are allowed on Owner's properties.

I. Roofing contractor shall not refuel any roofing equipment or electrical generators on the roof. All refueling of roofing equipment and generators shall be accomplished on the ground and a minimum of 25 feet from the side of any materials and the side of each building. Provide appropriate fire extinguishers in the designated refueling area. At the end of the work day, all motorized (gasoline, propane, natural gas, or diesel powered engines) are to be removed from the roof at the end of the work day.

J. All terrain vehicles, i.e. "four-wheelers," or any motorized rideable roofing equipment will not be allowed for facilitating any segment of the Owner roofing project. This includes any type of ATVs, rideable roofing carts, and lawn tractors.

K. Schedule and coordinate all mechanical and electrical service interruptions with Owner's Representative and designated on-site personnel.

L. 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 Owner Representative.

M. Restrictions:
   1. Comply with Owner's General Requirements on use of site.
   2. Firearms, Smoking, and Tobacco products are prohibited on all roof areas and on the campus grounds.
   3. No food products are allowed on the Owner facility grounds and on the roof at any time.
   4. Water is the only liquid allowed on the roof at any time. Provide approved individual and disposable water drinking cups for employees. After use, the disposable drinking cups are to be disposed in approved trash container. Do not dispose drinking cup debris in the roofing debris trash container. Drinking cups debris is to be removed from the facility each day.
   5. Maintain facility and all utility services in a functional condition.
   6. Provide and maintain sanitary facilities for employees. Provide sanitary soaps for employees.

PART 2 PRODUCTS

2.01 DECK AND SUPPORT MATERIALS

A. Steel Deck: Install new metal decking / panel(s) in areas of deteriorated decking.

B. All New Steel Decks: Align top plane to the existing decking.

C. Curbs and Support Members: Wood or metal curbs and support items as indicated and required for existing conditions.

D. Miscellaneous Metals: Conform to existing Products and installations.

2.02 TESTS

A. Roofing Contractor shall comply with Single Ply Roofing Institute (SPRI) "Standard Pullout Test Procedure" for providing fastener pullout testing as indicated in the provision of Section 07540. Testing shall be performed by using certified equipment and personnel.

PART 3 EXECUTIONS

3.01 EXAMINATION AND PREPARATION

A. Contractor shall have a full understand of the Work and the existing conditions of the Project in order to complete the Work as outlined in the bid documents. Any discrepancies found between the Drawings and Specifications and Project site conditions, or any errors or omissions in the Drawings or Specifications, the Contractor shall report in written, a minimum of five (5) days before bid submission date, to the Owner Representative describing the

discrepancies in the drawings and /or specifications, problems with the substrate slopes, physical latent conditions or any condition that may affect the installation of the Work. Neglect or failure to report any errors, physical latent conditions, or discrepancies in the Drawings and Specifications after submitting the Roofing Contractor's proposal will be the burden and financial responsibility of the Roofing Contractor to correct any problems, conflicts or lack of definition of Work in order to meet the Contract Agreement between Owner and the Roofing Contractor.

B. Roofing Contractor will be responsible for scheduling a certified testing company for conducting fastener pullout testing. Fastener pullout testing shall be performed by using certified equipment and personnel. Fastener pullout testing shall comply with Single Ply Roofing Institute (SPRI) "Standard Pullout Test Procedure." Copy of the fastener pullout test results shall be submitted to Owner's Representative and to the roofing manufacturer's technical department for recommendations for the type of fastener to be used and for the appropriate fastening pattern for the membrane and insulation fasteners and securement plates or adhesive.

C. Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including exterior and interior finish surfaces that might be misconstrued as having been damaged by roof replacement operations. Submit to the Owner Representative before starting any Work at the Owner Facility.

D. Contractor must communicate the proposed starting date for reroofing the referenced roof areas to Owner. Contractor must allow Owner time to have the inside protection system installed. In the areas where interior protection is required, the interior protection system must be in place prior to starting the roofing in "that" roof area.

E. Contractors shall remove existing securement fasteners from the existing roofing system by mechanically backing out the securement fasteners from the steel decking. Breaking or snapping off the fasteners will not be permit.

F. Prevent movement or settlement of adjacent structures and paving. Provide bracing and shoring.

G. Emergency Equipment and Materials: Maintain on site equipment and materials necessary to apply emergency temporary edge seal in event of sudden storms or inclement weather. If inclement weather occurs while a temporary water stop is in place, the contractor shall provide the labor and materials necessary to monitor the conditions to maintain a 100% watertight condition.

H. Arrange work sequence to avoid use of newly constructed Roofing for storage, walking surface, and equipment movement. Where such access is absolutely required, the contractor shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent areas. A suitable temporary protective surface shall be provided for all Roofing areas which receive traffic during construction. Any damage which occurs to the Roofing membrane and/or system is to be brought to the attention of the Owner's Representative and membrane manufacturer. All damage is to be repaired or replaced according to the membrane manufacturer's recommendations. The party responsible for damage shall bear the cost of repairs.

I. Protect existing landscaping materials, appurtenances, structures, paving, roofing and siding, roof mounted equipment, roof deck (new and existing) and structures that are not to be demolished.

J. Examine existing mechanical and electrical items to determine conditions and operability.

K. The roofing contractor is to verify the drainage piping is properly connected, free flowing, and sealed to the new roof drain bowls. Additionally, roofing contractor is to verify all roof drains components are in serviceable and functional condition and are clear of debris. Roofing contractor is to replace all existing drain covers with new metal drain strainer covers. The new drain covers are to be painted "Owner Blue," (Pantone 280).

L. Prior to the starting any Work, any inoperable items or unsafe conditions found in the referenced work area(s), the roofing contractor must immediately notify Owner Representative verbal and in writing of the inoperable item(s) or of the unsafe conditions.

M. Beginning any Work indicates acceptance of existing conditions, including operability of plumbing, mechanical and electrical items / equipment located in the referenced work area(s).

3.02 EXECUTION

A. Coordinate all aspects of demolition work with Owner's Representative and with all other Trades.

B. Roofing Contractor is to provide safety protective measures inside, outside, and around the building by following all OSHA and Owner safety requirements. If inside protection measures are being provided by Owner's employees or by a contracted interior protection company, the roofing contractor shall coordinate all roofing activities which may affect the activities of installing or removal of the interior protection system.

C. Prior to demolition work, verify all roof drains, soil pipes, flutes, roof equipment, steel decking and associated members, piping, electrical conduit, and other roof top equipment are secured to the building structure. Coordinate removal and securement of all unsecured roof penetrations and equipment with the electrical / mechanical contractor prior to the start of the roofing demolition.

D. Broom clean, using power assisted apparatus, all loose gravel on designated areas.

E. Owner will occupy portions of building immediately below roof replacement area. Conduct roof replacement so Owner's operations will not be disrupted. Provide Owner with not less than 72 hours' notice of activities that may affect Owner's operations.
   1. Coordinate with Owner to shut down all air-intake equipment in the vicinity of the Work. Cover air-intake louvers before proceeding with reroofing work that could affect indoor air quality or could activate smoke detection equipment in the ductwork or equipment.
   2. Before working over structurally impaired areas of deck, notify Owner to evacuate occupants from below the affected area. Verify that occupants below the work area have been evacuated prior to proceeding with work over the impaired deck area.

F. Remove and dispose all designated, obsolete-roof penetrations and mechanical equipment as identified by the Owner's Representative in an orderly and careful manner. Contractor shall verify and coordinate all roof penetrations and mechanical removal with the Owner's Representative. Contractor shall coordinate with Owner's Representative and perform all necessary service disconnects.

G. All piping and electrical supports shall be adjusted to accommodate the new height or thickness of the specified roofing system. All lifting and lowering work required for the refrigeration piping supports shall be completed by a Owner approved, licensed mechanical contractor. All roofing work associated with the refrigeration piping supports shall be closely coordinated by the roofing contractor with the mechanical contractor.

H. Remove and replace any deteriorated metal decking. Any metal deck replacement will match existing metal decking type and gauge. Any steel deck replacement will be based upon per unit cost established in the contractor's bid form and document replacements.

I. Remove and dispose of all existing wood blocking, used for piping and equipment supports.

J. Remove and dispose of existing roof related sheet metal, i.e. metal coping, perimeter metal edging, and metal counter-flashing, unless a particular component is identified on the project drawings for reuse of the existing sheet metal.

K. Evenly cut edges of existing materials that are to be expanded, replaced, or modified. Completely remove materials from areas to be replaced or repaired each day.

L. Cease operations and notify Owner immediately if adjacent structures or materials appear to be endangered. Do not resume operations until corrective measures have been taken.

M. Remove materials to be re-installed or retained in a manner to prevent damage. Store and protect.

N. Remove roofing, insulation, flashing, and damaged nailers and deck.

O. Perimeter wood blocking shall be left in place for re-use for attachment of the perimeter metal edging or metal coping. Contractor shall provide a unit cost for the replace of the perimeter wood blocking should owner's representative finds the perimeter wood blocking to be damaged or deteriorated. Any perimeter wood blocking replacement will be based upon per unit cost established in the project's bid form and document replacements.

P. Contractor shall provide, where required to match the new insulation and Dens Deck thickness, additional wood blocking at the perimeter metal edge or expansions joints. All Existing and New Wood Nailers shall be anchored to resist a minimum force of 300 pounds per lineal foot (4,500 Newton / lineal meter) in any direction. Individual nailer lengths shall not be less than 3 feet (0.9 meter) long. Nailer fastener spacing shall be at 12 inches (0.3 m) on center or 16 inches (0.4 m) on center if necessary to match the structural framing. Fasteners shall be staggered 1/3 the nailer width and installed within 6 inches (0.15 m) of each end. Two fasteners shall be installed at ends of nailer lengths. All wood nailer attachment shall meet the current Factory Mutual Loss Prevention Data Sheet 1-49. Refer to Section 06 1000 for acceptable fasteners for wood product attachments.

Q. Except when instructed otherwise, immediately remove demolished material from site as work progresses. There shall not be any stock piling of roof removal materials on any roof section. All roofing removal materials shall be removed from the roof each day. All roofing debris is to be disposed in a state approved landfill. At the end of the reroofing project, documentation of each trash bin disposal shall be submitted to the Owner's Representative for verification of proper disposal.

R. Remove and properly dispose of contaminated, vermin infested, or dangerous materials encountered.

S. Do not burn or bury materials on site.

T. Clean up debris daily, both on the roof and around the facility grounds. Leave site in clean condition each day.

3.03 STEEL DECK AND SUPPORT REPLACEMENT AND REPAIR

A. In areas of deteriorated steel decking, the roofing contractor shall install new steel deck and accessories.

B. Any steel deck replacement will be based upon per unit cost established in the contractor's bid form and per the required documentation for replacements.

C. Remove deteriorated decking by cutting in straight lines. Coordinate cuts with structural supports to ensure proper installation of replacement materials.

D. Where necessary, grind away existing welds and protrusions. Provide smooth and even surface for new deck on existing structural framing.

E. Install new steel decking with all edges properly supported on structural members or adjacent decking. Secure with approved fasteners, spaced per local building code requirements.

3.04 MODIFICATIONS TO EXISTING MECHANICAL AND ELECTRICAL ITEMS

A. When required to achieve recommended clearances, minimum curb heights, or other modifications, disconnect, modify, and reconnect mechanical and electrical services, contractor shall coordinate all work with the and licensed electrical / mechanical contractor.

B. Do not disrupt any services unless specifically approved by Owner's Representative and on-site personnel.

C. Restore services and verify proper operational conditions to satisfaction of Owner's Representative.

3.05 MODIFICATIONS TO EXISTING ROOF DRAINS AND PLUMBING

A. Examine areas to receive new roofing system; prior to starting reroofing project. Roofing contractor shall note the existing height of the existing roof drain bowls in regard to the new roofing insulation thickness.

B. Where required to achieve a roof drain bowl height to match the total insulation thickness, the roofing contractor shall be responsible for raising or lowering the drain bowl and / or associated piping to achieve a smooth transition from the flat stock / tapered insulation to the roof's drain bowl. Any modifications, disconnect, modify, and reconnecting the roof drain / plumbing services, contractor shall coordinate all work with Owner approved licensed mechanical contractor.

C. Do not disrupt any services unless specifically approved by Owner Representative.

D. Restore services and verify proper operational conditions to satisfaction of Owner Representative.

3.06 TEMPORARY ROOFING TERMINATIONS AND PROTECTION

A. Prior to starting roofing project, the roofing contractor shall inspect the facility existing roof area(s) associated with the contract roofing project for any defects which could cause water or moisture vapor entries into the building during the roofing application. Any defects or concerns shall be address in writing to the Owner representative prior to starting the roofing project. Proceeding with the roofing project indicates the roofing contractor's acceptance of the existing facility conditions.

B. For existing roof areas where access is absolutely required for the installation of the new roofing system on another roof area, the roofing contractor shall provide all necessary protection and barriers to segregate the work area and to prevent damage to adjacent roof areas. A suitable temporary protective surface shall be provided for all roof areas which receive traffic during construction of the new roofing system. During the roofing project, any damage which occurs to the new or existing roofing membrane and/or system shall be removed and replaced at the contractor's expense.

C. The roofing contractor shall provide the labor and materials required to maintain a watertight and impermeable condition at all times on the roof areas as referenced in the project's contract documents. All membrane and metal flashings shall be installed concurrently with the field membrane installation to maintain a 100% watertight condition as the work progresses each day. For freezer applications, all equipment and piping flashings, perimeter flashings, i.e. metal edge and coping, must be 100% completed and must be 100% airtight to prevent any air/water vapor infiltration into the completed roofing system each day.

D. When an interruption or a postponement in the roofing work occurs in the installation of the roofing system, the roofing contractor shall install temporary watertight and hermetic terminations across the installed roofing system. The roofing system shall be 100% impermeable to prevent water and air/water vapor infiltration into or under the new roofing system. When work resumes, any contaminated membrane shall be removed from the work area and disposed off site. None of these materials shall be reused in the new work.

E. During inclement weather or during a postponement in the roofing work occurs while a temporary water stops or terminations are in place, the contractor shall provide the labor and materials to monitor and ensure the temporary water stops and terminations are 100% watertight and impermeable condition.

F. If any weather related moisture or the result of moisture caused by the condensation of water vapor are allowed to enter into the newly-completed Roofing System, the affected roof area(s) shall be removed and replaced at the contractor's expense.

3.07 QUALITY CONTROL – PERFORMANCE OF INSTALLATION

A. Roofing Contractor to assign a qualified, full, non-working Quality Control Supervisor to be on Project site at all times during installation of Work. This supervisor is to have good communication skills and be able to communicate with the Owner Representative and with Contractor's Employees.

B. Roofing Contractor to assign a qualified, full, non-working Quality Control Supervisor to inspect all installed Work, particularly roofing tie-ins, at the end of each working day, and as otherwise required ensuring water-tightness. Inspection to be verified by signature on the Contractor's Quality Assurance Form signifying installation is in accordance with specified requirements for "that" day of installation.

3.08 CLEANING

A. Contractor will be responsible for all cleaning of occupied or work areas when soiled or polluted by Work or operations of the roofing project.

END OF SECTION 07 5900

SECTION 07 6000 - SHEET METAL FLASHING AND TRIM

PART 1 GENERAL

1.01 SUMMARY

A. Section Includes:
   1. Flashings and counterflashings, gutters and downspouts, metal coping, metal edge and fabricated sheet metal items.
   2. Splash pads
   3. Sheet metal accessories

B. Related Documents: The Contract Documents apply to the Work of this Section. Additional requirements and information necessary to complete the Work of this Section may be found in other Documents.

1.02 RELTATED SECTIONS

A. Section 06 1000 - Carpentry (for Roofing): Wood blocking, nailers, and grounds.

B. Section 07 5400 - Membrane Roofing.

C. Section 07 5900 - Preparation for Re-Roofing Removal procedures for existing materials.

D. Section 07 9000 - Joint Sealers (for Roofing).

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
   2. A653 - Steel Sheet, Zinc Coated, (galvanized) by the Hot-Dip process, Structural (Physical) Quality Property.
   3. A924 - Steel Sheet, Zinc Coated, (galvanized) by the Hot-Dip process.

B. Federal Specifications (FS):
   1. FS TT-C-494 - Coating Compound, Bituminous, Solvent Type, Acid Resistant.
   2. Q-F-506 - Flux, Soldering, Paste and liquid.
   3. QQ0L-201F - Lead Sheet.
   4. QQ-S-571 - Solder, Tin Alloy

C. National Roofing Contractors Association (NRCA): Roofing and Waterproofing Manual.

D. Sheet Metal and Air Conditioning Contractor's National Association (SMACNA): Architectural Sheet Metal Manual.

1.04 SYSTEM DESCRIPTION

A. Work of this Section is to physically protect membrane roofing, base flashings, and expansion joints from damage that would permit leakage to building interior.

1.05 SUBMITTALS

A. Submittal Procedures: Procedures for submittals.
   1. Product Data: Provide data on prefabricated components.
   2. Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
   3. Samples: Provide full sized sample of metal flashing illustrating typical seam, external corner, internal corner, material, and finish.
   4. Submit color chart or physical samples for selection of prefinished metal color by the Owner.

5. Assurance/Control Submittals:
   a. Certificates: Manufacturer's certificate that Products meet or exceed specified requirements.
   b. Qualification Documentation: Submit documentation of experience indicating compliance with specified qualification requirements.

1.06 QUALITY ASSURANCE

A. Standards: Comply with latest edition of standards specified in this section and as referenced below:
   1. ANSI/SPRI ES -1
   2. Architectural Sheet Metal Manual, Sheet Metal and Air Conditioning Contractors
   3. The NRCA Roofing and Waterproofing Manual, Latest Edition - National Roofing Contractors Association
   4. Published installation from manufacturers of selected products.
   5. Annual Book of ASTM Standard, Latest Edition - ASTM International

B. Qualifications:
   1. Fabricator: Company specializing in manufacturing Products specified with minimum 3 years documented experience.
   2. Installer: Company specializing in performing the Work of this Section with minimum 3 years documented experience. Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Product Requirements: Transport, handle, store, and protect Products

B. Stack material to prevent twisting, bending, and abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.

C. Prevent contact with materials during storage and installation that may cause discoloration, staining, or damage.

1.08 WARRANTY

A. All new materials and workmanship provided under this section of the specifications shall be guaranteed in writing by the Contractor to maintain all sheet metal flashing in a watertight condition without cost to the Owner for a period of five (5) years after date of substantial completion.

PART 2 PRODUCTS

2.01 MATERIALS

ALL SHEET METAL ON ENERGY MANAGEMENT TO BE STAINLESS STEEL AS INDICATED BELOW.

A. **Stainless Steel: ASTM A 167, Type 302/304, soft temper, 24-gauge minimum, No. 2B finish**

B. Aluminum Sheet: ASTM B209, 3004 alloy, 0.040 inch thick.

C. Lead: FS QQ-L-201F, 4-lb/sq ft and 2-1/2-lb/sq ft.

D. Copper: ASTM B 370, cold rolled temper, commercially pure alloy 110; minimum 16 ounces per foot.

E. Where sheet metal is required and material or gauge is indicated on the drawings, provide the highest quality and gauge commensurate with the referenced standards.

F. Contractor shall use gauges or thickness listed in the referenced standards for specific girths.

G. Continuous clip shall be fabricated with material one gauge heavier than connecting.

2.02 COMPONENTS

A. Counter and Slip Flashings, Base and Cover Plates, End Caps, Joint Fasteners, and Gravel Stop: Profiled as indicated and to suit existing conditions.

B. Downspouts: Rectangular profile; fabricated from Pre-Finished Galvanized Steel.

C. Counter and Slip Flashings, Base and Cover Plates, End Caps, Joint Fasteners, and Gravel Stops, Scupper Sleeves and Boxes: Profiled as indicated and to suit existing conditions.

D. End Caps, Downspout Outlets, Gutter and Downspout Support Brackets and Straps, Joint Fasteners, Gutters, Downspout Strainers, Downspout Header, and Scupper Boxes: Profiled to suit gutters and downspouts.

2.03 FASTENERS

A. Manufacturers:
1. Construction Fasteners, Inc.
2. Hilti
3. OMG
4. Powers
5. Simplex

B. Fasteners and Anchorage Devices: Comply with SMACNA requirements, unless otherwise indicated.
1. Appropriate for purpose intended, approved by Factory Mutual where required.
2. Rust-resistant and compatible with materials to be joined.
    a. Ferrous Metals: Stainless steel, finish of exposed fasteners same as flashing metal.
    b. Rivets: Stainless steel (rivet and mandrel), Series 44.
3. Length: As required for thickness of material to penetrate substrate ½-inch minimum.
4. Exposed Fasteners: Provide metal-jacketed neoprene washers, jacket color to match pre-finished sheet metal.

C. Mechanical Fasteners for Sheet Metal to Substrate Anchorage:
1. Masonry: One-step, screw-type drive anchor (nailing); heat-treated, stress relieved, stainless steel pin; zinc jacketed; sized for intended application; minimum 1-1/4-inch length x ¼-inch diameter; Hammer-Screw® manufactured by Powers Fasteners, Inc.
2. Wood Blocking: Hexagonal head screws, stainless steel, with neoprene rubber washers with jacket color to match pre-finished sheet metal.
3. Concrete: Same as masonry or other power actuated fasteners, suitable for application.

D. Roofing Nails: Hot-dipped galvanized or non-ferrous type, with annular rings, size as required to suit application, minimum 11-gauge with 3/8-inch diameter head.

E. Mechanical Fasteners for Sheet Metal to Metal Fabrications (Support Framing) Anchorage: Appropriate for purpose intended, size as required to suit application and achieve positive anchorage to substrate material.

2.04 ACCESSORIES

A. Solder: FS QQ-S-571, 50/50 type.

B. Flux: FS O-F-506.

C. Metal Primer: Zinc-rich, or Zinc Chromate, compatible with metal and substrate material.

D. Reglets/Receivers: Surface mounted or recessed pre-finished steel, face and ends covered with plastic tape.

E. Downspout Supports: Brackets; Pre-Finished Stainless-Steel.

F. Sealant: As specified in Section 07900. Urethane.
1. Metal Contact: Type I.

2. Pitch Pan Filler: Type II.

F. Vent Pipe, Piping, and Electrical Conduit Flashings: Preformed membrane pipe flashings, minimum height above roof: 8 inches.

G. Roof Drain Flashings: Membrane flashing extended minimum 36-inches beyond drain bowl in all directions.

H. Aluminum Tape: Pressure sensitive aluminum tape, approved by membrane manufacturer.

2.05 FABRICATION

A. General: Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.
1. Fabricate sheet metal flashing and trim in 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 without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. Form all sheet metal sections and components (except corners) in longest practical length up to 10-feet maximum, true to shape, accurate in size, square, and free from distortion or defects detrimental to appearance or performance.

C. Fabricate continuous cleats and starter strips of same material as sheet, interlocking with sheet.

D. Form pieces in longest possible lengths.

E. Hem exposed edges on underside ½-inch, miter and seam corners.

F. Form all sheet metal material to provide watertight joints. Form material with flat lock seams, except where otherwise indicated. At moving joints, use sealed lapped, bayonet-type or interlocking hooked seams.
1. Unprotected Horizontal Surface (expansion joint covers, etc.) Standing seam or drive cleat joints.
2. Vertical Surfaces (copings, cap flashings, etc.): Flat lock or cover and backer plate seams.

G. Fabricate corners on all sheet metal components (copings, cap flashings, etc.) to form one piece with minimum 18-inch and maximum 36-inch long legs.

H. Prefabricate all sheet metal accessory components (pitch pans, utility sleeves, umbrellas, etc.) as much as practical.

I. Gutter and Downspouts: Form in sections from minimum Stainless-Steel 24-gage sheet metal with all required special pieces and accessories. Owner's Representative shall select gutter and downspout color from manufacturer's standard color. Gutter and downspouts shall be form to the profiles and sizes accord to SMACNA requirements.

J. Fabricate downspout accessories; solder watertight.

K. Miter all sheet metals corners and solder, weld, tape, or fasten and seal all joints watertight:
1. Cover joints with 2-inch wide aluminum tape and heat weld 4-inch wide Membrane over aluminum tape.
2. Pre-finished Galvanized Steel: Apply minimum ¼-inch bead of sealant between connecting metal flanges and drill and fasten with rivets at 2-inches on center.
3. Unfinished Galvanized Steel: Solder joints watertight.
   a. After soldering, remove flux. Wipe and wash solder joints clean.
4. Install sealant so it will not be visible on outside of joints.

L. Fabricate elements complete with required connection pieces.

M. Fabricate all components with allowance for expansion at joints. Provide enlarged or oval holes at all piercing fasteners.

N. Fabricate all components, i.e. coping cap, with horizontal (flat) surfaces with built-in slope for drainage toward roof unless indicated otherwise.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of Conditions: Verify that field measurements, surfaces, substrates and conditions are as required, and ready to receive Work.
   1. Verify roof openings, curbs, pipes, sleeves, ducts, and vents through roof are solidly set, reglets in place, and nailing strips located.
   2. Verify roofing termination and base flashings are in place, sealed, and secure.

B. Report in writing to Owner's Representative prevailing conditions that will adversely affect satisfactory execution of the Work of this Section. Do not proceed with Work until unsatisfactory conditions have been corrected.

C. By beginning Work, Contractor accepts conditions and assumes responsibility for correcting unsuitable conditions encountered at no additional cost to the Owner.

3.02 PREPARATION

A. Field measure site conditions prior to fabricating Work. Contractor shall be responsible for all dimensions for all sheet metal applications and installations.

B. Apply manufacturer's approved protective backing paint, to a minimum dry film thickness of 15-mil, on surfaces in contact with dissimilar materials.

3.03 INSTALLATION - VARIOUS SHEET METAL COMPOTENTS

A. Install starter and edge strips, and cleats before starting installation.

B. Install reglets and / or receivers on vertical surfaces to receive counterflashings.
   1. Sawcut new reglets where required.
      a. Install receiver component and anchor with lead wedges at 12-inches on center.
      b. Provide bayonet style lap joints, minimum 4-inch overlap.
      c. Fill voids between wedges with backer rod.
      d. Seal receiver to vertical face of wall.
   2. Install surface mounted reglets true to lines and levels.
      a. Fasten to substrate with neoprene head screws at 12-inhes on center maximum.
      b. Seal top of reglets with sealant.

C. Insert flashings into reglets or receivers to form tight fit. Apply ¼-inch bead of sealant and lap sheet metal minimum 4-inches.
   1. Reglets: Secure in place with plastic wedges at maximum 6-inches on center.
   2. Receivers: Secure in place with neoprene head screws at maximum 12-inches on center.
   3. Seal flashings into reglets with sealant.

D. Secure flashings in place using concealed fasteners. Use exposed fasteners only in locations approved by Owner's Representative.

E. Metal coping shall be secured to the parapet with a continuous metal cleat. The 22 gauge metal cleat shall be secured with appropriate concrete fastener, spaced 12 inches on center, to both sides of the parapet wall.

F. Fit flashings tight in place. Make corners square surfaces true and straight in planes and lines accurate to profiles.

G. Provide minimum 6-inch wide backer and corner plates at copings. Fit to ensure complete and permanent watertight seal of joints.
   1. Apply ¼-inch bead of sealant between each layer of metal at each edge.
   2. Corner and Backer Plates: Secure with the Backer Plates by using appropriate fasteners and securing to the parapet wall.
   3. Cover Plates: Hook front or exposed face of cover plate over drip edge; and enclosing or clamping interior seam to the metal coping drip edge.
   4. Do not use mastic between sheet metal components.

H. Where indicated in project drawings, provide pre manufactured perimeter metal edging. Fabricate the metal edge to match existing metal edge configuration. The perimeter metal joints are to have ¼ inch spacing; to have a 2-inch wide aluminum tape apply over the joint.

I. Provide stainless steel metal scuppers at all roof scuppers. Contractor to verify scupper dimension prior to fabrication of the metal scuppers.

J. Lock and seal all sheet metal joints watertight.

K. Install pre-fabricated vent pipe flashing.

L. Install membrane flashings at all roof drains.

M. Provide Stainless Steel Rain Hoods and Umbrellas at all hot stacks, hot pipe penetrations, and at insulated pipe penetrations.

N. **Pitch pans are not desired**. Construct pitch pans from metal. Install only where specifically indicated or approved by Owner's Representative. Provide flanged umbrellas at all pitch pans.
   1. Fill with non-shrink grout to 1-inch from top of flange.
   2. Top with 2 part Pitch Pan Filler .

O. Protect all membrane penetrations as indicated and as recommended in SMACNA and NRCA manuals.

3.04 SCHEDULE - MATERIALS

A. Exposed to View Components:
   1. Through Wall Scuppers
   2. Scupper Face Plate: Polished Stainless-steel.
   3. Metal Coping and associated components: Stainless-Steel.
   4. Perimeter Metal Edge: Stainless-Steel.
   5. Wrap downspout straps and other heavy gauge materials with Stainless-Steel.

B. Concealed Components, (Counterflashings, Etc.): 24gage Stainless-Steel.

C. Drip Pans Accessories: Stainless steel

D. Rain Hoods and Umbrellas: Stainless steel.

3.05 SCHEDULE - MINIMUM STEEL THICKNESS

A. Stainless Steel: ASTM A 167, Type 302/304, soft temper, 24-gauge minimum, No. 2B finish

B. Perimeter Metal Fascia: ASTM A 653, Grade A, G90, 24 gauge minimum core steel.

C. Rain Hoods and Umbrellas: Stainless Steel 24-gauge.

D. Hook Cleats: 22-gauge.

3.06 TESTING AND ADJUSTING

A. Test all modified, relocated, and new systems and equipment.

B. Correct all deficiencies identified, including replacement of parts and components when required.

C. Adjust all Products and equipment to ensure proper operation and function.

3.07 CLEANING

A. Clean work.

B. Clean Owner occupied areas when soiled by Work or operations of this Division.

END OF SECTION 07 6000

SECTION 07 7000 - NON-PENETRATING, ROOFTOP PIPE AND DUCT SUPPORTS

PART 1: GENERAL

1.01 SECTION INCLUDES

A. Rooftop pipe supports for small pipes or conduits.

B. Rooftop duct work supports for small ducts.

1.02 RELATED SECTIONS

A. Division 7 – Membrane Roofing

1.03 SYSTEM DESCRIPTION

A. System design to support rooftop pipes and or duct work with an engineered prefabricated supports designed for installation without roof penetrations or other features to damage the single ply roof system.

1.04 SUBMITTALS

A. Provide specification and data sheet.

B. Shop Drawings: Show installation layout including sizes and spacing.

C. Verification Samples: Actual samples of each size of support.

1.05 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to project site in manufacturer's original packaging, marked with manufacturer's name, product model names and catalog numbers, identification numbers and other related information.

B. Store materials under cover until needed.

PART 2: PRODUCTS

2.01 MANUFACTURER

A. Acceptable Manufacturer:
   1. Micro Industries, Inc., 844 South 430 West, Suite 100, Heber City, UT. 800-768-6978.
   2. MAPA Products, 103 W CJ Wise Parkway, Naples, Texas. 877-897-2371
   3. Owner Approved Equal

2.02 MATERIALS

A. Pipe Support shall have the following characteristics:
   1. Capable of supporting gas piping and electrical conduit up to a diameter size of 4 inches.

B. Duct Support shall have the following characteristics:
   1. Capable of supporting square or round duct work.

C. Pipe Support Acceptable Products:
   1. Micro Industries, Inc. Model No. 3-RAH-7
   2. MAPA product number – MS-3RA7.

D. Duct Support Acceptable Products:
   1. Micro Industries, Inc. Model No. 10-DS

PART 3: EXECUTION

3.01 PREPARATION

A. The contractor will confirm the correct size supports have been chosen for the size of pipe and or duct work to support.

3.02 INSTALLATION

A. Install the pipe and or duct supports in accordance to manufacturer's recommendations.

B. Pipe Supports shall be installed at all locations where existing piping or electrical conduit runs across the roof area that are presently mounted on wood blocking.

C. Contact roof system manufacturer as to requirements of separator sheet between pipe and or duct support and the installed roof system. Dead wood blocking shall be installed within the roofing system when weight of the supports exceeds recommend weight loads of the specified polyisocyanurate insulation.

D. Consult roofing manufacturer on proper installation and requirements for "dead" wood sleepers.

E. Pipe Support placement recommendations.
   1. The following are to be used as minimum recommendations. For specific requirements, the installer should consult a structural engineer.
   2. For pipe diameters of 1 ½" to 5"– space supports at a maximum distance of 8' apart.
   3. For pipe diameters less than 1 ½" – space supports at a maximum distance of 10' apart.
   4. Along with the above noted spacing recommendations, one additional support should be placed at every union and source and along with one at side of junctions.

F. Duct Support placement recommendations.
   1. The following are to be used as minimum recommendations. For specific requirements, the installer should consult a structural engineer.
   2. Manufacturer's recommended spacing is not to exceed 8' centers depending upon the load. Do not exceed load weight and make certain each duct support is adjusted in height to even load on all duct supports. Support spacing is not to exceed the maximum spacing required in the duct specifications where applicable.

END OF SECTION 07 7000